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RG-211

Surface Water Treatment Plant Requirements for Monthly Reporting and Public Notification

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Abbreviations

ACC	alternative compliance criteria
BW	backwash
BWN	Boil Water Notice
C	concentration
CA	corrective action
CAP	corrective action plan
CDA	calculated dose approach
CF	correction factor
CFE	combined filter effluent
CIP	clean-in-place
CLA	chloramine
CLO ₂	chlorine dioxide
COD	certificate of delivery
CPE	Comprehensive Performance Evaluation
CT	concentration time
DBP	disinfection byproduct
DIT	direct integrity test
DPD	N,N diethyl-1,4 phenylenediamine sulfate
DWW	Drinking Water Watch
EPA	Environmental Protection Agency
FAR	Filter Assessment Report
FCL	free chlorine
FPR	Filter Profile Report
GAC	granulated activated carbon
gfd	gallons per square foot per day
gpd	gallons per day
gpm	gallons per minute
GUI	groundwater under the direct influence of surface water
HAA5	haloacetic acids
ID	identification
IFE	individual filter effluent
IIT	indirect integrity test
ISA	intensity setpoint approach
LAS	liquid ammonium sulfate
L/D	length to depth
LOH	loss of head
LOHG	loss of head gauge
LRC	log removal credit
LT2	Long Term 2 Enhanced Surface Water Treatment Rule
MBT	marker-based test
MCL	maximum contaminant level
mCPE	Mandatory Comprehensive Performance Evaluation
MD	missing data
MDL	minimum detection limit
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter

MOR	monthly operating report
mNTU	milli-nephelometric turbidity unit
M/R	monitoring or reporting
ND	no data
NA	not applicable
NIST	National Institute of Standards and Testing
NTU	nephelometric turbidity unit
O ₃	ozone
PBT	pressure-based test
pH	potential of hydrogen
PN	public notification
PODR	point of diminishing returns
psi	pounds per square inch
PWS	public water system
QBT	flow-based test
RAA	running annual average
RG	regulatory guidance
RO	reverse osmosis
ROFC	rate-of-flow controller
SCADA	Supervision Control and Data Acquisition
SD	standard deviation
SDWA	Safe Drinking Water Act
SOP	standard operating procedure
SUVA	specific ultraviolet light absorbance
SWTP	surface water treatment plant
SWTR	Surface Water Treatment Rule
SWMOR	Surface Water Monitoring Operation Report
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TMP	transmembrane pressure
TNTC	too numerous to count
TOC	total organic carbon
TTHM	total trihalomethanes
UC	uniformity coefficient
UCL	upper control limit
UV	ultraviolet
UVT	ultraviolet transmittance

Overview

This guidance is for public water systems (PWSs) that treat surface water or groundwater under the direct influence of surface water. To comply with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule), surface water treatment plant (SWTP) personnel must collect daily performance and operational data and submit monthly reports for regulatory review. This guidance explains the steps SWTPs must take to comply with monthly reporting requirements, depending on the type of technology employed.

In addition to monthly reporting, SWTP personnel must investigate performance issues, conduct special studies, and do extra reporting if they do not comply with certain rule requirements. These extra requirements are also explained in this guidance, including the requirements for public notification (PN), when applicable. The appendices include additional resources and background information related to the forms and monitoring requirements.

A list of abbreviations is provided at the front of the document for quick reference. The glossary at the end provides a comprehensive list of specialized terms with their definitions.

Rules Associated with this Guidance

The State of Texas has primacy over the regulation of public drinking water. In this capacity, TCEQ writes, adopts, and enforces Texas rules that are at least as stringent as the drinking water rules promulgated by EPA.

The primary rules governing SWTP monitoring, reporting, and compliance are contained in the following sections of Title 30, Texas Administrative Code (30 TAC) Chapter 290, Subchapter F:

- 290.110: Disinfectant Residuals
- 290.111: Surface Water Treatment
- 290.112: Total Organic Carbon
- 290.119: Analytical Procedures
- 290.122: Public Notification

SWTPs personnel should also be aware of and comply with additional rules pertaining to drinking water. Examples include:

- 30 TAC Chapter 25: Environmental Testing Laboratory Accreditation and Certification
- 30 TAC Chapter 30: Occupational Licenses and Registrations
- 30 TAC Chapter 290, Subchapter D: Rules and Regulations for Public Water Systems
- 30 TAC Chapter 290, Subchapter H: Rules and Regulations for Community Public Water Systems related to Consumer Confidence Reports

- 30 TAC Chapter 291: Utility Regulations

You can view the official, online versions of the [rules](#)¹ on the Secretary of State website. This guidance is not a substitute for the rules. It is the responsibility of each SWTP to ensure its operations comply with applicable rules and regulations. If there appears to be a discrepancy between this guidance and the rules, then follow the rules.

Additional Reporting Requirements

SWTPs are responsible for additional reports other than that described in this document. If applicable, these reports include, but are not limited to the following:

- Chlorine Dioxide MOR (TCEQ Form 00690)
- Bromate monitoring data (i.e., laboratory test reports)
- Texas Optimization Program MOR (TCEQ Form 10493)
- Recycling Practices Report (TCEQ Form 20100)

TCEQ Contact Information

For questions about rules, additional reporting requirements, or this guidance in general, call 512-239-4691 and ask for a Surface Water Treatment Rule (SWTR) Coordinator. You can also contact a SWTR Coordinator by emailing SWTR@tceq.texas.gov.

TCEQ Publications

To locate TCEQ publications, visit the [publications webpage](#)². Publications personnel can also help find documents. Contact them in one of the following ways:

- Email order to puborder@tceq.texas.gov
- Call 512-239-0028

We and You in This Guidance

“We” and “us” in this guidance refer to TCEQ. “You” refers to the individuals associated with a SWTP who do the work described in this guidance. This includes but is not limited to individuals who monitor and collect data, enter the data into forms, and sign report(s).

¹ www.tceq.texas.gov/goto/drinkingwater-rules

² www.tceq.texas.gov/publications

1. Introduction

1.1 Reporting Forms

The SWTR requires that all SWTPs complete and submit a surface water monthly operating report (MOR) each month; and, if necessary, additional reports based on individual filter effluent (IFE) or combined filter effluent (CFE) results. Prior to 2022, three Microsoft Excel surface water monthly operating reports (SWMORs), with versions for plants that produce less than 10,000 gallons per day (gpd) were available:

- SWMOR (TCEQ-00102C) for conventional SWTPs that use gravity media filtration with no innovative or alternative treatment.
- SWMOR-Alt (TCEQ-00102D) for SWTPs that use unconventional filters or another type of alternative treatment technology.
- SWMOR2 (TCEQ-00103) SWTPs with only two filters that use conventional treatment with no innovative or alternative technology.

One combined SWMOR (TCEQ-00105), referred to as ‘SWMOR’ in this guidance, was developed to simplify the reporting process for SWTPs. The combined SWMOR is customized based on the treatment technologies, additional LT2 Rule requirements, and corrective action requirements for the SWTP. Once customization of the form is completed, all necessary worksheets will be automatically generated.

The combined SWMOR and additional reporting forms, if required, are summarized in Table 1.1. If you have questions regarding the forms, contact a SWTR Coordinator.

Table 1.1. Reporting Forms and When they Apply

Form	Form Number	Application
SWMOR	00105	SWTPs that use gravity media filtration. SWTPs that use gravity media filtration with <i>only</i> two filters. SWTPs that use unconventional filters or another type of alternative treatment technology.
Filter Profile Report (FPR)	10276	SWTPs that have one or more filters which produce filtered water with elevated turbidity levels above 1.05 NTU.
Filter Assessment Report (FAR)	10277	SWTPs that have three or more turbidity exceedance events within any consecutive three-month period.
CPE Request Form	10278	SWTPs that produce filtered water with turbidity levels above 2.0 NTU during two consecutive months.

PN forms are not listed in Table 1.1. If PN is applicable, additional forms are required (see Chapter 11).

Note: The reporting forms described in this guidance involve Microsoft® Excel 2016 spreadsheets of intermediate to high complexity. Users may need training or experience with Excel spreadsheet applications before trying to use the features described in this guide. This document does not replace the training or experience needed to successfully use the forms.

Accessing Report Forms and Version Information

The combined SWMOR discussed in this guidance along with instructions and worksheets for filling out the form are found on TCEQ's [SWMOR webpage](#)³.

Stay up to date with the latest versions of excel to ensure compatibility with the SWMOR form.

Periodically, TCEQ adopts updated software versions. These updates can affect the functionality of forms, especially complex ones like the combined SWMOR. We will keep you informed of these changes when they occur, and what impact they have on reporting.

1.2 Organization of this Guidance

The chapters are organized by the steps to customize, complete, and submit your MOR; and comply with related requirements, including PN. The steps are listed in Table 1.2 with a cross reference to the chapter that explains each step.

Additional information for customizing, completing, and submitting the SWMOR for plants that use alternative treatment technologies or two-filter plants is contained in Chapters 5 and 6, respectively.

Table 1.2. Steps for Completing and Submitting an SWMOR

Step	Description	Chapter
1	Customizing an SWMOR workbook	2
2	Entering data in an SWMOR workbook	3
3	Compiling summary data and summary pages	4
4	Additional Information for alternate treatment technology and two-filter plants	5, 6
5	Completing FPRs, if required	7
6	Completing FARs, if required	8
7	Completing CPE Requests, if required	9
8	Printing, signing, and submitting an MOR	10
9	Issuing PN, if required	11

1.3 Electronic Form Features

The SWMOR and other report forms described in this guidance have electronic features which speed reporting, improve security, and reduce reporting errors. These features perform the following functions:

- Limit the types of values you can report
- Perform calculations automatically
- Ensure reports are filled out completely

³ www.tceq.texas.gov/goto/swmor-forms

The forms also contain features that prevent you from accidentally overwriting data from a previous month, helping you comply with record retention requirements. (See Section 1.4.)

Workbook and Worksheets

The SWMOR form described in this guidance is referred to as a workbook. The workbook includes numerous spreadsheets called worksheets which are used to report specific information about plant performance and operation. The tabs at the bottom of the workbook screen identify the worksheets. Tabs are visible based on the specific technology employed at your plant and how you tailor your workbook. Clicking on a tab changes it from gray to white and opens the worksheet. Figure 1.1 shows the worksheet tabs that will be present for conventional SWTPs. Figure 1.2 shows tabs that might be present based on the alternative treatment that is selected when customizing the workbook. Figure 1.3 shows the tabs that will be present if the workbook is customized for a two-filter plant.



Figure 1.1. Worksheet Tabs for Conventional SWTPs

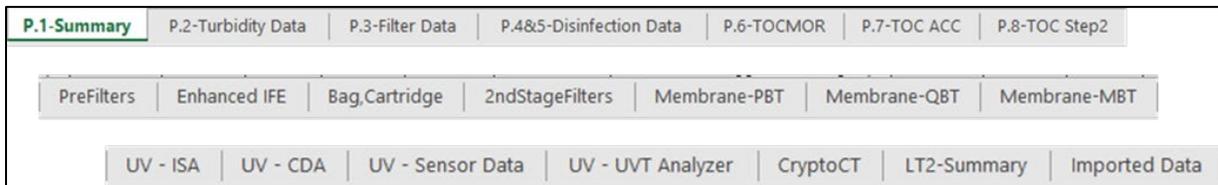


Figure 1.2. Worksheet Tabs for Plants with Alternative Treatment Technologies

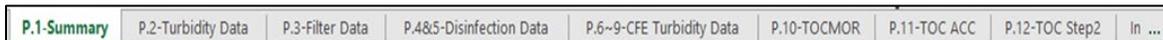


Figure 1.3. Worksheet Tabs for 2-Filter Plants

Worksheet Contents

Table 1.3 summarizes the worksheets for the SWMOR workbook. Becoming familiar with the names and contents of each worksheet will help you customize and enter data.

Table 1.3. Worksheet Titles and Contents

Worksheet Title(s)	Worksheet Contents	Conventional Plants	2-Filter Plants	Plants with Alternative Treatment
P.1-Summary	Compilation of monthly data summaries. Includes a Summary Page Addendum informing the user of triggered violations and PN requirements	√	√	√
P.2-Turbidity Data	Raw and settled water turbidity data, 4-hr CFE turbidity data, and minimum disinfectant residual data entering the distribution system	√	√	√
P.3-Filter Data	IFE turbidity data for conventional filters such as pressure filters or gravity filters that use a filter media like sand, anthracite, or garnet	√	√	√
P.4&5-Disinfection Data	CT calculation data for reporting virus and <i>Giardia</i> inactivation ratios	√	√	√
P.6-TOCMOR	TOCMOR Page 1 TOC Removal	√	√	√
P.7-TOC ACC	TOCMOR Page 2 alternative compliance criteria	√	√	√
P.8-TOC Step 2	TOCMOR Page 3 Step 2 Jar Test Report Form	√	√	√
P. 6-9 CFE Turbidity Data	CFE turbidity data		√	
Imported data	SCADA data to import into the MOR workbook, if applicable	√	√	√
PreFilters	Data for plants that use prefilters to receive <i>Cryptosporidium</i> removal credit			√
Enhanced IFE	Data for plants that use enhanced IFE reporting			√
Bag, Cartridge	Data for plants that use bag or cartridge filter			√
2ndStageFilters	Data for plants that use two-stage filtration with conventional filters			√
Membrane-PBT	Data for membrane filter plants that measure the pressure decay rate during a DIT			√
Membrane-QBT	Data for membrane filter plants that measure the air flow rate during a DIT			√
Membrane-MBT	Data for membrane filter plants that use marker or tracer tracking for direct integrity testing			√
UV - ISA	Data for plants that use UV disinfection with the ISA reactor			√
UV - CDA	Data for plants that use UV disinfection with the CDA reactor			√
UV - Sensor Data	Sensor calibration data for plants with UV disinfection that use either the ISA or CDA			√
UV - UVT Analyzer	Benchtop analyzer calibration data for plants that use calculated dose reactors to provide UV disinfection			√
CryptoCT	<i>Cryptosporidium</i> inactivation calculations using chemical disinfectants, related to P.4&5, which contain similar information for <i>Giardia</i> and virus inactivation			√
LT2- Summary	Identifies the treatment technologies used for <i>Cryptosporidium</i> inactivation data for compliance with LT2 requirements			√

Custom Toolbar

The SWMOR workbook has a customized toolbar. This toolbar appears when you open the workbook and remains active until you close it. This toolbar, shown in Figure 1.4, includes two special command buttons; Save As Excel 2016 and Paste Values.

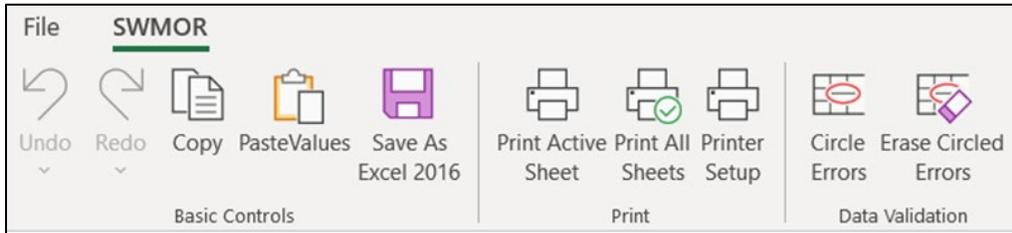


Figure 1.4. Custom Toolbar

Select [Save As Excel 2016] to avoid accidentally overwriting data from a previous month by requiring you to confirm the proposed filename each time you save a file. It also helps establish a standardized file structure based on the year, month, and treatment facility where the data was collected.

Select [Paste Values] to avoid accidentally damaging the worksheets by only pasting values, and not formulas, when you cut and paste data.

Data Validation

The tool bar has a feature that automatically draws a red circle around empty cells that cannot be left blank, or data that does not meet the validation requirements. Figure 1.4 shows these data validation options on the right side of the Toolbar.

The first button puts red circles around all cells that either need data entered or have errors. It does not circle cells you have already filled in correctly. The second button erases the circles, so it is easier for you to enter the required information.

Electronic Comments and Instructions

Since the workbook is an electronic file, we have been able to add comments and instructions directly in the associated cells. Once you learn how to use the workbook, these data entry prompts will reduce or eliminate your need for this guidance.

Each cell with a comment or instruction has a little red triangle in the upper right corner. To see the comment, move the cursor over the cell, and it will appear, as shown in Figure 1.6.

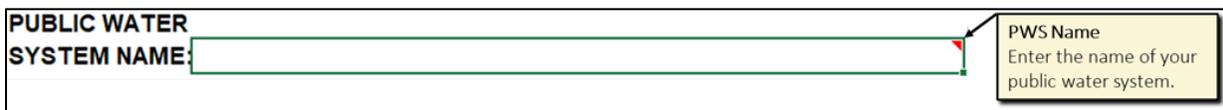


Figure 1.5. Example of a Data Entry Prompt

Drop-down Lists

Some cells have a drop-down list that provides the options for that cell. The cells with drop-down lists appear when you move your cursor over them. A small downward-pointing arrow appears when you click in the cell. Click on the arrow to view the list.

For example, the drop-down list associated with the **Month** cell of the **P.2 Turbidity Data** worksheet is shown in Figure 1.7.

In this example you would move your cursor over the month you want to select and click your left mouse button. The month you selected will appear in the cell.



Figure 1.6. Example of Drop-down List

Special Fonts and Symbols

The special fonts and symbols, shown and described in Table 1.4, are used throughout this guidance to focus your attention on certain instructions.

Table 1.4. Special Fonts and Symbols Used in this Document

Symbol	Meaning
CALC	Denotes a cell where you cannot enter data, because there is a formula that automatically reports a value.
[]	Denotes an area in either a message box, a dialog box, or a drop-down list where you need to select a preset option.
{ } and ()	Regular brackets denote where you need to enter information or data, rather than select from a list of preset options. The parentheses, as used in this case, denote the unit in which the data must be reported. Example: Enter the {Flow (in MGD)} of raw water pumped.
Name or Area of a worksheet	Words typed in Arial font and bolded denote the name of a worksheet or an area on a worksheet, like a dialog box, table, cell, area, or section. Example: Plant Parameters dialog box.
Text Box	Contains important information critical to the successful implementation of this guidance. This includes information directly related to compliance violations if the instructions contained in the guidance are not properly executed.
Note	Contains ancillary information which is as important but not as critical to the successful completion of the forms as the information contained in text boxes.

Protected Cells

Some worksheet cells are protected so they can't be altered. You cannot type in a protected cell. For example, if you only have two filters, and you try to enter data for Filter 3, the worksheet won't let you because the cell is protected. Another example of a protected cell is one containing a formula for automatic calculations. When you click on a protected cell, the warning screen, shown in Figure 1.8 will appear. When you select OK, the box disappears.

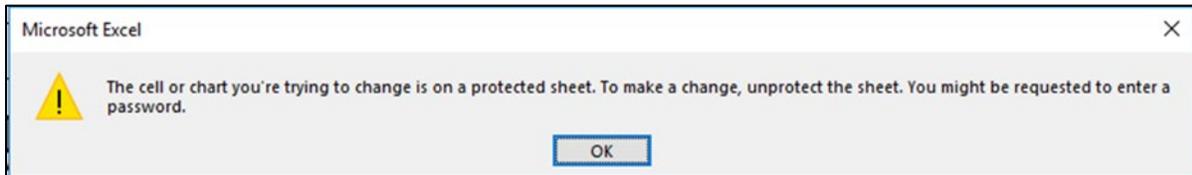


Figure 1.7. Protected Cell Warning

Macros

Macros are programs that automatically perform specific tasks when you open a file. There are multiple macros in the worksheet that do things like circle empty cells that should contain data. Macros can take time to run. Be patient and do not click buttons or type while you are waiting for a macro to run.

1.4 Reports and Records

You are required to keep copies of your MORs, as well as other records and reports according to specified time periods defined in 30 TAC Chapter 290.46(f). Copies of PWS records and reports must be maintained in an organized manner and be available upon request. Records and reports can be stored electronically or as hard copy depending on your system's operating practices.

SWTPS must retain copies of reports and records for the following time periods, at a minimum:

Two years:

- Amounts of chemical used.
- Volume of water treated and distributed each day.
- Maintenance records for water system equipment and facilities. Systems using reverse osmosis or nanofiltration must maintain records of each CIP process including the date, duration, and procedure used for each event.

Three years:

- Notices of violation and any resulting corrective actions beginning after the last action taken.
- PNs issued.
- Disinfectant residual monitoring results from the distribution system.

- Calibration records for laboratory equipment, flow meters, rate-of-flow controllers, online turbidimeters, and online disinfectant residual analyzers.
- Raw surface water monitoring results and source water monitoring plans.
- Free and total chlorine, monochloramine, ammonia, nitrite and nitrate monitoring results if chloramines are used.
- Records of treatment effectiveness monitoring for systems using reverse osmosis or nanofiltration membranes. Treatment effectiveness monitoring includes the parameters for determining when maintenance is required.

Five years after they are no longer in effect:

- Records concerning a variance or exemption granted to the system.
- CT studies for SWTPs.
- Recycling Practices Report and other records pertaining to site-specific recycle practices, if applicable.
- Turbidity monitoring results and exception reports for individual filters.

Five years:

- Inspection results for all water storage, pressure maintenance facilities and pressure filters.

Ten years:

- MORs and supporting documentation including CFE turbidity monitoring results.
- Results of chemical analysis.

For a complete list of retention requirements, refer to the rules to ensure your retention and maintenance practices comply. If you have questions, contact a SWTR Coordinator.

1.5 Monitoring and Analysis

To ensure the water you produce is safe for drinking, you must be able to accurately monitor and analyze the operational and performance parameters described in this guidance. These parameters include all the following:

- Flow rate of raw and treated water.
- Flow rate through each disinfection zone.
- Turbidity of raw water, settled water, IFE, and CFE.
- TOC concentrations of raw water and treated water.
- Temperature, pH, and disinfectant residual in each disinfectant zone.
- Disinfectant residuals leaving the plant and in the distribution system.
- Additional parameters if you are using alternative treatment like membranes or UV disinfection.

To comply with monitoring and reporting requirements, all analyses including those taken in the field must be performed by an approved facility or laboratory. To get this approval, your testing facility or laboratory must do the following:

- Use approved test methods.
- Document and report all methods used to TCEQ on the Laboratory Approval Form.
- Properly calibrate and maintain testing instruments and equipment. (See Appendix G.)
- Maintain acceptable records.

Because accurate monitoring and analysis is so important to public health, we require a monitoring plan for your plant and distribution system. The plan must include specific information on your testing facility or laboratory, the testing methods you employ.

Because every SWTP is required to develop and submit a monitoring plan for review and approval, we have published a separate document entitled, [How to Develop a Monitoring Plan for a Public Water System](#)⁴ (RG-384).

For questions about monitoring and analysis, contact TCEQ's Laboratory Approval Coordinator at 512-239-4691. For more information on developing a monitoring plan visit [TCEQ's website](#)⁵.

⁴ www.tceq.texas.gov/goto/monitoringplan

⁵ www.tceq.texas.gov/drinkingwater/monitoring_plans

2. Customizing an SWMOR Workbook

The first time you use the SWMOR form, you will customize it by entering the data and information specific to your plant. In this chapter, we explain how to customize an SWMOR form to create your own workbook to use as a masterfile for reporting month after month. You only customize the SWMOR workbook once unless there is a change in plant operation or design.

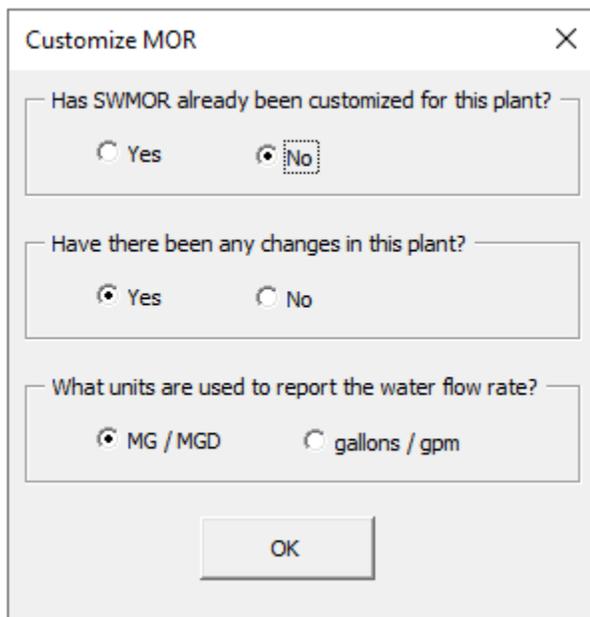
You will need the following records to customize the SWMOR workbook:

- Plant design information, or letters approving your plant design.
- CT Study approval letter. (See Appendix A.)
- Exception approval letters, if applicable.

This chapter explains how to customize an SWMOR form using the example CT Study approval letter in Appendix A. Additional guidance for completing the SWMOR for plants that use alternative treatment technologies or 2-filter plants can be found in chapters 5 and 6, respectively.

2.1 Opening Screen Security Warning

To begin customizing a SWMOR form, locate and open a blank form from our website. When you open a SWMOR form the first time, and any time thereafter, a security warning may appear to enable the macros that run the programs. If prompted, select [Enable Content] and the **Customize MOR** dialog box will appear.



Customize MOR

Has SWMOR already been customized for this plant?

Yes No

Have there been any changes in this plant?

Yes No

What units are used to report the water flow rate?

MG / MGD gallons / gpm

OK

Figure 2.1 Customize MOR Dialog Box

Select the appropriate response for the three questions in the box. If the SWMOR is already customized for the plant and there have been no changes, the form will open.

If you have not yet customized the SWMOR for the plant or if there have been changes in the plant, then the **System Information** dialog box will appear. Select the correct units used to measure your plant's flow rate for disinfection.

Note: Before beginning this step, review the Chapter 1 information about accessing a blank form on our website and using the various workbook features. Do not try to use the workbook while a macro is running. Be patient because macros take time to run.

2.2 System Information Dialog Box

The **System Information** dialog box, shown in Figure 2.2, is divided into two sections. In the **Plant Information** section, enter the following: PWS Name, Plant Name or Number, PWS ID Number (must enter 7-digit number), Plant ID Number (must enter 'NA' or a 3-7 digit number), number of connections, and system population size.

In the Report Info section, select the month and year of the period for which you are reporting using the drop-down list.

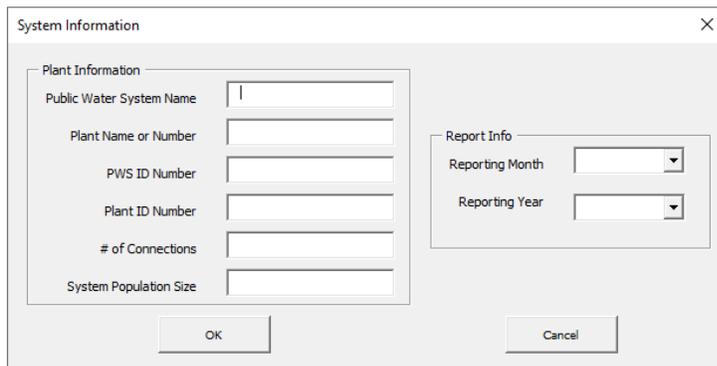


Figure 2.2. System Information Dialog Box

2.3 Plant Parameters Dialog Box

The **Plant Parameters** dialog box shown in Figure 2.3 will prompt you to enter the information needed to begin customizing a workbook. This dialog box is divided into a **Plant** section and a **Monitoring** section. For the workbook to run properly, you must complete all sections of this dialog box.

Figure 2.3. Plant Parameters Dialog Box

Plant

Number of Sedimentation Basins

Enter the {number of sedimentation basins} at your plant.

Number of Filters

Enter the {number of filters} at your plant. If you enter two filters in the **Number of Filters** cell, the workbook asks for confirmation, and the **Confirm 1 or 2 Filters with CFE Turbidimeter** dialog box shown in Figure 2.4 appears.

If you have CFE turbidimeters and do not have IFE turbidimeters on both filters, select [Yes] to continue customizing your workbook. If you do not have CFE turbidimeters and instead have IFE turbidimeters installed on both filters, select [No].

If you select Yes to this question, the structure of the form will change to account for the data. See Chapter 6 for completing the SWMOR for a 2-filter plant.

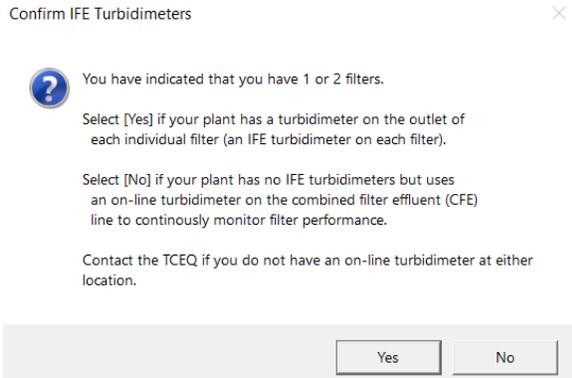


Figure 2.4. Confirm CFE Turbidimeter Dialog Box

Number of Disinfection Zones

Your CT Study approval letter describes the disinfection zones and treatment trains at your plant. The disinfection zones are numbered; for example, D1, D2, and so on. Enter the {total number of disinfection zones} specified in your letter.

Note: If your CT Study approval letter does not accurately describe your disinfection zones or if you want to change disinfection zones, you will need to submit a new CT Study for our review.

Number of Trains

After entering the number of disinfection zones, press enter on your keyboard. The **Number of Trains** cell will appear beside each of the zones identified.

For each disinfection zone, enter the {number of treatment trains} defined in your CT Study approval letter.

If there is more than one train in a zone, your CT Study approval letter identifies each train with an alphabetical letter. For example, if disinfection zone D1 contains three trains, the trains will be identified as D1A, D1B, and D1C in the **Disinfection Process Parameters** dialog box.

Monitoring

Settled Water Turbidity Is Required

We typically require plants to periodically monitor levels of settled water turbidity if we have approved an exception to our requirements for detention time design and surface overflow rate. We occasionally enforce this requirement for other reasons. For example, we may require that plants monitor settled water turbidity as part of a

mandatory CAP. If your plant does not have an exception or a mandatory CAP, we still recommend, but seldom require that you monitor settled water turbidity levels.

If you are required to monitor settled-water turbidity, select [Settled Water Turbidity Is Required]. Do not select this option if you are not required to monitor settled water turbidity, even if you routinely do so.

Once you have entered all data in the **Plant Parameters** dialog box, select [OK]. The workbook macro updates the appropriate cells on the **P.2 Turbidity Data**, **P.3 Filter Data**, and **P.4&5 Disinfection Data** worksheets. If the **Plant Parameters** dialog box already properly describes your plant, select [CANCEL] because the update can take some time.

Once the macro finishes updating worksheets, the **Disinfection Process Parameters** dialog box appears.

2.4 Disinfection Process Parameters Dialog Box

The **Disinfection Process Parameters** dialog box shown in Figure 2.5 prompts you to enter additional information needed to customize your workbook. This dialog box is divided into a **Residual Disinfectant** section and an **Approved CT Study Parameters** section. You must complete both sections or the workbook will not work properly. Most of the information for this dialog box can also be found in the CT Study approval letter.

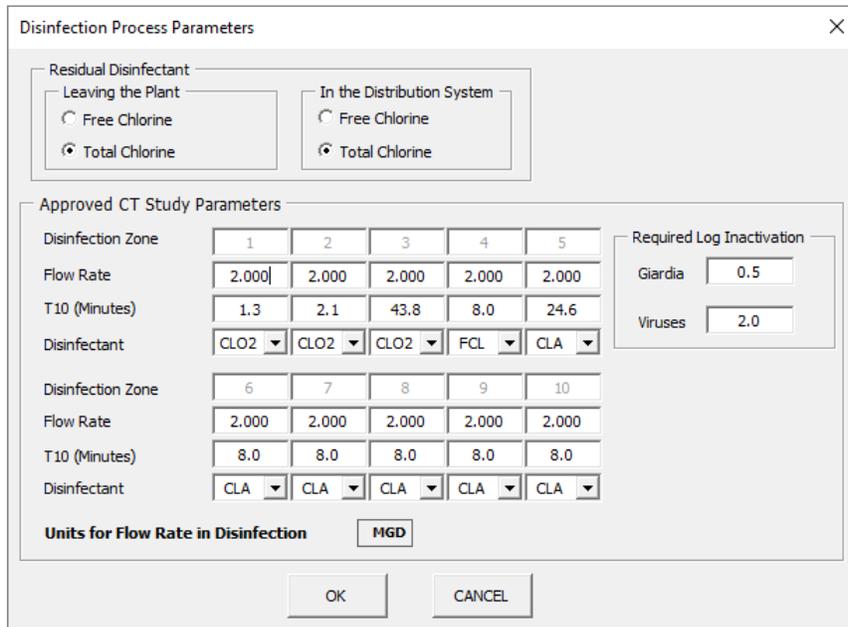


Figure 2.5. Disinfection Process Parameters Dialog Box

Residual Disinfectant

This section of the **Disinfection Process Parameters** dialog box is based on your plant's normal operating practices. This section requires information on the disinfectant residual in the water leaving the plant and in the distribution system.

Leaving the Plant

Select [Total Chlorine] if your plant normally adds ammonia at some point in the treatment process, or you purchase and redistribute chloraminated water. Select [Free Chlorine] as your default disinfectant if your plant does not add ammonia to the water before it leaves the plant.

The SWMOR workbook uses the disinfectant you select to set the default residual level you must maintain in the water leaving the plant.

In the Distribution System

Select [Total Chlorine] if your distribution system contains chloraminated water. Select [Free Chlorine] if your distribution system contains free chlorine in the water.

The SWMOR workbook uses the information you select to set the default residual level you must maintain in the distribution system. Typically, the type of disinfectant residual leaving the plant is the same type within the distribution system. However, the workbook does not prevent you from selecting a different type for each. This treatment approach is highly unusual though and the dialog box shown in Figure 2.6 appears if the two disinfectant types do not match.

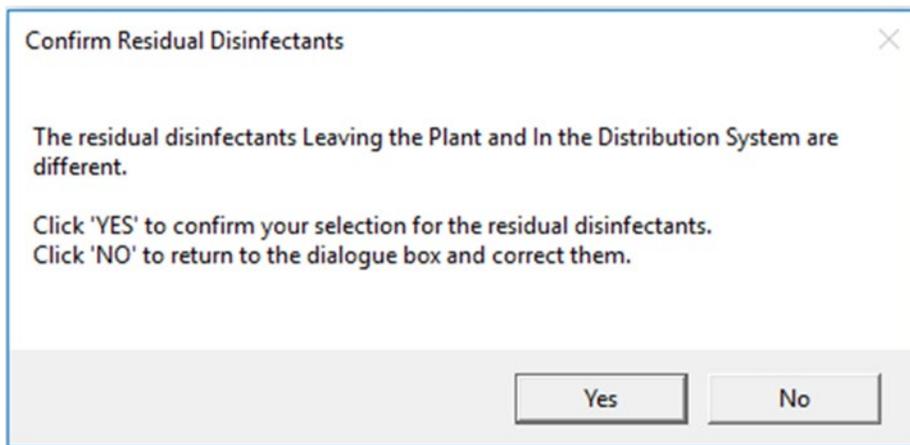


Figure 2.6. Confirm Residual Disinfectants Dialog Box

Approved CT Study Parameters

The CT Study approval letter describes the following three approved parameters for each disinfection zone and treatment train:

- flow rate
- T_{10}

- disinfectant type

The flow rate and T_{10} information is usually in a table near the end of the CT Study approval letter. Information about the disinfectant used in each zone is found near the beginning of the letter where we describe the plant's general treatment and disinfection processes.

Flow Rate

Enter the flow rate for each disinfection zone and train in your CT Study approval letter.

T_{10} (Minutes)

Enter the {approved T_{10} (in minutes)} for each disinfection zone and train in your CT Study approval letter.

Disinfectant

Using the drop-down list, select the type of [disinfectant] maintained in each disinfection zone and treatment train identified in your CT Study approval letter. The abbreviations for the types of disinfectants are shown in Table 2.1.

Table 2.1. Abbreviations for Disinfectants

Abbreviation	Disinfectant
FCL	free chlorine
CLO ₂	chlorine dioxide
O ₃	ozone
CLA	chloramines
NA	disinfection zone not used

Required Log Inactivation

Your CT Study approval letter also establishes the performance requirements for your plant's disinfection process. Based on the treatment processes at your plant, the required log inactivation designated in the letter must be achieved by disinfection.

Giardia

Enter the {required log inactivation for *Giardia*} that your disinfection process is required to achieve. The minimum inactivation requirement for *Giardia* is 3.0 log. Your CT Study approval letter may allow some of this inactivation credit to come from your filtration technology. If so, then the rest must come through disinfection and will be shown in the CT Study table that contains the disinfection zone parameters.

Viruses

Enter the {required log inactivation for viruses} your disinfection process is required to achieve. The minimum inactivation requirement for viruses is 4.0 log. As with *Giardia*,

some of the inactivation credit may come from your filtration technology. The rest must come through disinfection. See your CT Study table for those virus disinfection inactivation goals.

Once you have finished entering data in the **Disinfection Process Parameters** dialog box, select [OK]. When you click OK, the macro updates the appropriate cells on the **P.1 Summary** and **P.4&5 Disinfection Data** worksheets. After the macro finishes, the next dialog box to pop up is **Alternative Technologies and LT2 ESWTR** box.

2.5 Alternative Technologies and LT2 ESWTR Dialog Box

This dialog box is split into two sections, as seen in figure 2.7. The first section consists of a checkbox that should only be selected if your plant uses alternative treatment technologies. If you do not use any alternative treatment leave the box unchecked. If you do use alternative treatment technologies refer to Chapter 5 of this guidance for information on further customizing the workbook to match the design of your plant.

The second section is **LT2 Compliance**. To determine which Bin class to select, refer to your plant's Bin classification letter. This letter will also contain the effective date. For more information on completing the alternative technologies dialog box, refer to Chapter 5 of this guidance.

Figure 2.7. SWTP Information Section of the SWMOR Workbook

2.6 Entering Your Plant Information (P.2)

If you do not recustomize your SWMOR to update the reporting information each month, you may adjust the reporting information on **P.2 Turbidity Data** of the SWMOR.

The plant information cells are locked on all other worksheets except for this page. The **P.2 Turbidity Data** worksheet is programmed so that the information entered on this page is automatically copied to the other worksheets.

SURFACE WATER MONTHLY OPERATING REPORT
FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
 OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)
Turbidity Data Page

PUBLIC WATER SYSTEM NAME: _____	PLANT NAME OR NUMBER: _____
PWS ID No.: _____	Plant ID No.: _____
Month: _____	Year: _____
	Connections: _____
	Population: _____

Figure 2.8. SWTP Information Section of the SWMOR Workbook

Public Water System and Plant Names and ID Numbers

Enter the following information:

- {PWS Name}
- {Seven-digit PWS ID Number}
- {Plant Name}
- {Plant Number} unique to the plant.

2.7 Saving Your Customized Workbook

After completing all data entry, save the customized workbook as a master file. Using the custom tool bar, select [Save as Excel 2016]. A warning will appear prompting you to ensure that the plant information is correct. Confirm the plant information (except for year and month) is correct and select [OK].

We recommend saving your customized workbook master file using the following filenames:

- SWMOR workbook: SWMOR_master_PWSIDNumber_PlantName

We also recommend creating a series of special folders (or subdirectories), so all your MOR records are stored in the same place. Several plants have found the file structure shown in Figure 2.9 to be very useful.

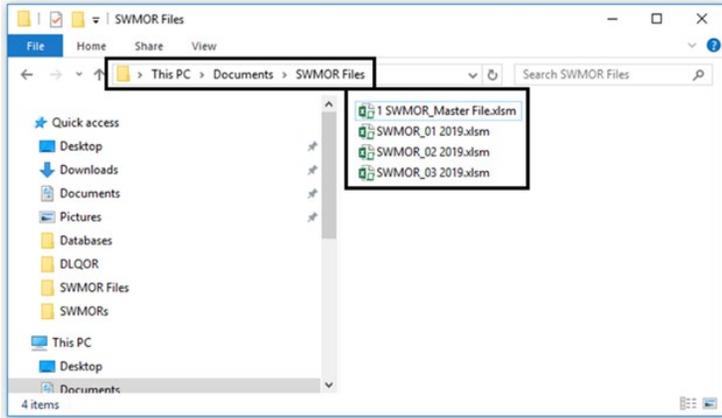


Figure 2.9. Sample File Structure

3. Entering Data in a Customized SWMOR Workbook

Each day, SWTP personnel must monitor and record information related to plant operations and performance. This chapter explains how to enter compliance data in the SWMOR workbook. The workbook’s data validation features help determine if you have omitted any required data, thereby preventing you from submitting an incomplete report and incurring a reporting violation.

The MOR workbook is designed so that you can migrate data directly from a Supervision Control and Data Acquisition (SCADA) system or digital data files instead of manually entering data into every workbook cell. Although this option requires advanced knowledge and experience in spreadsheet applications, it can help with data entry errors, and save time in the long run. (See Section 3.6.)

Some or all this chapter will apply to your water treatment plant. Plants that use alternative treatment should see Chapter 5 for additional instructions. 2-filter plants should see Chapter 6 for additional instructions. When additional instructions apply, they are noted, and you are directed to one of these other chapters.

3.1 Creating a Monthly Workbook File

When you are ready to begin entering data for a reporting month, open your saved master file workbook and select [enable contents], if applicable. The programming dialog boxes appear automatically. If you would like to adjust the reporting information by re-customizing the form, select that the form has been customized and that there have been changes when the **Customize Form** dialog box appears. If nothing at your plant has changed and you would prefer to enter the reporting information on the **P.2 Turbidity Data** worksheet, select that there have been no changes.

If you do not enter the reporting information by re-customizing the form, select the **P.2 Turbidity Data** worksheet tab to begin entering the reporting month and year, number of connections, and population at the top of the page as shown in Figure 3.1. The workbook automatically copies the information from these cells onto the other SWMOR worksheets.

SURFACE WATER MONTHLY OPERATING REPORT
 FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
 OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)
Turbidity Data Page

PUBLIC WATER SYSTEM NAME: _____ PWS ID No.: _____ Month: _____	PLANT NAME OR NUMBER: _____ Plant ID No.: _____ Year: _____ Connections: _____ Population: _____
--	--

Figure 3.1. Plant Information Section of the P.2 Worksheet

Month and Year

Using the drop-down menu, select the [month] and the [year] of the reporting month.

Note: The value of the first year in the list can be changed by changing the value shown in cell AQ2 located on the right-hand side of the **P.2** worksheet. This may be important if you use the workbook for an extended number of years and you need to update the year drop-down list.

Connections

If you have a community water system that does not sell water to other systems, enter the {number of residential connections}. Non community systems, like RV parks and industrial facilities, or wholesale systems with no residential connections do not have to complete this cell.

Population

Enter the {total number of customers} served by your system during the reporting month. The number should include the entire population of your distribution system or the entire population of the any wholesale systems and should match what is in Drinking Water Watch (DWW). This is important because the turbidity and disinfection requirements for SWTPs are based on the total population served by a plant. If you know your total system population is different than what is shown in DWW, you should contact us to update your population.

The number of connections and population must match what we have on file. Check DWW if you are unsure. You should update this information as needed, and at least annually to ensure it matches.

Saving Your Monthly Workbook

To help you establish a standardized file structure when you begin each month, select [Save As . . .] on the customized workbook toolbar. When you select this button, the workbook will ask you if the plant information is correct. Select [OK] and the workbook will format a filename as follows:

FileType_Year_Month_PWSID Number_PlantName

If you prefer to use another filename structure, enter it instead and then save.

To avoid overwriting data, always start each MOR using your customized master file workbook. Do not use the previous month's workbook as a starting point.

3.2 Turbidity and Disinfectant Residual Performance Data (P.2)

The **Performance Data** table on the **P.2 Turbidity Data** worksheet of the SWMOR workbook is shown in Figure 3.2. To open, select the **P.2 Turbidity Data** worksheet tab. This table is used to report turbidity and disinfectant residual data to summarize your plant’s performance each day. You must enter data on this worksheet daily, including days when your plant does not treat water.

P.2 for conventional plants and plants that use alternative treatment technologies are the same. The only difference in **P.2** of the workbook for 2-Filter plants is where you enter finished water (i.e., CFE) turbidity data. You enter CFE data on **P.6-9** (see Chapter 6) instead of **P.2**.

The **Performance Data** table in this section contains data for the plant referenced in the CT Study approval letter in Appendix A. As we explain how to complete this table, we refer to the shaded entries in this figure.

PERFORMANCE DATA																				
Date	Raw Water Pumpage (MGD)	Treated Water Pumpage (MGD)	RAW WATER ANALYSES		SETTLED WATER TURBIDITY (Mandatory Data)						FINISHED WATER QUALITY									
			NTU	Alk.	Basin No.						Turbidity						Lowest Residual	Time		
					1	2	3	4	5	6	NTU1	NTU2	NTU3	NTU4	NTU5	NTU6				
1	1.411	1.322	49	52	2.4	1.9						X	0.19	0.07	0.03	0.31	ND	2.4		
2	1.484	1.444	26	68	2.8	1.8						X	0.33	0.24	0.27	0.15	0.12	3.4		
3	1.588	1.511	12	59	2.1	2.2						X	0.23	0.08	0.12	0.17	0.26	3.1		
4	1.154	1.064	80	92	5.2	4.3						X	0.34	0.46	0.78	1.06	1.17	2.3		
5	0.000	0.889	X	X	X	X						X	X	X	X	X	X	1.1		
6	2.650	1.103	15	61	1.8	1.4						X	X	0.26	0.32	0.21	0.10	2.8		
7	1.302	1.239	73	55	2.3	2.0						X	0.13	0.28	0.38	0.34	0.30	3.0		
8	1.377	1.280	10	47	1.7	1.9						X	0.27	0.24	0.17	0.19	0.04	2.7		
9	1.701	1.687	24	53	1.9	1.6						X	0.24	0.32	0.25	0.18	0.12	0.3	0.75	
10	1.408	1.397	16	44	1.2	1.1						X	0.33	0.08	0.07	0.21	0.11	1.9		
11	1.457	1.402	70	62	1.8	1.5						X	0.30	0.06	0.20	0.23	0.34	2.2		
12	1.537	1.522	98	43	3.2	2.3						X	0.29	0.08	0.16	0.14	0.27	3.1		
13	1.092	1.084	16	57	2.2	1.8						X	0.33	0.28	0.10	0.27	0.29	2.0		
14	1.564	1.506	68	48	2.0	1.7						X	0.23	0.26	0.31	0.28	0.03	1.4		
15	1.361	1.278	93	69	25.6	2.1						X	0.30	0.20	0.23	0.05	0.25	1.8		
16	1.879	1.794	10	55	2.1	1.9						X	0.31	0.21	0.17	0.28	0.22	1.5		
17	0.109	0.000	91	58	2.2	X						X	0.20	0.31	0.24	0.34	0.20	X		
18	0.230	0.050	95	64	2.5	X						X	0.17	0.13	0.16	0.32	0.28	nd		
19																				

Figure 3.2. Section of Performance Data Table on P.2 with Example Data

Raw and Treated Water Pumpage Data

Raw Water Pumpage

For each day of the month, enter the {volume of raw water (in MGD)} pumped to the plant that day. The volume of raw water pumped to the plant may not be the same as the volume of water pumped to distribution (i.e., treated water pumpage).

If raw water was not pumped to the plant on a specific date, enter {0.000}. If water was pumped, but you didn't record how much, enter {ND}.

In Figure 3.2, the entry for Day 5 shows that raw water was not pumped to the plant; therefore, the operator entered 0.000 in the **Raw Water Pumpage** cell for that date. Since no water was treated, the operator was not required to monitor or enter turbidity results for raw, settled, or finished water.

Treated Water Pumpage

For each day of the month, enter the {volume of water treated (in MGD)}. Do not enter the meter reading; instead, enter the total volume of water pumped to the distribution system during the day.

If the plant did not pump treated water to distribution on a specific day, enter {0.000}. If the plant pumped treated water to the distribution system, but you didn't record how much, enter {ND}.

In Figure 3.2, the entry on Day 17 shows that the plant treated 0.109 MGD of raw water but did not pump treated water to the distribution system. Since treated water was not pumped to distribution, the plant was not required to enter disinfectant residual data entering the distribution system.

Pumpage Summaries CALC

Figure 3.3 shows the section of the **Performance Data** table where it automatically reports the total amounts of raw and treated water pumped during the month as well as the average, maximum, and minimum daily pumpage rates. The table calculates these results using the values for raw and treated water pumpage that you entered each day.

48				
49	Total			
50	Avg			
51	Max			
52	Min			

Figure 3.3. Pumpage Summary Section of the Performance Data Table

Raw Water Analyses

You must measure the turbidity and the alkalinity of the raw water at least once each day when your plant treats water.

For each day of the month, enter the {raw water turbidity in nephelometric turbidity unit (NTU)} in the **NTU** column. Enter the {raw water alkalinity in milligrams per liter of calcium carbonate (mg/L of CaCO₃)} in the **Alk.** column.

If you conduct more than one set of tests during the day, record the average reading for each parameter. If your plant did not treat water on a specific day, enter {X} in both the **NTU** column and the **Alk.** column. If your plant treated water but did not collect turbidity or alkalinity data on a specific day, enter {ND} in each column.

Settled Water Turbidity

If we require you to monitor settled water turbidity, you must do so as specified in your exception approval letter. Even if we don't require that you monitor settled water turbidity, we still recommend you measure it at the effluent of each sedimentation basin at least once each day. Data on settled-water turbidity allows for valuable analysis of sedimentation performance; and in particular, the performance of each basin.

The **Performance Data** table on **P.2** contains six columns to record the turbidity of the settled water from Basins No. 1 through 6. If your plant has more than six basins; six additional columns for Basins No. 7 to 12 will appear on an addendum page.

If your plant collects settled water turbidity data from each sedimentation basin every day, enter the {settled water turbidity (in NTU)} of each basin for each date. If you conduct more than one set of tests during the day, enter the maximum or highest value from each basin.

If a basin is not in operation on a specific day, enter {X}. If settled water turbidity is mandatory and you did not collect the turbidity for an operational basin, enter {ND}. If settled water turbidity monitoring is optional, either leave the cell blank or enter {ND}.

In Figure 3.2, the example entries in the **Settled Water Turbidity** columns indicate the following:

- The SWMOR workbook was customized to require settled water turbidity data.
- The operators monitored and reported settled water turbidity at least daily when it was in service.
- The plant was offline on Day 5.
- Basin No. 2 was not in operation on Days 17 and 18.

Finished Water Quality

Turbidity

You must measure and record CFE turbidity each day that your plant treats water. This means you must record CFE turbidity results each day that you show a raw water pumpage above 0.000 MGD.

As specified previously, 2-Filter plants enter CFE data on the **P.6-9 CFE Turbidity Data** worksheet. These plants should skip the information in this subsection related to CFE turbidity and refer to Chapter 6. All the other information in this section (i.e., Lowest Residual and Time) apply to all customizations of the combined SWMOR.

CFE Turbidity Monitoring Requirements

In most cases, you must collect CFE turbidity samples at the filter outlet header or the clearwell inlet line. However, we occasionally approve other sampling sites, such as the clearwell outlet line and the service pump discharge line.

The frequency and timing of your CFE turbidity measurements depend on the number of people that your water system serves as explained in the following sections.

Systems Serving 500 or Fewer Persons

If your system serves 500 or fewer persons, you must measure CFE turbidity at least once each day.

Systems Serving More than 500 Persons

If your system serves more than 500 persons, you must measure CFE turbidity at regular, 4-hr intervals whenever the plant is in operation. Use the same schedule each day. If you measure CFE turbidity more frequently than once every four hours, only report the readings collected at the scheduled times.

Reporting Periods

TCEQ sets six standard 4-hr CFE reporting periods each day. NTU1 is 12:00 a.m. to 4:00 a.m.; NTU2 is 4:00 a.m. to 8:00 a.m.; and so forth. Systems serving more than 500 persons must identify six compliance times throughout the day, one within each reporting period; and report CFE turbidity at those same compliance times each day. For example, if you identify 1:00 a.m., 5:00 a.m., 9:00 a.m., 1:00 p.m., 5:00 p.m., and 9:00 p.m. as your compliance times, you must report the CFE turbidity at those exact times each day. Systems serving fewer than 500 persons must report their daily reading in the reporting period block that reflects when their sample was collected.

If your plant is offline for an entire reporting period (i.e., between 12:00 a.m. and 4:00 a.m.), you are not required to report CFE turbidity under NTU 1 for that day. However, if your plant is online for any part of a 4-hr reporting period, but not at the scheduled compliance time, you must report the CFE turbidity right before your plant shuts down, or after the filters come back online within that reporting period. Intervals

between compliance measurements can be less than four hours; however, they should not exceed four hours.

Special Cases

If you are using automated systems to operate or monitor your plant, there are some special requirements to consider as discussed below.

Auto-cycling: If your plant automatically cycles off and on, we consider the plant to be in continuous operation unless you turn off the raw water pumps with the manual override. If your plant is not treating water when the sample is supposed to be collected, you must use the last 15-min. reading that was collected when the plant was in operation. The clearwell and the service pump station may however, continue to operate when the plant is not in operation because these facilities can continue to operate even if the plant is not filtering water.

Online turbidimeters: If your plant uses a continuous turbidity analyzer, you may either take the turbidity data from the recorder chart or use the results of grab samples.

If you choose to use data from the recorder chart, you must verify the accuracy of the turbidity monitor at least once each week.

You should always avoid calibrating your online turbidimeters immediately before a sample is scheduled to be collected. If there is a problem during calibration, you could record an erroneous result. You should also allow at least 15 to 20 minutes to complete a calibration procedure so that you don't miss a sample or accidentally report the turbidity of the calibration standard, rather than the sample. If you are calibrating an online turbidimeter when a sample is supposed to be collected, you can report CFE turbidity using one of the following methods:

- Grab samples and a benchtop turbidimeter.
- The turbidity reading from the online meter recorded 15 minutes after the calibration process finished.
- The last turbidity reading recorded by the online turbidimeter before taken offline for calibration.

See Appendix G for additional information on calibration and verification of instruments.

CFE Turbidity Data Entry

The **Performance Data** table contains six columns for entering CFE turbidity data (see Figure 3.2). If your plant is in operation during any portion of a 4-hr period, enter the {turbidity (in NTU)} in the appropriate column. If your plant was offline during the entire 4-hr period, enter {X} in the corresponding column. If the plant treated water at any time during a 4-hr period but turbidity was not measured during the entire 4-hr period, enter {ND} in the appropriate cell.

In Figure 3.2, the example CFE turbidity entries in the **NTU1** column through the **NTU6** column indicate the following:

- The plant was offline between 12:00 a.m. and 4:00 a.m. each day.

- The plant was offline for the entire day on Day 5.
- The plant was offline between 4:00 a.m. and 8:00 a.m. on Day 6.
- The plant was in operation between 8:00 p.m. and midnight on Day 1, but CFE turbidity was not measured during that reporting period.

Lowest Residual

The **Lowest Residual** column is used for entering the lowest disinfectant residual entering the distribution system (see Figure 3.2). You must enter each day’s lowest disinfectant residual whenever treated water pumpage is above 0.000 MGD.

Disinfectant Residual Monitoring Requirements

You can measure your disinfectant residuals at any location in the plant where the quality is representative of the water entering the distribution system. Common sampling sites include the clearwell outlet line and the service pump discharge line. The timing and number of measurements depends on the population your water system serves. The specific requirements are explained below.

Systems Serving 3,300 or Fewer Persons

If your system serves 3,300 or fewer persons each day, you can collect grab samples to measure the disinfectant residual of the water entering the distribution system. You must collect the residual data at regular intervals throughout the daily period of operation. Table 3.1 shows the number of daily residual measurements required based on population served.

For systems maintaining a free chlorine residual in the distribution system, the minimum acceptable level is 0.2 mg/L, measured as free chlorine. For systems maintaining a chloramine residual, the minimum acceptable level is 0.5 mg/L, measured as total chlorine. If the residual entering the distribution system falls below the acceptable level, systems collecting grab samples must measure the residual entering the distribution system at least once every four hours. This increased monitoring frequency must continue until the plant restores an acceptable residual.

Table 3.1. Point of Entry Disinfectant Residual Measurement Requirements

Population Served	Number of samples required per day
500 or fewer	1
501–1,000	2
1,001–2,500	3
2,501–3,300	4

Systems Serving More than 3,300 Persons

If your system serves more than 3,300 persons, you must install equipment to continuously monitor disinfectant residuals. The continuous analyzer must monitor the residual entering the distribution system at least once every 30 minutes. Systems

using continuous analyzers to monitor the disinfectant residual must take the data from the recorder chart.

Note: These analyzers must be verified at least once every seven days and recalibrated if expected results differ by greater than 15% (see Appendix G).

A plant that experiences a failure in the continuous monitoring equipment may collect grab samples every four hours for no more than five working days. The plant must collect these samples at the same time it collects the CFE turbidity samples.

Lowest Residual Data Entry

For each day, enter one of the following:

- {Lowest disinfectant residual (in mg/L)} of water entering the distribution system if you collected all the required readings.
- {X} if your plant did not pump treated water to distribution on a specific day.
- {ND} if your plant pumped treated water to the distribution system at any time during the day but you did not collect any finished water disinfectant residual data.

If you recorded some, but not all required readings, then for each day enter one of the following:

- {Lowest disinfectant residual (in MGD)} measured if it was below the acceptable level of 0.2 mg/L free chlorine or 0.5 mg/L chloramines, measured as total chlorine.
- {MD} if all the measurements were above the minimum required level.

Time

The **Time** column is used to report the amount of time each day that the disinfectant residual entering the distribution system level was below the minimum acceptable level. For each day, enter the {longest consecutive period (in hours)} that the disinfectant residual entering the distribution system was below the minimum acceptable level.

When calculating the duration of an event, it begins when the reading falls below the acceptable level and concludes when the reading is equal to or greater than the acceptable level. For example, if the 4 p.m. free chlorine reading was 0 mg/L, the 8:00 p.m. reading was 0.1 mg/L, and the midnight reading was 0.3 mg/L, then the duration of the event was 8 hours (i.e., 4:00 p.m. to midnight).

A plant may increase the monitoring frequency to more accurately determine the duration of an event. For example, if you collect residual data every 15 or 30 minutes after getting a low reading, you may report the duration of the event in ¼-hr or ½-hr increments. Therefore, an event lasting only 15 minutes is reported as 0.25 hours, and one lasting 2 hours, 45 minutes is reported as 2.75 hours.

The time entered in the **Time** column may not be the period in which the lowest residual occurred. However, it should always be the longest period in which residuals below the minimum were measured. For example, if your lowest measured residual was 0.0 mg/L at midnight, but you had a 5-hr event between 2:00 and 7:00 PM when

your residual was 0.1 mg/L, then your entries in the **Lowest Residual** column and the **Time** column will not represent the same event.

If you did not record the time period that the disinfectant residual was below the acceptable level on a specific day, enter {ND} for that day.

Leave the cell blank, if the residual entering the distribution system was always above the acceptable level on a specific day. Also, leave the cell blank if you entered ND or MD for a specific date in the **Lowest Residual** column.

The Lowest Residual example entries in Figure 3.2 indicate all of the following:

- The plant did not pump any treated water to distribution on Day 17.
- The disinfectant residual entering the distribution system fell below the minimum acceptable level of 0.5 mg/L for total chlorine at least one time on Day 9. The longest duration of time that the residual was below the acceptable level was 45 minutes, or 0.75 hours.
- The plant pumped water to distribution on Day 18, but the plant failed to continuously monitor the chlorine residual entering the distribution system. However, some of the data was recorded and all of those readings were above 0.5 mg/L.

3.3 IFE Turbidity Performance Data (P.3)

You must measure and enter IFE turbidity data on the **P.3 Filter Data** worksheet every day that your plant treats water. You must also enter additional information at the end of the month about the performance of individual filters during previous months. Select the **P.3 Filter Data** worksheet tab to open this worksheet.

This section also applies to plants that use alternative treatment. 2-Filter plants should refer to Chapter 6 – Entering Daily IFE Turbidity Data and CFE Summary Data.

Daily IFE Turbidity Data

The **Individual Filter Turbidity** section of the **Performance Data** table shown in Figure 3.4 contains columns for entering the turbidity of the filtered water from Filters No. 1-10. If your plant has more than 10 filters, additional columns for up to 50 filters are provided on addendum pages.

		PERFORMANCE DATA																
		INDIVIDUAL FILTER TURBIDITY																
		Filter No. 1		Filter No. 2		Filter No. 3		Filter No. 4		Filter No. 5		Filter No. 6		Filter No. 7		Filter No. 8		Filter
Date		Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max
1																		
2																		
3																		

Figure 3.4. Data Section for IFE Turbidity on P.3

The two examples at the end of this subsection demonstrate how to complete and interpret the information related to daily IFE turbidity data.

IFE Turbidity Monitoring and Calibration Requirements

You must measure the turbidity of the water produced by a filter whenever it is sending water to the clearwell. That means that you must enter at least one IFE turbidity result each day when you show a raw water pumpage above 0.000 MGD. IFE turbidity must be measured every 15 minutes at the outlet of each filter before that water is mixed with the water from any other filter. These readings must be collected on the quarter hour; for example, at 1:00 p.m., 1:15 p.m., 1:30 p.m., and so forth.

The calibration of each continuous turbidity monitor must be verified at least once each week. A plant that experiences a failure in the continuous monitoring equipment may collect grab samples every four hours, for no more than five working days; or 14 days, if you have a small system less than 10,000 population. If the result of a grab sample is greater than 1.0 NTU, the plant must collect a confirmation sample 15 minutes later.

Avoid calibrating your online turbidimeters immediately before a sample is scheduled to be collected. If there is a problem during the calibration procedure, an erroneous result might be recorded. If you have a calibration problem that affects two consecutive 15-min. readings, you must either document that these readings were collected during a calibration procedure or complete an FPR (see Chapter 7).

Note: A filter is in operation when it is discharging water that contributes to the CFE. A filter is not in operation if it is offline or filtering to waste. Whenever maintenance activities are conducted, SWTP operators must make a record in the plant's operational logs for reference to verify why IFE turbidity monitoring was not conducted or reported.

IFE Turbidity Data Entry

Max

For each day of the month, enter the {maximum turbidity (in NTU)} recorded from each filter.

Enter {X} if a filter is not in operation on a specific day. Enter {ND} if you did not collect any of the required IFE 15-min. turbidity readings for a specific filter.

If you recorded some, but not all required 15-min. readings in a day, enter one of the following:

- {Highest turbidity (in NTU)} if it was confirmed to be above 1.0 NTU.
- {MD} if all readings were 1.0 NTU or less.

Systems may be required to conduct additional monitoring if the turbidity level from a filter exceeds the 1.0 NTU or 2.0 NTU trigger levels. Readings above these trigger levels must be confirmed in two consecutive 15-min. readings for the readings to count towards compliance. Do not report any turbidity reading above either trigger level unless a filter exceeds the trigger level in two consecutive 15-min. readings. If the turbidity level does not exceed either trigger level in two consecutive 15-min. readings, report the maximum reading that was less than or equal to 1.0 NTU.

4 Hrs

If your system serves fewer than 10,000 persons each day, you may leave the cell in the **4 Hrs** columns blank.

If your system serves 10,000 or more persons, enter the {turbidity (in NTU)} measured at the end of four hours of continuous filter operation after the filter is returned to service from backwash or shutdown. If this occurs more than once a day for a given filter, enter the {turbidity (in NTU)} measured for the event with the maximum turbidity level at four hours. If no such event occurs for a filter on a specific day, enter {X}.

If you failed to measure the required 4-hr turbidity readings for a specific filter, enter {ND}.

If you recorded some, but not all required readings on a given day, enter one of the following:

- {Highest turbidity (in NTU)} of the day if any of the 4-hr readings that you do have were above 0.5 NTU.
- {MD} if you recorded some, but not all required readings, but all of the readings that you do have were 0.5 NTU or less.

Note: Systems serving fewer than 10,000 people are not required to report 4-hr data. However, the worksheet allows you to report the data if you wish. If you decide to include the data, the **P.3** worksheet will calculate the number of days when the **4 Hrs** column contains readings above 0.5 NTU but it automatically excludes the information when determining whether additional monitoring is required. As a result, there are no negative consequences to including the additional information.

Systems serving 10,000 or more persons may be required to conduct additional monitoring if the turbidity level from a filter exceeds 0.5 NTU in two consecutive 15-min. readings at the end of four hours of continuous filter operation.

Do not report any turbidity reading above 0.5 NTU unless a filter exceeds 0.5 NTU in two consecutive 15-min. readings at the end of four hours into a filter run. If the turbidity level from a filter is greater than 0.5 NTU at 4 hours, report that reading only if the preceding reading (i.e., the reading at 3 hours, 45 minutes), or the following reading (i.e., the reading at 4 hours, 15 minutes) is also greater than 0.5 NTU. Otherwise, report the subsequent reading; that is, the reading at 4 hours and 15 minutes.

IFE Turbidity Data Entry Examples

IFE Turbidity Data Example 1

This example demonstrates how to enter data in the **Max** and **4 hrs** cells. It is based on turbidity measurements for samples collected at the effluent of hypothetical Filter No. 2 shown in Figure 3.5.

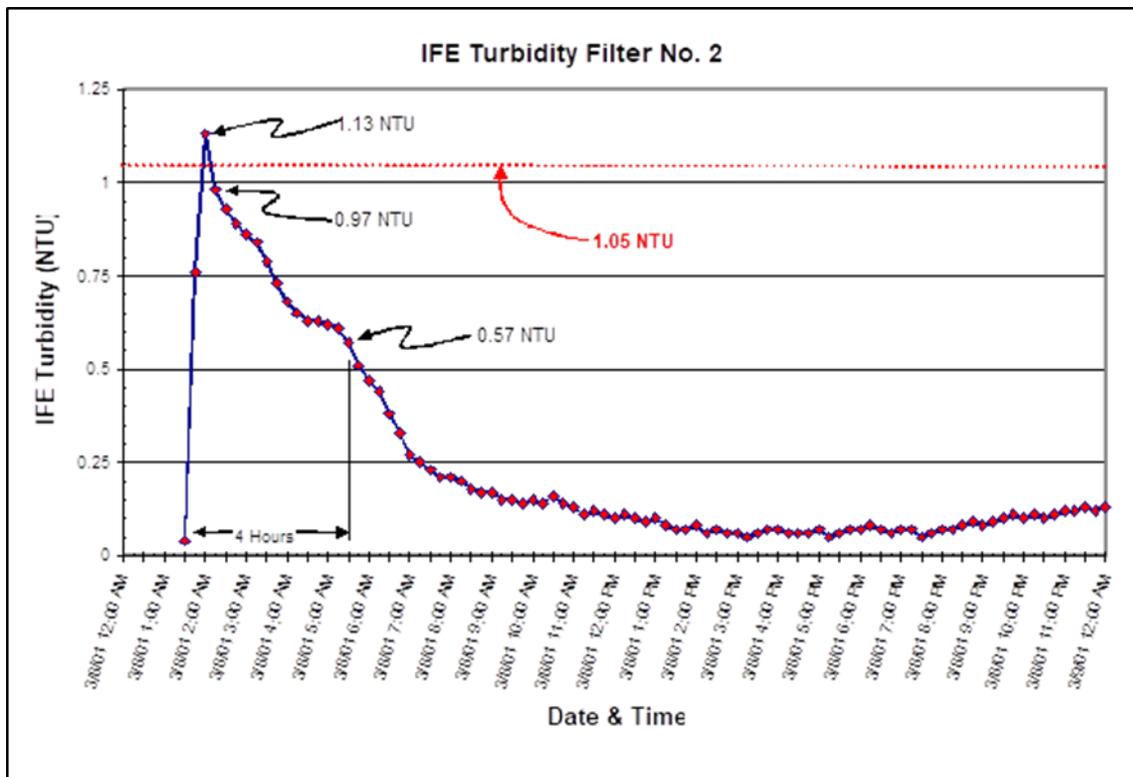


Figure 3.5. Example Graph of IFE Turbidity Readings

Filter No. 2 was backwashed the previous day and allowed to sit idle for three hours to “pre-ripen.” It was returned to service at 1:20 a.m. Since turbidity readings must be collected on the quarter hour, the first turbidity reading of the filter run occurs at 1:30 a.m.

Max: Although the maximum daily turbidity reading from this filter was 1.13 NTU, the value was not confirmed by a second consecutive reading which is required when turbidity readings are 1.05 NTU or higher. Consequently, when completing **P.3** of the SWMOR workbook, the operator should enter 0.97 NTU in the **Max** cell for the day.

4Hrs: At 5:30 a.m., four hours after the first turbidity measurement, the operator documented a turbidity level of 0.57 NTU. Since this reading is above 0.50 NTU, the operator must check both the previous and subsequent turbidity measurements to confirm the 5:30 a.m. reading. In this case, both measurements exceeded 0.5 NTU, thus the 5:30 reading is confirmed. The operator must enter 0.57 NTU in the **4Hrs** cell.

IFE Turbidity Data Example 2

This example demonstrates how we interpret IFE data. Figure 3.6 shows the **Individual Filter Turbidity** section of a **Performance Data** table, as might be reported by a SWTP.

PERFORMANCE DATA														
Date	INDIVIDUAL FILTER TURBIDITY													
	Filter No. 1		Filter No. 2		Filter No. 3		Filter No. 4		Filter No. 5		Filter No. 6		Filter No. 7	
	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs	Max	4 Hrs
1	0.52	X	0.66	0.11	0.93	0.17	0.33	X	0.45	X	0.34	X		
2	0.40	0.14	0.35	0.30	ND	ND	0.86	0.37	0.78	0.28	X	X		
3	0.23	ND	0.65	X	MD	0.22	0.27	X	0.31	X	0.45	0.09		
4	1.60	0.57	0.73	0.09	0.43	X	0.59	0.19	1.10	ND	0.26	X		
5	X	X	X	X	X	X	X	X	X	X	X	X		

Figure 3.6. Example IFE Turbidity Data

The individual IFE data from Figure 3.6 indicates the following occurred:

- On Day 1:
 - All six of the plant’s filters were operated for some period of time.
 - There are no 4-hr readings for Filters No. 1, 4, 5, and 6. Consequently, they were either operated all day long, or they were taken offline at some point during the day and not restarted.
 - Filters No. 2 and 3 were either taken offline or backwashed at least once during the day. The filters were then restarted and operated for a period of at least four hrs.
- On Day 2:
 - No data was recorded for Filter No.3.
 - Filter No.6 was not operated at all.
- On Day 3:
 - Filter No.1 was taken out of service, backwashed, and then restarted at least once during the day. However, the operator did not record the turbidity level of the water four hours after beginning one of the production runs.

- The SCADA system failed to record all required 15-min. IFE turbidity readings from Filter No. 3. However, we know that none of the readings that were recorded were above 1.0 NTU; otherwise, the operator would have entered the exceedance.
- On Day 4:
 - The turbidity levels from Filters No. 1 and 5 exceeded 1.0 NTU in two consecutive 15-min. readings.
 - The turbidity level from Filter No. 1 exceeded 0.5 NTU in two consecutive 15-min. readings at 4 hours after the filter was returned to service.
 - The SCADA system failed to record the turbidity level produced by Filter No.5 four hours after it began a filter run.
- On Day 5, the plant was completely offline as reflected in the raw water flow rate on P.2 of 0.000 MGD.

Note: The workbook will prevent you from entering X for all filters unless the flow rate is 0.000 MGD.

If your water system serves at least 10,000 people, you are required to take 4-hr turbidity readings. The missing 4-hr turbidity readings, reported as ND, during the first 4 days of the month in the example above may result in a monitoring or reporting (M/R) violation.

If your water system serves less than 10,000 people, 4-hr turbidity data is not required and the worksheet does not treat empty spaces as missing data. In this situation, you would not incur a M/R violation.

Summary and Compliance Actions

The **Summary and Compliance Actions** table at the bottom of the **P.3 Filter Data** worksheet has columns for summarizing the historical performance of Filters No. 1-10 (see Figure 3.7). If your plant has more than 10 filters, additional columns for recording the IFE turbidity data turbidity for up to 50 filters are available on addendum pages.

47	SUMMARY & COMPLIANCE ACTIONS	Criteria	Filter No.						
			1	2	3	4	5	6	7
48		Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon							
49		Number of days with event(s) above 1.0 NTU this month							
50		Number of days with event(s) above 1.0 NTU last month							
51		Number of days with event(s) above 1.0 NTU two months ago							
52		Total number of days with event(s) above 1.0 NTU in three mon							
53		Number of events above 2.0 NTU this month							
54		Number of events above 2.0 NTU last month							
55		Does the filter/plant have an approved Corrective Action Plan?							
56		Is the plant required to submit a Filter Profile Report?							
57		Is the plant required to submit a Filter Assessment Report?							
58		Is the plant required to submit a Request for Compliance CPE?							
59									

Figure 3.7. Summary and Compliance Actions Section on P.3

The example at the end of this subsection demonstrates how to complete and interpret the **Summary and Compliance Actions** section on **P.3**, and what compliance actions are required.

Entering Summary Information

Number of Days with Event(s) Above 0.5 NTU at 4.0 Hours this Month

CALC

For each filter at the plant, the worksheet automatically reports the number of days you entered a turbidity reading above 0.5 NTU.

Number of Days with Event(s) Above 1.0 NTU this Month

CALC

For each filter at the plant, the worksheet automatically reports the number of days you entered a turbidity reading above 1.0 NTU.

Number of Days with Event(s) Above 1.0 NTU last Month

For each filter at the plant, enter the {number of days} during the last month you entered a turbidity level above 1.0 NTU. Get this information from the previous month's worksheet cell labeled **Number of days with event(s) above 1.0 NTU this month**.

Number of Days with Event(s) Above 1.0 NTU Two Months Ago

For each filter at the plant, enter the {number of days} you entered a turbidity level above 1.0 NTU during the reporting period two months ago. Get this information from the cell labeled **Number of days with event(s) above 1.0 NTU last month** on the worksheet from the previous month.

Total Number of Days with Event(s) Above 1.0 NTU in Three Months

CALC

For each filter at the plant, the worksheet automatically reports the total number of days you entered a turbidity level above 1.0 NTU during the last three reporting months.

Number of Days with Event(s) Above 2.0 NTU this Month

CALC

The worksheet automatically reports how many days there was at least one turbidity reading for any filter above 2.0 NTU.

Number of Days with Event(s) Above 2.0 NTU last Month

Enter the {number of days} during the last month that you entered one or more turbidity readings above 2.0 NTU. Get this information from the cell on the previous month's worksheet labelled **Number of days with event(s) above 2.0 NTU this month**.

Approved Corrective Action Plan at the Filter or Plant

For each filter at the plant, use the drop-down list to indicate whether we have approved a CAP that waives the additional monitoring requirements for a specific filter. If the filter has a TCEQ approved CAP, select [Y]. If the filter does not have a TCEQ approved CAP, select [N].

Note: You do not have an approved CAP unless we have written you a letter identifying the filter or plant that is covered in the CAP and describing the actions that must be completed by the compliance deadline. We generally do not approve a CAP for the plant unless the system has participated in a Mandatory Comprehensive Performance Evaluation (mCPE).

Filter Profile Report Requirement CALC

For each filter, the worksheet automatically reports if you are required to conduct a filter profile on the filter and submit an FPR with your monthly report.

Unless a filter has an approved CAP that waives the filter from additional monitoring requirements, you must either identify the cause of exceedance or produce a filter profile on the filter each time that the IFE turbidity level in the water produced by that filter exceeds 1.0 NTU in two consecutive 15-min. readings.

If your system serves 10,000 people or more, you must also identify the cause of exceedance or produce a filter profile each time that the IFE turbidity level exceeds 0.5 NTU in two consecutive 15-min. readings at four hours after the filter is returned to service.

Filter Assessment Report(s) Requirement CALC

For each filter at the plant, the worksheet automatically reports if you are required to conduct a filter assessment on the filter and submit one or more FARs with your MOR.

Unless a filter has an approved CAP that waives the filter from additional monitoring requirements, you must conduct an assessment on it each time that a filter exceeds 1.0 NTU in two consecutive 15-min. readings on three separate occasions during the last three reporting months.

CPE Request Form Requirement CALC

The worksheet automatically reports if you are required submit a CPE Request with your monthly report and participate in an mCPE.

Unless your plant has an approved CAP that waives the mCPE requirement, you must participate in an mCPE each time a filter or any combination of filters exceeds 2.0 NTU in two consecutive 15-min. readings during the last two reporting months.

Summary and Compliance Actions Example

This example demonstrates how to use a previous month's MOR to complete the **Summary and Compliance Actions** section of the current month's **P.3** worksheet, and what additional reporting is required. Figure 3.8 shows the two worksheet sections from a hypothetical treatment plant for July, the current reporting month and June, the previous reporting month.

July (Current Month)

47	SUMMARY & COMPLIANCE ACTIONS	Criteria	Filter No.										Plant				
			1	2	3	4	5	6	7	8	9	10					
48		Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon	0	0	0	1											
49		Number of days with event(s) above 1.0 NTU this month	1	0	0	0											
50		Number of days with event(s) above 1.0 NTU last month	1	1	2	0											
51		Number of days with event(s) above 1.0 NTU two months ago	1	1	1	0											
52		Total number of days with event(s) above 1.0 NTU in three mon	3	2	3	0											
53		Number of events above 2.0 NTU this month															0
54		Number of events above 2.0 NTU last month															1
55		Does the filter/plant have an approved Corrective Action Plan?	N	N	Y	N											N
56		Is the plant required to submit a Filter Profile Report?	Y	N	N	Y											
57		Is the plant required to submit a Filter Assessment Report?	Y	N	N	N											
58		Is the plant required to submit a Request for Compliance CPE?															N

June (Previous Month)

49	SUMMARY & COMPLIANCE ACTION	Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon	0	0	0	0											
50		Number of days with event(s) above 1.0 NTU this month	1	1	2	0											
51		Number of days with event(s) above 1.0 NTU last month	1	1	1	0											
52		Number of days with event(s) above 1.0 NTU two months ago	0	0	0	0											
53		Total number of days with event(s) above 1.0 NTU in three mon	2	2	3	0											
54		Number of events above 2.0 NTU this month															1
55		Number of events above 2.0 NTU last month															0
56		Does the filter/plant have an approved Corrective Action Plan?	N	N	Y	N											N
57		Is the plant required to submit a Filter Profile Report?	Y	Y	N	N											
58		Is the plant required to submit a Filter Assessment Report?	N	N	N	N											
59		Is the plant required to submit a Request for Compliance CPE?															N

Figure 3.8. Summary and Compliance Sections of the P.3 Worksheet

This example shows where to find the following information in the June worksheet for the July worksheet:

- Number of days with events above 1.0 NTU last month.
- Number of days with events above 1.0 NTU two months ago.
- Number of days with events above 2.0 NTU last month.

A FPR for Filters No. 1 and 4 was required with the July MOR because:

- There was one day when the maximum turbidity reported on Filter No. 1 was above 1.0 NTU.
- There was one day when the turbidity level on Filter No. 4 was above 0.5 NTU exactly four hours after it was placed online.
- We have not approved a CAP for either of these filters.

A FAR for Filter No.1 was required in July because:

- The maximum turbidity level exceeded 1.0 NTU on a total of at least three days during the past three months.
- It does not have an approved CAP.

A FAR for Filter No. 3 was not required in July because:

- There is an approved CAP for Filter No. 3. Therefore, an FAR for that filter was not required even though there was a total of three days when the turbidity level rose above 1.0 NTU.
- None of the three readings above 1.0 NTU occurred during the month of July.

3.4 Disinfection Process Performance Data (P.4 & 5)

Disinfection process performance data is used to determine if a plant achieved an adequate level of disinfection each day. This data is entered on the **P.4&5 Disinfection Data** worksheet. Select the tab to open the worksheet.

The **P.4&5** information in this section applies to all plant types.

Disinfection Process Parameters

CT Study Parameters and Performance Standards CALC

Figure 3.9 shows the section of the **Disinfection Process Parameters** table on **P.4&5**. In this section of the table, the worksheet automatically reports the plant's approved CT Study parameters and performance standards that you previously entered in the **Disinfection Process Parameters** dialog box when you customized your workbook.

The table contains five columns for the CT Study parameters for Disinfection Zones 1 through 5 (or any combination of five zones or trains). If your plant has more than five zones, the program will automatically create addendum pages and add up to five additional columns for Zones 6-10.

Figure 3.9 includes hypothetical data from the CT Study approval letter in Appendix A. The figure, the following information, and the example helps explain this section.

14		Disinfection Zones					Log Inactivations	
15	Parameters	D1	D2	D3	D4	D5	Giardia lamblia Cysts	Viruses
16	Flow Rate (MGD)	1.440	0.480	96.000			0.5	2.0
17	T ₁₀ (minutes)	46.7	11.7	222.1				

Figure 3.5. Disinfection Process Parameters Section on the P.4&5 Worksheet

Disinfection Process Performance Data

You must monitor the effectiveness of the disinfection process by measuring the following operational parameters through each disinfection zone whenever you report a raw water pumpage above 0.000 MGD:

- disinfectant residual concentration
- flow rate
- temperature
- pH

If the calculated inactivation ratio for *Giardia* and viruses, as described later in this chapter, is less than 1.00, you must collect the disinfection process data at least once every four hours until the inactivation ratio is no longer less than 1.00.

Disinfection Process Performance Data Monitoring Requirements

You must collect the disinfection process performance data at the end of each disinfection zone described in your CT Study approval letter. We require that you monitor each disinfection zone even if you can meet the minimum inactivation requirements using a fewer number of zones. This is so we can assess the overall impact of any changes you propose to make in the disinfection process.

You must measure each of the required parameters when the plant is operating at peak hourly flow rate for the day. The peak hourly flow occurs at the plant’s highest point production, when the maximum volume of water flows through the plant during a 1-hr period. If you reduce the flow rate during the day, you do not have to recollect performance data. However, if you increase the flow rate during the day, you must recollect all the data.

Disinfection Process Performance Data Entry

Figure 3.10 shows the section of the **P.4&5** worksheet where you enter the disinfection process data for your plant. If you collect more than one set of disinfection process data during the day, you must calculate the level of disinfection (log inactivation) for each sample set, and then enter the set of readings that corresponds to the lowest total inactivation ratio for *Giardia* and viruses. Do not mix the data collected from two or more data sets. For example, if you get one set of data at 10:00 a.m. and another set at 4:00 p.m., you must either use all the morning data or all the afternoon data. TCEQ provides a tool for calculating the log inactivation of a sample set in the form of an excel spreadsheet. This CT calculator can be found on TCEQ’s website.

PERFORMANCE DATA									
DISINFECTION PROCESS DATA									
Date	Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	Giardia Log	Virus Log	Inact. Ratio	Time
24	CLO2 D1								
25	FCL D2								
26	1 CLA D3								
27	D4								
28	D5								

Figure 3.10. Disinfection Process Performance Data Section of the P.4&5 Worksheet

Disinfectant

The SWMOR workbook automatically reports the type of disinfectant in each zone based on the information you entered when customizing your workbook. You can change the disinfectant residual if it is different from the type of disinfectant you entered at that time. Use the drop-down list and select the correct [disinfectant residual]. The abbreviations for the possible disinfectants are shown in Table 3.2.

Table 3.2. Abbreviations for Disinfectants

Abbreviation	Disinfectant
FCL	Free chlorine
CLO2	Chlorine dioxide
O3	Ozone
CLA	Chloramines
NA	Applies if the disinfection zone was not used during the day (i.e., the flow rate in the zone was 0.000 MGD, or there was no disinfectant applied at or upstream of the zone). You can select NA for a disinfection zone only if the treatment train was not in operation, or disinfectant had not yet been applied in the treatment process.

Under certain operating conditions, the **P.4&5** worksheet limits the options for selecting a disinfectant in one or more of the disinfection zones because you entered one or more of the following:

- Flow of 0.000 MGD in the **Raw Water Pumpage** column on **P.2**.
- Flow of 0.000 MGD in the **Flow** column for that zone.
- Values in the **C** column, the **Temp** column, or the **pH** column.
- A disinfectant residual in an upstream disinfection zone.

C (mg/L)

Enter the {disinfectant residual concentration, (in mg/L)} measured from the end of each disinfection zone. If you failed to measure the disinfectant residual, enter {ND} in the applicable cell.

The worksheet does not allow you to enter a disinfectant residual for a zone where you selected NA from the drop-down list of disinfectants. It also does not allow you to enter a disinfectant residual where the Raw Water Pumpage entered on **P.2** is 0.000 MGD. If you try to enter a residual in these zones, you will get an error message.

Special Information for Chloramine Users: The DPD test for total chlorine measures more than just monochloramine. Other combined chlorine compounds such as dichloramine, trichloramine, and organic chloramines can interfere with the colorimetric DPD test. Consequently, chloramine users that use DPD tests for reporting should periodically run process-control tests that are specific for monochloramine. Even if the results cannot be used for reporting, they can be used to adjust the treatment so that the desired monochloramine residual is maintained.

Special Information for Ozone Users: Plants that use ozone have some important special reporting requirements. The ozone concentration that you use for CT calculations depends on several factors which are explained in Table 3.3.

Table 3.3. CT Calculation Factors for Ozone

If:	and the water flows:	the reported concentration is:
ozone is applied in the contactor cell	in the same direction that the ozone rises (concurrent flow)	the same as the measured concentration at the outlet of the cell
ozone is applied in the contactor cell	in the opposite direction as the ozone rises (countercurrent flow)	one-half of the measured concentration at the outlet of the cell
no ozone is applied in the contactor cell	any direction (reactive flow)	the same as the measured concentration at the outlet of the cell

Flow (MGD)

Enter the {flow rate (in MGD)} of water through the disinfection zone at the time you collected the performance parameter data set. If your plant has more than one treatment train, enter the {flow rate (in MGD)} through each of the individual trains. *Note:* If your plant does not have flowmeters on each train, you must use an alternate method we have approved in writing.

If, on a specific day, your plant does not treat any water, or a disinfectant is not used in a disinfection zone, leave this column blank. If you failed to measure the flow rate through a disinfection zone on a day you treated water, enter {ND} in the applicable cell.

The flow rate values that you enter on **P.4&5** are the instantaneous flow rates (calculated to MGD) occurring in each disinfection zone when the measurements were made. Unless your plant operates at a constant production rate for an entire 24-hr day, the daily raw water flow shown on **P.2** will not match the flow rate shown on **P.4&5** for that day. If your plant operated for less than 24 hours during the day, the flow rates on **P.4&5** will usually be greater than flow rate shown on **P.2**, unless the flow is split between two or more trains.

Temp (°C)

Enter the {water temperature (in °C)} of each disinfection zone

If, on a specific day, your plant does not treat any water or a disinfectant is not used in a disinfection zone, leave this column blank. However, if you treated water but failed to measure the temperature of the water, enter {ND} in the applicable cell.

pH

Enter the {pH} of the water measured in each disinfection zone.

If, on a specific day, your plant does not treat any water or disinfectant is not used in a disinfection zone, leave this column blank. However, if you treated water but failed to measure the pH of the water at the end of a disinfection zone, enter {ND} in the applicable cell.

Giardia and Viral Log Inactivations

The worksheet uses a series of mathematical equations to determine the levels of *Giardia* and viral inactivation obtained in each of the disinfection zones. It then totals the log inactivations of each and automatically reports the results in the **Giardia Log** column and the **Virus Log** column, respectively.

An asterisk after the number indicates the value is not representative of the total log inactivation for all disinfection zones because you failed to enter disinfection process data for all zones, or entered ND in one or more cells. Use the circle button to identify missing data.

Inactivation Ratio

The worksheet calculates the inactivation ratio for both *Giardia* and viruses, and then automatically reports the lower inactivation ratio in the **Inact. Ratio** column. The letter beneath the number tells you if the lower inactivation ratio is the one for *Giardia* or for viruses

If the inactivation ratio is greater than, or equal to 1.00, your plant met both the minimum *Giardia* and viral inactivation requirements for the day.

Time

Enter {time (in hours)} that the inactivation ratio was less than 1.00. If the inactivation ratio was 1.00 or greater during the day, leave this column blank. If the inactivation ratio fell below 1.00 more than once during the day, enter the longest period of time that it was below 1.00.

If the inactivation ratio fell below 1.00 during the day and you failed to determine how long it remained below 1.00, enter {ND} in the applicable cell.

A plant may increase the monitoring frequency to more accurately determine the duration of an event. For example, if you collect disinfection process data every 15 or 30 minutes after getting a low inactivation ratio, you may report the duration of the event in ¼-hr or ½-hr increments. Therefore, an event lasting only 15 minutes is reported as 0.25 hours. An event lasting 2 hours, 45 minutes is reported as 2.75 hours.

Note: If you collect a data set that produces an inactivation ratio below 1.0, you must take action to raise your inactivation ration within four hours. The **Time** column will represent the length of time that you were below 1.0. If you have any questions about how to report this data, contact a SWTR Coordinator.

Log Inactivation Summaries CALC

Figure 3.11 shows the section of the worksheet where it uses the disinfection data you enter daily to automatically report the average, maximum, and minimum, daily inactivation ratios for both viruses and *Giardia*. It also calculates the standard deviation for the two averages.

31	D3								
	D4								
	D5								
	Max								
	Min								
	Avg								
	SD								

Figure 3.11. Log Inactivation Summary Section of the Disinfection Data Worksheet

The worksheet limits the amount of inactivation credit that your plant receives if one or more of the disinfection zones contain a free chlorine residual above 4.0 mg/L. If you exceed this level on any day, the worksheet displays the following note in the **Log Inactivation Summary** cell: *The LRCs for this plant were restricted on at least 1 day this month due to high free-chlorine levels in 1 or more zones or trains.*

Disinfection Process Performance Data Example

The example in Figure 3.12 contains disinfection process data for a SWTP for the first three days of a month. The information below the table explains what this data indicates.

PERFORMANCE DATA									
Date	DISINFECTION PROCESS DATA								
	Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	Giardia Log	Virus Log	Inact. Ratio	Time=
1	NA D1								
	CLA D2A	3.0	3.000	12.0	7.2				
	CLA D2B	3.0	3.000	12.0	7.4	0.81	1.97	0.85	1.40
	CLA D3	3.5	6.000	12.0	7.4			(V)	
	D4								
2	NA D1								
	NA D2A								
	NA D2B					NA	NA	NA	
	NA D3								
	D4								
3	CLO2 D1	0.2	3.000	12.0	7.2				
	CLA D2A	2.8	3.000	12.0	7.5				
	NA D2B					1.78	4.83	2.39	
	CLA D3	3.5	3.000	12.0	7.5			(V)	
	D4								

Figure 3.12. Performance Data Example

This example indicates the following information:

- There are three disinfection zones and two treatment trains in zone D2.
- On Day 1:
 - The plant was not feeding a disinfectant in zone D1 when this set of data was collected.
 - The plant was achieving 0.81 log of *Giardia* inactivation and 1.97 log of viral inactivation when this set of data was collected.
 - The minimum inactivation ratio for the day was 0.85 and was limited by the viral inactivation requirements.
 - The longest period of time that the inactivation ratio was below 1.00 was 1.4 hours.
- On Day 2 the plant did not treat any water.
- On Day 3, Train D2B was not in operation when the operator collected this set of data.

3.5 TOC Data (P.6, 7, 8, and SUVA)

If your plant has sedimentation or clarification treatment processes, you are required to collect and report total organic carbon (TOC) data each month. The worksheets described in this section are used to meet the TOCMOR reporting requirement.

This section applies to all plant types, if your plant is subject to TOC monitoring requirements.

Depending on your specific treatment processes, you enter TOC information and data on one or more of the worksheets identified by the tabs in Figure 3.13. These worksheets tabs are visible if you entered at least one sedimentation basin when you completed the **Plant Parameters** dialog box when you customized your workbook; otherwise, they are hidden.

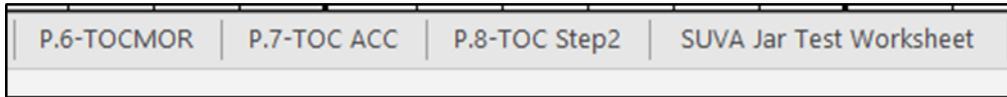


Figure 3.13. Worksheet Tabs for Reporting Results of TOC Monitoring

P.6 TOCMOR Worksheet

Every SWTP with at least one sedimentation or clarification basin must submit a **P.6 TOCMOR** worksheet each month. The worksheet contains cells reporting both information about the type of treatment, and TOC data.

Conventional or Unconventional Plants

The boxes in Figure 3.14 are used to report whether your treatment plant is conventional or unconventional. Enter {X}, as applicable, in the appropriate box.

A plant is conventional if it has gravity or pressure (granular media) filters, and any of the following:

- Flocculators and sedimentation basins.
- Conventional solid-contact clarifiers such as slurry-recirculation clarifiers and sludge blank clarifiers.
- High-rate clarifiers.

If you select Unconventional, then you must also explain why. A plant is unconventional if it uses membrane filters, regardless of whether there is a clarifier to pretreat membrane feed water. A plant with granular media filters may also be unconventional, if we have approved an exception allowing you to use alternative treatment technologies with extremely high surface overflow rates and very short detention times. If your plant uses an exception to use an unconventional clarifier, you must still comply with raw water TOC monitoring requirements.

	A	B	C	D	E	F	G	H	I	J	K	L
1	MONTHLY TOTAL ORGANIC CARBON REMOVAL REPORT (TOCMOR)											
2	FOR SURFACE WATER OR GROUND WATER UNDER THE INFLUENCE OF SURFACE WATER SYSTEMS											
3	PUBLIC WATER SYSTEM NAME: _____						PLANT NAME OR NUMBER: _____					
4	PWS ID No.: _____			Plant ID No.: _____			Month: <u>January</u>			Year: <u>2018</u>		
5	Type of treatment: <input type="checkbox"/> Conventional			<input type="checkbox"/> Unconventional explain: _____								
6												

Figure 3.14. Conventional or Unconventional Plant Selection

TOC Monitoring Requirements

You must collect at least one complete TOC sample set each month under normal operating conditions. A complete TOC sample set contains the following three samples:

- raw water alkalinity
- raw water TOC
- treated water TOC

You must collect treated water TOC samples between 1 and 8 hours after collecting the raw water sample. This time will vary based on detention time of the water. The goal is to collect the same water at your treated water sample point that you collected at your raw water sample point. If it takes the water six hours to flow from your raw sample point to the treated sample point, then that is the time you should wait between collecting those samples. These samples should also all be collected near the end of a long production run so the plant has time to reach normal operating conditions.

Raw water samples must be collected prior to any treatment, including those for taste and odor control, pre-disinfection, and coagulation. They must also be collected upstream of the site where you recycle reclaimed water, such as decant water from a lagoon or spent backwash water.

Treated water samples may be collected at the effluent of clarifiers, at the influent or effluent of filters, or at the entry point to the distribution system.

The TOC sample set results must reflect the typical operating conditions during the month. For example, if you change water sources, switch coagulants, or significantly alter the coagulant dose on the tenth day of the month, you must collect at least one complete TOC sample set after making the change. This is because data collected during the first 10 days of the month do not reflect the typical conditions that existed when you produced most of the water.

Note: We recommend that you evaluate raw water or treated water TOC levels each time source water quality or the treatment process change, even if you decide not to run a complete TOC sample set. Although incomplete data sets may not be reported, the information is still valuable for making process-control decisions.

TOC Data Entry

Figure 3.15 shows the TOC data entry area of the **P.6 TOCMOR** worksheet. Although you are only required to collect one complete TOC sample set each month, the **P.6** worksheet provides cells for you to enter sample set results once each day. The form will calculate the averages of all the sample sets you enter. As stated previously, you must enter the results of all the complete TOC sample sets you collect during the month. Do not enter the results unless you collected a complete sample set.

Test No.	Test Date	Monthly TOC Sample Set			Actual % TOC Removed	Step 1 Required % Removal	Step 1 Removal Ratio	Optional data		INDIVIDUAL SAMPLE COMPLIANCE REMOVAL RATIO
		Raw Alkalinity	Raw TOC	Treated TOC				Step 2 Required % Removal	Step 2 Removal Ratio	
		Enter the Sample Set results								
1										
2										
3										

Figure 3.15. TOC Data Entry Area in the P.6-TOCMOR Worksheet

Test Date

In the **Test Date** column, enter the {date} you collected a complete TOC sample set. If you failed to collect a complete TOC sample set during the month, enter the first day of the month on the first row.

Monthly TOC Sample Set Results

Enter the {raw water alkalinity concentration (in mg/L)}, the {raw water TOC concentration (in mg/L)}, and the {treated water TOC concentration (in mg/L)} in the cells corresponding to their test date. Enter the complete sample set results from the first date in the first row, the second set in the second row, and so on.

If you failed to collect a complete sample set during the month, enter {ND} in each of the three cells on the first row.

Actual % TOC Removed, Required Step 1 % Removal, Step 1 Removal Ratio **CALC**

The worksheet uses the Step 1 Removal Ratio results to automatically populate these cells first. If you have indicated that your facility uses Unconventional treatment, the worksheet will calculate the Actual % TOC removal but will automatically enter NA in the other two cells.

Optional Data, Step 2 Required % Removal, and Step 2 Removal Ratio **CALC**

If you want to use the results of a Step 2 jar test to ensure you meet the TOC treatment technique requirements, you must complete the **P.8 TOC Step2** worksheet. The workbook will use the data recorded on that worksheet to complete these two cells.

Compliance Removal Ratio **CALC**

The worksheet uses the TOC sample results to complete these cells. If you have not completed the **P.8 TOC Step2** worksheet, the compliance-removal ratio for each sample set will be copied from the corresponding **Step 1 Removal Ratio** cell. If you entered data on **P.8**, the compliance removal ratio will be based on the higher of the step 1 and step 2 removal ratios. This ensures that you will always receive the highest credit possible for each complete sample set.

TOC Removal Summary

The **P.6 TOCMOR** worksheet automatically reports a summary of the TOC data in the **TOC Summary** section shown in Figure 3.16.

TOTAL ORGANIC CARBON (TOC) REMOVAL SUMMARY					
TOC Summary					Monthly Compliance Ratio
Raw Water Alkalinity	Raw Water TOC	Treated Water TOC	TOC % Removal	ACC # used	

Figure 3.16. TOC Data Summary Area on the P.6-TOCMOR Worksheet

Raw Water Alkalinity, Raw Water TOC, Treated Water TOC, TOC % Removal **CALC**

The worksheet automatically reports these values based on a single TOC sample set or the averages of all the TOC sample sets reported.

ACC # Used **CALC**

This cell will indicate which ACC was used on **P.7 TOC ACC** if the system qualifies for that ACC.

Monthly Compliance Ratio **CALC**

If the average removal ratio for all of the complete sample sets reported is 1.00 or higher, the worksheet will automatically report that value in this cell. If the average is less than 1.00, then **P.6** will use the information you entered on **P.7 TOC ACC** to determine if you have met one of the ACCs. If you have, **P.6** will automatically report a monthly compliance ratio of 1.00. If you indicated your facility uses Unconventional treatment, the worksheet automatically reports NA in this cell.

Compliance with TOC treatment technique requirements is based on a RAA calculated at the end of each quarter. For example, at the end the second quarter (i.e., April, May, and June), we determine compliance by calculating the average removal ratio achieved between July of the previous year and June of the current year. You are in compliance with treatment technique requirements if that annual average removal ratio is 1.00 or greater.

Since treatment technique compliance is based on four quarters, you may still be in compliance if you get a removal ratio of less than 1.00 occasionally. However, you may want to investigate ways to improve your removal ratios by qualification with one of the ACCs, or running a Step 2 Jar Test to identify a more appropriate removal goal.

P.7-TOC ACC Worksheet

If you use one of the ACCs to meet your TOC removal requirements, you will also need to complete and submit the **P.7 TOC ACC** worksheet with your MOR. Table 3.4 lists and briefly describes each of the eight ACCs and their compliance options.

Table 3.4. Description of TOC ACCs and Compliance Options

ACC No.	Compliance Options		Description
	Monthly	Yearly (Based on RRA)	
1	Yes	Yes	Raw water TOC less than 2.0 mg/L
2	Yes	Yes	Treated water TOC less than 2.0 mg/L
3	No	Yes	All apply: <ul style="list-style-type: none"> • Raw water TOC less than 4.0 mg/L • Alkalinity greater than 60 mg/L • TTHM less than or equal to 0.040 mg/L • HAA5 less than or equal to 0.030 mg/L
4	No	Yes	All apply: <ul style="list-style-type: none"> • TTHM less than or equal to 0.040 mg/L • HAA5 less than or equal to 0.030 mg/L • Free chlorine is the only disinfectant used in the plant and in the distribution
5	Yes	Yes	Raw water SUVA less than or equal to 2.0 L/mg-m
6	Yes	Yes	Treated water SUVA less than or equal to 2.0 L/mg-m
7	Yes	Yes	Treated water alkalinity less than 60 mg/L
8	Yes	Yes	Magnesium hardness removal greater than or equal to 10 mg/L as CaCO ₃

Most plants use the same ACC each month, especially at plants using one of the annual compliance options. However, plants may switch between ACCs when appropriate.

The **P.7 TOC ACC** worksheet is hidden unless it helps with the TOC removal compliance. In other words, **P.7** is hidden based on one of the following:

- The average raw water TOC results for all the sample sets collected during the month is less than 2.0 mg/L.
- The average treated water TOC results for all the sample sets collected during the month is less than 2.0 mg/L.

ACC Selection

Before you enter performance data on the **P.7 TOC ACC** worksheet, you must select the ACC you want credit for during the reporting month (see Figure 3.17). Enter {X} in one of eight ACC boxes at the top of the worksheet. After you select the ACC for the month, **P.7** will remove the data entry areas for the other ACC options.

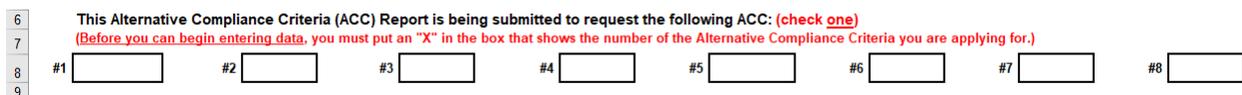


Figure 3.17. ACC Selection Boxes on the P.7-TOC ACC Worksheet

ACC Data Entry

After you select the ACC, you need to enter the data for that ACC option.

Except for ACC #3 and ACC #4, you can meet the ACC based on the data collected during the reporting month or the data you collected during each of the previous four calendar quarters. If you meet the ACC requirement on either a monthly or annual basis, the worksheet will automatically make appropriate changes to the **ACC # Used** and the **Monthly Compliance Ratio** cells on the current month's **P.6 TOCMOR** worksheet.

Current Month Data

If you collected the data needed to evaluate compliance with an ACC requirement for the month covered by the report, enter the results in the applicable **Current Month TOC** cell. If the monthly data meets the ACC requirement, the worksheet will hide the data entry area for the annual data.

Historical Data

The **P.7 TOC ACC** worksheet will only let you enter data for previous months if either of the following is true:

- You did not enter any data in the **Current Month** cell.
- Data for the current reporting period does not meet the ACC requirement.

The worksheet will automatically populate the **Month and Year** cells with the months used to evaluate compliance with the ACC requirement on an annual basis. After you have entered historical data for each of the three months for a quarter, the worksheet will record the average value in the **Quarterly Average** cell. Once you have entered the historical data for all four quarters, the worksheet will report the RRA in the **RAA** cell.

Once you have entered 12 months of historical data, the worksheet will not allow you to enter data in the **Current Month** cell unless the value in the **RAA** cell does not meet the ACC requirement.

ACC #1 and ACC #2

As Figure 3.18 indicates, ACC #1 and ACC #2 are available on both a monthly and an annual basis.

Source Water TOC less than 2.0? (either based on most recent month's data OR calculated quarterly as a running annual average)		Q1	Q2	Q3	Q4
ACC #1	Current Month TOC				
	Month/Year				
	Average River Water TOC				
	Quarterly Average				
RAA					

Treated Water TOC less than 2.0? (either based on most recent month's data OR calculated quarterly as a running annual average)		Q1	Q2	Q3	Q4
ACC #2	Current Month TOC				
	Month/Year				
	Average Treated Water TOC				
	Quarterly Average				
RAA					

Figure 3.18. TOC ACC #1 and ACC #2 Data Entry Areas

The average monthly values for both raw and treated water TOC are copied into the table from the **TOC Summary** area at the bottom of the **P.6 TOCMOR** worksheet. If either of these monthly results meets the respective ACC criterion, the workbook will hide the **P.7 TOC ACC** worksheet. Otherwise, the data-entry area will be displayed for the historical data corresponding to the ACC you selected.

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the previous four quarters. Enter the values from each of the **Month/Year** rows at the bottom of **P.6** into the applicable cells on **P.7**.

ACC # 3

As Figure 3.19 indicates, ACC #3 can only be evaluated on an annual basis.

Source Water TOC less than 4.0? (calculated quarterly as a running annual average)					
AND Source water alkalinity over 60 mg/L (as CaCO3)? (calculated quarterly as a running annual average)					
ACC # 3	Month/Year	Q1	Q2	Q3	Q4
	Average Raw Water TOC				
	Quarterly Average				
	RAA				
	Average Raw Water Alkalinity				
	Quarterly Average				
	RAA				
	AND TTHM and HAA5 no greater than 0.040 mg/L and 0.030 mg/L, respectively? (calculated as a running annual average of quarterly averages)				
TTHM RAA for the 4 quarters that end : <input type="text"/> mg/L		HAA5 RAA for the 4 quarter that end : <input type="text"/> mg/L			

Figure 3.19. TOC ACC #3 Data Entry Area

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the previous four quarters. Enter the historical values from each of the **Raw Water TOC** and the **Raw Water Alkalinity** cells in the **TOC Summary** area into the appropriate cells.

You also need the TTHM and HAA5 results collected during the previous four quarters identified in the **Month/Year** row of the past tables. Use the following procedure to calculate the RAAs for the TTHM and HAA5 results and enter the results in the appropriate cells:

1. Add results for all TTHM samples collected during a given quarter.
2. Calculate the quarterly TTHM average by dividing the results from step 1 by the number of samples collected during the quarter.
3. Repeat steps 1 and 2 to calculate the quarterly TTHM average for the other three quarters.
4. Add the four quarterly TTHM averages together and divide by four to get the TTHM RAA for the 12-month period.
5. Repeat steps 1-4 using the HAA5 results.

ACC #4

As Figure 3.20 indicates, ACC #4 can only be evaluated on an annual basis.

ACC # 4	TTHM and HAA5 no greater than 0.040 mg/L and 0.030 mg/L, respectively? (calculated as a running annual average of quarterly averages)	
	TTHM RAA for the 4 quarters that end: <input type="text"/> mg/L	HAA5 RAA for the 4 quarters that end: <input type="text"/> mg/L
AND only chlorine is used in the whole plant and distribution system. Chlorine only?: <input type="text"/>		
I certify that for the last 12 months, only free chlorine was used as a disinfectant for primary disinfection and for maintenance of a residual in the distribution system.		
_____ Certified Operators Signature/ Certificate Number / Date		

Figure 3.20. TOC ACC #4 Data Entry Area

To complete this portion of the report, you need the results from all TTHM and HAA5 samples that were collected during the previous four calendar quarters. Use the five steps outlined for ACC #3 to calculate the TTHM and HAA5 RAA values and enter them in the appropriate cells in the data-entry area.

You must also certify whether free chlorine was the only disinfectant that your system used during this 12-month period. Enter {Yes} or {No} in the **Chlorine only?** cell and sign the form on the line provided.

ACC #5

As Figure 3.21 indicates, ACC #5 is available both monthly and annually.

ACC # 5	Source water SUVA less than or equal to 2.0 L/mg-m? (either based on most recent month's data OR calculated quarterly as a running annual average) <small>(Source water SUVA is the dissolved organic carbon concentration divided by the ultraviolet light absorption at 254 nanometers in the source water before any treatment of any kind. Measure monthly.)</small>													
	Current Month SUVA	Month/Year	Q1			Q2			Q3			Q4		
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
	Monthly Raw Water SUVA		<input type="text"/>											
	Quarterly Average RAA		<input type="text"/>											

Figure 3.21. TOC ACC #5 Data Entry Area

If you ran a raw water SUVA test during the reporting period, enter the {SUVA (in L/mg-m)} in the **Current Month SUVA** cell. If the value meets the ACC #5 criterion, the worksheet hides the historical data table, since you do not need historical data to meet the requirement.

To complete the historical data table, you need your historical data results for the previous four quarters. Enter the historical SUVA results into the appropriate **Monthly Raw Water SUVA** cells.

ACC #6

As Figure 3.22 indicates, ACC #6 is available both monthly and annually.

ACC # 6	Treated water SUVA less than or equal to 2.0 L/mg-m? (either based on most recent month's data OR calculated quarterly as a running annual average) <small>(Treated water SUVA is the dissolved organic carbon concentration divided by the ultraviolet light absorption at 254 nanometers in the finished water before any disinfection of any kind, or measured using a finished water SUVA jar test. (See the instructions worksheet for more info.) Measure monthly.)</small>													
	Treated water SUVA measured:	<input type="text"/>	In Plant	I certify that an oxidant was used upstream of the Treated Water TOC monitoring point during the period for which treated water SUVA data is reported.										
		<input type="text"/>	By Finished Water SUVA Jar Test	_____ Certified Operators Signature / Certificate Number / Date										
	Current Month SUVA	Month/Year	Q1			Q2			Q3			Q4		
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Monthly Treated Water SUVA		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Quarterly Average RAA		<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	

Figure 3.22. TOC ACC #6 Data Entry Area

If you ran a treated-water SUVA test during the reporting period, enter the results in the **Current Month SUVA** cell. If the meets the criterion, the worksheet hides the historical-data table.

To complete the historical data table, you need your historical data results for the previous four quarters. Enter the treated water SUVA results into the appropriate **Monthly Treated Water SUVA** cells.

You must also certify whether you performed the SUVA test on treated water produced by the plant or on water in a SUVA jar test. If the test was run on a sample of plant treated water, enter {X} in the **In Plant** cell. If the test was run on a sample of water obtained after running a SUVA jar test, enter {X} in the **By Finished Water SUVA Jar Test** cell. Sign the form on the line provided.

If you place an X in the **By Finished Water SUVA Jar Test** cell, a **SUVA Jar Test Worksheet** tab will appear. This worksheet provides a convenient place for you to record the SUVA jar test results and the plant conditions at the time you ran the test. You don't have to include this worksheet with your MOR.

ACC #7

As Figure 3.23 indicates, ACC #7 is available on both a monthly and an annual basis to plants that perform lime softening.

Treated water alkalinity less than 60 mg/L (as CaCO ₃)? (softening practiced)		(either based on most recent month's data OR calculated quarterly as a running annual average)															
ACC #7	Current Month ALK	Q1				Q2				Q3				Q4			
	Month/Year	Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average	
	Month/Year	Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average	
	RAA	Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average		Monthly Treated Alkalinity		Quarterly Average	

Figure 3.23. TOC ACC #7 Data Entry Area

If you ran treated water alkalinity tests during the reporting period, enter the {average alkalinity (in mg/L)} in the **Current Month ALK** cell. If the value is less than 60 mg/L, the worksheet hides the unneeded historical-data table.

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the previous four quarters. Enter the monthly alkalinity values from each of the **Month/Year** rows to into the appropriate **Monthly Treated Alkalinity** cells.

ACC #8

As Figure 3.24 indicates, ACC #8 is available both monthly and annually to plants that practice lime softening.

Magnesium hardness removal greater than or equal to 10 mg/L (as CaCO ₃)? (softening practiced)		(either based on most recent month's data OR calculated quarterly as a running annual average)															
ACC #8	Current Month Mg Hardness	Q1				Q2				Q3				Q4			
	Raw	Monthly Raw Mg Hardness		Quarterly Average		Monthly Raw Mg Hardness		Quarterly Average		Monthly Raw Mg Hardness		Quarterly Average		Monthly Raw Mg Hardness		Quarterly Average	
	Treated	Monthly Treated Mg Hardness		Quarterly Average		Monthly Treated Mg Hardness		Quarterly Average		Monthly Treated Mg Hardness		Quarterly Average		Monthly Treated Mg Hardness		Quarterly Average	
	Removal	Monthly Mg Removal		Quarterly Average		Monthly Mg Removal		Quarterly Average		Monthly Mg Removal		Quarterly Average		Monthly Mg Removal		Quarterly Average	

Figure 3.24. TOC ACC #8 Data Entry Area

If you measured the magnesium levels in both the raw and treated water during the reporting period, enter the {magnesium (Mg concentration (in mg/L))} in the **Raw** and **Treated** cells, located under the **Current Month Mg Hardness** cell. The worksheet automatically reports the amount of magnesium removed. If you removed at least 10 mg/L, the worksheet will hide the historical-data table.

To complete the historical data table, you need your historical raw and treated Mg hardness results for the previous four quarters. Enter the results into the appropriate **Monthly Raw Mg Hardness** cells and the **Monthly Treated Mg Hardness** cells. The worksheet will then automatically report the amount of magnesium hardness removed each month and each quarter as well as the RRAs.

P.8 TOC Step2 Worksheet

You only need to complete the **P.8 TOC Step 2** worksheet if you ran a Step 2 Jar Test and you want to use the results to help meet your TOC treatment technique requirement.

The results of a Step 2 Jar Test are valid for six consecutive months beginning with the first month of the calendar quarter when you ran the test and ending with the last month of the following calendar quarter. For example, the results of a Step 2 Jar Test conducted in March can be used from January through June.

We may require you to conduct another Step 2 Jar Test if your raw water conditions change significantly during the six-month period. For example, we may require a new jar test if you switch to a new water source and the chemical matrices (TOC, alkalinity, etc.) of the two sources differ significantly.

For more information about how to conduct a Step 2 Jar Test, please refer the *TOC Guidance Manual* (TCEQ publication RG-379).

Date of Jar Test

Before you can enter any other data on the worksheet, enter the {date} that you ran your Step 2 Jar Test in the report header as shown in Figure 3.25. This date may be no earlier than the first day of the month at the beginning of the previous calendar quarter, and no later than the last day of the current reporting period. This is because the plant may use this test to meet the alternative TOC requirement for each month in both the quarter when the test was performed and the following quarter, for six months total. For example, if you are submitting a report for March, 2022, the date you enter may not be earlier than October 1, 2021 (i.e., the first day of the month at the beginning of the previous quarter) and no later than March 31 (i.e., the last day of the current reporting period).

	A	B	C	D	E	F	G	H	I	J	K
1	STEP 2 JAR TEST REPORT										
2	FOR SURFACE WATER OR GROUND WATER UNDER THE INFLUENCE OF SURFACE WATER SYSTEMS										
3	PUBLIC WATER SYSTEM NAME: _____					PLANT NAME OR NUMBER: _____					
5	PWS ID No.: _____			Plant ID No.: _____			DATE OF JAR TEST: _____				
6											

Figure 3.25. Jar Test Report Header

Plant Conditions

Enter information about the operating conditions at your treatment plant in the **Plant Conditions** area of the worksheet as shown in Figure 3.26. This includes raw water source(s), and type and dose of coagulant, coagulant aid, etc.

6									
7	PLANT CONDITIONS								
8	RAW WATER SOURCE(s)	COAGULANT		COAGULANT AID		FLOC AID		pH ADJUSTMENT	
9		Type	Dose (mg/L)	Type	Dose (mg/L)	Type	Dose (mg/L)	Type	Dose (mg/L)
10									

Figure 3.26. Plant Conditions Area of TOC Step 2 Jar Test Worksheet

If you conducted your Step 2 Jar Test during the current reporting period, enter the operating conditions and information for the day you ran the test. However, if you conducted your test during some other month, record the conditions from the date when you collected your TOC sample set. If you collected more than one TOC sample set, report the conditions that most accurately reflect typical operational practices for the month.

If you were not using one or more of the treatment chemicals identified in table above when you collected the operating data, enter {NA} in the **Type** cell and leave the corresponding **Dose (mg/L)** cell blank.

Step 2 Jar Test Parameters

Enter the information about the dosing solutions, jars, and test conditions you used to conduct the test in the **Step 2 Jar Test Parameters** section of the worksheet as shown in Figure 3.27.

12	STEP 2 JAR TEST PARAMETERS									
13	COAGULANT		BASE		JAR SIZE	JAR TEST CONDITIONS				
14	Type	Stock Solution Concentration (g/L)	Type	Stock Solution Concentration (g/L)	Volume (liters)	Rapid Mix		Flocculation		Settling
15						Speed (rpm)	Duration (minutes)	Speed (rpm)	Duration (minutes)	Duration (minutes)
16										
17										

Figure 3.27. Jar Test Parameters Area of the TOC Worksheet

If you did not adjust the pH when you conducted the Step 2 Jar Test, enter {NA} in the **Base Type** cell and leave the corresponding **Stock Solution Concentration** cell blank.

Note: Many Texas SWTPs do not need to add a base during their Step 2 Jar Test because they have source water with relatively high alkalinity. We may, however, require that you use a base when conducting your jar test if the pH drops rapidly in the first two or three jars, or if the first jar contains a relatively high alum dose.

Jar Test Results

Record the results of your Step 2 Jar Test in the **Jar Test Results** section of the worksheet as shown in Figure 3.28.

		JAR TEST RESULTS							
Jar No.	COAGULANT		BASE		Alkalinity (mg/L as CaCO ₃)	pH	TOC (mg/L)	Incremental TOC Removal (mg/L TOC removed per 10 mg/L of alum)	Cumulative TOC Removal (%)
	Dose (Alum eq.) (mg/L)	Volume (mL)	Dose (mg/L)	Volume (mL)					
RAW									
1									
2									
3									
4					Target pH (based on raw water alkalinity)				
5									
6									
7									
8									
9									
10									
11									
12									
Has the TCEQ approved this source as "Not Amenable" to Treatment even though Target pH was not reached? If "yes", provide the date of the TCEQ letter or e-mail.					TOC, % Removal at Apparent P00R:				

Figure 3.28. Jar Test Results Data Entry Area

The table has enough room for you to enter the results for up to 12 jars; however, you may not need to run such an exhaustive test. You only need to test enough coagulant doses to reach both of the following:

- a point of diminishing return
- your target pH

Coagulant Dose and Volume

Enter the {coagulant dose (as mg/L of dry alum)} used in each jar and the {volume of dosing solution (in mL)} that you added to achieve that dose. If you used a coagulant other than dry alum to prepare your stock solution, be sure to report the dose in the proper units.

Base Dose and Volume

If you adjusted the pH in any of the jars, enter the {base dose (in mg/L)} used in each jar and the {volume of dosing solution (in mL)} that you added to achieve that dose. If you did not add base to one or more of the jars, leave the applicable cells blank.

Alkalinity and Target pH

Enter the {alkalinity (in mg/L)} of the raw water. After you enter the alkalinity concentration, the worksheet will automatically enter the {pH} in **Target pH** cell.

pH and TOC

Enter the {pH} and {TOC (in mg/L)} of the settled water in each of the jars.

Incremental TOC Removal CALC

After you enter the TOC concentration of the settled water from each jar, the worksheet automatically reports the incremental reduction achieved in each jar. The incremental value reported for each jar is the difference between the TOC levels in that

jar and the previous one divided by one tenth of the increase in alum dose in those same two jars.

If results indicate that the TOC level in a given jar is higher than the TOC level in the preceding jar, the incremental removal will be reported as a negative value.

Cumulative TOC Removal **CALC**

After you enter the TOC level of the settled water in each jar, the worksheet will also report the cumulative TOC reduction achieved in each jar, expressed as percent reduction. The cumulative value recorded for a given jar is the difference between the TOC level in that jar and the TOC level in the raw water divided by the raw water TOC level.

If the incremental TOC removal value for a jar is a negative number, the worksheet will display the words, bad data point in the **Cumulative TOC Removal** cell.

TOC, % Removal at Apparent PODR **CALC**

Based on the test data entered, the worksheet will automatically report the information for the cell shown in Figure 3.29 with one of five results explained in the following subsections.

TOC, % Removal at Apparent PODR:	

Figure 3.29. TOC, % Removal at Apparent PODR Cell

Numerical Value

If the worksheet automatically reports a numerical value, it means the Step 2 Jar Test identified only one PODR. If this happens, the worksheet will copy the appropriate value from the cumulative TOC removal data to the cell and use the result to determine your TOC removal ratio for each TOC sample set.

Bad Data Point

This result means the Step 2 Jar Test also identified only one PODR; however, the PODR occurred in a jar that had negative incremental TOC reduction. If this happens, contact a SWTR Coordinator to help determine what follow-up is required.

Not Found

This result means your Step 2 Jar Test did not identify a PODR. Usually, this is because you failed to reach the target pH in any of your jars. It could also mean the highest coagulant dose you used in the jar test produced a TOC reduction of 0.3 mg/L or higher for each 10 mg/L of alum in the last two jars. If you get this result, you will need to repeat the test using higher alum doses.

More than 1 Point of Diminishing Returns

This result means your Step 2 Jar Test produced a PODR in two or more jars. If you get this result, you need to determine which of the values best characterizes the jar test findings; and copy the appropriate value from the **Cumulative TOC Removal** cell to the empty cell below the **More than 1 PODR** notice. Contact a SWTR Coordinator if you have any questions about which PODR value to use.

Not Amenable

This result means your Step 2 Jar Test revealed that you reached your target pH in at least one of the jars but that all the of the jars produced TOC reductions of less than 0.3 mg/L for each 10 mg/L of alum applied.

If you get this result, contact a SWTR Coordinator so that we can review your jar test results. If we concur that the TOC in your source water is not amenable to treatment, we will send you a letter or email confirming the finding. Once you have consulted with us, use the drop-down menu and enter {Yes} in the upper highlighted cell and enter the {date} of our correspondence in the lower one.

SUVA Jar Test Worksheet

As indicated previously, if you entered an X in the **By Finished Water SUVA Jar Test** cell on the **P.7-TOC ACC** worksheet, a **SUVA Jar Test** worksheet will be available. We have included this worksheet for you to record the test results and the plant conditions at the time of testing. Since the **SUVA Jar Test** worksheet is not used for compliance, it is not protected and contains no automated calculations or formulas. This worksheet is provided for your convenience; you do not have to include it when you submit your MOR. If you have questions about filling out the SUVA Jar Test Worksheet, contact a SWTR Coordinator.

General Information about SUVA Jar Tests

A SUVA jar test estimates the relative amount of humic substances present in the water. SUVA is an indirect indicator of whether the organic carbon in water is humic or non-humic. It is calculated by dividing a sample's UV absorption at a wavelength of 254 nm by its concentration of dissolved organic carbon.

Water that contains higher amounts of humic material is generally more amenable to enhanced coagulation. Plants that produce treated water with SUVA levels below 2.0 L/mg-m are unlikely to remove significantly more TOC.

It is generally better to test the SUVA levels of the treated water actually produced by your plant. However, it is not possible to measure treated water SUVA levels at plants that use iron-based coagulants (such as ferric chloride and ferric sulfate) or chemical preoxidants (such as chlorine and sodium or potassium permanganate), because these compounds interfere with the SUVA analytical method. In order to estimate the level of humic materials in the treated water they produce, these plants must conduct a SUVA jar test.

The following conditions apply to SUVA Jar Tests:

- You cannot add any iron-based chemicals (such as ferric chloride or ferrous sulfate) or any oxidant (such as chlorine or permanganate).
- You can (and should) add organic polymers and pH adjustment chemicals currently used in your plant prior to the sedimentation basin or clarifier. These chemicals include coagulant aid polymers, flocculant aid polymers, or acids and bases you add to adjust the pH or alkalinity of the coagulation process.
- You should not add any chemicals applied to settled or filtered water in your plant. These chemicals include filter aid polymers, corrosion control chemicals such as caustic or phosphates, and fluoride.

3.6 Imported Data

The **Imported Data** tab is useful for plants that want to migrate data directly from a SCADA system or their digital data files into the SWMOR workbook instead of manually entering data into every cell each month.

You will need to determine the capabilities of your SCADA system or data files to perform the initial migration of data into the **Imported Data** tab. You will also need to develop a formatted table arrangement for the data once it is in the **Imported Data** tab. Having a predetermined table arrangement to migrate data into each month will limit the number of formulas that you will have to change within other reported data tabs.

Once you have your data in the Imported Data tab in an arrangement that you can recreate each month, you can begin to program formulas into data cells of the other tabs. For example, in Day 1 of the **Raw Water Pumpage** column on **P.2 Turbidity Data**, enter the formula, ='Imported Data'!A1. This formula will tell the **P.2 Turbidity Data** worksheet to find the Raw Water Pumpage data point for this cell on the **Imported Data** tab in cell A1. If you have questions about building your workbook to operate using the Imported Data tab, contact a SWTR Coordinator.

4. Compiling Summary Data

Summary data is compiled at the end of the reporting month after entering all daily operational and performance data for that month. The **P.1 Summary Data** worksheet includes the following tables:

- Treatment Plant Performance
- Distribution System
- Additional Reports and Worksheets
- Statistical Analysis of Turbidity Data
- Statistical Analysis of pH Data
- Summary Page Addendum; if violations occurred, and PN is required

The **P.1 Summary Data** worksheet automatically reports most of the summary data based on the data and information you entered on **P. 2** through **P.9**; however, you need to enter some data manually. To begin entering summary data, select the **P.1** worksheet tab. It is important that all cells on the **P.1 Summary Data** worksheet are completed, as specified in the following sections. If your **P.1** worksheet has missing data, a warning or error message may appear, and in some instances, you will not be able to print a report. Use the Circle Errors button to locate the missing entries on its source page. If data is missing, enter a value, as applicable. This will correct the missing entries on **P.1**.

If **P.1** of the MOR you submit to TCEQ has missing entries, it indicates you did not conduct the required tests. As such, you may incur a M/R violation and be required to notify your customers.

4.1 Treatment Plant Performance

The **Treatment Plant Performance** table is divided into four sections for plants. Plants without alternative treatment technologies will only see three of these. These sections summarize the following data:

- turbidity
- microbial inactivation/CT
- disinfectant residuals leaving the plant
- Bin class and credits received

Turbidity

Figure 4.1 shows the section of the **Treatment Plant Performance** table that summarizes CFE turbidity data.

The **P.1 Summary** worksheet automatically reports most of the data in this section using information you entered on the other worksheets.

TREATMENT PLANT PERFORMANCE			
Total number of turbidity readings:	_____	Number of 4-hour periods when plant was off-line:	_____
Number of readings above 0.10 NTU:	_____	Number of 4-hour periods when plant was on-line but turbidity data was not collected:	_____
Number of readings above 0.3 NTU:	_____	Number of days when plant was on-line but individual filter turbidity data was not collected:	_____
Number of readings above 0.5 NTU:	_____	Number of days with readings above 1.0 NTU:	_____ (2)
Number of readings above 1.0 NTU:	_____	Number of days with readings above 5.0 NTU:	_____ (3)
Maximum allowable turbidity level:	_____		
Percentage of readings above this limit:	_____ % (1)		
Statistical Summary	Maximum turbidity reading: _____ NTU	Average turbidity value:	_____ NTU
	Minimum turbidity reading: _____ NTU	Standard deviation:	_____ NTU
	CFE 95 th percentile value: _____ NTU	IFE 95 th percentile:	_____ NTU

Figure 4.1. Filter Effluent Turbidity Summary Section

Total Number of Turbidity Readings CALC

The **P.1** worksheet for plants other than 2-Filter plants, automatically calculates and reports the total number of CFE turbidity readings based on data in the **NTU1** through **NTU6** columns on **P.2**. The **P.1** worksheet for 2-Filter plants performs a similar calculation using the information entered on **P.6-9** of that workbook.

Number of Readings Above NTU Triggers CALC

The **P.1** worksheet for plants other than 2-Filter plants, automatically calculates and reports the number of CFE turbidity readings above 0.10 NTU, above 0.3 NTU, above 0.5 NTU, and above 1.0 NTU based data from the **NTU1** through **NTU6** columns on **P.2**. The **P.1** worksheet for 2-Filter plants workbook performs a similar calculation using the information entered on **P.6-9** of that workbook.

Maximum Allowable Turbidity Level CALC

In most cases, the **P.1** worksheet automatically reports 0.3 NTU in the **Maximum Allowable Turbidity Level** cell. If the cell is empty, use the drop-down list and select the [maximum allowable turbidity level] for your plant. *Note:* We strongly encourage all PWSs to maintain turbidity as low as possible.

Percentage of Readings Above this Limit—Box (1) CALC

The **P.1** worksheet automatically reports the percentage of CFE turbidity above the maximum allowable turbidity level.

Box (1) is the first of several numbered boxes in the **Treatment Plant Performance** and **Distribution System** tables on **P.1**. The information in these boxes is related to one of the treatment technique violations or M/R violations that trigger a requirement to issue PN.

Number of 4-hour Periods when Plant was Offline CALC

If your system serves more than 500 persons, the **P.1** worksheet for plants other than 2-Filter plants, reports the number of 4-hr periods when the plant was offline. This is based on the number of Xs you entered in the **NTU1** through **NTU6** columns on **P.2**.

If your system serves 500 or fewer persons, the **P.1** worksheet for plants other than 2-Filter plants, reports the number of days when the plant was offline. This is based on

the number of days when the plant did not treat any water and a flow rate was 0.000 was entered in the **Raw Water Pumpage** column on **P.2**.

The **P.1** worksheet for 2-Filter plants uses the 15-min. CFE turbidity readings you entered on **P.6-9** of that workbook to determine when the plant was not operating.

Number of 4-hour Periods Plant was Online but Turbidity Data was Not Collected **CALC**

If your system serves more than 500 persons, the **P.1** for plants other than 2-Filter plants, calculates and reports the number of 4-hr periods when the plant was online, but you did not enter CFE turbidity data. The calculation is based the number of NDs you entered in the **NTU1** through **NTU6** columns on **P.2**.

If your system serves 500 or fewer persons, the **P.1** worksheet for plants other than 2-Filter plants, calculates and reports the number of days when the plant was online but you did not record a single CFE turbidity reading. The **P.1** worksheet for 2-Filter plants does a similar calculation for this entry but uses the 15-min. CFE turbidity readings that you entered on **P. 6-9**. *Note:* Systems serving 500 or fewer persons are required to collect and report CFE data at least once a day.

Number of Days When Plant was Online but Individual Filter Turbidity Data was Not Collected **CALC**

The **P.1** worksheet calculates and reports this information based on the number of days the plant was online, but you failed to report IFE turbidity data. In other words, the worksheet counts the number of days when you entered ND because you failed to record any of the required readings; as well as days when you entered MD because you only collected some of the required 15-min. readings. If your system serves 10,000 or more persons, the **P.1** worksheet counts the number of days with missing turbidity data in either the **Max** or **4 Hrs** columns on **P. 3**. If your system serves fewer than 10,000 persons, the **P.1** worksheet only counts the number of days with missing turbidity data in the **Max** columns.

If your plant has only one filter and you are using the workbook customized for 2-Filter plants, the worksheet will automatically report NA in this cell.

Note: Most of the data and information in the **Treatment Plant Performance** table is applicable to overall plant performance; however, this one piece of information is related to the monitoring of individual filters. You must measure the turbidity of the water from each filter every day that your plant treats raw water. If your plant has IFE turbidimeters, you must continuously monitor the turbidity of the filtered water from each individual filter and record the readings every 15 minutes. If your plant serves fewer than 10,000 people and has two filters but no IFE turbidimeters, you must collect at least one grab sample from each filter each day.

Number of Days with Readings Above NTUs-Boxes (2) and (3) CALC

For plants other than 2-Filter plants, **P.1** worksheet automatically calculates and reports the number of days when one or more CFE turbidity readings were above 1.0 NTU and 5.0 NTU, using the **NTU1** through **NTU6** columns on **P.2**. For 2-Filter plants, the **P.1** worksheet of workbook does a similar calculation for this entry based on the information entered on **P.6-9** of that workbook.

Bin Class and Crypto Credits

Figure 4.2 shows the section of the Treatment Plant Performance table related to the Bin class and crypto credits received for plants with alternative treatment technologies. Plants without alternative treatment technologies will not see this section.

Bin Class: _____	Crypto Credit Required: _____ (7A)	Crypto Credit Achieved: _____ (7B)	Bin 3&4 Credits: _____ (7C)
Watershed Protection: _____	Conventional Treatment: _____	Second Stage Filtration: _____	
Bank Filtration: _____	Enhanced Filter Performance: _____	UV: _____	
Presedimentation with Coagulation: _____	Bag and Cartridge Filtration: _____	Ozone, Chlorine Dioxide: _____	
Two-Stage Lime Softening: _____	Membrane Filtration: _____	Perform. Demonstration: _____	

Figure 4.2. Bin Class and Crypto Credits

The cells in this section are calculated and will populate based on data from other areas of the workbook and the technologies selected during the initial customization of the workbook.

Microbial Inactivation and CT

Figure 4.3 shows the section of the **Treatment Plant Performance** table related to microbial inactivation and CT. The worksheet automatically reports all this data using the information you entered on the **P.4&5-Disinfection Data** worksheet.

36	Number of days with a low CT		Average log inactivation for Giardia: _____
37	for no more than 4.0 consecutive hours: _____		Average log inactivation for viruses: _____
38	Number of days with a low CT		Number of days when profiling data was not collected: _____
39	for more than 4.0 consecutive hours: _____ (4)		Number of days when CT data was not collected: _____

Figure 4.3. Microbial Inactivation and CT Summary Section

Number of Days with a Low CT for Four Hours or Less CALC

A low CT occurs when a plant fails to meet the CT requirements because the inactivation ratio for *Giardia* or viruses falls below 1.00. The **P.1** worksheet automatically reports the total number of days when the total inactivation ratio in the **Inact. Ratio** column on **P.4&5** was less than 1.00, and the duration in the **Time** column was 4.0 hours or less.

Number of Days with a Low CT for Over Four Hours—Box (4)

CALC

The **P.1** worksheet also reports the number of days when the total inactivation ratio in the **Inact. Ratio** column on **P.4&5** was less than 1.00 and the duration in the **Time** column was greater than 4.0 hours.

Note: If you did not report the length of time that the inactivation ratio fell below 1.00 on **P.4&5**, the workbooks assume the event lasted all day (i.e., 24 hours).

Average Log Inactivations for *Giardia* or Viruses **CALC**

The **P.1** worksheet automatically reports the average log inactivation for *Giardia* and viruses from the summary at the bottom of **P.5**.

Number of Days when Profiling Data was Not Collected **CALC**

The **P.1** worksheet automatically calculates and reports the number of days when the plant was online, but you failed to report the disinfection process data from all disinfection zones. This calculation is based on the number of days with missing disinfection process data in the **C (mg/L)** column, the **Flow (MGD)** column, the **Temp (°C)** column, or the **pH** column on **P.4&5**. Lacking this data, the worksheet cannot calculate the *Giardia* and virus inactivations; or it determines the calculated values are not representative of the total log inactivations for all disinfection zones.

Number of Days when CT Data was Not Collected **CALC**

The **P.1** worksheet automatically reports the number of days you failed to collect disinfection process data for a CT calculation, when the plant was online. This is based on the number of days with missing disinfection process data in the **C (mg/L)** column, the **Flow (MGD)** column, the **Temp (°C)** column, or the **pH** column on **P.4&5**. As a result, the **Inact. Ratio** column on **P.4&5** could not be calculated.

Disinfectant Residual Leaving the Plant

Figure 4.4 shows the section of the **Treatment Plant Performance** table for the disinfectant residuals leaving the plant. The **P. 1** worksheet automatically reports all this information based on prior information you entered.

41	Minimum disinfectant residual required leaving the plant:	0.5 mg/L, measured as Total Chlorine
42	Number of days with a low residual	
43	for no more than 4.0 consecutive hours:	
44	Number of days with a low residual	Number of days when disinfectant residual
45	for more than 4.0 consecutive hours: <input type="text" value="(5)"/>	leaving the plant was not properly monitored: <input type="text"/>

Figure 4.4. Summary Section of Disinfectant Residuals Leaving the Plant

Minimum Disinfectant Residual Required Leaving the Plant

CALC

The **P.1** worksheet automatically reports this information based on data you entered in the **Disinfection Process Parameters** dialog box.

The worksheet also allows you to use the drop-down list to override the dialog-box selection. If needed, you can select the required minimum disinfectant residual leaving the plant. If your system adds free chlorine to the water before it enters distribution system, select [0.2]. If your system injects ammonia at the plant to form monochloramine before water enters the distribution system, select [0.5]. The worksheet uses the selected residual to indicate whether you should be testing for free chlorine or for total chlorine.

Number of Days with a Low Residual for No More than 4.0 Consecutive Hours

CALC

The worksheet automatically reports this information based on data from **Lowest Residual** column and the **Time** column on the **Performance Data** table on **P.2**.

Number of Days with a Low Residual for More than 4.0 Consecutive Hours—Box (5)

CALC

The **P.1** worksheet automatically reports this information using the data from the **Lowest Residual** column and the **Time** column on the **Performance Data** table on **P.2**.

If you do not report the length of time that the residual was below the minimum requirement, the workbook assumes that the event lasted all day (i.e., 24 hours).

Number of Days when Disinfectant Residual Leaving the Plant was Not Properly Monitored

CALC

The **P.1** worksheet automatically reports the number of days that the plant pumped treated water to the distribution when the operator failed to properly monitor the disinfectant residual in water leaving the plant. This is based on the number of days you entered ND or MD in the **Lowest Residual** column on **P.2**.

4.2 Distribution System

Figure 4.5 shows the **Distribution System** table on the **P.1** worksheet. This is the only place on the worksheet where distribution system information is required. The worksheet automatically reports some of the information, but most must be entered manually. There is an example at the end of the section demonstrating how to complete this table.

DISTRIBUTION SYSTEM	
48	
49	Minimum disinfectant residual required in distribution system: <u>0.5</u> mg/L, measured as Total Chlorine
50	Total number of readings this month: <input type="text"/>
51	Average disinfectant residual value: <input type="text"/> Percentage of readings with a low residual this month: <input type="text"/> % (6A)
52	Number of readings with a low residual: <input type="text"/>
53	Number of readings with no detectable residual: <input type="text"/> Percentage of readings with a low residual last month: <input type="text"/> % (6B)

Figure 4.5. Distribution System Table

Minimum Disinfectant Residual Required in Distribution System CALC

The **P.1** worksheet automatically reports this information based on the information you entered when you customized your SWMOR workbook.

The worksheet allows you to use the drop-down list to override the dialog box selection. If your system uses free chlorine in the distribution system, select [0.2]. If your system injects ammonia at any point before or within the distribution system to form monochloramine, select [0.5].

Total Number of Readings this Month

Enter the {total number of disinfectant residual sample readings} you collected at designated residual and bacteriological sampling sites in the distribution system during the month. If you did not collect any disinfectant residual readings in the distribution system during the month, enter {0}. If you performed tests, but failed to record the results, enter {ND}.

Note: You are required to measure the disinfectant residual in the distribution system at least once each day at one or more of the designated sites in your system’s approved monitoring plan. You must also measure the disinfectant residual each time you collect a bacteriological sample at a site designated in your monitoring plan. When completing this section of the worksheet, you must include the disinfectant residual readings from all designated residual and bacterial sampling sites in your monitoring plan. Do not include any additional disinfectant readings from locations that are not designated in your monitoring plan.

Average Disinfectant Residual Value

Enter the {average disinfectant residual (in mg/L)} based on all the distribution readings you collected during the month at designated sampling sites. (See prior note.)

Calculate the average by adding all the distribution residual readings and dividing by the total number of readings in the month. If you recorded either 0 or ND in the **Total number of readings this month** cell above, enter {NA} or {ND} in this cell, respectively.

Number of Readings with a Low Residual

Enter the {number of readings} for the month that the distribution disinfectant residual was below the minimum required. Include only those readings collected at

designated sites. If you recorded either 0 or ND in the **Total number of readings this month** cell above, enter {NA} or {ND} in this cell, respectively.

Note: The number of low readings cannot be greater than the number of readings for the month; and the number of low readings must be greater than, or equal to the number of readings with no detectable residual.

Number of Readings with No Detectable Residual

Enter the {number of readings} for the month when the distribution disinfectant residual was not detected. Include only those samples collected at designated sites. If you recorded either 0 or ND in the **Total number of readings this month** cell above, enter {NA} or {ND} in this cell, respectively.

Note: The number of readings with no residual cannot be greater than the total number of readings, or greater than the number of readings with a low residual.

Percentage of Readings with a Low Residual this Month—Box (6A) CALC

The worksheet automatically reports the percentage of readings in which the distribution residual was below the minimum requirement during the month.

Percentage of Readings with a Low Residual last Month—Box (6B)

Enter the {percentage of readings} during the month that the distribution residual was below the minimum requirement. You get this information from Box 6A of your previous month's report.

The **P.1** worksheet cannot report that you have complied with the distribution system disinfection requirements unless you complete Box 6B. If you do not complete this box, you will get an error message in the **Public Notices** table of the worksheet and may incur a M/R violation.

Distribution System Table Example

This example demonstrates how to complete the **Distribution System** table on **P.1**. The example chlorine residual data shown in Table 4.1 is from a hypothetical SWTP where ammonia is not used in the treatment process. During the month, the operators collected 31 chlorine residual readings as part of distribution residual monitoring; and 8 chlorine residual readings as part of bacteria monitoring. These 39 (31+8) samples were collected from designated sites on the plant's approved monitoring plan.

Note: The operators also collected 16 (12 +4) additional samples from non-designated sites (i.e., not on their monitoring plan) because they investigated some complaints during the reporting period.

Table 4.1. Example Chlorine Residual Data

Sample Type	Location	Number of readings	Total of all residual readings (mg/L)	Number below 0.2 mg/L	Number with no detectable residual
chlorine only	designated site	31	30.8	3	1
chlorine and coliform	designated site	8	12.9	0	0
chlorine only	not a designated site	12	3	5	2
chlorine and coliform	not a designated site	4	1.8	1	1

Using the information in table 4.1, you would follow the steps below to complete the **Distribution System** table:

1. Verify the minimum required residual is correct. Because the plant is not adding ammonia, either select [0.2] from the drop-down list or re-customize your MOR workbook to show Free Chlorine in the distribution system
2. Determine the total number of readings during the month. Do not include the 16 readings collected at sites not on the monitoring plan. The total number of readings for the month is 39 (31+8).
3. Determine the average residual in the samples collected at designated sites. The total residual in the 39 samples that count is 43.7 mg/L (30.8+12.9). The average result is 1.1 mg/L (43.7 divided by 39).
4. Separately count the number of readings that are below the minimum and non-detectable. There are 3 (3+0) samples below the minimum and one (1+0) with no detectable residual. Remember, the 16 samples collected at sites not on the monitoring plan do not count.
5. In Box 6B, enter the value shown in box 6A for the previous month.

4.3 Additional Reports and Worksheets

Figure 4.6 shows the section of **Additional Reports and Worksheets** table that specifies if you need to submit a **Summary Page Addendum** with your MOR; as well as what, if any, additional reports and worksheets to include.

ADDITIONAL REPORTS & WORKSHEETS			
Additional report(s) for individual filter monitoring required:	<input checked="" type="radio"/> NONE	<input type="radio"/> Filter	<input type="radio"/> CPE
Additional report(s) for individual filter monitoring submitted:	<input checked="" type="radio"/> NONE	<input type="radio"/> Filter Profile	<input type="radio"/> CPE (11)
No additional IFE Reports are required this month.			
	<input type="radio"/> filter	<input type="radio"/> filter Assessment (10)	

Figure 4.6. Additional Reports and Worksheet Table

The worksheet automatically reports if any treatment technique or M/R violations occurred during the reporting period. If there were violations during the month, this section displays the statement in bold, red letters: *The Summary Page Addendum (Public Notices) is required because there was at least one treatment technique or monitoring/reporting violation reported.*

If there were no violations during the month, this section of the worksheet displays the statement: *The Summary Page Addendum (Public Notices) is not required because there were no treatment technique or monitoring/reporting violations reported.*

Additional Report(s) for Individual Filter Monitoring Required CALC

The worksheet automatically reports whether your plant is required to conduct additional monitoring and complete an FPR, an FAR, or a CPE Request Form. This is based on the IFE turbidity data entered on **P.3**. If None is indicated, your plant is not required to conduct additional monitoring or complete any of the additional reports.

Additional Report(s) for Individual Filter Monitoring Submitted

Select either [FPR], [FAR], or [CPE], as applicable if you are submitting additional reports with your MOR; otherwise, select [None].

If you select None, and your MOR indicates you are required to submit one of these reports, you may incur a M/R violation.

Note: The worksheet allows you to submit a special report even if not required. For example, if you are having problems with a specific filter, you can complete and submit an FAR and a proposed CAP before you have your third event with IFE turbidity readings over 1.0 NTU.

Statement for Individual Filter Reports CALC

The worksheet compares the additional filter reports you are required to submit with those you indicate you are submitting.

If you choose to submit a report when none are required, the worksheet automatically displays the statement: *No additional IFE Reports are required this month.*

If you do not indicate that you are submitting the additional reports required, the spreadsheet automatically displays the statement in bold, red letters: *Additional IFE Reports are required this month.*

Statement for Report Waive Due to CAP CALC

The **P.1** worksheet uses the information you entered on the **P.3** worksheet to determine if your plant is exempt from one or more of the additional reports because you have an approved CAP. If you do not have an approved CAP, the worksheet will leave this line blank. However, if an approved CAP is the only reason that you are not required to submit additional reports, the spreadsheet will automatically display the statement in bold, red letters: One or more additional reports have been waived due to an approved corrective action plan.

We do not require that you submit a copy of the CAP with your report. We do, however, check our records to verify that you currently have a valid CAP approved in writing, which is not expired, and covers all applicable filters requiring an additional report. If we cannot verify that you have a valid CAP, you will be required to submit a corrected MOR. You may also incur a M/R violation.

4.4 Statistical Analysis of Turbidity Data CALC

The **P.1** worksheet automatically calculates and reports the following summary statistics based on the turbidity data you entered throughout the month on the settled water, the IFE, and the CFE:

- maximum and minimum
- average value
- standard deviation
- 95th percentile

4.5 Statistical Analysis of pH Data CALC

The **P.1** worksheet also automatically calculates and reports the following summary statistics based on the pH data you entered throughout the month:

- maximums and minimum
- average value
- standard deviation
- 95th percentile

4.6 Summary Page Addendum (Violations and Public Notices)

The **P.1** worksheet automatically determines and reports if you have a treatment technique or an M/R violation. If so, you must complete a **Summary Page Addendum** to include with your MOR. If not, the **Summary Page Addendum** page is excluded when you print your MOR.

The **Summary Page Addendum** contains a **Public Notices** table with the following information:

- List and description of the possible violation type(s).

- Indication if a violation has occurred.
- Dates you notified us and your customers of the violation.
- Dates, or month and year of the violation.

Figure 4.7 shows the **Public Notices** table header row of the **Summary Page Addendum**. If the statement related to the **P. 1 Summary Page Addendum** in Section 4.3 indicates it is required, enter the required information in this table as described in the subsections below.

SURFACE WATER MONTHLY OPERATING REPORT					
FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)					
Summary Page Addendum (Violations and Public Notices)					
PUBLIC WATER SYSTEM NAME: <u>City of Bigge City</u>			PLANT NAME OR NUMBER: <u>Old Plant</u>		
PWS ID No.: <u>2540099</u>		Month: <u>March</u>		Year: <u>2012</u>	
PUBLIC NOTICES					
VIOLATION TYPE	DESCRIPTION OF VIOLATION	VIOLATION OCCURRED?	NOTICE TO TCEQ <input type="checkbox"/>	NOTICE TO CUSTOMER * <input type="checkbox"/>	VIOLATION DATES
	More than 6.0% of the turbidity readings above the				

Figure 4.7. Heading of Summary Page Addendum

Violation Types CALC

Violations are classified according to their risk to public health. The general types of violations that can occur at SWTPs are of two types - treatment technique violations (including acute and non-acute) and M/R violations. (See Chapter 11.)

Figure 4.8 shows the section of the **Summary Page Addendum** where you report treatment technique violations. Figure 4.9 shows the section of the **Summary Page Addendum** where you report M/R violations. Keep in mind, the violations shown in the following figures may be different in each of the three MOR workbooks.

PUBLIC NOTICES							
VIOLATION TYPE	DESCRIPTION OF VIOLATION	VIOLATION OCCURRED?	NOTICE TO TCEQ <input type="checkbox"/>	NOTICE TO CUSTOMER * <input type="checkbox"/>	DATE OF NOTICE	DATE OF NOTICE PENDING	VIOLATION DATES
88	TREATMENT TECHNIQUE	Were more than 5.0% of the turbidity readings above the acceptable level? - see (1) on the Summary Page					
89		Were there any days with turbidity readings above 1.0 NTU? - see (2) on the Summary Page					
90		Were there any days with turbidity readings above 5.0 NTU? - see (3) on the Summary Page					
91		Were there any periods when the plant failed to meet the CT requirements for more than 4.0 consecutive hours? - see (4) on the Summary Page					
92		Were there any periods when the residuals leaving the plant fell below the acceptable level for more than 4.0 consecutive hours? - see (5) on the Summary Page					
93		Were more than 5.0% of the residuals in the distribution system below the acceptable level for two months in a row? - see (6A) and (6B) on the Summary Page					

Figure 4.8. Section of the Summary Page Addendum for Treatment Technique Violations

95	MONITORING & REPORTING	Were there any days when the plant failed to report all of the required Combined Filter Effluent (CFE) turbidity readings? - see the Turbidity Data Page					
96		Were there any days when the plant failed to report all the CT data needed to evaluate the level of microbial inactivation achieved? - see the Disinfection Data Page					
97		Were there any days when the plant failed to report the minimum disinfectant residual entering the distribution system? - see the Turbidity Data Page					
98		Did the system fail to collect enough samples in the distribution system to meet the minimum disinfectant monitoring requirements? - see (8) on the Summary Page					
99		Were there any days when the plant failed to report the maximum individual filter effluent (IFE) turbidity level produced by each filter? - see the Filter Data Page					
100		Were there any days when the plant failed to report the IFE turbidity level 4-hours after beginning a filter run? - see the Filter Data Page					
101		Did the plant fail to submit a Filter Profile Report if one was required? - see (9) on the Summary page					
102		Did the plant fail to submit a Filter Assessment Report if one was required? - see (10) on the Summary Page					
103		Did the plant fail to submit a Comprehensive Performance Evaluation Request if one was required? - see (11) on the Summary Page					
104	Did the plant fail to collect at least one Total Organic Carbon sample set? - see TOCMOR Page						
105	<input checked="" type="checkbox"/> Treatment technique violation notices are due no later than the end of the next business day. Please include a copy if possible.						
106	* Copies of each Public Notice must accompany this report if they have already been issued.						

Figure 4.9. Section of the Summary Page Addendum for M/R Violations

Description of Violation

This column contains brief descriptions of the various treatment technique violations and M/R violations that can occur. It also tells where in a workbook you can find the data used to make the compliance determinations. In some cases, these references will direct you to one of the numbered items on the **P.1 Summary** worksheet. In other cases, the references will direct you to another worksheet.

Violation Occurred?

The **Summary Page Addendum** automatically reports if one or more violations occurred during the reporting period. If the violation occurred, Yes is reported next to the violation description. If the violation did not occur, No is reported next to the description.

Notice to TCEQ

You are required to notify us when a treatment technique or M/R occurs. The communication method you use, and the amount of time you have to contact us depends on the type and severity of the violation, and whether or not we have to take any action. See Chapter 11 for information on notifying us of violations.

If you sent an email or faxed us a completed Violation Report Form (TCEQ Form 10449), enter the {date} you sent it in the **Notice to TCEQ** column. If possible, include a copy of the email or the fax confirmation sheet with your MOR.

If you have not already sent us a separate notice, enter the date that you expect to mail your completed MOR.

Notice to Customers

In addition to notifying us, you are also required to notify your customers when a treatment technique or M/R violation occurs. Again, the communication method you must use, and the amount of time you have to issue the notice depends on the type and severity of the violation. See Chapter 11 for notifying your customers of violations.

The **Notice to Customer** column is subdivided into two additional columns, a **Date of Notice** column and a **Pending** column. If you have already issued your PN you must do both of the following:

- Enter the {date} you notified your customers in the **Date of Notice** column.
- Submit a sample copy of the exact PN language and the certificate of delivery with your MOR.

If you have not yet issued a required PN, you must confirm that the notice is pending. If this is the case, select [Yes] from the drop-down list in the **Pending** column. If not, select [No].

If you select No in a **Pending** cell, the worksheet assumes that you have already issued the notice (because it is no longer pending). Therefore, you will not be able to print your report until you enter a date in the corresponding **Date of Notice** cell.

The **Summary Page Addendum** will allow you to select Yes in a **Pending** cell even if you have entered a date in the **Date of Notice** cell. Although this situation is relatively uncommon, we recognize that there may be times when you have notified your customers of some, but not all, of the violations that occurred during the reporting period. In that case, the date indicates when you issued the applicable notices and Yes indicates that some of the PNs are still pending.

Violation Dates

The **Summary Page Addendum** includes formulas which determine the dates when each violation occurred. To help you make sure your PNs are completed, we have programmed the **Addendum** to automatically record all violation dates or periods in the appropriate **Violation Dates** cell.

4.7 Printing, Signing, and Submitting Your MOR

After you complete the **P.1 Summary** worksheet, you must print, sign, date, and submit each page of your workbook. (See Chapter 10.)

5. Additional Guidance for Plants with Alternative Treatment Technologies

This chapter describes how to enter and report compliance data using this workbook when customized for alternative treatment technologies, and how to complete the required worksheets for the following technologies:

- Pre-sedimentation with coagulation
- Two-stage lime softening
- Bank filtration
- Enhanced filter performance
- Bag or cartridge filtration
- Membrane filtration
- Second stage filtration
- Inactivation (using chlorine dioxide or ozone, or UV light)

Alternative Technology Worksheets

Your workbook will automatically determine which alternative technology worksheets you are required to submit each month, based on how you customize it. The required worksheets are indicated by visible tabs at the bottom of the workbook screen. The individual worksheets are explained in this chapter beginning with Section 5.4.

Note: We have not developed worksheets for alternative technologies such as watershed control programs and site-specific demonstration of performance. If you have approved credit for one of these programs, you should have an exception approval letter from us explaining what data to report with your MOR. If you need a copy of an approval letter, contact a SWTR Coordinator.

5.1 Customizing Your Workbook

To begin customizing your SWMOR workbook, refer to Chapter 1 for instructions on accessing and opening a blank copy of an MOR workbook. Save a blank copy of the workbook on your desktop. After you open the workbook, select [Enable Content], if applicable and follow the guidance in this section. After customizing the workbook once, and saving the customized workbook as a master file, you will not need to customize it again unless there are changes to your plant.

Note: Do not use the workbook while a macro is running. Be patient because macros take time to run.

System Information Dialog Box

Refer to Chapter 2.2.

Plant Parameters Dialog Box

Refer to Chapter 2.3.

Disinfection Process Parameters Dialog Box

Refer to Chapter 2.4.

Alternative Technologies and LT2 ESWTR Dialog Box

The **Alternative Technologies and LT2 ESWTR** dialog box apply to plants that use alternative treatment technologies. Most of the alternative treatment technology information you need to enter in this dialog box can be found in your approval letter(s). If you cannot locate your approval letter(s), contact a SWTR Coordinator.

The **Alternative Technologies and LT2 ESWTR** dialog box, as shown in Figure 5.1 consists of a **Non-conventional treatments/programs** section and a **LT2 Compliance** section.

Figure 5.1. Alternative Technologies and LT2 ESWTR Dialog Box

Non-conventional Treatments or Programs?

Select [YES] if you have received TCEQ approval for at least one of the following treatment systems or programs:

- Source water protection
- Presedimentation with coagulation
- Two-stage lime softening
- Bank filtration
- Enhanced filter performance
- Demonstration of performance
- Bag or cartridge filtration
- Membrane filtration
- Second stage filtration
- Inactivation using chlorine dioxide or ozone, or UV light

LT2 Compliance

Select the [bin class] of your plant. Refer to the Bin Classification letter from TCEQ to determine which bin classification your source was assigned. If you select Bin 2, Bin 3, or Bin 4, you must also select the [system size range], which includes both residential and wholesale connections, and enter the {LT2 effective date}. If you select Bin 1 or N/A, the size range and LT2 effective date portion of the dialog box will be greyed out because it does not apply to your system.

Treatment Technologies Dialog Box

Based on your responses in the **Alternative Technologies and LT2 ESWTR** dialog box, the workbook determines whether you need to complete the **Treatment Technologies** dialog box. As shown in Figure 5.2, the **Treatment Technologies** dialog box includes categories specific to the types of alternative treatment used at your facility. The additional information will allow the workbook to calculate the treatment credits achieved by your plant for *Cryptosporidium* removal or inactivation.

Note: You must have TCEQ approval before you can claim *Cryptosporidium* removal or inactivation credit for any of the technologies listed in the **Treatment Technologies** dialog box.

Figure 5.2. Treatment Technologies Dialog Box

Source Protection and Management

Select [Watershed Control Program] if TCEQ has approved a watershed control program for your treatment plant that includes removal or inactivation credit.

Pre-Filtration

Presedimentation Basin with Coagulation

Select [Presedimentation Basin with Coagulation] if all the following apply:

- You have a TCEQ approval letter stating that your plant may receive presedimentation Cryptosporidium treatment credit.
- You have a presedimentation basin located upstream of your primary rapid mix and sedimentation basins or clarifiers.
- All the water that you treat normally passes through the presedimentation basin before primary treatment begins.
- You normally apply a coagulant continuously to the water as it enters the presedimentation basin.

Two-stage Lime Softening

Select [Two-stage Lime Softening] only if you have approval to claim additional removal credit for two-stage lime softening.

Bank Filtration

Select [Bank Filtration] if you have approval for riverbank filtration. In the **Well** box, enter the {number} of bank filters (or wells) that supply your plant. The SWMOR workbook can accommodate as many as 20 bank filters so you may only enter values from 1 to 20. If you have more than 20 wells, you will need to contact us for another version of a workbook.

Treatment Performance

You can receive additional pathogen removal credit by ensuring that your plant operates efficiently by producing water with extremely low turbidity from each individual filter; or by demonstrating excellent plant performance overall. You must have documented test results that demonstrate these requirements.

Enhanced Filter (IFE) Performance

Select [Enhanced Filter (IFE) Performance] if you receive pathogen removal credit for enhanced IFE performance data; that is, producing filtered water with 95% of IFE turbidity levels below 0.15 NTU, and never exceeding 0.3 NTU.

This additional credit is only available if you use conventional, granular media filters. To receive any enhanced credit for granular filters, you must continuously monitor turbidity from each filter.

Demonstration of Performance

Demonstration of performance applies to any innovative or nonstandard treatment that is not described by the specific processes described in this guidance. Select [Demonstration of Performance] and enter the {approved credit} given to you by TCEQ in the **Log Credit** box.

Additional Filtration

Bag or Cartridge Filters

Select [Bag or Cartridge Filters], if applicable, and enter the {number of assemblies} and the {maximum approved credit} you received. There is a maximum of 15 assemblies allowed.

Select either [primary] or [secondary] treatment. Primary applies if the bag or cartridge is your only filtration technology. Secondary may apply if you are also claiming pathogen removal credit using conventional filters or membranes.

If we have approved an alternative method for continuously monitoring the performance of the individual cartridge assemblies other than turbidity, select [Alternative Monitoring Approved].

Note: If you have granular filters with continuous IFE monitoring, and you are claiming log removal for granular filtration, you can add bag and cartridge filters downstream as secondary treatment. To receive credit for bag and cartridge filters as secondary treatment, you must monitor turbidity downstream of each bag or cartridge filter assembly at least once per day.

Membrane Filtration

Click [Membrane Filtration], if applicable. If you select this option, you must select which DIT method indicated below is used to verify the ongoing performance of the membrane units:

- [PBT] if you use a pressure based DIT method, meaning you measure the rate that the pressure drops in the membrane unit during a DIT.
- [QBT] if you use a volumetric, or airflow, based DIT method, meaning you measure the volume of air added to the membrane unit during a DIT.
- [MBT] if you use a marker based DIT method, meaning you feed a known amount of a pathogen sized marker (or particles) during the DIT and then measure the amount of marker removed by the membrane unit.

If you specify that you use a specific DIT method, you must also indicate how many membrane units use that method. The workbook can accommodate as many as 20 units for each type, so you may only enter values between 1 and 20.

You must also indicate what kind of IIT method you use to continuously monitor membrane performance. Select [Turbidity] if you use a laser turbidimeter (or one of the other approved turbidimeters) to continuously monitor the performance of each unit. Select [Others] if you use a particle counter, particle monitor, or some other parameter to monitor performance.

If you select Membrane Filtration, you must specify the DIT parameters for each membrane unit. Depending on your selection, additional dialog boxes will appear so you can enter the approved DIT parameter for each membrane unit. They will open after you complete this dialog box and select [OK]. These additional dialog boxes are explained later in this chapter.

Second Stage Filtration

Select [Second Stage Filtration] if you have approval to claim additional credit for second stage filtration and meet all the following criteria:

- Your plant has two or more conventional granular media filters that operate in a series.
- Coagulant is applied upstream of the first stage filters.
- IFE turbidity levels are continuously monitored upstream of the second stage filters.

Inactivation

Select [chlorine dioxide or ozone] or [UV] if your plant has approval to claim *Cryptosporidium* inactivation credit for chlorine dioxide or ozone; or ultraviolet inactivation processes. If you select chlorine dioxide or ozone, enter the {amount of credit} we approved in the **Log Credit** box.

If you select UV, additional dialog boxes will appear for you to record information about your UV facilities and the inactivation credit they receive. These additional dialog boxes are explained later in this chapter. They will open after you complete this dialog box and select [OK].

Note: Do not select chlorine dioxide or ozone unless you are using them as disinfectants for *Cryptosporidium* inactivation and have a letter from us stating this. The SWMOR workbook will automatically give you disinfection credit for *Giardia* and viruses, so additional reporting is not required.

DIT Parameters Dialog Boxes

If you selected Membrane Filtration in the **Treatment Technologies** dialog box, you must enter the DIT parameters specified in your DIT approval letter for each type of membrane unit. One of three dialog boxes will appear corresponding to which DIT treatment technology you selected. For example, if you selected PBT, the **PBT DIT Parameters** dialog box shown in Figure 5.3 will appear. If you selected QBT or MBT, those corresponding dialog boxes will appear.

	Pmin (psi)	LRC	UCL (psi/min)
Unit 1	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 2	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 3	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 18	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 19	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 20	<input type="text"/>	<input type="text"/>	<input type="text"/>

OK Cancel

Figure 5.3. PBT DIT Parameters Dialog Box

PBT DIT Parameters

Pmin (psi)

Enter the {minimum test pressure in pounds per square inch (psi)} for each membrane unit given to you by TCEQ. To pass a DIT, the air pressure must be lower than the P_{min}

shown in your approval letter through the entire DIT. *Note:* P_{\min} is referred to as P_{test} in *EPA Membrane Filtration Guidance Manual* (EPA 815-R-06-009, November 2005).

LRC

Enter the {log removal credit} for each membrane unit. The approved log removal credit is the maximum log removal credit you can claim based on your approved DIT test conditions. *Note:* The log removal credit is referred to as LRV_{DIT} (the log removal value for a DIT) in *EPA Membrane Filtration Guidance Manual*.

UCL (PSI/min)

Enter the {UCL (in psi/min)} for each membrane unit. To pass a DIT, the pressure decay rate measured during the DIT test cannot exceed the approved UCL shown in your approval letter.

The UCL is the maximum pressure decay rate that guarantees the integrity of a membrane system during a DIT. That is, if the pressure decay rate obtained during a DIT is greater than the UCL, the membrane system has at least one breach greater than $3\ \mu\text{m}$ and fails the DIT.

QBT DIT Parameters

The **QBT DIT Parameters** dialog box is shown in Figure 5.4.

	Pmin (psi)	LRC	UCL (L/min)
Unit 1	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 2	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 3	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 18	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 19	<input type="text"/>	<input type="text"/>	<input type="text"/>
Unit 20	<input type="text"/>	<input type="text"/>	<input type="text"/>

OK Cancel

Figure 5.4. QBT DIT Parameters Dialog Box

P_{\min} (psi)

Enter the {minimum test pressure (in psi)} for each membrane unit. To pass a DIT, the air pressure cannot fall below the P_{\min} shown in your approval letter. *Note:* P_{\min} is referred to as P_{test} in *EPA Membrane Filtration Guidance Manual*.

LRC

Enter the {log removal credit} for each membrane unit. The approved log removal credit is the maximum log removal credit you can claim based on your approved DIT test conditions. *Note:* The log removal credit is referred to as LRV_{DIT} (the log removal value for a DIT) in *EPA Membrane Filtration Guidance Manual*.

UCL (L/min)

Enter the {UCL (in L/min)} for each membrane unit. To pass a DIT, the air flow rate measured during the DIT test cannot exceed the approved UCL shown in your approval letter.

The UCL is the maximum pressure decay rate that guarantees the integrity of a membrane system during a DIT. That is, if the pressure decay rate obtained during a DIT is greater than the UCL, the membrane system has at least one breach greater than 3 μm .

MBT DIT Parameters

The **MBT DIT Parameters** dialog box is shown in Figure 5.5.

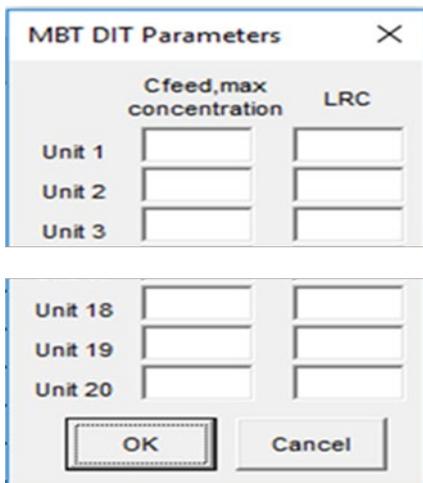


Figure 5.5. MBT DIT Parameters Dialog Box

Cfeed, Max Concentration

Enter the {Cfeed, max concentration (in mg/L)} for each unit. The maximum marker concentration in the feed water that you apply during the test must not be higher than the $C_{feed,max}$ shown in your approval letter. *Note:* $C_{feed,max}$ is referred to as $C_{test,max}$ in *EPAs Membrane Filtration Guidance Manual*.

LRC

Enter the {log removal credit} for each membrane unit. The approved log removal credit is the maximum log removal credit you can claim based on your approved DIT

test conditions. *Note:* The log removal credit is referred to as LRV_{DIT} (the log removal value for a DIT) in *EPAs Membrane Filtration Guidance Manual*.

UV Validation Method Dialog Box

If you clicked UV in the **Treatment Technologies** dialog box, you must complete the **UV Validation Method** dialog box shown in Figure 5.6. The dialog box consists of a **Location of UV Reactors** section and a **UV Reactor Validation Method** section.

Figure 5.6. UV Validation Method Dialog Box

Location of UV Reactors

Select [Upstream of the clearwell] or [Downstream of the clearwell] depending on where the UV reactors are located.

UV Reactor Validation Method

To receive treatment credit, UV reactors must undergo validation testing. Validation testing can involve either an ISA or a CDA.

Enter the approved {Minimum Required Crypto Log Inactivation} for your plant and then select the type and number of reactors as follows:

- [UV intensity Setpoint Approach] and enter the {number of ISA reactors}, if your plant uses any reactors that were validated using the ISA.
- [UV Calculated Dose Approach] and enter the {number of CDA reactors} and the {Number of UVT analyzers} if your plant uses any reactors that were validated using the CDA.

If your plant uses both types of reactors, enter the required information for each type.

UV Intensity Setpoint Approach Dialog Box

The ISA reactor relies on one or more UV intensity setpoints established during validation testing to ensure the reactor provides the required level of inactivation. The UV intensity, as measured by the UV sensors during operation, must meet or exceed the approved setpoint(s). This criterion ensures delivery of the required dose. Additionally, the reactors must operate within validated operational conditions for flow rates and lamp status. In this approach, UVT does not need to be monitored separately because the sensors account for this parameter.

As shown in Figure 5.7, the **UV Intensity Setpoint Approach** dialog box is used to enter information about validation parameters specific to your plant. The number of spaces depends on the number of reactors you specified in the **UV Validation Method** dialog box. The units for the Maximum Validated Flow Rate will be based on the selection in the Customize MOR dialog box. Enter the {Maximum Validated Flow Rate}; the {Intensity Setpoint}; and the {Number of Duty Sensors} for each reactor. *Note:* Duty sensors are online UV sensors that continuously monitor UV intensity during operation.

UV Reactor Validation Method - Intensity Setpoint Approach						
Reactor 1	Maximum Validated Flow Rate (MGD)	5	Intensity Setpoint	5	Number of Duty Sensors	10
Reactor 2	Maximum Validated Flow Rate (MGD)	5	Intensity Setpoint	5	Number of Duty Sensors	10
Reactor 3	Maximum Validated Flow Rate (MGD)	5	Intensity Setpoint	5	Number of Duty Sensors	10
Reactor 4	Maximum Validated Flow Rate (MGD)	5	Intensity Setpoint	5	Number of Duty Sensors	10

Figure 5.7. UV Intensity Setpoint Approach Dialog Box

UV Calculated Dose Approach Dialog Box

The CDA uses a dose monitoring equation to calculate an estimated UV dose. The applied UV dose is based on operating conditions such as UV intensity, flow rate, and UVT. The UV unit is calibrated during validation testing to determine the required dose for the target pathogen and log inactivation level.

The number of spaces in the **UV Calculated Dose Approach** dialog box shown in Figure 5.8 depends on the number of reactors you specified in the **UV Validation Method** dialog box. The units for the Maximum Validated Flow Rate will be based on the selection in the Customize MOR dialog box. Enter the {Maximum Validated Flow Rate}; the {Minimum Validated UVT (in percent)}; and the {Number of Duty Sensors} for each reactor. *Note:* Duty sensors are online UV sensors that continuously monitor UV intensity during operation.

UV Reactor Validation Method - Calculated Dose Approach						
Reactor 1	Maximum Validated Flow Rate (MGD)	1	Minimum Validated UVT (%)	5	Number of Duty Sensors	10
Reactor 2	Maximum Validated Flow Rate (MGD)	2	Minimum Validated UVT (%)	5	Number of Duty Sensors	10
Reactor 3	Maximum Validated Flow Rate (MGD)	3	Minimum Validated UVT (%)	5	Number of Duty Sensors	10

Figure 5.8. UV Calculated Dose Approach Dialog Box

LT2 Summary Worksheet

Figure 5.9 shows the tab for the **LT2 Summary** worksheet if you selected Bin 2 or higher or that you use alternative technologies when customizing the form. If this tab is not visible when it should be, close the file and recustomize your workbook.

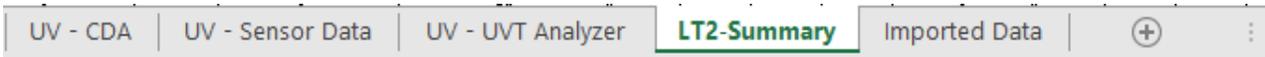


Figure 5.9. LT2 Summary Worksheet Tab

At the top of this worksheet, there is a block of information describing your system, plant, and reporting period. Leave this information blank during this step. It will be copied here from the information you enter when you complete the **P.2 Turbidity Data** worksheet as explained in the next section (see Section 5.2). The plant information cannot be reentered or edited here.

Treatment Technologies Table

The **LT2-Summary** worksheet contains two tables, the **Treatment Technologies** table and the **Giardia and Cryptosporidium Treatment Credits** table. Figure 5.10 shows the upper section of the **Treatment Technologies** table.

Note: Indicate the treatment processes in each train. (see comment)	TREATMENT TECHNOLOGIES																
	PRETREATMENT CREDITS				FILTRATION TECHNOLOGY CREDITS						ENHANCED PERFORMANCE CREDITS		DISINFECTION TECHNOLOGY CREDITS			OTHER TREATMENT CREDITS	
	Riverbank Filtration	Presed. with Coagul.	Two-stage Lime Softening	Conventional Sedimentation or Clarification	Conventional Granular Media Filters	Bag or Cartridge Filtration	Two-Stage Filtration	Membrane Filtration (PBT)	Membrane Filtration (QBT)	Membrane Filtration (MBT)	Enhanced CFE Perform	Optimized IFE Perform	Crypto Chemical Disinfect.	UV Disinfect. (ISA)	UV Disinfect. (CDA)	Watershed Protection	Perform. Demon.
Overall	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE
Train 1																	
Train 2																	
Train 3																	
Train 4																	
Train 5																	

Figure 5.10. Upper Section of the Treatment Technologies Table

The **Treatment Technologies** table lists all 17 potential treatment credits, identifies all your treatment technologies, and provides five rows to describe up to five different trains (see description below). Below the heading, there are 31 rows for the daily or monthly log removal credits the plant receives for using specific technologies or processes; and a row for the minimum credit received for each specific technology.

Overall CALC

The **Treatment Technologies** table uses the information you entered when customizing it to report all your treatment technologies and processes in the **Overall** row. If you indicated that your plant includes a specific process or technology, the worksheet will automatically report TRUE in the cell immediately below the corresponding heading. If not, the worksheet will report FALSE.

If the information shown on the **Overall** row is incorrect, close the file and recustomize your workbook.

Trains 1 – 5

The term “train” is used to describe a unique combination of parallel treatment technologies or processes, like conventional filters and membrane filters, rather than a series of disinfection zones. All water treatment plants have at least one unique combination of treatment processes or technologies. This section is used to specify your treatment trains and describe up to five unique treatment trains.

Using the drop-down list, select [TRUE] if a specific train contains a certain treatment process technology. If the train does not contain that specific process, leave the cell blank or use the drop-down list and select [FALSE]. You must enter data in the **Train 1** row. Only enter data in the **Train 2** through the **Train 5** rows if you have more than one unique combination of treatment processes. Similar units operating in parallel should not be shown as separate trains.

Note: Examples of different treatment trains are described later in this chapter. (See Figures 5.13, 5.14, and 5.15.)

Daily Data and Monthly Minimum CALC

The **LT2 Summary** worksheet uses the data you entered on other worksheets to automatically determine how much *Cryptosporidium* removal or inactivation credit each technology or process provides on a daily or monthly basis. It then uses the daily data to determine the minimum daily credit received by each technology or process your plant uses.

Perform. Demon.

If your plant has received our written approval to use some other technology or process to remove or inactivate *Cryptosporidium*, then summarize the daily removal credit that the plant receives in the **Perform. Demon.** column. Attach any required supporting documentation when you submit your MOR.

Giardia and Cryptosporidium Treatment Credits Table CALC

Figure 5.11 shows the heading for the **Giardia and Cryptosporidium Treatment Credits** table. After you enter treatment technologies data and daily performance data, the worksheet automatically completes this table and transfers the applicable information to the **P.1 Summary** worksheet. You cannot enter data in this table.

GIARDIA AND CRYPTOSPORIDIUM TREATMENT CREDITS												
Total Daily Credit By Train						Total Daily Bin 3 & 4 Credit by Train						
FALSE						Minimum	FALSE					Minimum
	FALSE							FALSE				
		FALSE							FALSE			
			FALSE							FALSE		
				FALSE							FALSE	

Figure 5.11. *Cryptosporidium* Treatment Credits Table

Total Daily Credit by Train CALC

After entering treatment technologies data and daily performance data, the worksheet automatically reports the total *Cryptosporidium* removal and the inactivation credit achieved in each of treatment trains each day. The worksheet also determines the lowest total credit for any of your trains and automatically reports it in the **Minimum** column. The results shown in the **Total Daily Credit by Train** section include cumulative, or total, log removal and inactivation credit achieved in each train.

Total Daily Bin 3 and 4 Credit by Train CALC

If we assigned your treatment plant to Bin 3 or Bin 4, you must achieve at least a 1.0 log removal or inactivation of *Cryptosporidium* with membrane filters, bag filters, cartridge filters, chlorine dioxide, ozone, or UV light. Therefore, the worksheet also calculates the total daily treatment credit your plant receives for using one or more of these specific Bin 3 and Bin 4 technologies. From this, it determines the minimum daily credit achieved by any train and reports the result in the **Minimum** column.

Treatment Trains Examples

Figures 5.12, 5.13, and 5.14 show three example approaches for defining treatment trains at plants utilizing a combination of cartridge, conventional, and membrane filters. Advantages and disadvantages are discussed after each example.

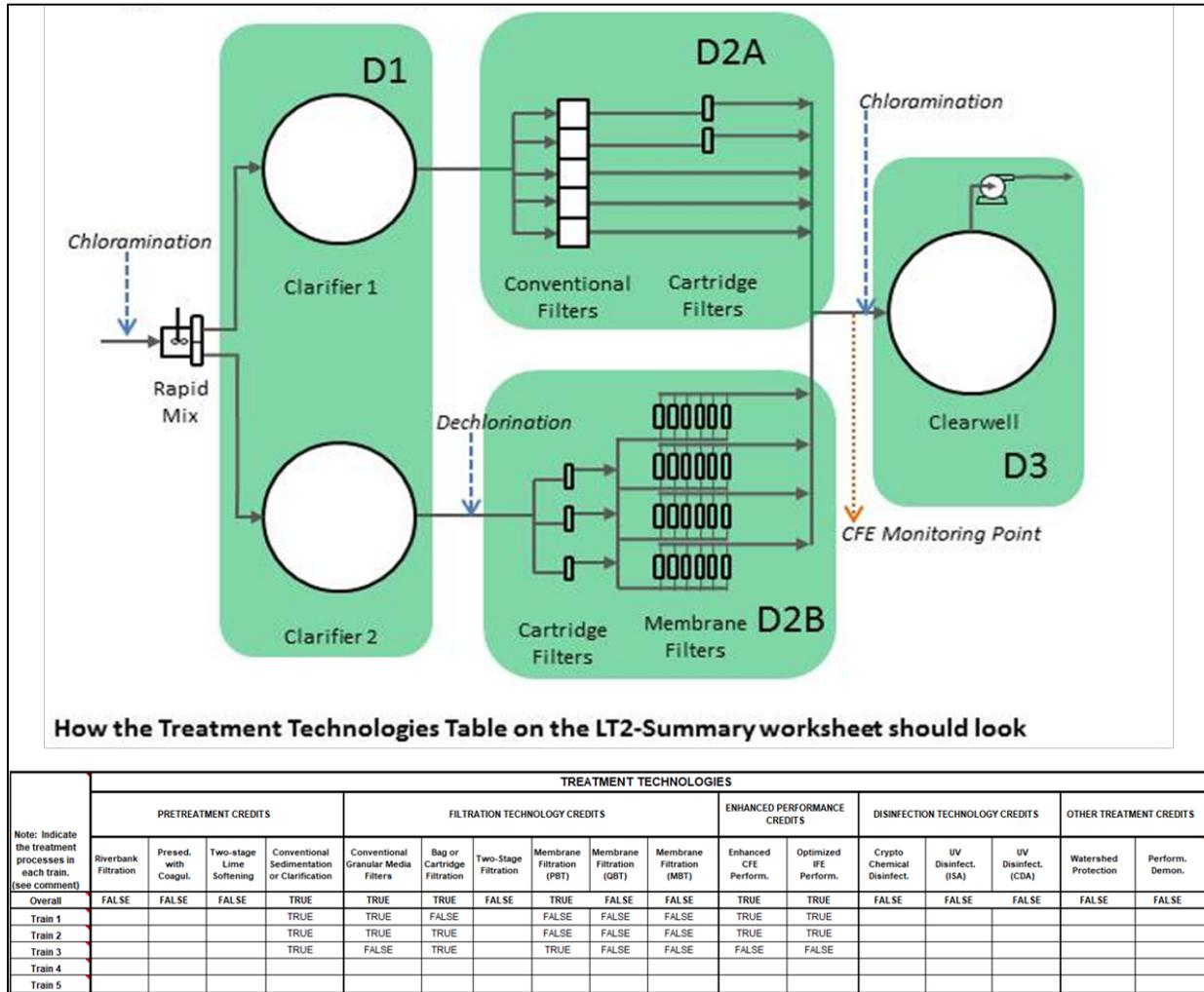


Figure 5.12. Treatment Train Approach 1 (Complex)

Advantages of Approach 1 (Complex):

- One SWMOR workbook.
- One CFE monitoring point.
- SWTP can claim disinfection credit for Zone D2A when the membrane train is not used.

Disadvantages of Approach 1 (Complex):

- Disinfection practices must achieve a 0.5 log *Giardia* inactivation because of the conventional filters without secondary cartridge filtration in Train 2.

- Operators must monitor the chlorine residual at the end of both Zones D2A and D2B.
- If Train 3 (the membrane train) is in operation, the SWTP will not receive disinfection credit for Zone D2. Regardless of the credit achieved in Zone D2A, the credit in Zone D2B will be 0.0 log because there will be no residual.
- If Train 3 is online, the plant must achieve all the required 0.5 log *Giardia* inactivation in the clarifiers and clearwell. There will be no credit for zone D2 when any of the water is passing through the membrane train.
- CFE turbidity levels above 1.0 NTU will trigger a BWN because the CFE monitoring point includes membrane filtration.

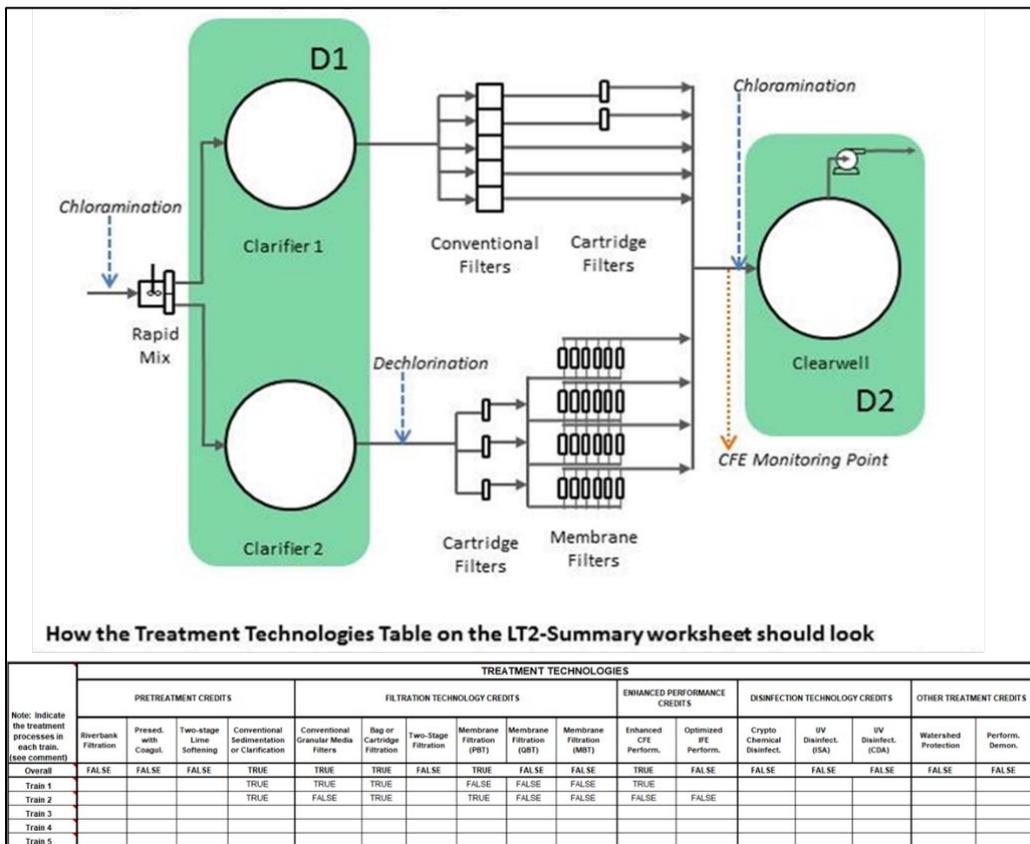


Figure 5.13. Treatment Train Approach 1 (Simplified)

Advantages of Approach 1 (Simplified):

- One SWMOR workbook.
- One CFE monitoring point.
- Eliminating the disinfection credit for the filters means no CT disinfectant monitoring will be required downstream of the filters; in contrast to the Complex Approach 1.

Disadvantages of Approach 1 (Simplified):

- Disinfection practices must achieve a 0.5 log *Giardia* inactivation because of the conventional filters without secondary cartridge filtration in Train 2.
- Because Zones D2A and D2B are eliminated, the plant must achieve all the required 0.5 log *Giardia* inactivation in the clarifiers and clearwell, even when Train 3 is not in service.
- CFE turbidity levels above 1.0 NTU will trigger a BWN because the CFE monitoring point includes membrane filtration.

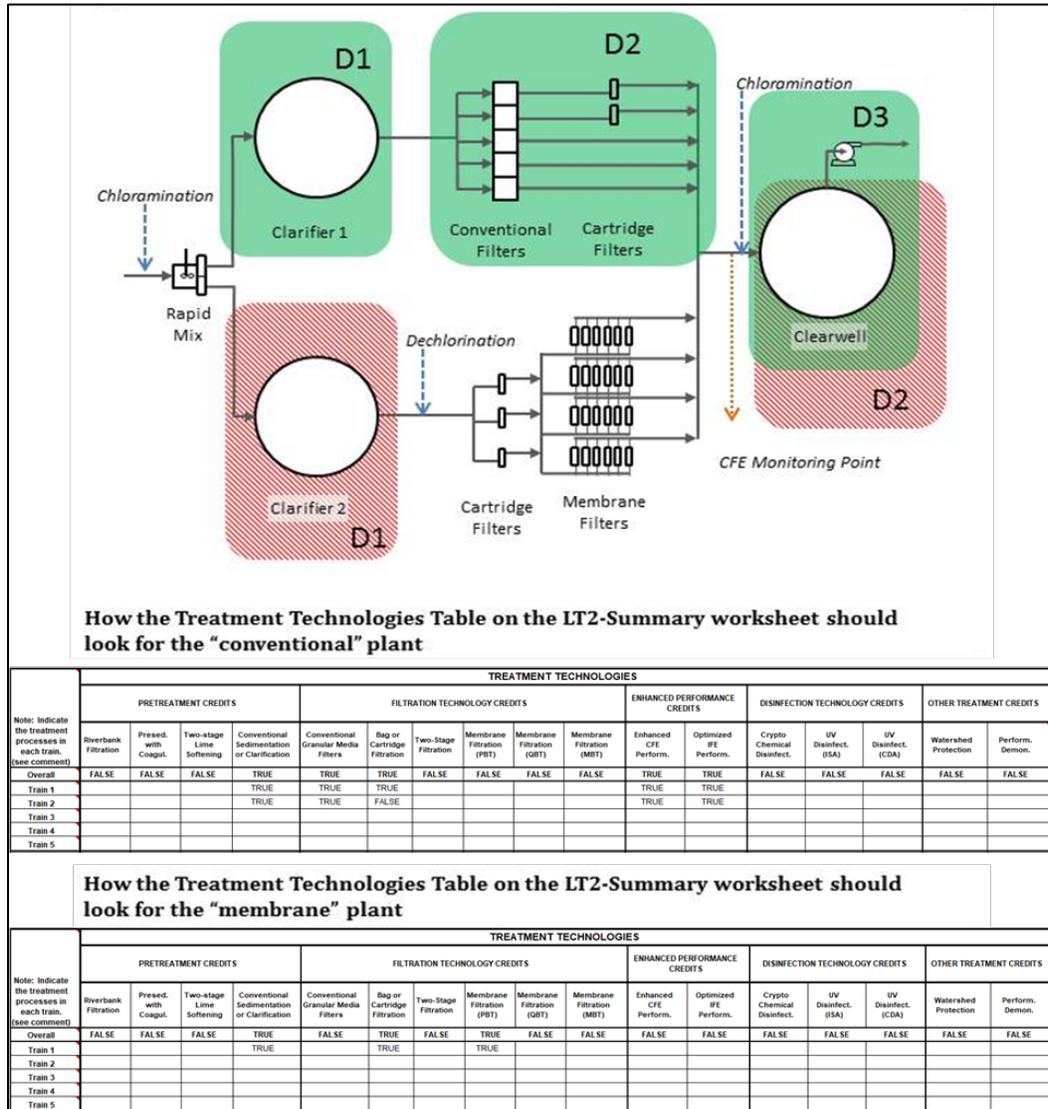


Figure 5.14. Treatment Train Approach 2 (Two SWMOR Workbooks)

Advantages of the Two SWMOR Workbook Approach:

- The SWTP can optimize the disinfection process for each plant independently.
- Turbidity levels above 1.0 NTU at the CFE monitoring point for the membrane plant automatically triggers a BWN; however, an automatic BWN at the

conventional plant is not triggered until the CFE turbidity levels at that monitoring site rise above 5.0 NTU.

Disadvantages of the Two SWMOR Approach:

- The SWTP submits one SWMOR workbook for the membrane plant and a separate SWMOR workbook for the conventional plant. *Note:* Operators could also use the regular SWMOR workbook since some of the water produced by conventional filters does not pass through secondary cartridge filtration. Doing so, however, would prevent the plant from claiming additional removal credit when the two filters with cartridges are the only ones in operation for the entire day.
- The CFE turbidity levels at each SWTP must be monitored before the water is blended.

Entering Your Plant Information (P.2)

Refer to Chapter 2.6.

Saving Your Customized SWMOR Workbook

Refer to Chapter 2.7.

5.2 Entering Data in Customized SWMOR for Plants with Alternative Treatment

To begin entering data at the beginning of each month, open your customized master workbook. The **Customize MOR** dialog box will prompt you to determine whether the SWMOR workbook needs an update to reflect plant changes. If no changes have occurred, select [Yes] for the first question and [No] for the second question, and then [OK]. You can now begin entering data and information for the reporting month. *Note:* The **Customize Dialog** box will appear each time you open a saved workbook during the reporting month. Repeat the sequence described above and continue entering data.

To avoid overwriting data, always start each monthly report using your customized master workbook. Do not use the previous month's workbook as a starting point.
--

Creating a Monthly Workbook File

Refer to Chapter 3.1.

Data Entry

Every day your plant treats water, or sends water to the distribution system, you must monitor and enter data in the applicable MOR workbook pages. The instructions for entering performance and operation data for plants with alternative treatment are identical to those for conventional plants.

Refer to the following Chapters:

- 3.2 Entering Performance Data (P.2)
- 3.3 Entering IFE Turbidity Data (P.3)
- 3.4 Entering Disinfection Process Performance Data (P.4 & 5)
- 3.5 Entering TOC Data (P.6, 7, 8 and SUVA)

5.3 Compiling Summary Data

Refer to Chapter 4.

5.4 Membrane Worksheets (PBT, QBT, and MBT)

The three worksheets described in this section are used to record daily performance data for DIT membrane units. The **Membrane PBT** worksheet is for pressure based DIT units; the **Membrane QBT** worksheet is for flow based DIT units; and the **Membrane MBT** worksheet is for marker based DIT units. If you indicated that your plant has one of these types of membrane systems when you customized the SWMOR workbook, that worksheet will be visible. Select the applicable tab at the bottom of your workbook to begin entering data.

DIT Conditions and Additional Data

Just below the block of plant information at the top of each worksheet, there is the **DIT Conditions and Additional Data** table. This table contains the DIT parameters for each membrane unit; its DIT results from the previous month; and cells where you enter other general information about the membrane unit.

Figures 5.15, 5.16, and 5.17 show the sections of the **DIT Conditions and Additional Data** table for Unit 1 for each type of system. The worksheet automatically reports the information in the **DIT Cond'ns** row based on information you entered during customization. You cannot edit this information here. Because the **DIT Cond'ns** section of **DIT Conditions and Additional Data** table varies slightly depending on the type of membrane system, this table section is explained separately for each type. The other two sections (**Prev. Month Data and Optional Data**) in this table are identical for each membrane type, and therefore are not explained separately.

Note: The majority of SWTPs with membrane filters utilize PBTs. The QBT and MBT types are in limited use.

DIT Cond'ns – PBT **CALC**

DIT CONDITIONS & ADDITIONAL DATA	Unit No. 1									
	DIT Cond'ns	P_{test} psi	LRC -	UCL psi/min		Prev. Month Data	DIT _{last} date	Pass? Yes/No	C/A success?	95th % count
	Optional Data	Filt.Flux gfd	TMP psi							

Figure 5.15. DIT Conditions and Additional Data Table for PBT Membranes

P_{test} psi **CALC**

This cell contains the minimum test pressure (in psi) at which you must conduct each DIT for the membrane unit to receive treatment credit.

LRC **CALC**

This cell contains the log removal credit that the membrane unit receives when it passes its DIT.

UCL psi/min **CALC**

This cell contains the UCL (in psi/min), which is the maximum allowable rate that the pressure can drop during the DIT.

DIT Conditions – QBT **CALC**

DIT CONDITIONS & ADDITIONAL DATA	Unit No. 1									
	DIT Cond'ns	P_{test} psi	LRC -	UCL L/min		Prev. Month Data	DIT _{last} date	Pass? Yes/No	C/A success?	95th % count
	Optional Data	Filt.Flux gfd	TMP psi							

Figure 5.16. DIT Conditions and Additional Data Table for QBT Membranes

P_{min} psi **CALC**

This cell contains the minimum test pressure (in psi) at which you must conduct each DIT for the membrane unit to receive treatment credit.

LRC CALC

This cell contains the log removal credit that the membrane unit receives when it passes its DIT.

UCL L/min CALC

This cell contains the UCL (in L/min), which is the maximum allowable air flow rate during the DIT.

DIT Conditions – MBT CALC

DIT CONDITIONS & ADDITIONAL DATA	Unit No. 1									
	DIT Cond'ns	$C_{feed,max}$ Conc.	LRC -		Prev. Month Data	DIT _{last} date	Pass? Yes/No	C/A success?	95th % count	
	Optional Data	Filt.Flux gfd	TMP psi							

Figure 5.17. DIT Conditions and Additional Data Table for MBT Membranes

$C_{feed, max}$ Conc. CALC

This cell contains the maximum marker concentration (in particles/mL or mg/L) in the DIT feed stream for the membrane unit to receive treatment credit.

LRC CALC

This cell contains the log removal credit that the membrane unit receives when it passes its DIT.

Prev. Month Data

The **Prev. Month Data** section of the **DIT Conditions and Additional Data** table is for data you entered the previous month. To complete, this section, review your operational records from the last DIT performed in the previous month and enter the required information for the current month. Do not leave the cells in this section blank because the worksheet uses this information to determine when the first DITs are needed during the current month.

DIT_{last} Date

Enter the {date} the last DIT was conducted on the membrane unit during the previous month. If you do not know the date of the last DIT, enter {ND}.

Pass? (Yes or No)

This cell specifies whether the membrane unit passed the last DIT conducted in the previous month. Enter {YES} if the unit passed. Enter {NO} if the unit failed. Enter {ND} if you did not record or have the results of the last DIT.

CA Success?

The **CA success?** cell specifies the status of CA based on the last DIT of the previous month.

CA is required if a unit failed the last DIT of the previous month, or you did not enter the data from the unit's last DIT. To successfully complete CA when required, you must run, pass, and document the results of a subsequent DIT. If you cannot verify that the barrier is intact, stop producing water from the membrane unit, or you will receive a treatment technique violation.

Enter one of the following:

- Leave the cell blank if no DIT was performed the previous month, and therefore no CA was taken.
- {NA} if the unit passed the last DIT of the previous month.
- {YES} if you investigated why the unit failed the DIT and demonstrated the membrane unit is intact by passing a subsequent DIT. Enter {YES} even if the only CA you took was to successfully repeat the DIT before you placed the unit into service for the first time this month.
- {NO} if you investigated why the unit failed the DIT, but the unit is still unable to pass a subsequent DIT. Enter {NO} even if the only CA you took was to repeat the DIT without success.
- {ND} if one of following applies:
 - You have not yet investigated why the unit failed the DIT.
 - You investigated the problem but have not yet conducted a subsequent DIT.
 - You investigated the problem and conducted a subsequent DIT but failed to collect the data needed to determine if the unit passed the DIT.

95th % Count

You may only enter data in the **95th % count** cell if you use particle counters or particle monitors to continuously monitor the performance of your membrane units. If you use laser turbidimeters for continuous monitoring, the header will be hidden, and the data entry cell will be locked. If you continuously monitor the performance of the membrane unit with a particle counter or particle monitor, you must determine and enter the {95th percentile reading (in number of particles per mL)} from the previous month. The 95th percentile value for the membrane unit must be calculated from all the data recorded by its SCADA system during the previous month.

Optional Data

The **Optional Data** section of the **DIT Conditions and Additional Data** table contains cells to enter other design or operational data used to assess the ongoing performance of the membrane unit. Since the data in this part of the table is not used for daily compliance calculations, you may leave the cells in this portion of the report blank.

Filt. Flux gfd

Enter the {maximum temperature adjusted normalized filter flux in gallons per square foot per day (gfd)} that we approved. You may leave this cell blank; however, this data can help determine if the membrane unit is operating at an approved flux. It can also help if you need to request permission to operate at higher flux rates.

TMP psi

Enter the {maximum TMP (in psi)} approved for the membrane unit. You may also leave this cell blank; however, this data can help you determine if the membrane unit is operating at an approved TMP. It could also help if you need to request permission to operate the unit at higher pressures.

The cells to the right of the **TMP psi** cell are unprotected and can be used to record a variety of data that might be helpful. For example, some plants use one of the columns to keep track of the normalized temperature adjusted specific flux of a clean membrane unit. This helps determine if it is time to chemically clean the unit; calculate the level of irreversible fouling that remains after a CIP is completed, or both.

Performance Data

The **Performance Data** table is for reporting daily data about membrane operating conditions and results of DITs and IITs for each membrane unit. This table contains an **Operational Data** section, a **DIT Data** section, and a **Summary** section. Only the **DIT Data** section is different for each membrane type and is presented separately for each membrane type.

Operational Data

Figure 5.18 shows the **Operational Data** section headings of the **Performance Data** table. This section contains six columns. The first five columns are for reporting data that summarizes the daily performance of the membrane unit. The last column is used to report any date you conducted a full chemical cleaning of a membrane unit. Leave cells in the **CIP done?** column blank if a complete CIO was not performed that day.

Operational Data					
Daily	Norm.	TMP	Norm.	Daily	CIP
Pump.	Filt.Flux		Spc.Flux	Max.	done?
MG	gfd	psi	gfd/psi	mNTU	-

Figure 5.18. Operational Data Table for All Membrane Types

Daily Pump. MG

Each day, you must measure the total volume of filtered water produced by the membrane unit each day. Enter one of the following:

- {Total volume (in MG)} of filtered water.
- {ND} if you know that the membrane unit sent filtered water to the clearwell, but you have no production data.
- {0.0} if the unit was offline for the entire day and sent no water to the clearwell.

The worksheet uses the data recorded in this cell to determine which days the membrane unit sent filtered water to the clearwell. If your plant's control system only tracks the volume of feed water sent to the membrane, you must enter the volume of feed water treated each day (rather than the volume of filtrate produced) and assume that all the feed water was filtered and sent to the clearwell.

Norm.filt. flux gfd

At least once per day, you must measure the normalized (i.e., temperature adjusted to 20°C) filter flux of the membrane. Enter one of the following:

- {Normalized filter flux (in gfd)}. Enter the average of all readings from the day if you measure this more than once each day, or your membrane control system continuously monitors the flux rate of your membrane unit.
- {X} if the unit was offline for the entire day.
- {ND} if the membrane unit sent any water to the clearwell, but you did not record any temperature adjusted normalized filter flux data.

TMP psi

At least once per day, you must measure the TMP applied to the membrane unit. Enter one of the following:

- {TMP (in psi)}. Enter the average of all readings from the day, if you measure this more than once each day, or your membrane control system continuously monitors the TMP of your membrane unit.
- {X} if the unit was offline for the entire day.
- {ND} if the membrane unit sent any water to the clearwell, but you did not record any TMP data.

Norm. Spc. Flux gfd/psi CALC

Do not enter anything in this cell. The normalized specific flux is automatically reported based on the values entered for normalized filter flux and TMP.

Daily max. mNTU

The **Daily Max. mNTU** cell is used to report the highest level of turbidity or particles measured from each unit each day. These tests are referred to as IITs because they only provide a qualitative indication that the membrane unit is structurally intact. You

must conduct these IITs at least once every five minutes whenever the membrane unit is sending filtered water to the clearwell, unless you have a letter from us that allows you to monitor less frequently.

The column heading will automatically specify either mNTU or P. Count based on how you customized your SWMOR workbook. If you reported that your plant uses a turbidimeter, the column heading will specify mNTU. If you reported that your plant uses particle counters or particle monitors, the column heading will specify P. count.

Enter one of the following:

- Highest {Turbidity (in mNTU or P. count)} of the filtered water produced by the membrane unit. Only enter a reading above 154 mNTU if it was confirmed by two consecutive 5-minute readings (or particle count higher than last month's 95th percentile).
- {X} if the unit was offline for the entire day and sent no filtrate to the clearwell.
- {ND} if the unit sent filtrate to the CW, but you did not record any of the required filtrate turbidity data.
- {MD} if the unit sent filtrate to the CW and you recorded some, but not all, of the required filtrate turbidity data and all the readings you did record were 154 mNTU or less (or less than last month's 95th percentile reading if you are using particle counters or monitors). Otherwise, enter the highest confirmed turbidity above 154 mNTU (or particle count higher than last month's 95th percentile).

If CIP was Conducted

Enter {YES} if you conducted a full chemical CIP on the membrane unit during the day. Leave the cell blank if you conducted a mini CIP or partial CIP, or you did not conduct a CIP at all.

DIT Data

The number of DITs you must run each month depends on the following conditions at your plant independent of membrane type:

- At least once per day when the membrane unit sends water to the clearwell, if your plant has been assigned to Bins 2, 3, or 4, and the LT2 requirements are in effect at your plant.
- At least once every 7 days if your plant:
 - is assigned to Bin 1; or,
 - has been assigned to Bins 2, 3, or 4, but the LT2 requirements are not yet in effect;
- On any day you have a confirmed turbidity reading above 154 mNTU (or above last month's 95th percentile reading if you are using particle counters or monitors).
- Immediately after you conduct a full CIP procedure, but not after a mini CIP or partial CIP.

The following sections describe the different reporting requirements for the three membrane types.

PBT

Figure 5.19 shows the **DIT Data** section of the **Performance Data** table for PBT membranes.

DIT Data			
P_{min}	$\Delta P/\Delta t$	DIT	C/A
psi	psi/min	pass?	success?
-	-	-	-

Figure 5.19. DIT Data Table for PBT Membranes

P_{min} psi

Enter one of the following:

- {Minimum pressure (in psi)} recorded at any point during the DIT. Enter the lowest of all minimum pressure values, if more than one DIT was performed during the day.
- {X} if the unit was offline for the entire day.
- {ND} if:
 - you did not conduct a DIT when one was required
 - you conducted one or more DITs on the unit but failed to record the minimum pressure measured
 - you attempted one or more DITs and the membrane control system interrupted the test(s) before entering the pressure decay portion (often the result of a membrane unit failing to pressurize or to maintain a stable starting pressure).

Leave the cell blank if a DIT was not performed on the unit because it was not required.

$\Delta P/\Delta t$ psi/min

Enter one of the following in this cell:

- {Pressure decay rate (in psi/min)} that occurred during the DIT. Enter the highest pressure decay rate if more than one DIT was performed.
- {X} if the unit was offline for the entire day.

- {ND} if:
 - you did not perform a DIT when one was required
 - you conducted one or more DITs on the unit but failed to record the minimum pressure measured
 - you attempted one or more DITs and the membrane control system interrupted the test(s) before entering the pressure decay portion (often the result of a membrane unit failing to pressurize or to maintain a stable starting pressure).

Leave the cell blank if a DIT was not run on the unit because it was not required.

If DIT Passed CALC

The worksheet automatically reports whether or not (Y or N) the unit passed the DIT by comparing the DIT data entered with the DIT criteria for the unit. If you did not record the data from the DIT, the worksheet reports ND in this cell.

If CA was Successful

The **CA success?** cell is used to specify whether CA was required following the DIT and; and, if so, document whether the CA was successfully completed.

CA is required if a unit failed the DIT, or you did not enter the DIT data. To successfully complete CA when required, you must run, pass, and document the results of a subsequent DIT. If you cannot demonstrate that the barrier is intact, stop producing water from the membrane unit, or you will incur a treatment technique violation.

Enter one of the following:

- {NA} if the unit passed the DIT.
- {YES} if you investigated why the unit failed the DIT and demonstrated an intact barrier by passing the subsequent DIT. Enter YES even if the only CA you took was to successfully repeat the DIT.
- {NO} if you investigated why the unit failed the DIT, but the unit is still unable to pass a subsequent DIT. Enter NO even if the only CA you took was to repeat the DIT without success.
- {ND} if one of the following applies:
 - You have not yet investigated why the unit failed the DIT.
 - You investigated the problem but have not yet conducted a subsequent DIT.
 - You investigated the problem and conducted a subsequent DIT but failed to collect the data needed to determine if the unit passed the DIT.

Leave the cell blank if no DIT was performed, and no CA was therefore required or taken.

QBT

Figure 5.20 shows the **DIT Data** section of the **Performance Data** table for QBT membranes.

DIT Data			
P_{min}	Q_{air}	DIT	C/A
psi	L/min	pass?	success?
		-	-

Figure 5.20. DIT Data Table for QBT Membranes

 P_{min} psi

Enter one of the following:

- {Minimum pressure (in psi)} recorded at any point during the DIT. Enter the lowest of all the minimum pressure values if more than one DIT was performed during the day.
- {X} if the unit was offline for the entire day.
- {ND} if:
 - you did not conduct a DIT when one was required
 - you conducted one or more DITs on the unit, but failed to record the minimum pressure measured
 - you attempted one or more DITs and the membrane control system interrupted the test(s) before the portion that measures air flow rate (often the result of a membrane unit failing to pressurize or to maintain a stable starting pressure).

Leave the cell blank if a DIT was not run on the unit because it was not required.

 Q_{air} L/min

Enter one of following:

- {Air flow rate (in L/min)} that occurred during the DIT. Enter the highest of all average air flow rate, if more than one DIT was performed during the day.
- {X} if the unit was offline for the entire day.
- {ND} if:
 - you did not conduct a DIT when one was required
 - you conducted one or more DITs on the unit, but failed to record the minimum pressure measured
 - you attempted one or more DITs and the membrane control system interrupted the test(s) before the portion that measures air flow rate (often the result of a membrane unit failing to pressurize or to maintain a stable starting pressure).

Leave the cell blank if a DIT was not run on the unit because it was not required.

If DIT Passed CALC

The worksheet automatically reports whether or not (Y or N) the unit passed the DIT by comparing the DIT data entered with the DIT criteria for the unit. If you did not record the data from the DIT, the worksheet automatically reports ND in this cell. You may not enter any results in this cell.

If CA was Successful

The **CA success?** cell is used to specify whether CA was required following the DIT and, if so, document whether the CA was successfully completed.

CA is required if a unit failed the DIT, or you did not enter DIT data. To successfully complete CA when required, you must run, pass, and document the results of a subsequent DIT. If you cannot demonstrate that the barrier is intact, stop producing water from the membrane unit, or you will incur a treatment technique violation.

Enter one of the following:

- {NA} if the unit passed the DIT.
- {YES} if you investigated why the unit failed the DIT and demonstrating an intact barrier by passing the subsequent DIT. Enter YES even if the only CA you took was to successfully repeat the DIT.
- {NO} if you investigated why the unit failed the DIT, but the unit is still unable to pass a subsequent DIT. Enter NO even if the only CA you took was to repeat the DIT without success.
- {ND} if one of the following applies:
 - You have not yet investigated why the unit failed the DIT.
 - You investigated the problem but have not yet conducted a subsequent DIT.
 - You investigated the problem and conducted a subsequent DIT but failed to collect the data needed to determine if the unit passed the DIT.

Leave the cell blank if no DIT was performed, and no CA was therefore required or taken.

MBT

Figure 5.21 shows the **DIT Data** section of the **Performance Data** table. As the figure shows, this section contains four columns.

DIT Data			
C_{feed}	$C_{product}$	DIT	C/A
Conc.	Conc.	pass?	success?
-	-	-	-

Figure 5.21. DIT Data Table for MBT Membranes

C_{feed} Conc.

Enter one of the following:

- {Marker concentration (in particles/mL or mg/L)} in the DIT feed stream. If more than one DIT was performed during the day, enter the lowest of all the feed stream marker concentrations.
- {X} if the unit was offline for the entire day.
- {ND} if you did not conduct a DIT when one was required; or if you conducted one or more DITs on the unit but failed to record any feed stream marker concentration data.

Leave the cell blank if a DIT was not run on the unit because it was not required.

C_{product} Conc.

Enter one of the following:

- {Marker concentration (in particles/mL or mg/L)} in the DIT permeate or filtrate stream. If more than one DIT was performed during the day, enter the highest of all the product stream marker concentrations.
- {X} if the unit was offline for the entire day.
- {ND} if you did not conduct a DIT when one was required; or you conducted one or more DITs on the unit but failed to record any product stream marker concentration data.
- {MDL} of the analytical instrument used to test the sample if no marker was detected in the product stream.

Leave the cell blank if a DIT was not run on the unit because it was not required.

If DIT Passed CALC

The worksheet automatically reports whether or not (Y or N) the unit passed the DIT by comparing the DIT data entered with the DIT criteria for the unit. If you did not record the data from the DIT, the worksheet automatically reports ND in this cell. You may not enter any results in this cell.

If CA was Successful

The **CA success?** cell is used to specify whether CA was required following the DIT and; and, if so, document whether the CA was successfully completed.

CA is required if a unit failed the DIT, or you did not enter the DIT data. To successfully complete CA when required, you must run, pass, and document the results of a subsequent DIT. If you cannot demonstrate that the barrier is intact, stop producing water from the membrane unit, or you will incur a treatment technique violation.

Enter one of the following:

- {NA} if the unit passed the DIT.
- {YES} if you investigated why the unit failed the DIT and demonstrating an intact barrier by passing the subsequent DIT. Enter YES even if the only CA you took was to successfully repeat the DIT.
- {NO} if you investigated why the unit failed the DIT, but the unit is still unable to pass a subsequent DIT. Enter NO even if the only CA you took was to repeat the DIT without success.
- {ND} if one of the following applies:
 - You have not yet investigated why the unit failed the DIT.
 - You investigated the problem but have not yet conducted a subsequent DIT.
 - You investigated the problem and conducted a subsequent DIT but failed to collect the data needed to determine if the unit passed the DIT.

Leave the cell blank if no DIT was performed, and no CA was therefore required or taken.

Summary

At the end of each reporting month, you must complete the worksheet’s **Summary** section in Figure 5.22.

SUMMARY			Unit No. 1
	IIT	Number of days with DIT triggered by high turbidity or particle count	
		Number of days with a monitoring violation	
	DIT	Number of days with failure to pass a DIT	
		Number of days with a treatment technique violation	
	Comments	General Remarks	Additional Comments

Figure 5.22. Summary Table for All Membrane Types

The worksheet automatically reports all of the following IIT and DIT data:

- Number of days in which your plant needed to conduct a DIT due to high turbidity (or particle count).
- Number of days in which the membrane unit had one or more monitoring violations.
- Number of days in which the membrane unit failed to pass a DIT.
- Number of days in which the membrane unit had a treatment technique violation.

You will incur a monitoring violation for each day you fail to collect the required turbidity (or particle count data) in a day that the membrane unit sends filtrate to the clearwell (i.e., you entered MD or ND in the Daily Max cell). You will also incur a monitoring violation if you do not pass a DIT or complete successful CA on a day one is required.

You will incur a treatment technique violation each day you produce water after failing a DIT and not successfully completing CA. The worksheet “assumes” that you took the membrane unit offline as soon as it failed a DIT. Consequently, you will not be cited for a treatment technique violation on the day that the unit failed its DIT. The worksheet does not “assume” that CA was completed before you produced water on any subsequent day. Therefore, you must report successful CA at least one day before you report that the unit sent water to the clearwell. This means that if you fail a DIT on one day, and fix the unit the following day before restarting, you need to show the CA was completed on the first day. This way, the worksheet will “know” that CA was completed before the unit was restarted.

Comments

The worksheet provides a row for you to enter comments about the membrane treatment process, as well as comments about the performance of individual membrane units. Cells are available for both general and unit specific comments.

State and federal rules require that you describe the CAs you took for certain membrane failing a DIT. This information is required for Bin 2, 3, and 4 systems. Other comments are optional. Some examples of optional comments include dates you conducted mini CIPs or partial CIPs, or pinned fibers and how many fibers had to be pinned in each module. If you do not have enough room, enter {See attached page} and attach a separate page to the MOR.

5.5 Crypto CT Worksheet

The **Crypto CT** worksheet is used to calculate and report monthly log inactivation credit for *Cryptosporidium* based on chemical disinfection. According to the LT2, SWTPs in Bins 2, 3, and 4 must achieve additional log removal or inactivation credit for *Cryptosporidium*. One acceptable method is inactivation by ozone or chlorine dioxide. If your plant has been approved for this type of credit, this worksheet is a part of your MOR. Select the **Crypto CT** tab to begin entering data.

Performance Data

The **Crypto CT** worksheet consists of the **Performance Data** table only, as shown in Figure 5.23.

PERFORMANCE DATA								
CRYPTOSPORIDIUM INACTIVATION CREDIT (LOG INACTIVATION)								
Date	Disinfectant and Zone		Crypto Credit	Disinfectant and Zone		Crypto Credit	Total Credit	Time ^e (hrs)
	1							

Figure 5.23. Crypto-CT Worksheet Performance Data Table

Disinfectant and Zone CALC

The worksheet automatically reports the data in the **Disinfectant and Zone** from the information you reported on the **P.4&5 Disinfection Data** worksheet. The data cannot be reentered or edited here. You must complete the **P.4&5** worksheet before you complete this page or the corresponding cells on this **Crypto CT** worksheet will be blank. The maximum number of disinfectants and zones for each day is 10.

Crypto Credit CALC

The worksheet also automatically reports the log credit for *Cryptosporidium* inactivation. There is one cell for each disinfection zone. This data also cannot be reentered or edited on the **Crypto CT** worksheet.

If the disinfectant is either chlorine dioxide or ozone, the log credit for *Cryptosporidium* inactivation is calculated as follows:

- **Chlorine Dioxide:** $0.001506 \times (1.09116^{\text{Temperature}}) \times \text{Chlorine Dioxide Concentration} \times T_{10}$
- **Ozone:** $0.0397 \times (1.09757^{\text{Temperature}}) \times \text{Ozone Concentration} \times T_{10}$

If the Inactivation Ratio for a specific disinfection zone in the **P.4&5 Disinfection Data** worksheet is empty, the cell will be blank.

Cryptosporidium inactivation is not credited for any other disinfectant besides chlorine dioxide or ozone. In all other circumstances, the worksheet automatically reports 0 in this cell.

Total Credit CALC

For each day, the worksheet automatically reports the total log inactivation credit for *Cryptosporidium* by summing all data from the **Crypto Credit** column. This data cannot be reentered or edited.

If all **Crypto Credit** cells are empty for a given day, the worksheet leaves this cell blank.

Time (hrs)

For each day, enter the {total time (in hours)} the plant operated below the performance goal for total *Cryptosporidium* inactivation. Enter a value for the cumulative duration of time (in ¼-hr increments). If there were two or more periods in the day when the inactivation was less than the goal, enter the sum of the duration times for each excursion. Leave the cell blank if either of the following apply:

- The total inactivation credit achieved at the plant never fell below the inactivation performance goal at any time during the day.
- You did not use either chlorine dioxide or ozone in at least one of the disinfection zones.

5.6 UV Sensor Data Worksheet

The **UV Sensor Data** worksheet is one of four UV worksheets and is used to report UV Sensor calibration results. Using the calibration information, the worksheet automatically reports the sensor CFs. The CFs are then used by the **UV ISA** and **UV CDA** worksheets (see Sections 5.7 and 5.8). Select the UV Sensor Data tab shown in Figure 5.24 to begin entering data.



Figure 5.24. UV Sensor Data Tab

The **UV Sensor Data** worksheet contains two sections; one corresponding to the ISA and one corresponding the CDA. If your plant only uses one of these approaches, only the applicable section will be visible. If two sections are visible, the upper section contains the calibration data for the sensors in your ISA reactors. The lower section contains the calibration data for the sensors in your CDA reactors. Figure 5.25 shows the headings for both sections.

I

UV MONTHLY OPERATING REPORT			
<small>FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.) UV Sensor Calibration for Calculated Dose Reactors</small>			
PUBLIC WATER SYSTEM NAME: _____		PLANT NAME OR NUMBER: _____	
PWS ID No.: _____	Plant ID No.: _____	Month: _____	Year: _____
CALIBRATION DATA		CALIBRATION DATA	
CDA	UV Sensor Calibration Report for Calculated Dose Reactors	CDA	UV Sensor Calibration Report for Calculated Dose Reactors
UV MONTHLY OPERATING REPORT			
<small>FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.) UV Sensor Calibration for Calculated Dose Reactors</small>			
PUBLIC WATER SYSTEM NAME: _____		PLANT NAME OR NUMBER: _____	
PWS ID No.: _____	Plant ID No.: _____	Month: _____	Year: _____
CALIBRATION DATA		CALIBRATION DATA	
CDA	UV Sensor Calibration Report for Calculated Dose Reactors	CDA	UV Sensor Calibration Report for Calculated Dose Reactors

Figure 5.25. UV Sensor Calibration Section Headings (Top for ISA Reactors and Bottom for CDA Reactors)

UV Sensor Calibration Data Tables

A duty sensor is an online UV sensor installed in the UV reactor to monitor UV intensity during normal operation. You must use a reference sensor to calibrate each duty sensor in each of your UV reactors at least once each month and enter the calibration results in the appropriate **Calibration Data** table for that reactor. Figure 5.26 shows the cells where you enter calibration data for the first CDA reactor. The corresponding table for ISA reactors (not shown) is identical, except for the units for the sensor readings.

CALIBRATION DATA									
CDA Reactor Number	UV Sensor Calibration Report for Calculated Dose Reactors								
	Calibration Date and Data	Duty Sensor	Duty Sensor Serial #	Ref Sensor Serial #	Duty Sensor Reading (mJ/cm ²)	Ref Sensor Reading (mJ/cm ²)	Cal Ratio	Duty Sensor Replaced?	Calculated Sensor CF
UVCD No. 1	Previous Month's Sensor CF	1							
		2							
		3							
		4							
	Calibration Date	5							
		6							
		7							
	New Sensor CF	8							
		9							
		10							

Figure 5.26. UV Sensor Calibration Data Table

The worksheet uses the information you entered when you customized the SWMOR workbook and automatically configures the calibration data tables. Entry cells for reactors or sensors that do not exist are shaded and locked. The worksheet allows for up to 20 reactors of each type (ISA and CDA) and up to ten duty sensors per reactor.

If you are not allowed to enter calibration results for one of your sensors or reactors because that area is shaded, close the file and recustomize your workbook.

Calibration Date and Data

Previous Month's Sensor CF

At the beginning of each month, enter the {sensor CF} of each reactor from the previous month. This value is used in the calculations in the other UV worksheets for all days up to the date of recalibration for this month. The value you enter in this cell must match the value you reported in the **New Sensor CF** cell in the previous month's worksheet. Do not leave this cell blank.

Calibration Date

You must calibrate all the sensors in a given reactor on the same day. Enter the {date} in the current month that verified the performance of all the duty sensors in the UV reactor. If you tested the sensors in a given reactor more than once during the current month, enter the test date that produced the highest calibration ratio. Do not leave this cell blank.

New Sensor CF **CALC**

The worksheet uses the calibration data you enter for the duty and reference sensors (see below) to calculate a new CF for each UV reactor. The new sensor CF is based on the highest CF for any sensor in the reactor. This CF is used to evaluate the reactor's performance starting on the date the sensors are calibrated. Therefore, it is important, as previously stated, that you calibrate all the sensors in a given reactor on the same date. Prior to this date, the previous month's sensor CF is used.

UV Sensor Calibration Report

Duty and Reference Sensor Serial Numbers

Enter the {serial number} of each duty and reference sensor in the applicable cells. You do not have to enter the entire serial numbers. Include just enough information to identify the specific sensors used. Do not leave these cells blank.

Duty and Reference Sensor Readings

Measure and enter the {UV intensity} of both the duty and reference sensors. For ISA reactors, enter these values in milliwatts per square centimeter (mW/cm^2). For CDA reactors, the calculated dose approach should result in a calculated value of millijoules/cm² (mJ/cm^2) on your instrument's output. Do not leave either of these cells blank.

The duty and reference sensor readings must be reported in the same units. If your instrument shows the values in units other than those indicated here, contact us for guidance. Other units of measurement are likely acceptable as long as they are the same for both the duty and reference sensors.

Calibration Ratio **CALC**

The worksheet automatically reports the new calibration ratio for each sensor in the appropriate **Cal Ratio** column by dividing the applicable Duty Sensor Reading by the corresponding Reference Sensor Reading.

If Duty UV Sensor was Replaced

The selections available in the drop-down list for this column depend on the duty sensor's calculated calibration ratio in the adjacent **Cal Ratio** cell. Select one of the following responses:

- [NA] if the sensor's calibration ratio was 1.2 or lower, and you did not replace the sensor.
- [Yes] if one of the following applies:
 - The sensor's calibration ratio was greater than 1.20 and you replaced it with a new sensor having a calibration ratio of 1.20 or lower.
 - The sensor's calibration ratio was 1.2 or lower, and you replaced it anyway.
- [No] if the sensor's calibration ratio was greater than 1.20, and you did not replace it.

Note: Your duty sensor's calibration ratio must be 1.20 or less. You may not replace the duty sensor unless the replacement sensor has a calibration ratio that is 1.20 or lower.

Calculated Sensor CF CALC

The worksheet automatically reports the sensor CF for each sensor based on the data contained in the corresponding **Cal Ratio** and **Duty UV Sensor Replaced?** cells.

If the sensor's calibration ratio was 1.20 or lower, the worksheet reports a calibration ratio of 1.0 because the sensor meets minimum performance requirements for a properly calibrated sensor.

If the sensor's calibration ratio was greater than 1.20 and you replaced the inaccurate sensor with a properly calibrated one, the worksheet automatically reports the word **Replaced** in the **Calculated Sensor CF** cell and will exclude the sensor when calculating the New Sensor CF for the reactor.

If the old sensor's calibration ratio was greater than 1.20 and you did not replace it with a properly calibrated one, the worksheet automatically subtracts 0.2 from the value shown in the corresponding **Cal Ratio** cell and reports the result.

5.7 UV ISA Worksheet

This **UV ISA** worksheet is used to summarize the performance of the UV reactors with an intensity setpoint dose monitoring strategy. If applicable, select the **UV ISA** worksheet tab to begin entering data.

This worksheet is used to enter daily performance data for up to 20 ISA reactors. The **Performance Data** area groups every five UV reactors into a data entry sub-area for the entire month. The number of sub areas depends on the total number of UV reactors you entered when you customized your workbook. The data entry cells for reactors that do not exist are locked. If you are not allowed to enter daily data for one of your ISA reactors because it is locked, close the file and recustomize your workbook.

At the end of the month, the UV ISA worksheet automatically generates a performance summary for your ISA reactors. It is important that you enter all of the required performance data for each reactor. If not, you might not receive the correct treatment credit for the month and incur a violation.

Validated Operational Conditions for UV ISA CALC

Figure 5.27 shows the portion of the **UV ISA** worksheet where validated operational conditions are shown for the first five UV ISA reactors. If your plant has more than five UV ISA reactors, similar cells are located lower in the worksheet. The right-hand portion of the figure shows a blank cell (just below the Crypto Log Inactivation title) for the required *Cryptosporidium* log inactivation to be achieved.

The information in this section of the **UV ISA** worksheet is automatically reported based on the information you entered when you customized the SWMOR workbook. It is not possible to edit this data on this worksheet.

VALIDATED OPERATIONAL CONDITIONS						
VALIDATED PARAMETERS						PERFORMANCE REQUIREMENTS
Parameters	Reactor Number					Crypto Log Inactivation
	UVIS1	UVIS2	UVIS3	UVIS4	UVIS5	
Max. Validated Flow Rate (MGD)						
Intensity Setpoint (mW/cm ²)						

Figure 5.27. Validated Operational Conditions for ISA Reactors

Daily Performance Data for Individual UV Reactors

As shown in Figure 5.28, the **Operational Data** table of the **Performance Data** table is used to enter daily data for each UV reactor.

PERFORMANCE DATA								
Date	OPERATIONAL DATA							
	Reactor	Total Product. (MG)	Max. Flow Rate (MGD)	Min. Intensity (mW/cm ²)	Sensor CF	Adjusted Min. Intensity (mW/cm ²)	Total Off-Spec Product. (MG)	Consec. Off-Spec Hours (hr)
	1	1						
2								
3								
4								
5								
2	1							
	2							
	3							
	4							
	5							

Figure 5.28. Operational Data for UV Reactors No. 1-5 Using the ISA

Total Product. (MG)

Enter one of the following for each UV reactor:

- {Total amount of water (in MG)} treated by each UV reactor.
- {X} if a reactor was offline all day.
- {ND} if a reactor treated water on a specific day, but you failed to record how much.

Max. Flow Rate (MGD)

You are required to record the flow rate through each UV reactor at least once every 15 minutes whenever it is treating water. For each date, enter one of the following for each reactor:

- {Maximum flow rate (in MGD)} if you collected either of the following:
 - All the required data when the reactor was treating water.
 - Some of the required flow rate data, and it shows the reactor operated at a flow rate above the maximum validated flow rate.
- {X} if a reactor was offline all day.
- {ND} if a reactor treated water on a specific day but you failed to collect any flow rate data during the day.
- {MD} if a reactor treated water and you collected some, but not all, of the required flow rate data, and all of the data that you do have is less than the maximum validated flow rate. If you collected some, but not all of the required flow-rate data, and one or more of the readings is greater than the maximum validated flow rate, enter that peak flow reading in the **Max Flow Rate** cell for that UV reactor.

The maximum flow rate cannot be less than the total production (in MG) and will generally be greater. The two values will only be the same if the reactor operated at a constant flow rate for the entire 24-hr period. For example, if you ran the plant for 12 hours at 1 MGD, and 12 hours at 2 MGD, your total production would be 1.5 MG which is less than 2 MG maximum flow rate that occurred during that day.

Min. Intensity (mW/cm²)

You must also record the UV intensity in each UV reactor at least once every 15 minutes whenever it is treating water. For each date, enter one of the following for each reactor:

- {Lowest UV intensity (in mW/cm²)} recorded during the day if you recorded either of the following:
 - All of the required intensity data while the reactor was treating water.
 - Some of required intensity data, and the data show there were sensor readings below the required Intensity Setpoint.
- {X} if a reactor was offline all day.

- {ND} if a reactor treated water on a specific day, but you failed to collect any UV intensity data during the day.
- {MD} if you collected some, but not all of the required UV intensity data.

If your UV control system shows the sensor readings in units other than those indicated here, contact us for guidance. Other units are probably okay as long as they are the same for both the duty and the reference sensors.

Sensor CF CALC

The **UV ISA** worksheet automatically reports the sensor CF based on the data entered on the **UV Sensor Data** worksheet. Prior to the calibration date, the value is calculated using the previous month's CF. On and after the calibration date, the value is calculated using the new CF.

If the cell for a particular reactor reads Sensor MD, it means some of the data needed to calculate the sensor CF is missing. If this happens, go to the **UV Sensor Data** worksheet and enter the missing data for that reactor's sensors.

Adjusted Min. Intensity (mW/cm²) CALC

The **UV ISA** worksheet automatically reports the adjusted minimum intensity based on the data contained in the corresponding **Min. Intensity** and **Sensor CF** cells.

The adjusted minimum intensity values are valid only when the reactor is operating within its validated operating conditions. If the reactor operates outside its validated conditions at any point during the day, its adjusted minimum intensity value recorded in the cell will be followed by an asterisk.

Total Off-spec Prod. (MG)

The amount of off-spec water produced by a reactor cannot exceed the total amount of water it produces during the day. A reactor is off-spec when one of the following conditions occur:

- The Max Flow Rate is higher than the Max Validated Flow Rate of the reactor.
- The Adjusted Minimum Intensity is lower than the required Intensity Setpoint.

You cannot enter a nonzero value in this cell if the reactor was operating within validated conditions at or above the Intensity Setpoint. For each date, enter one of the following responses:

- {Volume of water (in MG)} produced by each reactor during periods when the reactor was operating off-spec that day.
- {X} if the reactor was offline all day.
- {0} or leave the cell blank if the reactor was continuously operated within its validated range and the Adjusted Minimum Intensity was not less than the required Intensity Setpoint.

Consec. Off-spec Hours (hr)

You must enter the duration of any event each day when one or more of the reactors was operating in an off-spec condition as described in the previous section. An off-spec event begins when the first reactor begins producing off-spec water and ends when all of the reactors are again simultaneously operating with validated conditions and meeting disinfection requirements. For each date, enter one of the following responses to describe the off-spec circumstances:

- {Time (in hours)} of consecutive off-spec production. If this occurs more than once during the day, enter the duration of the longest consecutive period when one or more of the reactors was operating off-spec.
- {X} if all of the reactors were offline all day.
- {0} or leave the cell blank, if every reactor continuously operated within its validated range and the Adjusted Min Intensity was not less than the Intensity Setpoint.

You cannot enter a nonzero value in this cell if the reactor was operating within validated conditions at or above the required Intensity Setpoint.

Monthly Summary for All UV Reactors

At the end of the month, the **UV ISA** worksheet summarizes the production data for all UV reactors. The **Monthly Summary for All UV Reactors** table shown in Figure 5.29 is located to the lower right of the **Data Performance** table where you entered the daily data explained above. If you have both ISA and CDA reactors at your plant this table will summarize data for both. The values in this table are updated daily based on the daily data you enter; however, the values at the end of the month are most important because those values use the entire months data set.

MONTHLY SUMMARY FOR ALL ISA REACTORS	Total Production (MG)	Total Off-spec Production (MG)	Total % Off-spec
Raw water pumpage and total production by all UV reactors differ in more than 15% on the following month and days:			

Figure 5.29. Monthly Summary for All UV Reactors

Total Production (MG)

The **UV ISA** worksheet automatically reports this value by summing the daily total production data for all the individual reactors at the plant.

Total Off-Spec Production (MG)

The **UV ISA** worksheet automatically reports the value by summing the daily total off-spec production data.

Total % Off-Spec **CALC**

The **UV ISA** worksheet automatically reports this value by dividing the total off-spec production data by the total production data.

Treated (or Raw) Water Pumpage and Total UV Production Differ by More than 15% on These Days **CALC**

The **UV ISA** worksheet automatically reports if there were days when there was more than a 15% difference between the amount of water produced by the plant and the total amount of water that passed through all the UV reactors.

If your reactor is located upstream of the clearwell, this calculation is based on the amount of raw water pumped during the day entered on the **P.2 Turbidity Data** worksheet. If your reactor is downstream from the clearwell, the calculation is based on the amount of treated water produced during the day.

If there were any days when there was more than a 15% difference in the two values, they are reported in this cell. If there were no days in which there was more than 15% difference in the two values, then the worksheet reports the word None.

5.8 UV CDA Worksheet

The **UV CDA** worksheet is used to summarize the performance of the UV reactors in plants that use a calculated dose monitoring strategy. If applicable, select the **UV CDA** worksheet tab to begin entering data.

The worksheet provides space to enter daily performance data for up to 20 CDA reactors. The **Performance Data** area is grouped into data entry sub-areas for the entire month. The number of subareas depends on the total number of UV reactors you entered when you customized your workbook. The data entry cells for reactors that do not exist are locked. If you are not allowed to enter daily data for one your reactors because it is locked; close the file, and recustomize your workbook.

At the end of the month, the UV CDA worksheet automatically generates a performance summary for your CDA reactors. Therefore, it is important that you enter all of the required performance data for each reactor. If not, you may not receive the correct treatment credit for the month and incur a violation.

Validated Operational Conditions for UV CDA

Figure 5.30 shows the section of the worksheet where validated operational conditions required by the CDA are shown for the first five UV CDA reactors.

The validated parameters include the Max Validated Flow Rate (MGD) and the Min Validated UVT (%). A cell for these parameters for each reactor is generated automatically. If your plant has more than five UV CDA reactors, similar cells are located lower in the worksheet. The righthand portion of the figure shows a blank cell (just below the Crypto Log Inactivation title) for the required *Cryptosporidium* log inactivation to be achieved.

The information in this section of the **UV CDA** worksheet is automatically reported based on the information you entered when you customized the SWMOR workbook. It is not possible to edit this data on this worksheet.

VALIDATED OPERATIONAL CONDITIONS							
VALIDATED PARAMETERS					PERFORMANCE REQUIREMENTS		
Parameters	Reactor Number					Crypto Log Inactivation	Required UV Dose (mJ/cm ²)
	UVCD1	UVCD2	UVCD3	UVCD4	UVCD5		
Max Validated Flow Rate (MGD)							
Min Validated UVT (%)							

Figure 5.30. Validated Operational Conditions for CDA Reactors No. 1 to 5

Daily CDA Performance Data for Individual UV Reactors

As shown in Figure 5.31, the **Operational Data** table of the **Performance Data** table provides for daily information entry for each UV reactor.

PERFORMANCE DATA								
Date	OPERATIONAL DATA							
	Reactor	Total Product. (MG)	Max. Flow Rate (MGD)	Min. Intensity (mW/cm ²)	Sensor CF	Adjusted Min. Intensity (mW/cm ²)	Total Off-Spec Product. (MG)	Consec. Off-Spec Hours (hr)
1	1							
	2							
	3							
	4							
	5							

Figure 5.31. Operational Data for UV Reactors No. 1-5 Using the CDA

Total Product (MG)

For each date that the UV reactor is used for treatment, enter one of the following responses:

- {Total amount of water (in MG)} treated by each UV reactor.
- {X} if the reactor was offline all day.
- {ND} if a reactor treated water on a specific day but you failed to record how much.

Max Flow Rate (MGD)

You are required to record the flow rate through each UV reactor at least once every 15 minutes whenever it is treating water. For each date, enter one of the following for each reactor:

- {Maximum flow rate (in MGD)} if you collected either of the following:
 - All the required flow rate data while the reactor was treating water.
 - Some of the required flow rate data and the data show the reactor operated at a flow rate above the maximum validate flow rate.
- {X} if the reactor was offline all day.
- {ND} if a reactor treated water on a specific day but you failed to collect any flow rate data during the day.
- {MD} if a reactor treated water and you collected some, but not all, of the required flow rate data, and all of your data is less than the maximum validated flow rate. If you collected some, but not all, of the required flow rate data, and some of the data you have is greater than the maximum validated flow rate, enter that peak flow reading in the **Max Flow Rate** cell for that UV reactor.

The maximum flow rate cannot be less than the total production (in MG) and will generally be greater. The two values will only be the same if the reactor operated at a constant flow rate for the entire 24-hr period. For example, if you ran the plant for 12 hours at 1 MGD, and 12 hours at 2 MGD, your total production would be 1.5 MG which is less than 2 MG maximum flow rate that occurred during that day.

Min UV Transmittance (%)

Treatment plants that use CDA reactors must use online analyzers to monitor and record the UVT of the water being treated by CDA reactors at least every 15 minutes. In situations in which the online analyzer is not measuring accurately, operators can collect grab samples at least once every 4 hours and measure the UVT of the water with a benchtop UVT analyzer. For each date, enter one of the following for each reactor:

- {Minimum UVT (as %)} recorded during the day if you collected either of the following:
 - All the required UVT data while the reactors were treating water.
 - Some of the required UVT data, and the data show there were UVT readings below the reactor's minimum validated UVT.
- {X} if the reactor was offline all day.
- {ND} if a reactor treated water on a specific day, but you failed to collect any UVT data.
- {MD} if you collected some, but not all of the required UVT data and the data that you do have is greater than the minimum validated UVT.

If you use a single UVT monitoring location for all of the reactors, you must enter the same value for each reactor. If there is more than one monitoring location, you must enter the applicable value for each individual reactor in the appropriate cells.

Minimum Meas'd UV Dose (mJ/cm²)

You must also continuously (i.e., every 15 minutes) record the UV dose provided by each reactor whenever it is treating water. For each date, enter one of the following for each reactor:

- {Lowest UV dose (in mJ/cm²)} recorded during the day if you collected either of the following:
 - All the required UV dose data while the reactors were treating water.
 - Some of the required UV dose data, and the data show there were readings were below the reactor's minimum validated UV dose.
- {X} if the reactor was offline all day.
- {ND} if a reactor treated water on a specific day, but you failed to collect any UV intensity data.
- {MD} if you collected some, but not all of the required UV dose data; and all of the data is greater than or equal to the dose required to meet your inactivation requirement.

A UV CDA reactor will receive reduced inactivation credit during periods when the actual UV dose was below the required UV dose.

Sensor CF CALC

The **UV CDA** worksheet automatically reports the sensor CF based on the data from the **UV Sensor** worksheet. Prior to the calibration date, the value is calculated using the previous month's CF. On and after the calibration date, the value is calculated from the new CF.

If the cell for a particular reactor specifies Sensor MD it means some of the data needed to calculate the sensor CF is missing. If this happens, go to the **UV Sensor Data** worksheet and enter the missing data for that reactor's sensors.

Adjusted Minimum UV Dose (mJ/cm²) CALC

The **UV CDA** worksheet automatically reports the Adjusted Minimum UV Dose based on the data entered in the **Minimum Measured UV Dose** cell and the **Sensor CF** cell.

The Adjusted Minimum UV Dose values are valid only when the reactor is operating within its validated operating conditions. If the reactor operates outside its validated conditions at any point during the day, its Adjusted Minimum UV Dose value is followed by an asterisk (*).

Total Off-Spec Production (MG)

The amount of off-spec water produced by a reactor cannot exceed the total amount of water it produces during the day. A reactor is off-spec when the one of the following occurs:

- Max Flow Rate is higher than the Max Validated Flow Rate of the reactor.
- Min UVT of the water is lower than the Min Validated UVT of the reactor.

- Adjusted Minimum UV Dose is below the Required UV Dose.

You cannot enter a nonzero value in this cell if the reactor was operating within validated conditions and provided the minimum required dose. For each date, enter one of the following for each reactor:

- {Amount of water (in MG)} produced by each reactor during periods each day when the reactor was operating off-spec.
- {X} if the reactor was offline all day.
- {0} or leave the cell blank if the reactor was continuously operated within its validated range and the Adjusted Minimum UV Dose was not less than the Required UV Dose.

Consecutive Off-Spec Hours (hr)

You must record the duration of any event when one or more of the reactors was operating off-spec as described in the previous section. An off-spec event begins when the first reactor begins producing off-spec water and ends when all the reactors are again simultaneously operating within validated conditions and meeting disinfection requirements. Enter one of the following responses in this cell.

- {Time (in hours)} of consecutive off-spec production. If this occurs more than once during the day, enter the duration of the longest consecutive period when one or more of the reactors were operating off-spec.
- {X} if every reactor was offline all day.
- {0} or leave the cell blank, if every reactor continuously operated within its validated range and the Adjusted Min Intensity was not less than the Required UV Dose. You cannot enter a nonzero value in this cell.

UV Treatment Credit and Performance Summary CALC

At the end of each month, the **UV CDA** worksheet automatically reports both the daily inactivation credits achieved by the UV reactors as well as UV treatment performance.

Daily Minimum Inactivation Credit

Figure 5.32 shows a partial view (i.e., first 16 days of the month) of the **Daily Minimum Inactivation** table for a plant with three CDA reactors. The **Summary Data** section of the table is for the entire set (or range) of UV CDA reactors at your plant. The worksheet automatically indicates the entire range of reactors.

DAILY MINIMUM INACTIVATION											
Reactor Range	SUMMARY DATA					Reactor Range	SUMMARY DATA				
	Date	Min Dose (mJ/cm ²)	Inactivation Credit Achieved				Date	Min Dose (mJ/cm ²)	Min Inactivation		
			Giardia Log	Virus Log	Crypto Log				Giardia Log	Virus Log	Crypto Log
1 to 3	1					1 to 3	9				
	2						10				
	3						11				
	4						12				
	5						13				
	6						14				
	7						15				
	8						16				

Figure 5.32. Daily Minimum Inactivation Summary for the UV CDA

Minimum Dose (mJ/cm²) **CALC**

For each day, the worksheet searches for the minimum adjusted UV dose applied in all UV reactors based on the daily information you entered in the **Performance Data** table. It then automatically reports this value in the **Min Dose** cell.

Inactivation Credit Achieved **CALC**

The worksheet uses a series of mathematical equations to determine the levels of *Giardia*, viral, and *Cryptosporidium* inactivation achieved in each of the UV reactors for each day. The worksheet then searches for the minimum inactivation level among all the UV reactors and automatically reports the minimum value in the **Giardia Log**, **Virus Log**, and **Crypto Log** columns.

Monthly Summary for All UV Reactors **CALC**

The **UVA CDA** worksheet automatically reports if your UV treatment met the performance criteria for the Crypto inactivation credit. This summary information shown in Figure 5.33 is located below the **Summary Data** section of the **Daily Minimum Inactivation** table. If you have both ISA and CDA reactors at your plant, this table will summarize data for both. The values in this table are updated daily based on the data you enter daily; however, the values at the end of the month are most important because those values use the entire months data set.

Total volume of water treated by all CDA reactors: _____ MG	Raw water pumpage and total production by all UV reactors differ by more than 15% on these days: <input type="text"/>
Total volume of off-spec water produced by all CDA reactors: _____ MG	
Percentage of off-spec water produced by all CDA reactors: _____ %	

Figure 5.33. Monthly Summary for All UV Reactors in the UV CDA Worksheet

Total Volume of Water Treated by UV Reactors **CALC**

The **UV CDA** worksheet automatically reports this value by summing the total production data for all reactors at the plant.

Total Volume of Off-spec Water Produced **CALC**

The **UV CDA** worksheet automatically reports this value by summing the total off-spec production data for the individual reactors.

Percentage of Off-spec Water **CALC**

The **UVA CDA** worksheet automatically reports this value by dividing the total off-spec production. data by the total production data.

Treated (or Raw) Water Pumpage and Total UV Production Differ by More than 15% on these Days **CALC**

The **UV CDA** worksheet automatically reports if there were any days when there was more than a 15% difference between the amount of water produced by the plant and the total amount of water that passed through all the UV reactors.

If your reactor is located upstream of the clearwell, this calculation is based on the amount of raw water pumped during the day on the **P.2 Turbidity Data** worksheet.

If your reactor is downstream from the clearwell, the calculation is based on the amount of treated water produced during the day.

If there were any days there was more than a 15% difference in the two values, they will be listed in this cell. If there were no days in which there was more than a 15% difference in the two values, then the worksheet reports the word None.

5.9 UVT Analyzer Worksheet

The **UVT Analyzer** worksheet is used to report the weekly calibration results, required for online UVT analyzers used for UV CDA reactors. The worksheet has space to enter data for up to 20 online analyzers with cells for 5 (i.e. weekly) calibration events per analyzer. As an example, Figure 5.34 shows the area for UVT analyzer No.1.

CALIBRATION DATA								
UVT Analyzer Number	Benchtop UVT Analyzer Serial Number:							
	Week	Calibration Date	On-line UVT Analyzer Serial #	On-line Reading (% UVT)	Grab Sample Reading (% UVT)	Difference (% UVT)	Recalibration Performed? (if Diff > 2%)	Other Action Taken
UVT No. 1	1							
	2							
	3							
	4							
	5							

Figure 5.34. UVT Analyzer Calibration Data for UVT No. 1

Calibration Data

Benchtop UVT Analyzer Serial Number

The calibration requirement discussed above requires a benchtop UVT analyzer. Enter the {serial number} of your laboratory benchtop UV analyzer. You don't need to include the entire serial number, just enough to identify it. Unless you have a new instrument put in service within the last month, this number should be the same as the previous month.

Calibration Date

Enter the {date} you perform each calibration.

Online UVT Analyzer Serial

Enter the {UVT analyzer serial number}. Again, you do not have to include the entire serial number, just enough to identify it. Unless you have a new instrument that was put in service within the last month, this number should also be the same as entered the previous month.

Online Reading (% UVT)

Enter the {%UVT reading} from the online UVT analyzer in the appropriate cell.

Grab Sample Reading (% UVT)

You are required to collect the grab samples for comparison to the online measurements from a location close to the online UVT analyzer sampling point. Enter the {%UVT} of the grab sample in the appropriate cell. *Note:* For the analysis, set the wavelength of benchtop spectrophotometer to 254 nm and use 1 cm cell.

Difference (% UVT) CALC

The worksheet calculates the difference between the %UVT readings from the online analyzer and the spectrophotometer, and automatically reports this value as a positive number).

If Recalibration Performed (Diff > 2% UVT)

For each UVT analyzer, use the drop-down list and select one of the following:

- [NA] if the value contained in the corresponding **Difference** cell is less than or equal to 2.00%.
- [YES] if the value contained in the corresponding **Difference** cell is greater than 2.00% and the online UVT analyzer has been recalibrated.
- [NO] if the value contained in the corresponding **Difference** cell is greater than 2.00% but the online UVT analyzer has not been recalibrated. In this case, you must enter information in the **Other Action Taken** column.

Other Action Taken

Select [NA] from the drop-down menu if the corresponding **Recalibration Performed** cell is either NA or YES.

Select one of the following from the drop-down list if the corresponding **Recalibration Performed** cell is NO:

- [Manual Sample] when you take manual UVT measurements with a calibrated benchtop spectrophotometer every 4 hours and enter the UVT into the UV reactor's program logic controller.
- [Daily verification] when you enter the design UVT value into the program logic controller and verify daily that the design UVT does not exceed the actual UVT with a grab sample.
- [None] when neither of the above two options are taken. If you select this operation, it means your UV facility is off-spec until one of the first two options is followed, or until the UVT analyzer meets the calibration criterion.

5.10 Prefilters Worksheet

The **Prefilters** worksheet is used to report the *Giardia* and *Cryptosporidium* log removal credit based on removal of turbidity or total hardness in prefiltration treatment systems. Prefiltration systems include presedimentation with coagulation; two-stage lime softening; and bank filtration. If your plant uses one of these approved systems for pathogen removal credit, the worksheet will be available. Select the tab to begin entering data.

The **Prefilters** worksheet has a **Performance Data** table and a **Summary** table for each prefiltration treatment method. It is unlikely that a PWS will have more than one method; but if so, tables will be visible for each type.

Presedimentation with Coagulation

We may approve up to 0.5 log *Cryptosporidium* removal credit for presedimentation if all of the following conditions apply:

- The basin treats 100% of the flow.
- Coagulant is added continuously during operation.
- There is a monthly mean turbidity reduction of 68% or greater.

Performance Data

Figure 5.35 shows the **Performance Data** section of the **Presedimentation with Coagulation** table.

<i>Presedimentation with Coagulation</i>				
PERFORMANCE DATA				
	100% of Plant Flow Treated?	Coagulant Added Prior to Basin	Presed Basin Influent Turbidity (NTU)	Presed Basin Effluent Turbidity (NTU)
Date	Yes/No	Yes/No	(NTU)	(NTU)
1				
2				

Figure 5.35. Presedimentation with Coagulation Performance Data Table

If 100% of Plant Flow Treated (Yes or No)

For each date, you must specify if 100% of the raw water was treated by the presedimentation basin.

Using the drop-down list, select [Yes] if 100% of the raw water passed through the basin; or [No] if, at any point in the day, some raw water bypassed the basin.

The worksheet automatically reports X if the plant did not treat any water on a given date.

If Coagulant Added Prior to Basin (Yes or No)

For each date, you must specify if coagulant was applied continuously upstream of the presedimentation basin.

Using the drop-down list, select [Yes] if coagulant was applied continuously to all raw water treated; or [No] if the coagulant was not added continuously.

The worksheet automatically reports X, if the plant did not treat any water on a given date.

Presed Basin Influent Turbidity (NTU)

If the presedimentation basin treated all of the raw water and operated under continuous coagulant addition for a given date, enter one of the following:

- {Raw water turbidity (in NTUs)}. If the raw water turbidity was tested multiple times, enter the average turbidity of all the readings.
- {ND} if the raw water turbidity was not tested at least once during the day.

Leave the cell blank, if 100% of the raw water was not treated or if coagulant addition was not continuous.

The worksheet automatically reports X, if the plant did not treat any water on a given day.

Presed Basin Effluent Turbidity (NTU)

If the presedimentation basin treated all of the raw water and was operated under continuous coagulant addition for a given date, enter one of the following responses:

- {Turbidity (in NTUs)} of the water leaving the presedimentation basin. If the effluent turbidity was tested multiple times, enter the average turbidity of all the readings.
- {ND} if the effluent turbidity was not tested at least once during the day.

Leave the cell blank, if 100% of the raw water was not treated or if coagulant addition was not continuous.

The worksheet automatically reports X if the plant did not treat any water on a given date.

Presedimentation Basin Summary and Credit Data

Figure 5.36 shows the **Presedimentation Basin Summary and Credit** table of the **Prefilters** worksheet.

PRESEDIMENTATION BASIN SUMMARY & CREDIT	Monthly Mean		
	Treatment Criteria & Credit		
	Did 100% of the water being treated pass through the presed basin?		
	Was coagulant continuously added upstream of the presed basin each day?		
	Did the plant achieve at least a 0.5-log of turbidity removal?		
	<i>Giardia</i> and <i>Cryptosporidium</i> Log Removal Credit Allowed For Presedimentation		

Figure 5.36. Presedimentation Basin Summary and Credit Table

Monthly Mean **CALC**

The **Prefilters** worksheet automatically reports the monthly mean of the presedimentation basin influent and effluent turbidity data. This information is updated daily as each day's data is entered; however, the value at the end of the month is most important.

If 100% of the Water Being Treated Passed Through the Presed Basin **CALC**

The worksheet automatically reports one of the following:

- YES if you specified in the **Performance Data** table on a given date that 100% of the raw water passed through the basin.
- NO if you reported some raw water bypassed the basin.
- X if the plant did not treat any water on a given date.

If Coagulant was Continuously Added to the Presedimentation Basin Each Day **CALC**

The worksheet automatically reports one of the following:

YES if you specified in the **Performance Data** table on a given date, that coagulant was continuously added upstream of the presedimentation basin during operation.

NO if you specified on any given date, that coagulant was not added continuously upstream of the presedimentation basin.

If the Plant Achieved at Least a 0.5-log of Turbidity Removal **CALC**

The worksheet calculates the log turbidity reduction between the monthly mean influent and effluent turbidity values; and automatically reports one of the following responses in this cell:

- YES if the calculated log reduction is greater than 0.5 (greater than 68% removal).
- NO if the calculated log reduction is less than 0.5
- NA, if the answer to either of the previous two questions is NO.
- Unknown, if either the monthly mean influent or the effluent turbidity values are missing.

If the worksheet reports either YES or NO, the calculated log removal value achieved will be reported in the bottom half of the cell.

Giardia and Cryptosporidium Log Removal Credit Allowed for Presedimentation **CALC**

To receive credit for pathogen removal using presedimentation basins, a plant must:

- treat 100% of the raw water with continuous coagulant addition; and,
- achieve a 0.5 log reduction of the monthly mean influent turbidity level.

The worksheet calculates the *Giardia* and *Cryptosporidium* log removal credit allowed for the month and automatically reports one of the following:

- 0.5, if all of the three previous cells are YES and the calculated value for the log removal is greater than or equal to 0.5.
- 0.5 Assumed, if the first two of those cells are YES and the third is Unknown. In other words, all the water passed through the presedimentation basin and was continuously dosed with coagulant, but the influent or effluent monthly average turbidity data is missing.
- Leaves blank if either of the cells for the first two questions (100% of the flow and coagulant addition) is blank. If this is the case, review the data to find the day where you forgot to enter the coagulant data.
- 0, in all other cases.

Two-stage Lime Softening

We may grant up to a 0.5 log *Cryptosporidium* removal credit for two-stage lime softening if chemical addition and hardness precipitation occur in both stages. To receive the LRC, 100% of plant flow must pass through the two-stage lime softening system.

Performance Data

Figure 5.37 shows the **Performance Data** section of the **Two-Stage Lime Softening** table.

Two-Stage Lime Softening					
PERFORMANCE DATA					
Date	100% of Plant Flow Treated? Yes/No	Chemical Added Each Stage? Yes/No	Total Hardness		
			Raw Water (mg/L)	Stage 1 Effluent (mg/L)	Stage 2 Effluent (mg/L)
1					
2					

Figure 5.37. Performance Data Table for Two-Stage Lime Softening

100% of Plant Flow Treated? (Yes or No)

For each date of the month, you must specify if 100% of the raw water was treated through the two-stage lime softening system.

Using the drop-down list, select [Yes] if 100% of the raw water passed through both stages. Select [No] if, at any point in the day, some raw water bypassed either stage or both stages.

The worksheet automatically reports X, if the plant did not treat any water on a given date.

Chemical Added to Each Stage? (Yes or No)

For each date of the month, you must also specify if the chemical(s), such as lime or soda ash, was applied to each stage.

Using the drop-down list, select [YES] if chemical was applied separately to both stages. Select [NO] if chemical was added to only one (or neither) stage.

The worksheet automatically reports X if the plant did not treat any water on a given date.

Total Hardness

If the two-stage softening system treated all of the raw water and both stages received chemical addition for a given date, enter one of the following in the applicable **Raw Water, Stage 1 Effluent, and Stage 2 Effluent** cells:

- {Total hardness as calcium carbonate (in mg/L)}. Enter the average hardness if total hardness was tested multiple times for any water during the day.
- {ND} if the total hardness was not tested at least once during the day for any water.

Leave the cell blank if any bypass occurred, or chemical addition did not occur in both stages (i.e., if the entry for either of the two cells to the left is NO).

The worksheet automatically reports X, if the plant did not treat any water on a given date.

Two-Stage Lime Softening Summary and Credit

Figure 5.38 shows the **Summary and Credit** section of the **Two-Stage Lime Softening** table.

TWO-STAGE LIME SOFTENING SUMMARY & CREDIT	Treatment Criteria & Credit	
	Did 100% of the water being treated pass through two softening stages?	
	Was lime or soda ash added at each stage each day?	
	Did Hardness removal occur in both stages of treatment each day?	
<i>Giardia</i> and <i>Cryptosporidium</i> Log Removal Credit Allowed For 2-Stage Softening		

Figure 5.38. Two-Stage Lime Softening Summary Table

If 100% of the Water Being Treated Passed Through Two Softening Stages **CALC**

The worksheet automatically reports one of the following:

- YES if you entered in the **Performance Data** table, that for each day of treatment, 100% of the raw water passed through the two-stage softening system.
- NO if you entered that some raw water bypassed all or part of the two-stage system.

If Lime or Soda Ash was Added at Each Stage Each Day **CALC**

The worksheet automatically reports one of the following:

- YES if you entered in the **Performance Data** table, that for each day of treatment, chemical was applied to both stages.
- NO if you entered that the chemical was only added to one (or neither) of the stages, the worksheet reports NO.

If Hardness Removal Occurred in Both Stages of Treatment Each Day **CALC**

The **PreFilters** worksheet automatically checks to ensure hardness reduction after each stage and automatically reports one of the following:

- YES if hardness removal occurred in both stages every day.
- NO if hardness removal did not occur in both stages every day.
- NA if the answer to either of the previous two questions is NO.
- Unknown if there is any missing data.

Giardia and Cryptosporidium Log Removal Credit Allowed for Two-Stage Softening **CALC**

To receive additional log removal credit using two-stage lime softening, a SWTP must pass 100% of the raw water through both stages; add chemical to each stage; and remove hardness in each stage.

The worksheet calculates the monthly *Giardia* and *Cryptosporidium* log removal credit and automatically reports one of the following:

- 0.5 if responses in all three previous cells are YES.
- 0.5 Assumed if the first two previous cells are YES and the third is Unknown. In other words, if all the water treated at the plant passed through the two-stage softening process and was continuously dosed with chemicals for softening; but some hardness data is missing.
- Left blank if any of the three previous cells is blank. If this is the case, review the data to find the day where you forgot to enter one or more data points.
- 0 in all other cases.

Bank Filtration

Bank filtration involves wells located near a surface water source, like a river, so that when water is pumped, it is filtered through the riverbank. To achieve *Cryptosporidium* log removal credit for this type of filtration, the wells that induce surface water infiltration through the bank must be monitored. To be eligible for log removal credit, the aquifer must be unconsolidated and contain 10% fines. In addition, the average turbidity from each pumping well must be less than 1.5 NTU. We may grant up to 0.5 log *Cryptosporidium* log removal credit if the wells are located at least 25 ft from the surface water source. We may grant up to 1.0 log *Cryptosporidium* log removal credit if the wells are located at least 50 ft from the surface water source.

Performance Data

Figure 5.39 shows the **Performance Data** section of the **Bank Filtration** table.

Bank Filtration				
PERFORMANCE DATA				
Date	100% of Plant Flow Treated? Yes/No	Bank Filter/Well No.		
		1	2	3
		Daily Max Turbidity (NTU)	Daily Max Turbidity (NTU)	Daily Max Turbidity (NTU)
1				
2				
3				
29				
30				
31				
Monthly Avg.				
Distance (ft)				
Credit				

Figure 5.39. Upper and Lower Portions of Performance Data Table for Blank Filtration

If 100% of Plant Flow was Treated (Yes or No)

For every date, you must specify if 100% of the raw water was treated through the bank filtration system. This question refers to the whole system, not to individual filters.

Using the drop-down list, select [YES] if 100% of the raw water passed through the bank filtration system. Select [NO] if, at any point in the day, some raw water bypassed the system. NO means some water was taken directly from the surface water source to the plant influent without passing through a bank filter wells

The worksheet automatically reports X if the plant did not treat any water on a given date

Daily Maximum Turbidity (NTU)

You must also collect and enter turbidity data for each bank filter well on any day that 100% of the water reaching the plant passed through one or more of the wells. The **Prefilter** worksheet allows you to enter turbidity data for up to 20 bank filters. The turbidity level of the water produced by each bank filter should be recorded at least every four hours when the filter is in service.

If 100% of the water reaching the plant passed through bank filters, enter one of the following:

- {Maximum turbidity (in NTU)} for the day if either of the following applies:
 - Turbidity level of the water produced by the bank filter was measured at least once every four hours that the well was in service.
 - Raw water turbidity was measured less than once every four hours but the highest NTU reading was 1.5 or higher.
- {MD} if you collected some but not all, of the required turbidity data for a given bank filter but all the readings were below 1.5 NTU.
- {ND} if you did not record the turbidity of the water produced by the bank filter at any time during the day.
- {X} if the bank filter was offline for the enter day.

Leave blank, if 100% of the water did not pass through the bank filters. The worksheet prevents you from entering any turbidity data for any of your wells if the bank filtration system is ineligible of removal credit that day.

The worksheet automatically reports an X for each of your bank filters if the plant did not treat any water on a given day.

Monthly Avg. CALC

The **PreFilters** worksheet calculates the monthly average of the maximum daily NTU readings for each bank filter; and reports one of the following:

- X if every value in the **Daily Max Turbidity** cell for the month is X, meaning the plant treated no water that month.
- ND if there are no turbidity values reported for a given well.

Distance

Enter the {distance (in ft.)} of each well from the source surface water. For vertical wells, the distance to the surface water is measured from the 100-year flood elevation to the well head. For horizontal wells, the distance to the surface water is measured from the normal flow stream bed to the well head. Your approval letter documents this distance.

Credit **CALC**

The **PreFilters** worksheet calculates the *Cryptosporidium* log removal credit the plant can claim for a bank filter or well, based on the maximum daily turbidity reading and the well distance from the source water. It automatically reports one of the following:

- 0 if for any day of the month, a well’s turbidity reading exceeds 1.5 NTU.
- 0.5 if a well is between 25 and 50 ft from the source water, all required turbidity measurements were obtained, and all were below 1.5 NTU.
- 0.5A (for assumed) if some readings were not obtained, but all existing readings were below 1.5 NTU.
- if the well is greater than 50 ft from the source water, all required turbidity measurements were obtained, and all were below 1.5 NTU.
- 1.0A (for assumed) if some readings were not obtained, but all existing readings were below 1.5 NTU.

Bank Filtration Summary and Credit

Figure 5.40 shows the **Bank Filtration Summary and Credit** section of the **Bank Filtration** table.

BANK FILTRATION SUMMARY & CREDIT	Treatment Criteria & Credit	
	Did 100% of the water treated being treated pass through a bank filter?	
	Was the Monthly Average of max daily NTU readings for each filter below 1.5 NTU?	
	<i>Giardia</i> and <i>Cryptosporidium</i> Log Removal Credit Allowed For Bank Filtration	

Figure 5.40. Bank Filtration Summary and Credit Table

Did 100% of the Water Treated Pass through a Bank Filter? **CALC**

The worksheet automatically reports one of the following:

- YES if you entered in the **Performance Data** table that, for each day of treatment, 100% of the raw water passed through the bank filter system.
- NO if you entered on any day of the month, that some raw water bypassed the bank filter system.

If the Monthly Average of the Max Daily Turbidity Readings for Each Filter was Below 1.5 NTU **CALC**

The worksheet automatically checks the monthly average turbidity measurements of each well and reports one of the following:

- YES if the monthly average of all wells was under 1.5 NTU.
- NO if the monthly average turbidity reading for any well exceeded 1.5 NTU.
- Unknown if there is any missing data.

Giardia and Cryptosporidium Log Removal Credit Allowed for Bank Filtration **CALC**

To receive log removal credit for bank filtration, a SWTP must pass 100% of the raw water through the system; and the maximum monthly average turbidity for each pumping well must be below 1.5 NTU.

The worksheet calculates the monthly *Giardia* and *Cryptosporidium* log removal credit based on bank filtration performance; and automatically reports one of the following:

- The minimum log credit, if the previous two cells for the above questions are YES, and the entire plant receives the minimum log credit achieved by any of the wells. For example, if the **Performance Data** table shows that one well received 0.5 credit and other wells received 1.0 credit, the plant will receive an overall 0.5 log removal credit for bank filtration.
- 0 if either of the previous two cells for the above questions are NO.
- Leaves blank if the cells for either of the answers to the above two questions are blank.

5.11 Bag, Cartridge Worksheet

The **Bag, Cartridge** worksheet is used to enter performance data for bag or cartridge filter assemblies, or units, that are used to meet minimum treatment requirements. If your plant uses these types of filters for pathogen removal credit, this worksheet will be available. Select the worksheet tab to begin entering data.

Bag or Cartridge Filtration Performance Data

The **Performance Data** table contains three sections. The top section, shown in Figure 5.41, contains the following design information about the bag or cartridge filters:

- Whether the bags or cartridges are a primary treatment technology or a secondary treatment technology.
- How much LRC you can claim.
- What alternative monitoring requirements, if any, apply to each bag or cartridge assembly you use.

Bag/Cartridge Filtration															
PERFORMANCE DATA															
Primary/Secondary Treatment:		Primary				Approved Removal Credit for Bag/Cartridge Filters:				2.0					
Date	100% of Plant Flow Treated? (Yes/No)	Bag or Cartridge Number													
		1		2		3		4		5		6		7	
		Turbidity (NTU)	Other	Turbidity (NTU)	Other	Turbidity (NTU)	Other	Turbidity (NTU)	Other	Turbidity (NTU)	Other	Turbidity (NTU)	Other	Turbidity (NTU)	Other

Figure 5.41. Bag/Cartridge Filtration Performance Table

Before you enter any daily performance results for your bag or cartridge filters, verify the information in the next two sections is correct. If the information shown in the **Primary/Secondary Treatment** cell and the **Approved Removal Credit** cell does not match the information contained in your exception approval letter, close the workbook and recustomize it.

If your approval letter requires you to continuously monitor a parameter other than turbidity, enter the {performance limit} we set for each unit in the **Other** cell. If your approval letter requires you to continuously monitor turbidity, the worksheet will lock these cells.

Primary or Secondary Treatment CALC

The worksheet uses the information you provided when you customized your workbook to automatically report one of the following:

- Primary if all the water that passes through the bag and cartridge units does not also pass through another type of filter.
- Secondary if all the water that passes through the bag and cartridge units also passes through another type of filter.

Note: A cartridge filter provides secondary treatment if all of the water it filters has been coagulated and already passed through a granular media gravity or pressure filter. However, cartridge filters are also considered to be a secondary filtration technology if all the water that passes through the units is subsequently sent to a membrane filter for primary filtration.

Approved Removal Credit for Bag and Cartridge Filters CALC

The worksheet automatically reports the approved log removal credit based on information you entered when you customized your workbook.

Daily Data for Bag and Cartridge Filters

The middle section of the **Performance Data** table contains daily data for each bag or cartridge assembly. Figure 5.42 shows the data entry area for the first few days of the month for filter assemblies 1 and 2.

Date	100% of Plant Flow Treated? (Yes/No)	1		2	
		Turbidity (NTU)	Other	Turbidity (NTU)	Other
		1			
2					
3					
4					

Figure 5.42. Middle Section of Performance Data Table

If 100% of Plant Flow was Treated (Yes or No)

If you treated any water during the day, you must indicate whether all of the water was treated by bag or cartridge filters.

Using the drop-down list, select [YES] if all of the water that was treated during the day was filtered through a bag or cartridge filter. Select [NO] if any of the water you treated was not filtered through the approved bag or cartridge filtration processes.

The worksheet automatically reports X if the plant was offline for the entire day and you did not treat any water at all. You must enter data each day. Do not leave any of these cells blank.

Turbidity (NTU)

Most plants that use bag or cartridge filters as a primary filtration process must measure and record the turbidity of the water produced by each membrane unit at least once every 15 minutes whenever it is sending data to the clearwell.

Even if you use bag and cartridge filters as a secondary treatment process or have been allowed to continuously monitor another performance parameter, you must still measure the turbidity of the water produced by each bag or cartridge filter at least once each day.

Enter one of the following:

- {Daily maximum turbidity (in NTUs)} if either of the following applies:
 - There were any confirmed readings above 1.0 NTU during the day.
 - You recorded all required readings, and none was above 1.0 NTU.
- {X} if the unit was offline for the entire day and no water was sent to the clearwell.
- {ND} if the unit was used during the day, but you did not record any of the required turbidity data.
- {MD} if both of the following apply:
 - The unit was used during the day.
 - You recorded some, but not all, of the required turbidity readings; and all of the readings were 1.0 NTU or less.

Do not leave any of these cells blank.

Turbidity levels above 1.0 and 2.0 NTU in the water produced by an individual bag or cartridge filter are not treatment violations. However, they can trigger mandatory special studies if they are confirmed by consecutive readings. Consequently, these turbidity levels are known as trigger levels and the consecutive readings are referred to as confirmed readings. You should never report turbidity levels on your MOR above the trigger levels unless they are confirmed, or you fail to collect a confirmation reading. If you fail to collect a confirmation reading, you must assume the worst and report the unconfirmed turbidity readings.

Other

Most plants using bag or cartridge filters must continuously monitor the turbidity level of water produced by each filter unit or assembly. However, we do sometimes allow plants to continuously monitor an operational parameter other than turbidity. For example, we may allow you to monitor the pressure of the water at the inlet of each filter or the pressure drop that occurs when water passes through the filter.

If your approval letter allows you to continuously monitor an alternative parameter, enter the {approved alternative performance standard} for each assembly in the appropriate cell at the top of each **Other** column. You must also measure the approved parameter at least once every 15 minutes that the filter assembly is sending water to the clearwell and enter the {highest reading} of the day.

If your approval letter requires you to continuously monitor turbidity, you cannot monitor an alternative parameter and the **Bag and Cartridge** worksheet does not allow you to enter alternative data. If the **Bag and Cartridge** worksheet does not allow you to enter data consistent with your approval letter, then you need to recustomize your workbook.

Summary and Compliance Actions

The last section in the **Performance Data** table is the **Summary and Compliance Actions** section. Figure 5.43 shows this section for a plant that uses bag and cartridge filters for primary treatment. An error message in any of the cells indicates an invalid entry in the **Turbidity** columns of the **Performance Data** table. If your plant uses bags and cartridges as a secondary filtration process, rows 49 through 60 will be hidden because the additional data is not required.

SUMMARY & COMPLIANCE ACTIONS	Criteria	Bag/Cartridge Number							Plant
		1	2	3	4	5	6	7	
	Number of days with elevated readings this month								
	Number of days with elevated readings last month								
	Number of days with elevated readings two months ago								
	Total number of days with elevated readings in last three months								
	Number of days with event(s) above 2.0 NTU this month								
	Number of days with event(s) above 2.0 NTU last month								
	Does the filter/plant have an approved Corrective Action Plan?								
	Is the plant required to submit a Filter Profile Report?								
	Is the plant required to submit a Filter Assessment Report?								
	Is the plant required to submit a Request for Compliance CPE?								
	Was 100% of Daily Plant Flow Treated Each Day?		Was the max IFE turbidity reading 1.0 NTU or lower each day?		Crypto Removal Credit Allowed this Month for Bag/Cartridge Filters				

Figure 5.43. Bag and Cartridge Summary and Compliance Actions

Number of Days with Elevated Readings this Month **CALC**

For each bag and cartridge unit at the plant, the worksheet automatically reports the number of days in the month that you reported having a turbidity reading above 1.0 NTU.

Number of Days with Elevated Readings Last Month

For each bag and cartridge unit at the plant, enter the {number of days} from your previous MOR that you had a turbidity reading above 1.0 NTU. Do not leave these cells blank.

Number of Days with Elevated Readings Two Months Ago

For each bag and cartridge unit at the plant, enter the {number of days} from two months ago that you reported a turbidity reading above 1.0 NTU. Do not leave these cells blank.

Total Number of Days with Elevated Readings in last Three Months **CALC**

For each bag/cartridge filter unit at the plant, the worksheet automatically reports the total number of days that you entered a turbidity reading above 1.0 NTU in the last three months.

Number of Days with Event(s) Above 2.0 NTU this Month **CALC**

The worksheet automatically reports the number of days in the current month that you entered a turbidity reading above 2.0 NTU for any bag or cartridge filter.

Number of Days with Events Above 2.0 NTU last Month

Enter the {total number of days} in the past month that you reported a turbidity reading above 2.0 NTU. Do not leave this cell blank.

If the Filter or Plant has an Approved Corrective Action Plan

This cell is used to indicate whether the plant is in the process of implementing a TCEQ approved CAP. Do not leave these cells blank.

Using the drop-down list, select [Yes] for a specific filter if you are currently implementing either an individual filter or plant wide CAP which has TCEQ approval. Select [No] if are not current implementing either type of CAP.

Note: An individual filter CAP is not TCEQ approved until the SWTP has completed a filter assessment; submits an FAR and schedule to us; and receives our approval in writing. A plant wide CAP is not TCEQ approved until the plant has participated in a CPE and we have finalized the CAP.

If the Plant is Required to Submit a Filter Profile Report **CALC**

For each bag and cartridge filter at the plant, the **Bag and Cartridge** worksheet automatically reports YES or NO, indicating whether the plant is required to produce a filter profile on the filter and submit an FPR with its MOR.

Note: Unless a unit has an approved CA schedule that waives the additional monitoring requirements, you must either identify the cause of the exceedance or produce a filter profile each time the filter exceeds 1.0 NTU in two consecutive 15-min. readings at any time during the filter run.

If the Plant is Required to Submit a Filter Assessment Report **CALC**

For each bag and cartridge filter at the plant, the worksheet reports YES or NO, indicating whether the plant is required to conduct a filter assessment on the unit and submit an FAR with its MOR.

Note: Unless the filter unit has an approved CA schedule that waives the additional monitoring requirements, you must conduct a filter assessment if you reported that a specific filter produced water with a turbidity level above 1.0 NTU on three or more separate occasions during the last three months.

If the Plant is Required to Submit a Request for Compliance CPE **CALC**

The worksheet automatically reports YES or NO, indicating whether the plant is required to participate in a third-party CPE and submit a Request for Compliance CPE with its MOR.

Note: Unless the plant has an approved CA schedule that waives the CPE requirement, the plant must participate in a third-party CPE each time a bag/cartridge unit or any combination of filter units exceeds 2.0 NTU in two consecutive 15-min. readings during the previous two months.

If 100% of the Daily Plant Flow was Treated Each Day **CALC**

The worksheet reviews the data in the **100% of Plant Flow Treated (Y/N)?** column to determine if all the water treated during the month passed through the bag and cartridge filters. In this cell, the worksheet automatically reports one of the following:

- YES if all the cells in the **100% of Plant Flow Treated (Y/N)?** column have a YES response (i.e., all water produced each day passed through a bag or cartridge filter).
- NO if any of the cells in the **100% of Plant Flow Treated (Y/N)?** column has a NO response.

If the Max IFE Turbidity Reading was 1.0 NTU or lower each day **CALC**

The worksheet reviews all the maximum daily turbidity entries to determine if any of the bag or cartridge filters produced water with a turbidity level greater than 1.0 NTU on any day. If all of the turbidity readings on the **Bag/Cartridge** worksheet are 1.0 NTU or lower, the worksheet automatically reports YES. If you reported any readings above 1.0 NTU, the worksheet reports NO.

Crypto Removal Credit Allowed this Month for Bag or Cartridge Filters **CALC**

The worksheet automatically reports data in this cell based on the answers to the previous two questions and information you entered during customization. If the answers to the previous two questions are both YES, the worksheet will give the plant log removal credit shown in the **Approved Removal Credit for Bag/Cartridge Filters** cell at the top of the **Performance Data** table.

5.12 Enhanced IFE Worksheet

The **Enhanced IFE** worksheet is used to report the *Giardia* and *Cryptosporidium* LRC based on the enhanced removal of turbidity in granular media filters. You will receive additional removal credit for operating with enhanced IFE performance if there are no readings over 0.3 NTU in any two consecutive measurements, and 95% of the IFE turbidity readings are less than 0.15 NTU.

If you selected enhanced filtration as a treatment technology when you customized your SWMOR workbook, this worksheet will be available. Select the worksheet tab to begin entering data.

Note: You can only claim credit for enhanced IFE performance if each granular media filter is equipped with an IFE turbidimeter, and turbidity data is recorded at least once every 15 minutes when the filter is sending water to the clearwell. Systems equipped with membrane filters are not able to receive this treatment credit.

Performance Data Table

Figure 5.44 shows a section of the **Performance Table** of the **Enhanced IFE** worksheet. There is one line for each filter and four parameters for each.

Optimized Individual Filter Effluent (IFE) Performance									
PERFORMANCE DATA									
Filter No.	Total No. of Readings	No. of Readings > or = 0.15 NTU	Percent of Readings > or = 0.15 NTU	No. of Confirmed Readings > 0.3 NTU	Filter No.	Total No. of Readings	No. of Readings > or = 0.15 NTU	Percent of Readings > or = 0.15 NTU	No. of Confirmed Readings > 0.3 NTU
1					26				
2					27				
3					28				
4					29				

Figure 5.44. Performance Data Table for Enhanced IFE Worksheet

Total Number of Readings

For each filter, enter the one of the following:

- {total number of 15-min. IFE turbidity readings} recorded for the month when the filter was sending water to the clearwell. If there were days when some, but not all the IFE data was recorded, enter the number of 15-min. IFE turbidity readings that were recorded.
- {X} If the filter was offline the whole month, and no readings were recorded.
- {ND} if the filter was used, but no IFE turbidimeter was installed; or you did not record the IFE data.

Number of Readings > or = to 0.15 NTU

For each filter, enter the one of the following:

- {Number of IFE turbidity readings equal to 0.15 NTU or higher}. (See note below.)
- {X} if the filter was offline the whole month.
- {ND} if the filter was used, but no IFE turbidimeter was installed; or you did not record the IFE data.

Note: The number you enter in this cell must be less than or equal to the total number of IFE turbidity readings you entered for that filter. Also, this number cannot be greater than zero unless the **P.3 Filter Data** worksheet has at least one day when the filter had a maximum daily reading of 0.15 NTU or higher; or, there was a day with missing data.

Percent of Readings > or = to 0.15 NTU

The worksheet automatically reports the percentage of readings equal to, or greater than 0.15 NTU for each filter based on the values in the **Total No. of Readings** cell and the **No. of Readings > or = 0.15 NTU** cell.

If you entered X in the previous cells to indicate that the filter was offline, the worksheet automatically reports X in this cell. If either of the two previous cells has ND in it, the worksheet reports ND, because there is no data.

Number of Confirmed Readings Over 0.3 NTU

For each filter, enter one of the following:

- {Number of IFE turbidity readings} equal to 0.35 NTU or higher. (See note below.)
- {X} if the filter was offline the whole month.
- {ND} if the filter was used, but no IFE turbidimeter was installed on it.

Note: The number you enter in this cell cannot be higher than the number of IFE turbidity readings greater than or equal to 0.15 NTU. Also, the value cannot be greater than zero, unless the **P.3 Filter Data** worksheet has at least one day with a maximum reading of 0.35 NTU or higher; or, has a day with missing data.

Summary Table

Figure 5.45 shows the **Summary** section of the **Enhanced IFE** worksheet.

Summary	Were more than 5% of the IFE readings from any of the filters above the 0.15 NTU performance criteria?		<i>Giardia and Cryptosporidium Log Removal Credit Allowed this Month For Enhanced IFE Performance</i>
	Did any of the filters have confirmed IFE readings above 0.3 NTU?		

Figure 5.45. Summary Table of the Enhanced IFE Worksheet

If More than 5% of the IFE Readings from any Filters above the 0.15 NTU Performance Criteria CALC

To receive log removal credit, no more that 5% of the IFE turbidity readings from each individual filter can be greater than or equal to 0.15 NTU. The worksheet automatically calculates the percent of readings that meets this performance criteria and reports one of the following:

- NO if none of the filters had more than 5% above 0.15 NTU; or, all the filters produced water with at least 5% of the readings less than 0.15 NTU.
- YES if any filter had 5% or more readings over 0.15.
- Unknown, if data was missing, so that you entered ND in any of the cells above.

If the cell is blank, check to see if you made an error completing the **P.3 Filter Data** worksheet

If Any of the Filters have Confirmed IFE Readings Above 0.3 NTU CALC

In order to receive log removal credit, a plant also cannot have any confirmed IFE turbidity readings greater than 0.3 NTU. This means that two consecutive 15-min. readings cannot exceed 0.3 NTU. The worksheet automatically determines and reports one of the following:

- YES if you reported that any of the filters had confirmed readings over 0.3 NTU.
- Unknown if there is any missing data.
- NO if your filters never exceeded 0.3 NTU in two consecutive readings during the month.

If the cell is blank, check to see if you made an error completing the **P.3 Filter Data** worksheet.

Giardia and Cryptosporidium Log Removal Credit Allowed this Month for Enhanced IFE Performance CALC

The worksheet automatically reports the log removal credit allowed monthly for *Giardia* and *Cryptosporidium* based on enhanced IFE performance. As stated

previously, to receive this credit, a plant cannot have any confirmed readings over 0.3 NTU; and, at least 95% of the readings must be less than 0.15 NTU.

If both answers to the previous two questions are NO, the worksheet automatically reports 1.0. Otherwise, it reports 0. If the cells for either of the answers to the two questions above are empty, the worksheet leaves this cell empty.

5.13 2nd Stage Filters Worksheet

This **2nd Stage Filters** worksheet is used for entering performance data for a second stage filter process used to meet minimum treatment requirements for pathogen removal credit. To qualify for this credit, the first stage filter must be preceded by a coagulation step and meet all of the requirements for IFE monitoring. If a plant has an approved second stage granular media filtration process in place, this worksheet will be available. Select the tab to begin entering data.

Performance Data Table

This worksheet contains only the **Performance Data** table shown in Figure 5.46.

Second Stage Filtration			
Performance Data			
Date	100% of Plant Flow Treated by 2nd Stage? (Yes/No)	Stage 1 Filter Performance Criteria Met? (Yes/No)	Giardia and Crypto Removal Credit Allowed
1			
2			
3			
4			
5			

Figure 5.46. Performance Data for the 2nd Stage Filter Worksheet

100% of Plant Flow Treated by 2nd Stage? (Yes or No)

Using the drop-down list, select [Yes] if all the flow treated by the plant on a specific day passed through the second stage filtration process. Select [NO] if some or all the flow treated by the plant on that day did not pass through the second stage filtration process.

Stage 1 Filter Performance Criteria Met? (Yes or No) CALC

This column automatically reports whether the flow entering the second stage filters meets the filtration criteria for the stage one filtration process. The worksheet reports this information based on the stage one filter performance data you entered on the **P.3 Filter Data** worksheet.

The worksheet automatically reports one of the following for each date in this column:

- X if the raw water pumpage for a day was zero.
- NO IFE>1.0 if the IFE turbidity for any of the stage 1 filters was greater than 1.0 NTU.
- MD if the Maximum IFE turbidity reading for any of the stage 1 filters was missing or not specified (i.e., MD or ND).
- YES if none of the above situations occurred.

Giardia and *Crypto* Removal Credit Allowed CALC

This column reports the *Giardia* and *Cryptosporidium* log removal credit allowed by using second stage filtration. The worksheet automatically calculates this information based on the values in the preceding two columns and automatically enters the following information for each date in this column:

- X if the plant did not treat any water at all.
- 0.5 if all water treated by your plant passed through second stage filtration and all the performance criteria attached with stage one filtration were met. This means your plant gets a log removal credit of 0.5 towards *Giardia* and *Cryptosporidium* removal due to your use of second stage filtration that day.
- 0.5 (Assumed) if all water treated by your plant passed through second stage filtration and it cannot be determined whether all the performance criteria attached with stage one filtration were met. This result means that, after review by TCEQ, your plant is likely to get a credit of 0.5 towards *Giardia* and *Cryptosporidium* removal due to your use of second stage filtration that day.
- 0 if one of the following applies:
 - All water treated by your plant passed through the second stage filtration process, but the performance criteria for stage one filtration were not met.
 - Some or all of the water treated by your plant did not pass through the second stage filtration process. This result means that your plant will not get any credit towards *Giardia* and *Cryptosporidium* removal for second stage filtration that day.

6. Additional Guidance for 2-Filter Plants

This chapter of the guidance is for conventional plants with only two filters that use conventional treatment (i.e., sedimentation and media filtration), with no innovative or alternate technology. Some small SWTPs can operate without a turbidimeter on each filter if all of the following conditions apply:

- The plant serves fewer than 10,000 people, including those served through wholesale connections.
- The plant has no more than two filters.
- The filters were constructed prior to October, 2000.
- The filters do not have (or never had) IFE turbidimeters.
- The plant has a CFE turbidimeter installed prior to the clearwell.

The information in this chapter for customizing, saving, and entering data in an SWMOR workbook should be used with information in other chapters. This information is cross referenced as applicable.

6.1 Entering Data in Customized SWMOR for 2-Filter Plants

To begin entering data, open your SWMOR workbook master file and if applicable, select [Enable Content]. If your plant has not changed, indicate so in the **Customize Workbook** dialog box. Also, select [Cancel] any time you open a saved file during the month.

To avoid overwriting data, always start each monthly report using your customized master file. Do not use the previous month's workbook as a starting point.

Creating a Monthly Workbook File

Refer to Chapter 3.1, for instructions on creating monthly workbook files and entering the information for the month, year, population, and number of connections. Use the drop-down lists as applicable.

Monitoring and Data Entry

Every day your plant treats water or sends water to the distribution system, you must monitor and enter operational data.

Operators for 2-Filter plants enter CFE data on the **P. 6-9 CFE Turbidity Data** worksheet rather than on **P.2**. This is addressed in this chapter; otherwise, refer to Chapter 3.2 for information on entering other performance data on **P.2**.

Another difference relates to how you report IFE turbidity and CFE Summary data. For all plants, this data is entered on the **P. 3 Filter Data** worksheet. However, **P.3** of the workbook for 2-Filter plants is different. Completing this version of **P.3** is also addressed in this chapter.

All other SWMOR workbook data is entered as described in Chapter 3. Refer to the following for instructions:

- Chapter 3.4 Entering Disinfection Process Performance Data (**P.4& 5**)
- Chapter 3.5 Entering TOC Data (**P.6, 7, 8, and SUVA**)

Finished Water Turbidity Data (P.6~9 CFE Turbidity Data)

You must measure CFE turbidity every day your plant treats water and enter the data on **P.6~9 CFE Turbidity Data**. To open the worksheet, select the **P.6~9 CFE Turbidity Data** tab at the bottom of the workbook as shown in Figure 6.1.



Figure 6.1. 2-Filter Plant Workbook Tabs

CFE Finished Water Turbidity Monitoring Requirements

CFE turbidity readings must be recorded using an online turbidimeter at regular 15-min. intervals when the plant is in operation. For example, readings may be taken at midnight, 00:15, 00:30, and so on throughout the day until 23:45. Use the same schedule every day. Only readings recorded at the designated times can be used to determine your plant's compliance.

If there is a continuous monitoring turbidimeter failure, you can collect grab samples every four hours for no more than 14 working days. If the grab sample result is greater than 1.0 NTU, the plant must collect a confirmation sample 15 minutes later.

CFE turbidity samples must be collected at a point between the filters and the clearwell. We do not approve other sampling points for plants without IFE turbidimeters. For plants using two filters, the sampling point must be at a site after the water leaving the two filters is blended.

CFE Finished Water Turbidity Data Entry

The workbook contains 31 columns and 96 rows for entering CFE turbidity data. Each column represents a day of the month and each row represents a daily 15-min. time period. For example, the midnight row represents midnight to 00:15.

If your plant is in operation during any part of a 15-min. period, you must enter the {turbidity (in NTU)} in the appropriate cell. Enter {X} if your plant is offline during the entire 15-min. period.

Daily IFE Turbidity Data and CFE Summary Data Entry (P.3)

You must collect at least one grab sample from each filter at least once each day the filter is in service. The section of **Performance Data** table on **P.3** shown in Figure 6.2 contains columns for entering the grab sample turbidity data for the two filters.

PERFORMANCE DATA												
INDIVIDUAL FILTER GRAB SAMPLE TURBIDITY												
Date	Filter No. 1		Filter No. 2									
	Grab Sample	Grab Sample										
1												

Figure 6.2. Individual Filter Grab Sample Turbidity

IFE Turbidity Monitoring Requirements

At least once per day, you must collect the IFE turbidity sample at the outlet of each operational filter before that water is mixed with the water from any other filter. The sample must be collected when the filter is in normal operation mode and is sending filtered water to the clearwell. Do not collect a sample under any of the following situations:

- During a filter backwash cycle.
- When the filter is idling.
- When operating in a filter to waste mode.
- During the first 15 minutes of a filter run.

IFE Turbidity Data Entry

For each date water is treated, enter the {turbidity (in NTU)} from each filter. Turbidity results must be reported each day there is a raw water pumpage above 0.000 MGD.

Summary and Compliance Actions

The **Summary and Compliance Actions** table at the bottom of **P.3** contains columns for summarizing historical CFE turbidity data. Figure 6.3 shows this table.

SUMMARY & COMPLIANCE ACTIONS	Criteria	CFE		
	Number of events above 1.0 NTU this month			
	Number of events above 1.0 NTU last month			
	Number of events above 1.0 NTU two months ago			
	Total number of events above 1.0 NTU in three months			
	Number of events above 2.0 NTU this month			
	Number of events above 2.0 NTU last month			
	Does the plant have an approved Corrective Action Plan?			
	Is the plant required to submit a Filter Profile Report?			
	Is the plant required to submit a Filter Assessment Report?			
Is the plant required to submit a Request for Compliance CPE?				

Figure 6.3. Summary and Compliance Actions Table on P.3 of the SWMOR

The example at the end of this subsection section demonstrates how to complete the **Summary and Compliance Actions** section on **P.3**, and what additional reporting is required.

Number of Events Above 1.0 NTU this Month CALC

The **P.3** worksheet reports the number of events when two or more consecutive 15-min. turbidity readings were above 1.0 NTU. The calculation is based on the CFE turbidity data you entered on **P.6-9**.

An uninterrupted series of readings above 1.0 NTU is considered a single event. For example, an event starting at 4:15 a.m. with a confirmed reading of 1.1 NTU and ending at 5:15 am with a reading of 0.93 NTU is considered a single event. An event cannot be called complete until there is a single reading below 1.0 NTU.

Number of Events Above 1.0 NTU last Month

Enter the {number of events} above 1.0 NTU during the previous month. Use the information from the previous month’s **Number of events above 1.0 NTU this month** cell.

Number of Events Above 1.0 NTU Two Months ago

Enter the {number of events} above 1.0 NTU during the previous two months ago. Use the information from the previous month’s **Number of events above 1.0 NTU last month** cell.

Total Number of Events Above 1.0 NTU in Three Months CALC

The workbook automatically reports the total number of events above 1.0 NTU during the last three reporting months using information from the three cells above.

Number of Consecutive Events Above 2.0 NTU this Month CALC

The workbook automatically reports the number of events when two or more consecutive 15-min. turbidity readings were above 2.0 NTU based on the CFE turbidity data you entered on **P.6-9**.

Number of Consecutive Events Above 2.0 NTU last Month

Enter the {number of consecutive events} above 2.0 NTU during the previous month. Use the information from the previous month's **Number of consecutive events above 2.0 NTU last month** cell.

If the Plant Has an Approved Corrective Action Plan

Using the drop-down lists, specify if the plant has an approved CAP. The drop-down list options are based on data you entered on the **P.3** and the **P.6-9** worksheets. Select the answer that applies to your plant as follows:

- If your plant is not required to conduct additional monitoring this month, select one of the following:
 - [NA] if your plant does not have an approved CAP.
 - [Y] if your plant has an approved CAP.
- If your plant is required to complete additional monitoring, select one of the following:
 - [Y] if your plant has an approved CAP and there is no need to complete the special study and develop a new CAP; or,
 - [N] if your plant does not have an approved CAP. The worksheet will tell you what follow-up action to take.

Note: You do not have an approved CAP unless you have an approval letter from us. Contact an SWTR Coordinator if you do not have an approval letter.

If the Plant is Required to Submit an FPR CALC

The worksheet automatically reports Y or N whether you are required to conduct a filter profile study and submit an FPR with your MOR.

If the Plant is Required to Submit a Filter Assessment Report CALC

The worksheet automatically reports Y or N whether you are required to conduct a filter assessment and submit an FAR with your MOR.

If the Plant is Required to Submit a Request for Compliance CPE CALC

The worksheet automatically reports Y or N whether you are required to submit a copy of your CPE request with your MOR and participate in an mCPE.

Summary and Compliance Actions Section Example

The example in Figure 6.4 demonstrates how to use a previous month's MOR to complete a **Summary and Compliance Actions** section of a **P.3** worksheet for the current month; and what additional reporting is required. In this example, the top

table is from a hypothetical treatment plant report from June (current month) and the bottom table is from May (previous month).

SUMMARY & COMPLIANCE ACTIONS	Criteria	Combined Filter Summary												Plant
		CFE												
	Number of events above 1.0 NTU this month	2												
	Number of events above 1.0 NTU last month	4												
	Number of events above 1.0 NTU two months ago	1												
	Total number of events above 1.0 NTU in three months	7												
	Number of events above 2.0 NTU this month													0
	Number of events above 2.0 NTU last month													2
	Does the plant have an approved Corrective Action Plan?	N												NA
	Is the plant required to submit a Filter Profile Report?	Y												
	Is the plant required to submit a Filter Assessment Report?	N												
	Is the plant required to submit a Request for Compliance CPE?													N

SUMMARY & COMPLIANCE ACTIONS	Criteria	Combined Filter Summary												Plant
		CFE												
	Number of events above 1.0 NTU this month	4												
	Number of events above 1.0 NTU last month	1												
	Number of events above 1.0 NTU two months ago	1												
	Total number of events above 1.0 NTU in three months	6												
	Number of events above 2.0 NTU this month													2
	Number of events above 2.0 NTU last month													0
	Does the plant have an approved Corrective Action Plan?	N												NA
	Is the plant required to submit a Filter Profile Report?	Y												
	Is the plant required to submit a Filter Assessment Report?	Y												
	Is the plant required to submit a Request for Compliance CPE?													N

Figure 6.4. Summary and Compliance Actions Section of the P.3 Worksheet

The following information in the May P.3 worksheet is used in the June worksheet:

- Number of days with events above 1.0 NTU last month.
- Number of days with events above 1.0 NTU two months ago.
- Number of days with events above 2.0 NTU last month.

An FPR is required with the June MOR for two reasons:

- There was at least one event when a CFE turbidity reading was above 1.0 NTU.
- we have not approved a CAP for the plant.

An FAR is not required with the June MOR for two reasons:

- The CFE turbidity level did not exceed 1.0 NTU on at least three occasions during the month.
- An FAR was required with the May MOR because the CFE turbidity level exceeded 1.0 NTU on four occasions. *Note:* Once an FAR is required, the three event counter resets to zero and a new count begins.

An FPR and an FAR were required with the May MOR because there was at least one event when the CFE turbidity was above 1.0 NTU. The FAR was required because there were at least three events in the month before when CFE turbidity rose above 1.0 NTU. Also, we have not approved a CAP for the plant.

6.2 Compiling Summary Data

Refer to Chapter 4.

6.3 Printing, Signing, and Submitting Your MOR

Refer to Chapter 10.

7. Filter Profile Studies and Reports

SWTPs may need to do special investigations and additional reporting if there are high IFE or CFE turbidity readings (i.e., filter exceedances) during the month. A filter profile report (FPR) is required for any of the following reasons:

- IFE turbidity of a specific filter exceeds 1.0 NTU for two consecutive 15-min. readings at any time during the month.
- The SWTP serves at least 10,000 people and the IFE turbidity exceeds 0.5 NTU for two 15-min. readings at the end of the first four hours of continuous filter operation. This only applies to the reading that is collected four hours after a filter is returned to service following a backwash cycle or is stopped and restarted.
- **For 2-Filter Plants only:** CFE turbidity exceeds 1.0 NTU for two consecutive 15-min. readings at any time during the month.

This chapter applies to all workbook users. If you do not prepare and submit an FAR when required, you may incur an M/R violation.

7.1 Filter Profile Report

The FPR form (TCEQ Form 10276) is a Microsoft Excel spreadsheet with many of the features described in Chapter 1. If you are required to submit an FPR with your MOR, download a blank form from our [Filter Reports for Individual Filters webpage](#) ⁶.

An example of a completed FPR is included for reference in Appendix C of this document. The form contains two pages - **Obvious Reasons** and **Narrative Description of Filter Profile**. Once you open and save a blank copy of the form, you can use the information in this chapter to complete and submit an FPR.

Each time an individual filter exceeds a turbidity trigger defined in the previous section, you must identify the reason or cause, or produce a filter profile on the filter within 7 days of the exceedance. There are multiple scenarios that trigger this requirement. For this reason, the **P.1 Summary** page is programmed to automatically report when an FPR is required. To ensure you meet the 7-day timeframe, you should enter data into your MOR workbook on a daily basis. The workbook will then alert you at any time during the month when an exceedance triggers an FPR.

Plant and Date Information

Enter the {PWS Name}, {Plant Name or Number}, and {PWS ID No.}. Make sure you enter this information exactly as you entered it in your MOR workbook.

Enter the {Month}, and {Year} in which the exceedance occurred. The month and year on the FPR must match the month and year on the MOR.

⁶ www.tceq.texas.gov/drinkingwater/swmor/swmor/fpr

The information in this section is automatically copied into the corresponding cells on **P.2** of the FPR.

7.2 Obvious Reasons (P.1)

The **Obvious Reasons** section on **P.1** of the FPR is used to report and describe the information listed below:

- Filter(s) with the exceedance.
- Date, time, and duration of the exceedance.
- Maximum turbidity level recorded during the event.
- Cause, condition, or reason that led to the exceedance.

If you can identify the cause of an exceedance on **P.1**, you do not need to complete **P.2** of the FPR form; otherwise, you need to complete the rest of the FPR.

Identifying the Filter and Exceedance

For each filter exceedance during the month, you must identify the filter, report when the event occurred, and summarize the severity and duration of the episode. **P.1** contains enough room to discuss up to six filter turbidity exceedances. If more than six events occurred in the month, you need to submit additional pages to describe them.

Filter Number

If you are conventional or non-conventional treatment plant, enter the {number of the filter} that did not meet the turbidity requirement as it appears on **P.3** of your workbook. Make sure the numbers match. If you are a 2-Filter plant, enter {CFE} in this cell.

Date and Time

Enter the {date} and the {time} the exceedance occurred.

Duration

Enter the [length of time (in hours)] that the exceedance lasted. Report the duration of the event in 0.25-hr increments.

Turbidity

Enter the {maximum turbidity (in NTUs)} recorded during the event.

Identifying the Reason for the Filter Exceedance

None Identified

Select [NONE IDENTIFIED] if you cannot identify an obvious reason for the filter exceedance. If you select this reason, do not select any other any other reason in this section of the report. You must also assign and record the profile number as a cross reference to the narrative description of the filter profile described on **P.2**.

Filter Problems

Filter performance can be affected by the design, operation, and maintenance of a filter. Select the reason next to any filter problem that resulted in (or even contributed to) the turbidity exceedance event.

Post Backwash Turbidity Spike

Select if the exceedance occurred during a post backwash turbidity spike when the filter was returned to service after backwash or after a period of inactivity.

Prolonged Filter Run Time

Select if the filter exceedance was caused by the filter being operated for a prolonged period that exceeded a typical filter run, and the prolonged filter run resulted in particle breakthrough.

Excessive Filter Loading Rate

Select if the filter exceedance occurred during a period when the filter was being operated at a loading rate above the maximum loading rate we allow. Typically, this excessive loading rate occurs during peak operating flow or when one or more other filters are taken offline.

Rate of Flow Control Valve Failure

A malfunctioning rate of flow control valve can cause hydraulic surges in the filter. Sudden changes in hydraulic loading rates can force particles to surge through the filter media. Select this reason if the filter exceedance was caused, in part or in whole, by a flow control valve that was not working properly.

Media Defects

Select if the filter exceedance was caused by problems with the condition and placement of the filter media or the support system. Media defects include, but are not limited to the following causes:

- Presence of mudballs.
- Surface cracking.
- Displaced media.

- Insufficient media depths.
- Poor media segregation (for dual media and mixed media filters).
- Damaged or disturbed support media and underdrains as evident from boils or vortexing during backwash.

Inadequate Surface Wash or Backwash Facilities

Filters that are not backwashed well can produce elevated turbidity readings. Select this reason if the filter was not cleaned adequately during routine backwash. Backwash limitations include, but are not limited to the following causes:

- Inadequate filter backwash rate or filter bed expansion.
- Absence of a surface wash or air scour system.
- Damaged surface wash or air scour system.

Backwash Artifact

Select if the filter exceedance occurred during the backwash of another filter and you believe that the backwash procedure caused a hydraulic surge that resulted in an elevated turbidity reading in the filter you are evaluating.

Turbidimeter Errors

The ability to accurately measure turbidity is essential. If the turbidimeter is not properly operated and maintained, you can get turbidity readings not indicative of actual filter performance. Select any turbidimeter problem identified below which, upon investigation, contributed to turbidity measurement error.

Incorrect Calibration

Filter exceedances can occur during a calibration procedure and be caused by improperly calibrated instruments. Select this reason, if you are certain that one of these problems caused the elevated turbidity readings. Be sure the error exists by verifying the instrument performance using primary or secondary standards, or by comparing the reading from the online unit with one from a properly calibrated turbidimeter. You can also use the instrument's built-in electronic diagnostics designed to determine proper calibration. The turbidimeter should measure correctly after it is thoroughly cleaned and recalibrated with a primary standard.

Air Bubble

A leak in the supply line may cause air to be introduced into the turbidimeter, resulting in an erroneous turbidity reading. The instrument should measure correctly after the leak is fixed. Select this reason, if you found a leak during your investigation, and repairing it corrected the problem.

Debris

Excessive debris can accumulate in the turbidimeter and contribute to elevated turbidity. The instrument should measure correctly after it is thoroughly cleaned and recalibrated with a primary standard. Select this reason if your investigation revealed an excessive accumulation of debris that you believe contributed to the filter exceedance.

Chemical Feed Equipment Failure

The failure of a chemical feed pump or piece of equipment can contribute to turbidity exceedances. Select either [coagulant], [coagulant aid], or [filter aid] if malfunctioning equipment resulted in an improper dosage of one of these chemical types, and this contributed to the filter exceedance.

Poor Raw Water Quality

Select if you determined that the filter exceedance was the result of unusually poor raw water quality, such as an elevated raw water turbidity level or some unusual chemical makeup that made coagulation difficult.

Other Major Unit Process Failures or Maintenance Activities

Select if some other major unit process failures or maintenance activities caused the filter exceedance. Specify the cause on the line below the box.

7.3 Narrative Description of the Filter Profile (P.2)

As specified previously, you must produce a filter profile and complete **P. 2** of this report if you cannot identify an obvious reason for a filter exceedance.

Filter and Exceedance Identifying Information

This information is copied automatically from **P.1**. Be sure the following information is copied exactly as you entered it on that page:

- Filter number corresponding to the filter profile.
- Number of the filter profile assigned on **P.1**.
- Date you began producing the filter profile.

Details

A filter profile is a graphical representation of filter performance based on turbidity readings recorded at 1-min. intervals for an entire filter run, from startup to backwash. The run length should be representative of a typical filter run and encompass the period when another filter is being washed. This section is used to describe the filter

profile. The description should identify significant events and include information such as:

- filter startup and shutdown
- filter backwash
- filter to waste events and idle periods
- changes in filter loading rates
- turbidity deviations over 0.1 NTU

In lieu of providing details in this section, you can annotate and attach your filter profile as described in the next section. If you choose to do this, refer to the information in the next subsection.

Total particle counts may be used in conjunction with turbidity measurements to offer additional insights to filter performance; however, you must take care in interpreting particle counts. The interpretation should focus on the change in count levels as opposed to specific count numbers.

To ensure the accuracy of the data reported in the profile, we encourage you to calibrate the online turbidimeter, or at least verify its accuracy, before beginning the profile. Do not calibrate your online turbidimeter while you are collecting filter profile data.

Attaching a Filter Profile to the FPR

The filter profile in Figure 7.1 shows an example of typical plant filter run that includes the backwash of another filter. This profile has been annotated to identify significant events and explain turbidity spikes.

You must include your filter profile(s) with your FPR, if applicable, when you submit it with your MOR. Either attach the profile(s) electronically prior to printing or include a hardcopy.

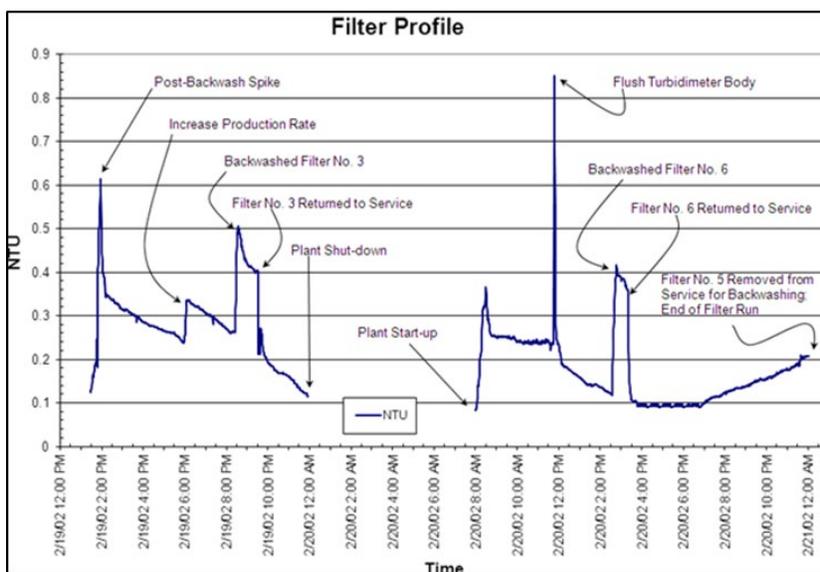


Figure 7.1. Example of an Annotated Filter Profile

7.4 Printing, Signing, and Submitting the FPR

Operator's Signature and Date

After printing the FPR, the operator in charge of preparing the report and producing the filter profile, if applicable, must sign and date each page. The signature must be handwritten, in ink. Stamped signatures or typewritten names are not acceptable.

The operator who signs the FPR may not be the same person responsible for the daily plant operations; therefore, the person who signs the FPR might not be the same person who signs the MOR.

Certificate Number and Grade

Enter the {certificate number} and {grade} of the operator who signs the FPR.

8. Filter Assessments and Reports

SWTPS may need to conduct a filter assessment and submit a filter assessment report (FAR) if a filter consistently produces water with elevated IFE or CFE turbidity levels (i.e., filter exceedances). A filter assessment and an FAR are required for either of the following reasons:

- IFE turbidity exceeds 1.0 NTU for two consecutive 15-min. readings on three separate occasions during any consecutive 3-month period.
- **2-Filter plants only:** CFE turbidity exceeds 1.0 NTU for two consecutive 15-min. readings on three separate occasions during any consecutive 3-month period. If this occurs, you will not know which of the two filters is causing the filter exceedance; therefore, you must do a filter assessment and prepare an FAR on both filters.

This chapter applies to conventional and 2-Filter Plants, as well as some plants that utilize alternative treatment. However, it does not apply to all alternative filtration technologies. If you are using an alternative technology and have a filter exceedance described above, contact a SWTR Coordinator for information about doing a filter assessment. If you do not perform a filter assessment when required, you may incur a M/R violation.

Note: A filter assessment requires that you physically access the filter to make physical measurements and excavate some of the media. Make sure you follow standard operating procedures (SOP) when you do this and be very careful to avoid injuries or damage to the filter media. Appendix B contains an example SOP to assist in developing your own procedure.

8.1 Filter Assessment Report

The FAR form (TCEQ Form 10277) is a Microsoft Excel spreadsheet that has many of the MOR form features described in Chapter 1. If you are required to submit an FAR with your MOR, download and save a blank form from the [Filter Reports for Individual Filters webpage](#).⁷

The form contains six pages. Once you open and save a blank copy of the form, use the information in this chapter to perform a filter assessment, fill out the report, and submit a completed FAR. An example of a completed FAR is included for reference in Appendix D of this guidance.

⁷ www.tceq.texas.gov/drinkingwater/swmor/swmor/fpr

Each time there is a filter exceedance, you must perform a filter assessment within 14 days of the exceedance. There are multiple scenarios that trigger this requirement. For this reason, we programmed the **P.1 Summary** page to automatically report when a filter assessment is required. To ensure you meet the 14-day timeframe, you should enter data into your MOR workbook daily. The workbook will then alert you at any time during the month when an exceedance triggers an FAR.

8.2 Design Specifications and Operating Procedures (P.1)

Plant and Date Information

Enter the {PWS Name}, {Plant Name or Number}, {PWS ID No.}, and {Plant ID No.} on **P. 1**. Make sure you enter this information exactly as you entered it in your MOR workbook.

For plants other than 2-Filter plants, enter the {Number} of the filter being evaluated exactly as it appears on **P. 3** of your MOR workbook. For 2-Filter plants, enter {CFE} in this cell.

The filter number may not correspond with the numbering system you use at your plant, so there is enough space to add some additional information to aid in identification. For example, your entry might look like the example shown in Figure 8.1.

FILTER	
NUMBER:	Filter No. 6 (our Filter No. 3-West)

Figure 8.1. Filter Number Example

Once you fill in the information in this section, it is automatically copied into the corresponding cells on **P. 2, 3, 4, 5, and 6**.

Events

Enter the {first date}, the {second date}, and the {third date} the filter produced consecutive readings above 1.0 NTU. If this is a voluntary filter assessment and there were not three consecutive days above 1.0 NTU, enter {NA} or {None}.

Design Specifications

This section contains the design specifications of the filter under evaluation. To complete this section, you need the following information:

- Design information from a variety of sources including engineering drawings for the plant.
- Specifications for the filter, filter media, and appurtenances.
- Information from pump curves and other plant documentation.

Filter Type

From the drop-down list, select the [filter type]. Table 8.1 contains each option in the list and its description.

Table 8.1. Filter Types and Descriptions

Type	Description
Gravity	Filter is open to the atmosphere. In these filters, settled water usually flows by gravity from the clarifier or sedimentation basin into the filter.
Pressure	Filter is completely enclosed. A transfer pump is usually used to pump settled water into the filter.
Permutit	Proprietary gravity filter that is fully enclosed. The filter discharges to a backwash tank immediately above the filter bed.
Other	None of the filter types above apply. If this is the case, or you are unsure what kind of filter you have, select this option and describe the filter in the Additional Remarks cell; or include a copy of the filter's engineering drawings with the FAR.

Operating Mode

From the drop-down list, select the [filter operating mode]. Table 8.2 contains each option in the list and its description.

Table 8.2. Filter Operating Modes and Descriptions

Mode	Description
Constant Rate/ Constant Level	The outlet of these filters is typically equipped with a mechanical rate of flow controller or a SCADA controlled motorized flow control valve. As the head loss through the filter increases, the flow controller automatically opens more to maintain the preset flow rate. Typically, the inlet to these filters is completely submerged, and the water level is essentially the same in all filters during the entire filter run.
Constant Rate/ Variable Level	The flow rate in these filters is typically controlled by a weir, a telescoping valve, or some other device located at the inlet of the filter rather than at its outlet. As the water passes through the flow control device, it falls through an air gap into the filter inlet pipe. Once the water passes through the air gap, there is no way for it to be redirected to another filter. Consequently, as the head loss increases, the water level in the filter rises. The rising water level provides the additional head needed to maintain the desired flow rate.
Declining Rate	The inlet piping to the filters is completely common and no attempt is made to maintain a uniform flow rate through the filter. At the beginning of the filter run, the flow rate is limited by an orifice plate (or flow control valve and flowmeter) located at the filter outlet. As the head loss in a filter increases the flow rate decreases and water tends to be redirected to other, cleaner filters.
Other	None of the modes above apply. In this case, or you are unsure what filter operating mode you have, select this option and then describe the filter's operating mode in the Additional Remarks cell, or on a separate page.

Media Bed Dimensions

Diameter (ft), Length (ft), and Width (ft)

If you are conducting an assessment on a round filter, enter the {diameter (in ft.)} of the filter bed, and leave the length and width cells empty. If the filter has a rectangular bed, enter the {length (in ft.)} and the {width (in ft.)}, and leave the diameter cell empty.

Surface Area (ft²)

The form will automatically report the surface area of the media bed in this cell if you entered the filter bed dimensions correctly. If you made a mistake, the word ERROR will appear.

Freeboard (ft)

Enter the {distance (in ft.)} from the top of the filter bed to the upper edge of the backwash water trough.

Max Head Loss (ft)

Enter the {maximum available head loss (in ft.)} for the filter. This is the maximum head loss that can be achieved during a filter run. This information can often be obtained from engineering drawings or filter specifications. If these sources do not provide the information, refer to Figure 8.2 below.

The feature that controls the maximum water level in the filter can be any of the following:

- Overflow elevation of the filter wall.
- Bottom of the filter overflow pipe.
- Maximum water level that can be achieved in the clarifier.

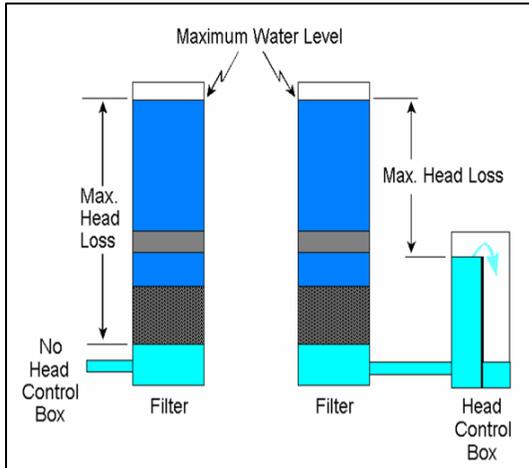


Figure 8.2. How to Determine Maximum Available Head Loss

Media Type

From the drop-down list, select the [media type] based on the original filter design. Make your selection based on information obtained from engineering drawings or filter specifications; and not on information obtained during a filter excavation. Table 8.3 contains each option in the list and its description.

Table 8.3. Media Types and Descriptions

Type	Description
Multiple Media	Filter has at least three different media materials. The most common design uses garnet, sand, and anthracite media.
Dual Media	Filter has exactly two different types of media. The most common design incorporates sand and anthracite.
Rapid Sand	Filter has only sand media.
Deep bed Mono Media	Filter has at least 48 inches of a single type of media. These filters commonly contain either anthracite or granular activated carbon.
Other	None of the media types above apply. In this case, select this option and describe the media bed in the Additional Remarks cell, or on a separate page.
Unknown	You are unsure of the media type, and do not have any engineering drawings or media specifications describing the media.

Media Specs

Material

From the drop-down list, select the [type of filter material] in each layer of the filter bed. If the filter contains fewer than four layers, select the materials used in each of the layers and leave the other layers blank.

If you do not have the specifications for the media in the filter being evaluated, select [Unknown] for the material used in Layer 1 and leave the rest of this section blank.

Depth (inches)

Enter the {thickness (in inches)} of each media layer.

Minimum Size (mm) and Maximum Size (mm)

If the media specifications include a range of acceptable sizes for each layer, enter the {minimum size (in mm)} and the {maximum size (in mm)} for the size range. If the specifications include only one a single size, enter that value in both the minimum and maximum cells.

UC

Enter the {UC} for each of the media materials used in the filter. Enter {Unknown} if the specifications do not include a UC for one or more of the materials.

Specific Gravity

Enter the {specific gravity} of the filter media in the appropriate cell. Enter {Unknown} if no specific gravity specification is available.

Total Depth (inches) CALC

If you entered the depth of each media layer, the spreadsheet automatically reports the total depth. However, if you do not have the media specifications and selected Unknown for the material in Layer 1, the form automatically reports Unknown.

L/D Ratio CALC

The form uses the information that you entered about media depth and size to automatically report the L/D ratio for the filter.

Underdrain Type

From the drop-down list, select the [underdrain type].

Support Gravel

Number of Grades

If your filter contains one or more layers of support gravel, enter the {number of different sizes} specified in the filter specifications. If you are using one of the gravel-less underdrain systems and have no support gravel, enter {None} in the **No. of Grades** cell, and leave the rest of the cells blank.

Minimum Size (inches) and Maximum Size (inches)

If your filter contains support gravel, Enter the {maximum gravel size (in inches)} and the {minimum gravel size (in inches)}.

Total Depth

Enter the {total thickness (in inches)} of the gravel support layer.

Troughs

Number

Enter the {number} of backwash troughs in the filter you are evaluating.

Separation (inches)

Enter the {distance (in inches)} between the edges of two adjacent troughs. If the troughs are not the same distance apart, enter {Variable} and describe the arrangement in the **Additional Remarks** cell. Also, if the edge of the last trough is farther from the filter wall than the distance between adjacent troughs, include this measurement in the **Additional Remarks** cell.

Supplemental Backwash

From the drop-down list, select the [supplemental backwash system type] used in the filter. Table 8.4 contains each option in the list and its description.

Table 8.4. Supplemental Backwash System Types and Descriptions

Type	Description
None	Filter has no supplemental backwash equipment.
Surface Wash	Filter has a supplemental backwash system with fixed or rotating arms that are designed to wash the surface of the media at the beginning of the filter backwash cycle.
Subsurface Wash	Filter has a fixed or rotating arm system that is designed to operate beneath the surface of the media when the bed has been expanded during the backwash cycle.
Air Scour	Filter was equipped with an integral air scour backwash system during its initial construction or a major renovation. Usually, this choice applies whenever the air scour system is incorporated into the design of the underdrains
Air Scour (retrofit)	Filter had an air scour system installed after construction. Usually, these systems are not an integral part of the underdrain design and utilize a network of laterals that are installed on top of the support gravel layers.
Other	The options above do not apply. If this is the case, or you are unsure what supplemental backwash system you have, select this option and describe the system in the Additional Remarks cell, or on a separate page.

Filter to Waste

From the drop-down list, select [Yes] or [No] to indicate whether the filter has the capability of filtering to waste.

Filter Flow Rate (gpm)

Regulatory Std

The form automatically reports the allowable filter flow rate based on the following factors:

- Surface area of the filter bed.
- Data you entered in the **Filter Type** and **Operating Mode** cells.
- Maximum allowable filter loading rate.

Design

Enter the {flow rate (in gpm)} at which the filter is designed to operate. This is the flow rate specified in the engineering plans and specifications.

Typical

Enter the {typical flow rate (in gpm)} through the filter when it is operating under normal conditions.

During Backwash

Enter the {typical flow rate (in gpm)} through the filter when one of the other filters is being backwashed.

Maximum

Enter the {maximum flow rate (in gpm)} that routinely occurs during a typical filter run.

App'd Exception

If you have received written approval from us to operate at a flow rate above the normal regulatory limit, enter that {flow rate (in gpm)}. Enter the {date} of the approval letter in the **Additional Remarks** cell. If you have not received approval to operate at higher a flow rate, leave this cell empty.

Loading Rate (gpm/ft²)

Regulatory Std

The form automatically reports the maximum filter loading rate allowed by our rules based on the data you entered in the **Filter Type** and **Operating Mode** cells.

Design, Typical, During Backwash, and Maximum

The form automatically reports the filter loading rate for each of the operating conditions based on the size of the filter bed and the flow rate information you provided.

App'd Exception

If your plant has received written approval from us to operate at a filter loading rate above the normal regulatory limit, enter that {loading rate (in gpm)}. Enter the {date} of the approval letter in the **Additional Remarks** cell. If you have not received written approval to operate at a higher loading rate, leave this cell empty.

Backwash Flow Rate (gpm)

Regulatory Std

The form automatically reports the minimum backwash flow rate allowed by our rules and the maximum backwash flow rate that we typically recommend. Both values are based on the reported surface area of the filter bed.

Design

Enter the {maximum backwash flow rate (in gpm)} that can be achieved during a backwash cycle.

The design backwash flow rate can be limited by the following factors:

- Design capacity of the backwash pump.
- Maximum flow rate that can be achieved through the remaining filters.
- Hydraulic capacity of the backwash supply header.

In some cases, it may not be possible to determine a design capacity of the backwash system. If you cannot determine the designed backwash flow rate, enter {Unknown}.

Typical

Enter the {typical backwash flow rate (in gpm)} that occurs during a backwash cycle. If the backwash flow rate changes during a routine cycle, enter the rate that is maintained during the main part of the cycle. Do not enter the backwash flow rate during the surface wash or air scour cycle unless that rate is maintained throughout the entire backwash cycle. If the backwash cycle includes ramp up and ramp down periods, do not enter the flow rate that occurs during those stages.

Maximum

Enter the {maximum backwash flow rate (in gpm)} that routinely occurs during a typical filter backwash cycle.

Backwash Loading Rate (gpm/ft²)

Regulatory Std **CALC**

The form automatically reports the minimum backwash loading rate allowed by our rules, and the maximum rate we typically recommend.

Design, Typical, and Maximum **CALC**

The form automatically reports the filter loading rate for each of the operating conditions based on the size of the filter bed and the flow rate you entered.

Filter Influent

Controller

From the drop-down list, select the [controller type] used to control the rate of flow into the filter. Only consider those devices used to proportion or otherwise regulate the flow rate into the filter. Do not include the valves if they are only used to isolate the filter; that is, to stop the settled water flowing into the filter during a backwash cycle. Table 8.5 contains each option in the drop-down list and its description.

Table 8.5. Influent Flow Rate Controller Types and Descriptions

Type	Description
None	The inlet piping of the filter does not have a rate of flow control device; or the filter inlet has a flow control valve that is only used to isolate the filter during backwash or is only used in the fully open or fully closed positions.
Fixed Weir Splitter	Flow rate into the filter inlet is controlled by a splitter box with a fixed weir or gate that was not designed to be raised or lowered; and the splitter box has drop pipes that control the distribution of water to the filters.
Variable Weir Splitter	Flow rate to the filter inlet is controlled by a splitter box with a weir or gate that was designed to be raised or lowered.
Manual Telescoping	Filter is supplied by a trough containing an adjustable telescoping valve.
Manual Butterfly	A manual butterfly valve is used to regulate the flow rate into the filter. Choose None if the valve is only used in the fully open or fully closed position.
Mechanical ROFC	Filter has a mechanical rate of flow controller on its inlet piping.
Mot. Valve (Auto.)	Filter has a motorized valve on its inlet pipe that automatically maintains the desired flow rate.
Siphon (Vacuum) Pipe	Feed rate into the filter is controlled by the size of a siphon pipe. This control mechanism is used in a proprietary design as in the Greenleaf filter.
Orifice Plate	Flow rate into the filter is limited by an orifice plate.
Other	The rate of flow controller types listed in this table do not apply. If you are sure that you have a flow control valve, but you do not know what kind it is, select this option and describe the device in the Additional Remarks cell, or on a separate page.

Meter

From the drop-down list, select the [meter type] used to monitor the flow rate into the filter. Table 8.6 contains each option in the drop-down list and its description.

Table 8.6. Meter Types and Descriptions

Type	Description
None	There is no way to determine the flow rate into the filter.
Proportional	Filter is equipped with a nonadjustable rate of flow controller such as a fixed weir, siphon tube, or orifice plate; or, the overall flow rate to the filter battery is metered at some point upstream of the filters.
Venturi Orifice Ultrasonic Propeller Rotating Disk Paddle V-notch Weir Flat Weir Parshall Flume	Flow rate is determined using a flow rate indicator method using one of these types of devices.
Other	None of the options above adequately describe the method used to determine flow rate. In this case, select this option and describe the method in the Additional Remarks cell, or on a separate page.

Turbidimeter

If the inlet of the filter is equipped with an online turbidimeter, enter the {make and model number}. If there is no online turbidimeter at the filter inlet, enter {None}.

Filter Effluent

Controller

From the drop-down list, select the [controller type] used to control the rate of flow at the filter outlet. Refer to Table 8.5 for a description of each option. Only consider those devices that are used to proportion or otherwise regulate the flow rate as it leaves the filter. Do not include the valves if they are only used to isolate the filter; that is, to stop the flow of filtered water during a backwash cycle. Remember, this cell applies to the flow control devices at the filter outlet, rather than the inlet.

Meter

From the drop-down list, select the [meter type] used to monitor the flow rate the filter outlet. Refer to Table 8.6 for a description of each option in the list. This cell also applies to the metering device located at the filter outlet, rather than the inlet.

Turbidimeter

If the outlet of the filter is equipped with an online turbidimeter, enter the {make and model number}. If there is no online turbidimeter at the filter outlet, enter {None}.

LOHG

From the drop-down list, select the [LOHG type] used. Table 8.7 contains each option in the drop-down list and its description.

Table 8.7. LOHG Types and Descriptions

Type	Description
None	There is no way to determine the head loss in the filter.
Differential Gauge	Filter has a single gauge or indicator that gives a direct head loss reading. This type of device is commonly incorporated into SCADA systems.
Two Gauges	Head loss is manually determined by subtracting the readings from two separate gauges.
Water Level Indicator	Head loss is determined using a ruled water level indicator. This type of device is commonly used on constant rate, variable level filters.
Other	You are sure that you have a way of determining head loss but none of the options above adequately describe the method. In this case, select this option and describe the method in Additional Remarks cell, or on a separate page.

Backwash Water

Source

From the drop-down list, select the [backwash water source] used to deliver backwash water to the filter. Table 8.8 contains each option in the drop-down list and its description.

Table 8.8. Backwash Water Sources and Descriptions

Source	Description
Filter Effluent	The only source of backwash water is the output of the other filters. This means that a filter cannot be backwashed unless the other filters are in operation. In some designs, the backwash water is supplied directly by the other filters. In other designs, the water enters a head control box, which then supplies the backwash water.
Filters & Pump	The principal source of backwash water is the other filters; and the plant can augment the filter output with additional water from the clearwell or distribution system. Again, the filter cannot be backwashed unless the other filters are in operation. The clearwell/distribution system is only used to ensure an adequate backwash rate when the other filters are not producing enough water.
Dedicated Backwash Pump	The filter is backwashed using a dedicated backwash pump that draws water from a clearwell or filtered water sump. In this design, the other filters do not have to be in operation during a backwash cycle. The backwash pump has enough capacity to adequately backwash the filters, whether or not the plant is treating water.
Elevated Backwash Tank	The plant has an elevated storage tank that it uses to supply backwash water for the filters. In this design, the elevated tank serves no other purpose than to backwash the filters; it is not connected to the distribution system.
Service Pump	The backwash water is supplied by the same pumps that discharge to the distribution system.
Distribution	The plant uses the distribution system as the principal source of its backwash water.
Other	None of the options above adequately describe the source of the backwash water. In this case, select this option and describe the method in the Additional Remarks cell, or on a separate page.

Controller

From the drop-down list, select the [flow rate controller type] used to regulate the backwash water flow rate. Refer to Table 8.5 for a general description of each option in the list. Only consider those devices used to regulate the flow rate of the backwash water. Do not include the valves if they are only used to isolate the filter (i.e., to start and stop the flow of backwash water).

Meter

From the drop-down list, select the [meter type] used to monitor the backwash water flow rate. Refer to Table 8.6 for a description of the options. Remember, this box applies to the metering device located on the backwash water supply line rather than the one located at the filter inlet.

Turbidimeter

If the filter is equipped with an online turbidimeter to measure the turbidity of the spent or dirty backwash water, enter the {make} and the {model number} of the unit. If the turbidity of the spent backwash water is not monitored using an online turbidimeter, enter {None}.

Additional Remarks

If you need to explain or clarify any of the information that you provided in the **Filter Design** area of the form, enter it in this cell. If you need more space, enter {See attached sheet} and include your remarks on a separate page.

Operating Procedures

This section of the FAR contains information about the way the filter is operated and maintained. Refer to the plant’s operating and maintenance procedures to complete this portion of the form.

Calibration

Methods: Flow Meter, Backwash Meter, and Mech. ROFC

From the drop-down list for each cell, select the [method] used to calibrate the flowmeters and mechanical ROFCs. Table 8.9 contains each option in the drop-down list and its description.

Table 8.9. Flowmeter Calibration Method Types and Descriptions

Type	Calibration Method
Unknown	You do not know what method used to calibrate the flowmeters and rate of flow controllers the last time they were calibrated. This option applies only when the calibration was checked or adjusted by a third-party contractor. If you select this option, enter the {name of the company} that performed the service in the Additional Remarks cell.
Weir	Calibrated using a weir.
Flume	Calibrated using a flume.
Ultrasonic	Calibrated using an ultrasonic meter.
Time & Volume	Calibrated the flowmeter or ROFC by measuring the volume of water that was discharged within a given time period.
Other	None of the options above apply. Select this option if you or a third-party contractor used some other method to calibrate the flowmeter or rate of flow controller. Describe the method in the Additional Remarks cell, or on a separate page.

Methods: NTU (Primary) and NTU (Secondary)

From the drop-down lists, select the [Primary NTU Standard Type] and the [Secondary NTU Standard Type] used when calibrating the online turbidimeters. Table 8.10 contains the options in each list and their descriptions.

Note: Primary standards are used to conduct a full calibration of the turbidimeter. Secondary standards are used to verify the calibration of the online turbidimeter.

Table 8.10. Turbidimeter Calibration Standard Types and Descriptions

Type	Description
Formazin	4000 NTU formazin calibration solution. This method requires you to make one or more dilute solutions to calibrate the instrument.
Stablized formazin	Stabilized formazin product.
Polymer beads	Polymer bead product.
Gel	Prepared gelatin standard.
Comparison	Calibration based on the results from another turbidimeter.
Proprietary device	Calibration with an online monitor using a manufacturer's proprietary device.
Other	None of the options above apply. In this case, select this option and describe the method in the Additional Remarks cell, or on a separate page.

Frequency (each device)

From the drop-down list, select the [frequency] at which you calibrate each filter device. The options include annual, semiannual, quarterly, monthly, etc.

Date of Last (each device)

Enter the {date} and the {time} that you calibrated each device the last time.

Data Consistency*Frequency and Span*

Enter the {number} of times the data recorder or SCADA system records an IFE turbidity reading. Also, enter the {highest turbidity reading (in NTUs)} that can be recorded.

Date and Time

Enter the {date(s)} and the {time(s)} that you checked the consistency of the IFE turbidity reading on the various instruments and data recorders.

NTU Meter Display

Enter the {IFE turbidity (in NTUs)} corresponding to each date from the filter's online turbidimeter display. Enter {NA} if the turbidimeter does not have a display.

SCADA Display

Enter the corresponding {IFE turbidity (in NTUs)} displayed on the SCADA system's screen. Enter {NA} if the plant does not have a SCADA system or the SCADA system does not display IFE turbidity readings.

Data Recorder

Enter the {turbidity (in NTUs)} recorded by the data recorder or data historian.

Grab Sample

Enter the {grab-sample turbidity (in NTUs)} measured with a benchtop turbidimeter.

Backwash

Criteria

For each of the criteria listed in this area, enter the {value} that triggers a backwash cycle at your plant.

Monitoring Interval

Enter the [frequency] that you monitor each of the criteria (e.g., daily, hourly, 15 minutes, 10 seconds).

Written SOPs

From the drop-down list, select the [status] that describes the listed SOP for each task. Table 8.11 contains each option in the drop-down list and its description.

Table 8.11. Status of SOPs and Descriptions

Status	Description
Complete	SOP lists the steps and equipment needed to complete the specific task and is up to date.
Partial	SOP is up to date but does not include all required steps or does not identify all the equipment required to complete the listed task.
Out of date	SOP is complete but does not accurately describe the procedures currently in use.
None	The operators do not follow an existing SOP, or a SOP does not exist.

Additional Remarks

If you need to explain or clarify any of the information that you entered in the **Operating Procedures** section of the FAR, enter it here. If you need more space, enter {See attached sheet} and include your remarks on a separate page.

8.3 Current, Media Surface, and Backwash Conditions (P.2)

Current Conditions

The **Current Conditions** section of **P.2** is used to document information about the current state of the filter when you begin the filter assessment before accessing it to observe the filter bed's surface conditions. To complete this portion of the FAR, you need to record some observations both before and after you take the filter offline as specified in the following subsections.

Date and Time

Enter the {start date} and the {start time} of the filter assessment.

Turbidity (NTU)

Enter the [turbidity (in NTU)] of the water leaving the filter at the beginning of the assessment.

LOH (ft)

Enter the {loss of head (in ft.)} immediately before taking the filter offline.

Flow Rate (gpm)

Enter the {flow rate (in gpm)} through the filter immediately before beginning the assessment. If you cannot determine the flow rate through the individual filter, enter {Unknown}.

Run Time (hr)

If you monitor the length of time that the filter is in service between backwash cycles, enter the {number of hours} that the filter has been in operation since the last backwash cycle. If you do not track this information, enter {Unknown}.

Run Volume (gal)

Enter the {volume of water (in gal)} that has been filtered since the last backwash cycle. If you do not track or know this information, enter {Unknown}.

Physical Condition

In this section of the FAR form, you will describe the physical condition of the filter after taking it offline.

Walls and Troughs

From the drop-down list, select the physical condition of the filter walls and the backwash troughs. Table 8.12 contains each option in the drop-down list and its description.

Table 8.12. Conditions of Walls and Troughs and Descriptions

Condition	Description
Excellent	No rust or corrosion. Coating materials in like new condition.
Good	Slight corrosion or coating material damage that has no impact on filter performance or filter life.
Minor Damage	Minor corrosion or filter wall damage that does not impair filter performance but requires repair during next scheduled filter renovation or repair.
Moderate Damage	Small leaks or other damage in troughs, walls, or other internal structural components that require immediate repair in order to ensure proper filter performance and avoid catastrophic filter failure.
Severe Damage	Severe leaks. The filter is at or near the point of catastrophic failure and needs major renovation or replacement. Describe the nature of this damage in the Additional Remarks cell, or on a separate page.
Other	The options above do not apply. In this case, describe the condition of the filter walls in the Additional Remarks cell, or on a separate page.

Suppl. Backwash, Flowmeter, Rate-of-Flow Controllers, etc.

From the drop-down list, select the operational condition of the filter appurtenances (equipment and attached devices). Table 8.13 contains each option in the drop-down list and a description of each.

Table 8.13. Filter Appurtenances Conditions and Descriptions

Condition	Description
Fully Operational	No apparent or detectable malfunction of any sort.
Slight Malfunction	Device has a slight malfunction that does not affect the ability to control or monitor filter performance. The problem is detectable but does not apparently impair filter performance. A surface wash arm with one or two damaged or missing nozzles is an example of a slight malfunction.
Moderate Malfunction	Device is malfunctioning to the extent the ability to monitor or control the filter is impaired. A rotating surface wash arm with several damaged or missing nozzles but still rotates is an example.
Severe Malfunction	Device is malfunctioning to the point that you are almost completely unable to monitor or control the filter. An example includes a rotating surface wash arm that will not rotate.
Other	The options above do not apply. In this case, select this option and describe the situation in the Additional Remarks cell, or on a separate page.

Additional Remarks

If you need to explain or clarify anything you entered in the **Current Conditions** section, enter the information here. For example, if you selected any type of filter appurtenance malfunction, be it slight, moderate, or severe; describe it in this cell. If you need more space, enter {See attached sheet} and include your remarks on a separate page.

Media Surface Conditions

The **Media Surface Conditions** section of **P.2** is used to document information about the appearance and condition of the filter media. To complete this portion of the FAR, the filter must be drained so you can observe the appearance and condition of the filter media. You will observe and record the required information twice for this section - before backwashing and after backwashing.

Mounds

Number

Enter the {number of mounds} that you observe before and after backwashing the filter. Do not backwash the filter until you have performed the probing and excavating portion of the filter assessment. Only include mounds that rise more than 1.0 inch above the height of the surrounding media. If there are no mounds over 1.0 inch, enter {0} in the cell.

Length (inches), Width (inches), Height (inches)

Enter the {size (in inches)} of the mounds entered in the **Number** cells. If the mound dimensions vary, enter the range of the dimensions. For example, if the mounds range in height from 1.5 inches to 3.5 inches, enter 1.5 to 3.5 in the cell. If there are no mounds, leave these cells blank. (See following example.)

Mound Data Example

In this example, an operator counted, prior to backwashing, seven mounds 8 inches wide ranging in height from 1.5 to 3.5 inches. After backwashing the filter, the operator counted two mounds. Although both mounds were rather large (about 42 inches in diameter), neither was more than one inch in height. Based on this example, the operator entered the data in the **Before BW** cells and **After BW** cells as shown in Figure 8.3. The length, width, and height of the **After BW** cells are left blank because there were no mounds greater than one inch in height after backwashing.

	Before BW	After BW
MOUNDS		
Number	7	0
Length (inches)	8 - 36	
Width (inches)	8 - 8	
Height (inches)	1.5 - 3.5	

Figure 8.3. Mound Data Example

Depressions

Number

Enter the {number} of depressions you observe before and after backwashing the filter. Do not include the depressions unless they extend more than one inch below the level of the surrounding media. If there are no depressions in the filter bed, enter {0}.

Length (inches), Width (inches), Depth (inches)

Enter the {size (in inches)} of the depressions. If none of the depressions are deeper than 1 inch, leave the cells blank.

Accumulated Floc

Thickness

Enter the {thickness (in inches)} of the floc mat before and after backwashing the filter. If the floc mat varies in thickness, enter the range of results. For example, if the floc mat ranges in depth from 0 inches to ¼ inches, you would enter 0-0.25 in the cell.

Distribution

From the drop-down list, select the [description] that explains how extensively the floc mat covers the surface of the filter media. Table 8.14 shows each option in the drop-down list and a description of each. If there is no floc accumulation on the surface of the media, leave the cell blank.

Table 8.14. Floc Accumulation and Descriptions

Accumulation	Description
Uniform	The floc mat is evenly dispersed on the top of the filter. It covers most of the media surface and there is no area that seems unusually free of floc.
Localized	Most of the filter has no accumulation of floc. Whatever floc is present is isolated to a few areas within the filter.
Other	The floc mat is relatively uniform but there are isolated, well-defined areas where there is an unusual absence of surface floc. In this case, describe the condition in the Additional Remarks cell, or on a separate page.

Retraction

Number

Enter the {number} of areas where the filter media has separated from the filter wall. Do not count the area unless the retraction is more than any of the following:

- 12 inches long
- ¼ inch wide
- ½ inch deep

If there are no such areas where the filter media has separated, enter {0}.

Length (inches), Width (inches), Depth (inches)

Enter the {size (in inches)} of the retractions defined above. Leave these spaces blank if there are no retractions.

Cracks

Number

Enter the {number} of cracks in the filter media. Do not count a crack unless it is more than the following:

- 12 inches long
- ¼ inch wide
- ½ inch deep

If there are no such cracks in the media, enter {0}.

Length (inches), Width (inches), Depth (inches)

Enter the {size (in inches)} of the cracks defined above. Leave these spaces blank or enter {NA} if there are no cracks.

Mudballs

Number per ft²

Enter one of the following options in this cell:

- {Number of mudballs} present on each square foot of media surface.
- {TNTC} if the mudballs are too numerous to count.
- {0} if there are no mudballs.
- {Minimum and maximum number of mudballs observed} if the distribution is not uniform across the media bed (e.g., 0-4, 2-15, and so forth).

Size (inches)

Enter one of the following options in this cell:

- {Size (in inches)} of the surface mudballs.
- {<.5} is the mudballs are all less than ½ inch in diameter.
- {6} if the size of the mudballs exceeds 6 inches in diameter.
- {Size range (in inches)} if the size of the mudballs varies (e.g., 0.5-9.0).
- Leave blank, if there are no mudballs on the surface of the media bed.

Distribution

From the drop-down list, select the {description} that best describes how the mudballs are spread across the surface of the filter media. Refer to Table 8.14 for a description of each option in the list.

Additional Remarks

If you need to explain or clarify anything you entered in the **Media Surface Conditions** section, enter that information here. If you need more space, enter {See attached sheet} and include your remarks on a separate page.

Backwash Conditions

The **Backwash Conditions** section on **P.2** is used to record information about the plant's backwashing processes. Backwashing should only be performed after you have probed and excavated the filter; therefore, you complete this portion of the form after you have completed and documented the probe and excavation step. (See **P.3**.)

BW Flow Rate (gpm)

Enter the {backwash flow rate (in gpm)} maintained during the main part of this backwash cycle. Do not enter the initial backwash rate, the final backwash rate, or the flow rate that was maintained during a simultaneous air-water backwash cycle unless this was also the flow rate used during the main part of the water-only backwash cycle.

Rise Rate (inches/min)

The form automatically reports the rise rate achieved during this backwash cycle. This calculation is based on the surface area of the filter and the backwash water flow rate you entered above.

Loading Rate (gpm/ft²)

The form also automatically reports the backwash loading rate. This calculation is based on the backwash water flow rate you entered and the surface area of the filter bed.

Duration (minutes)

Enter the {length of time (in min.)} that you backwashed the filter at the flow rate you entered in the **BW Flow rate** cell.

Total Volume (gallons)

Enter the {total volume (in gal.)} of backwash water used during the backwash cycle. When entering this number, include water used during any ramp-up and ramp-down periods, and any water used by supplemental backwash facilities.

Troughs

Levelness

From the drop-down list, select the [description] that describes the levelness of the filter trough. Table 8.15 contains each option in the drop-down list and a description of each.

Table 8.15. Trough Levelness and Descriptions

Levelness	Description
Level	Backwash water comes over the top of all the weirs at about the same time.
Slightly Unlevel	Backwash water comes over the top of one weir or over one end of the weirs before it comes over the rest of the weirs. However, the water ultimately comes over the entire top of all of the weirs before the maximum backwash water flow rate is achieved.
Moderately Unlevel	Backwash water comes over one weir or the ends of the weirs, and the problem persists until the maximum backwash flow rate is achieved.
Severely Unlevel	Even at the maximum backwash flow rate, water is not flowing over the entire length of the weirs. For example, water doesn't flow over both sides of one or more weirs, or water does not flow over an end of one or more weirs.

Flooding

From the drop-down list, select the [description] that describes any flooding that occurs during the backwash cycle. Table 8.16 contains each option in the drop-down list and a description of each.

Table 8.16. Trough Flooding and Descriptions

Flooding	Description
None	No flooding in any of the weirs.
Slight	Some flooding on one end of weirs, but they are not completely flooded, and the flow of spent backwash water does not appear to be obstructed.
Moderate	Significant flooding on one or more weirs, and the flow of spent backwash water appears to be affected. However, no part of any weir is completely submerged, and the velocity and direction of the floc particles in the area of the flooding appear to be unaffected.
Severe	One or more weirs are almost completely submerged. The flow of spent backwash water is clearly obstructed. Floc particles in the area of the flooding are not moving at the same velocity and in the same direction as the floc particles throughout the filter.
Complete	All weirs are completely submerged. The backwash water flow rate is restricted, and floc particles are not being effectively removed from the filter.

Suppl. Backwash

Duration (minutes)

Enter the {length of time (in minutes)} the supplemental backwash facilities were operated during the backwash cycle.

Effectiveness

From the drop-down list, select the [description] that describes the effectiveness of the supplemental backwash facilities. Table 8.17 contains each option in the drop-down list and a description of each.

Table 8.17. Supplemental Backwash Effectiveness and Descriptions

Effectiveness	Description
Excellent	Supplemental backwash facilities are completely effective in breaking up the floc throughout the entire filter bed.
Adequate	Supplemental backwash facilities are very effective, but do not affect all of the filter bed. Most of the large floc particles are broken into smaller ones that can be removed during the main part of the backwash cycle. However, the supplemental facilities appear to be less effective in the corners of the filter or on one side of the filter.
Poor	Supplemental backwash facilities are only somewhat effective. Large floc particles remain in the filter even after the completion of the supplemental backwash cycle. Even in the area where the supplemental backwash facilities appear to be fully operational, large floc is not broken into smaller particles that can be efficiently removed during the main backwash cycle.
Ineffective	Supplemental backwash process seems to have minimal effect on the size of the floc particles.

Jetting

Number of Sites

Enter the {number} of areas where significant jets are noted during the main part of the backwash cycle. During the initial phases of the cycle, some jetting may occur as the filter bed is expanded. Do not count these sites unless they continue to be noticeable during the main part of the backwash cycle, or they appear in the same spot each time that a backwash cycle is initiated.

Severity

From the drop-down list, select the [description] that describes the severity of the jetting problem. Table 8.18 contains each option in the drop-down list and a description of each.

Table 8.18. Backwash Jetting Severity and Descriptions

Severity	Description
Slight	Jets in the media during the backwash cycle, but they are small and do not seem to be affecting the overall effectiveness of the backwash cycle.
Moderate	Jets are rather large and you can see the media in the jetting area rising above the media in the adjacent areas. However, the media in the other areas of the filter is being effectively agitated; the filter grains are still moving well in all areas of the filter; and the floc particles are being effectively removed from all areas of the filter.
Severe	Jetting appears to be causing lower media layers to reach the surface of the expanded bed; or the jetting has reached a point where the media in other areas of the filter is not being agitated sufficiently, and the floc particles in the other areas of the filter are not being removed effectively.

BW Water Distribution

From the drop-down list, select the [description] that describes the distribution of the backwash facilities. Table 8.19 shows each option in the drop-down list and a description of each.

Table 8.19. BW Water Distribution and Descriptions

Distribution	Description
Uniform/Even	Backwash water is evenly distributed throughout the filter. The turbulence in the expanded filter bed appears to be relatively uniform everywhere in the filter.
Uneven	Some areas of the expanded filter bed are significantly more turbulent than others. Still, there is some media motion in all areas of the filter and floc is rising in all areas.
Inadequate	Some areas of the filter bed have adequate turbulence while other areas have no motion at all. The floc in some areas of the filter is being effectively removed while the floc in other areas remains virtually motionless.
Other	The options above do not apply. If this is the case, describe the distribution in the Additional Remarks cell, or on a separate page.

Spent BWW Turbidity

After the backwash cycle is finished, enter the {turbidity (in NTU)} of a water sample collected from above the filter media.

Expansion (inches)

You must make two measurements to determine the expansion obtained during the backwash cycle. First, while backwashing at the maximum flow rate, measure the distance from a fixed reference point (such as the top of the filter wall) to the top of the expanded filter bed. After the backwash cycle is over, measure the distance from that same reference point to the top of the unexpanded (settled media) filter bed. The expansion is the difference between these two measurements. Enter the {filter expansion (in inches)}.

Expansion (percent)

The form automatically reports the percentage of bed expansion based on the inches of expansion that you achieved during the backwash cycle and the average media depth that you measured as you probed the backwashed filter.

Yield (percent)

The form also automatically reports the yield or percentage of filtered water sent to the distribution system during this filter run. This percentage is based on the volume of filtered water produced during the filter run and the total volume of water used to backwash the filter. In other words, this percentage is based on the Run Volume you entered in the **Current Conditions** section divided by the Total Volume you entered in the **Backwash Conditions** section.

Additional Remarks

If you need to explain or clarify any of the information that you provided in the **Backwash Conditions** section of the FAR, enter that information here. If you need more space, enter {See attached sheet}, and include your remarks on a separate page.

8.4 Filter Probe, Filter Excavation, Additional Studies, and Conclusions (P.3)

Filter Probe

The **Filter Probe** section of **P.3** contains the information obtained when you probe the filter to measure the thickness of the media layer and the levelness of the media support system. Before completing this portion of the FAR, you must have already collected the information required to complete both the **Current Conditions** section and the **Media Surface Conditions (Before BW)** section on **P.2**.

Number of Sites

Enter the {number} of sites you probed to measure the thickness of the filter bed and to assess the levelness of the support gravel or underdrain.

The space between the sites may not exceed two ft. You must reduce the spacing between measurements if significant differences are detected between adjacent measurements for the distance to the support gravel, or the media depth.

If the distance or depth between adjacent measurements varies by more than 2 inches, make an additional set of measurements at the midpoint between the points. If the distance or depth continues to vary by more than 2 inches, continue to measure at midpoints until the distance between the measurements is only 3 inches.

Media

Max. Thickness (inches), Min. Thickness (inches)

Enter the {maximum thickness (in inches)} and the {minimum thickness (in inches)} you measured when probing the filter to determine the thickness of the filter media.

Typ. Thickness (inches)

Enter the {typical thickness (in inches)} of the media layer. You can determine this by averaging all the thickness measurement results. If most of the measurement results are the same, you can use this one value to avoid having to averaging the results. For example, if you probed the filter at 60 sites and 46 of the measurements were the same, you can enter the value that you got 46 times without calculating the average or typical thickness (even if the other measurements varied by as much as several inches).

Support Material

To determine the elevation of the support gravel (or underdrain), you must determine the distance from the top of the backwash troughs (or some other fixed reference point) to the top of the support gravel. You can determine this distance by either of the following methods:

- Measure from the top of the backwash trough to the top of the support gravel directly. This method may require a probe that is at least 7 or 8 ft. long.
- Measure from the top of the backwash trough to the surface of the media (A), measure the thickness of the media (B), then add the two readings to determine the total distance to the top of the support gravel. (See Figure 8.4.)

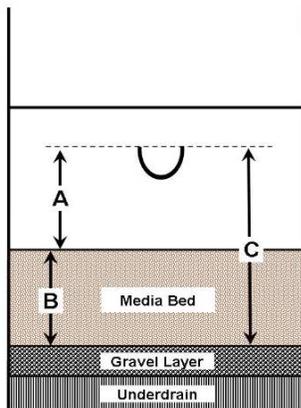


Figure 8.4. Filter Media Cross-section

Max. Elevation (inches), Min. Elevation (inches)

Enter the {maximum elevation (in inches)} and the {minimum elevation (in inches)} you measured to determine the distance to the top of the support gravel.

Typ. Elevation (inches)

Enter the {typical distance (in inches)} to the top of the support gravel. Calculate this value by averaging all of the elevation measurements. If most of the measurements are the same, you can use this one value to avoid having to calculate the average elevation. For example, if you probed the filter at 60 sites and 46 of the measurements were the same, you can enter the value that you got 46 times without calculating the true average, even if the other measurements varied by as much as several inches

Additional Remarks

If you need to explain or clarify anything you entered in the **Filter Probe** section of the FAR, enter that information here. If you need more space, enter {See attached sheet}, and include your remarks on a separate page.

Filter Excavation

This portion of the FAR form is where you summarize filter excavation results. The form provides space to enter data for up to 12 excavation sites. If you excavate fewer sites, leave the extra spaces blank. If you excavate more than 12 sites, include a comment in the **Additional Remarks** cell, and attach a separate page showing the additional data.

You must complete at least one excavation for each 100 square ft of filter surface. For example, a filter bed 20 by 30 ft (600 sq ft) must be excavated in at least six locations. You must also excavate the media at every site where you observe a significant filter problem. (See next section.)

Site Characteristics

You must excavate at least one site where there are no filter problems. This site is termed the reference site. The number and location of the remaining sites depend on the number, severity, and location of any filter or backwash problems identified in previous steps. From the drop-down list for each site, select the [explanation] that describes why you picked each site. Table 8.20 shows each option in the drop-down list and a description of each.

Table 8.20. Excavation Site Explanations and Excavation Requirements

Explanation	Excavation Requirement and Explanation Description
Normal	Excavate at least one site where no filter problems were observed. If no such site exists, excavate a site where the filter media appears to be in the best possible condition. No filter problems observed at the excavation site.
Media Mound	Excavate each site where the mound is at least 2 inches above the surface of the rest of the filter. Media mound present on the surface of the filter after the backwash cycle.
Media Depression	Excavate each site where the depression is at least 2 inches below the surface of the rest of the filter. Depression present on the media surface before or after the backwash cycle.
Crack	Excavate each site where you observe a crack that is at least 12 inches long, at least ½ inch wide, or at least 1 inch deep. Crack in the surface of the filter after the backwash cycle.
Retraction	Excavate each site where the retraction is at least 12 inches long, at least ½ inch wide, or at least 1 inch deep. Filter media retracted from the filter wall after the backwash cycle.
Floc Accumulation	Excavate the site where you observed the heaviest accumulation of floc. Excessive floc accumulation on the surface of the media before the backwash cycle.
Gravel Mound	Excavate each site where the mound rises at least 2 inches above the rest of the support gravel. Filter probe indicated a possible gravel mound under the media.
Gravel Depression	Excavate each site where the gravel layer drops at least 2 inches lower than the rest of the support gravel. Filter probe indicated a possible depression in the gravel layer beneath the media.
Poor Suppl. BW	Excavate at least one site where the supplemental backwash system seemed particularly ineffective. Supplemental backwash facilities seemed significantly less effective in the area of the excavation site.
Jetting	Excavate every site where you identified severe jetting during the backwash cycle. If there were no severe jets identified, excavate at least one site where you observed moderate jetting. Jet observed during the backwash procedure.
Poor BW Distr.	Excavate each area where no media movement was observed, and the floc was not being removed from the filter. Little if any media movement at the excavation site during the backwash cycle
Other	Excavate each site where you think that some other observation suggests that a severe filter problem exists. The explanations above do not apply. For example, you excavated the site because there was no floc accumulation at the site while the rest of the filter had 1/8 inch accumulation. If you select this option, describe the condition in the Additional Remarks cell, or on a separate page.

Media Layers and Interfaces

Starting at the filter surface, enter the {depth (in inches)} and the {name} of the filter material in each of the media layers you identified during the excavation. Figure 8.5 shows how to fill in these cells. Only complete the cells for which layers exist. Leave the other cells blank.

	REFERENCE
CONDITION	Normal
LAYER 1 (Top Layer)	18 in. anthracite
INTERFACE 1	4 inches
LAYER 2	10 in. sand
INTERFACE 2	1 inch
LAYER 3	3 in. garnet
INTERFACE 3	
LAYER 4	

Figure 8.5. Media Layers and Interfaces

Mudballs

From the drop-down list, select the [description] that most describes how many mudballs you found during excavation. Options include none, few, several, and many.

Max. Size (inches), Min. Size (inches)

Enter the {maximum size (in inches)} and the {minimum size (in inches)} of the mudballs you found during filter excavation.

Max. Depth (inches)

Enter the {maximum depth (in inches)} the mudballs have penetrated the filter bed. Measure the distance from the surface of the media.

Media Condition

Sharpness

From the drop-down list, select the [description] that describes the sharpness of the filter grains. Table 8.21 shows each option in the drop-down list and a description of each.

Table 8.21. Media Sharpness and Descriptions

Sharpness	Description
Excellent	The media grains in each of the layers are irregularly shaped and have sharp edges. The size, shape, and feel are very much like new media.
Good	The media grains in one or more layers have begun to lose their sharp edges but continue to have irregular shapes. The material is still about the same size and shape as new media but no longer looks and feels that way.
Worn	The media grains in one or more of the layers has worn to the point that they no longer have sharp edges. They are worn to the point where they all have essentially the same shape. The grains no longer have the size and shape of new media.
Other	The above options do not apply. Different media materials frequently wear out at different rates. For example, one of the materials like anthracite may be worn while another material like sand) is still in good shape. If you believe that a single media layer is contributing to poor filter performance, select this option, and describe the condition of each media layer in the Additional Remarks cell, or on a separate page.

Encrustation

From the drop-down list, select the [description] that describes the degree to which the filter grains are coated with precipitate. Table 8.22 shows each option in the drop-down list and a description of each.

Table 8.22. Media Encrustation and Description

Encrustation	Description
None	There is no apparent precipitate coating on the filter grains. The media looks and feels like new media.
Slight	There is visible coating on the filter grains in the upper layers of the filter. However, the shape of the media in the upper layers is not changed. There is little, if any, coating on the media in the lower levels.
Moderate	There is significant coating on the media throughout the filter. Some of the media has become so encrusted that the filter grains are beginning to change shape. However, most of the media is still in pretty good shape.
Heavy	The problem has become so severe that the different media materials have begun to have a common color and shape.

Uniformity

From the drop-down list, select the [description] that best describes how uniform the size of the media grains is in each filter layer. Table 8.23 shows each option in the drop-down list and a description of each.

When evaluating the uniformity of the filter grains, compare the size of larger and smaller grains with the size of typical grains. Do not pick the absolute, largest and smallest grains for the comparison.

Table 8.23. Media Uniformity and Descriptions

Uniformity	Description
Good	The media grains in each layer of the filter are almost the same size as each other.
Marginal	There is a significant range in the size of the media grains in one or more layers. The size of the larger (and smaller) grains is noticeably different from the size of the typical grain. However, there are few fine grains in the layer.
Poor	The sizes of the media grains in one or more layers vary so much that it is difficult to select a typical grain size for the layer.
Other	The options above do not apply. Different media materials frequently wear out at different rates. For example, harder materials like as garnet may have good uniformity while softer materials like GAC have poor uniformity. If you believe that a single media layer is contributing to poor filter performance, select this option and describe the condition of each media layer in the Additional Remarks cell, or on a separate page.

Additional Remarks

If you need to clarify any of the information in the **Filter Excavation** section of the FAR, enter the information here. If you need more space, enter {See attached sheet}, and include your remarks on a separate page.

Additional Studies

Additional study is required if one or more of the excavation sites contain several or many mudballs. If you only found a few mudballs when excavating the media, the study is optional. If you found no mudballs at any of the excavation sites, the study is unnecessary.

If Filter Profile is Attached

Select [Yes] or [No] from the drop-down list. This question is included to remind you to include a filter profile when you submit your report.

Percent Mudballs

If several of the excavation sites contained more than a few mudballs, you should mix the media from several of the sites before determining the mudball concentration in the composite sample before making the measurements for this section. On the other hand, if the mudballs seem to be concentrated in one area of the filter, you may want to focus on that area of the filter when you prepare your composite sample.

If you are measuring the mudball concentration, you must separate the mudballs from the media. Then you must measure the volume of the mudballs, and the volume of the mudball-free media.

Media Volume (mL)

Enter the {volume (in mL)} of the mudball-free media that you recovered from the excavation site (or sites). Leave blank if you did not do any additional study on mudballs.

Mudball Volume (mL)

Enter the {volume (in mL)} of the mudballs that you recovered from the excavation site (or sites) in this space. Leave blank if you did not do any additional study on mudballs.

% Mudballs

Once you have entered the information in **Mudball Volume** cell and the **Media Volume** cell, the form automatically reports the percentage of mudballs present in the sample.

Additional Remarks

If you need to explain or clarify anything you provided in the **Additional Studies** section of the FAR, enter that information here. If you need more space, enter {See attached sheet} and include your remarks on a separate page.

Also, if you conduct any other special studies such as a media solubility test or a media sieve analysis, enter these results here. If you need more space for this, enter {See attached sheet} and include your results on a separate page.

Conclusions

If you were able to determine what caused the filter performance problems, you must explain your conclusions. If you have developed a plan to prevent the problems from occurring in the future, you may also give us that information although we do not require it. If you need more space, enter {See attached sheet} and include your findings on a separate page.

If Corrective Action Plan is Attached

Select [Yes] from the drop-down list if you have developed a CAP you would want to provide. Select [No] if you prefer not to provide the CAP or have not yet developed one.

If you have decided what corrective actions you are going to implement and have developed a schedule for making the changes, we encourage you to provide this information on **P.6**. If we agree with your proposal, we will prepare a bilateral agreement. Once we both have signed the agreement, we will waive additional assessments on this filter for as long as you fulfill your part of the agreement.

If You Need Technical Assistance from TCEQ

If you have been unable to determine why the filter is malfunctioning and would like some technical assistance from us, select [Yes] from the drop-down list. If you would prefer to address this performance problem using other technical resources, select [No].

8.5 Filter Schematic (P.4)

This page is for a filter schematic which shows the locations of the following items:

- Backwash troughs and supplemental backwash facilities.
- Any filter media anomalies such as mounds, depressions, cracks, retraction, excessive or unusually light floc accumulation, or large accumulations of surface mudballs.
- Any significant backwash anomalies such as jetting or unusually low media movement.
- Sites where you probed the filter and the measurements you collected at each site.
- Sites where you excavated the filter.

Refer to the example of the completed FAR form in Appendix D to complete this page.

If you need more room for the filter schematic, use a separate sheet. You can also make a copy of **P.4** and put part of the information on each page. If you use a separate sheet, enter {See attached page}.

8.6 Narrative Description of Filter Profile (P.5)

Describe the filter profile on **P.5**. Refer to the example FAR in Appendix D. The description should include the cause of any turbidity spikes greater than 1.0 NTU and any interruption in the data. In lieu of a narrative in this section, you can annotate the graph of your filter profile. Enter {See attached sheet} in this section.

You must include the filter profile when you submit your FAR. You can attach it electronically before printing the report, or include a hardcopy attachment.

8.7 Corrective Action Plan (Optional) (P.6)

Describe the corrective actions your system has taken or plans to take. Include a completion date for each corrective action. Instead of listing your corrective actions, you can reference and attach your CAP. Enter {See attached sheet} and attach it electronically or as a hardcopy.

Note: Submitting the CAP is optional, as indicated in Section 8.4.

8.8 Printing, Signing, and Submitting the FAR

After you complete the FAR, you must print and sign every page. The completed and signed FAR, including the filter profile must be included when you submit your MOR.

Operator's Signature, Name, and Date

After printing the report, the operator in charge of the filter assessment must sign and date each page of the FAR. This signature must be handwritten, in ink. Stamped signatures or typewritten names are not acceptable.

The operator who signs the FAR may or may not be the same person who is responsible for the daily operation of the plant. Consequently, the individual who signs the FAR might not be the same person who signs the MOR.

Certificate Number and Class

Enter the {certificate number} and {class} of the operator who signs the FAR.

9. CPE Requests and mCPEs

SWTPs may need to submit a CPE Request and participate in an mCPE if there are extremely elevated turbidity readings in consecutive months. This is required when either of the following circumstances occur:

- IFE turbidity of a specific filter, or any combination of individual filters, exceeds 2.0 NTU during two consecutive 15-min. readings in any two consecutive months.
- **2-Filter plants only:** CFE turbidity levels exceeds 2.0 NTU during two consecutive 15-min. readings during two consecutive months.

This chapter applies to all workbook users. Contact a SWTR Coordinator immediately if you suspect a filter exceedance has triggered an mCPE. CPE Requests and mCPEs are subject to deadlines, and you may incur a violation if you fail to comply with the time requirements defined in this chapter.

Note: During the mCPE, we will review the design, operation, maintenance, and administration of your facility. The purpose is to identify factors limiting the facility's ability to produce high-quality drinking water. Once we complete the evaluation and prepare a report, we will develop a CAP specifying the improvements you must undertake and the compliance schedule.

9.1 General Information

The CPE Request form (TCEQ Form10278) is a Microsoft Excel spreadsheet with many features described in Chapter 1. If you are required to submit a CPE request and participate in an mCPE, download and save a blank form from our web site at <www.tceq.texas.gov/drinkingwater/swmor/swmor/fpr>. An example of a completed CPE Request form is included in Appendix E for reference.

Once you open and save a blank copy of the CPE Request form, follow the guidance in this chapter to document the events prompting the Request and specify your date preferences for the mCPE.

Each time there is a filter exceedance as defined in the previous section, you must submit a CPE Request as soon as possible after the exceedance occurs. The **P.1 Summary** page is programmed to automatically report when a CPE Request is required. To ensure you comply with deadlines, you should enter data into your MOR workbook daily. The workbook will then alert you at any time during the month when an exceedance triggers a CPE Request.

9.2 Plant Information

Enter the {PWS Name}, the {Plant Name or Number}, and the {PWS ID No.}. Make sure you enter this information exactly as you entered it in your MOR workbook.

9.3 Events that Prompted the CPE Request

This portion of the CPE Request form identifies the events that prompted you to request an mCPE and provides some background information on the steps you have taken already in response to poor filter performance.

Filter Number

If you are a conventional or 2-Filter plant, enter the number of the filter that produced the two consecutive 15-min. turbidity readings above 2.0 NTU, as it appears on **P.3** of your workbook. If your plant uses alternative treatment technologies, enter {CFE}.

This filter number on this form may not correspond with the numbering system used at the plant. For this reason, we left enough space for you to add additional information. For example, if Filter No.6 corresponds to your Filter 3 West, the completed form might look like the entry shown in Figure 9.1.

FILTER NUMBER:	Filter No. 6 (our Filter No. 3-West)
-------------------	--------------------------------------

Figure 9.1. Filter Number Example on a CPE request

Date of Event

Enter the {date(s)} when each high turbidity event occurred.

If FAR is Prepared

Using the drop-down list, select [Yes] or [No] if you have completed an FAR.

If CAP is Prepared

Using the drop-down list, select [Yes] or [No], depending on whether or not you have an approved CAP.

9.4 Public Water System Preferences

This portion of the CPE Request Form provides the information we need to help us schedule the mCPE.

Preferred Dates for the CPE

This area of the form is used to identify the date(s) you would like us to conduct the mCPE. For your consideration, the following time requirements apply:

- If your plant serves 10,000 people or more, the mCPE must be conducted within 90 days of the second event that prompted the request.

- If your plant serves fewer than 10,000 people, the mCPE must be conducted within 120 days of the second event that prompted the request.

When considering preferred dates, keep in mind that key plant personnel must be available during the mCPE. These people include the plant superintendent, chief operator, each shift supervisor, and most of the operators.

Key administrative personnel must also be available during the mCPE. These people may include the public works director, utilities director, mayor, district president, owner, and financial officer. Whatever their titles, the people with responsibility for high level planning and decision making must be available.

If capital improvements are planned, the water system's engineer must be available during the CPE.

Contact Information

This section provides the information for the individuals we will contact when arranging the mCPE. Enter the following information for both the administrative and plant contacts:

- {Name}
- {Title}
- {Phone}
- {FAX}, if applicable
- {Mailing address}

Note: SWTP contacts are on file on the [DWW website](#)⁸. You can update the information related to the points of contact by calling TCEQ at 512-239-4691 and asking for a member of the Inventory Group. You can also email PWSINVEN@tceq.texas.gov to request updates.

Administrative Contact

The administrative contact will usually be the mayor, chief administrator, utilities director or similar individual who can help us schedule administrative interviews and can make sure that all of the necessary financial and administrative information is compiled before our arrival.

Plant Contact

The plant contact will usually be the plant superintendent or similar individual who can make sure that the plant staff will be available for the mCPE and compile the plant schematics, the engineering plan and specifications, and the operational and maintenance records that we will require during the mCPE.

⁸ www.tceq.texas.gov/goto/dww

9.5 Printing, Signing, and Submitting the CPE Request

After the CPE Request is completed, you must immediately print, sign, and fax it to us at 512-239-6050. You must also include a copy when you mail your MOR to TCEQ.

Operator's Signature and Date

After printing the completed CPE Request form, the plant contact must sign and date each page. The signature must be handwritten, in ink. Stamped signatures or typewritten names are not acceptable.

The person who signs the CPE Request may not be the same person responsible for daily plant operations and signing the MOR.

Certificate Number and Class

Enter the {certificate number} and {class} of the person signing the CPE Request, if applicable.

Mandatory CPEs must be conducted within deadlines specified in Section 9.4; otherwise you may incur a violation. For this reason, it is imperative you FAX your CPE Request to us immediately upon signature. Do not wait until you send your MOR to submit your CPE Request the first time. We need as much time as possible to schedule the mCPE to ensure deadlines are met.

10. Printing, Signing, and Submitting Your MOR

After you enter all your data for the month and complete the **P.1 Summary** worksheet, you must print, sign, and date each page of your workbook and submit your MOR.

This chapter applies to all workbooks. It is important that you submit your MOR on time each month or you may incur a M/R violation. TCEQ Rules require that MORs be submitted to us by the tenth day of the month following the end of the reporting period.

10.1 Printing the Report

Immediately before printing the report, record the anticipated signature date on **P.2**, as well as the certificate number and grade of the operator who will sign it. The other pages are linked to **P.2** and the information you enter on this page will be automatically recorded on the other pages. If you don't know when the report will be signed, leave this information blank. It can be entered manually at the time of signature.

After entering the signature date and the certificate number and grade, print every page of each worksheet. To print a particular worksheet, activate the worksheet by clicking on its tab and selecting print from the File menu.

If there are one or more invalid cells in a worksheet, it may not print when you select Print. Make sure you entered all the necessary information correctly before you start printing. Refer to the appropriate section of this guidance for information to address invalid entries.

Always print the **P.1 Summary** worksheet last. Much of the data on **P.1** is based on data entered on other pages. If you make changes to other pages during the printing process, **P.1** will also change. By printing **P.1** last, you can be sure it contains the most complete and accurate summary of your results.

10.2 Signing the Report

The certified operator with responsibility for plant operations must sign the MOR documenting that the data is accurate. Use a pen or permanent marker to sign each page of the report. The signature must be handwritten. Stamped or typewritten signatures are not acceptable.

10.3 Submitting your Report

Before mailing your MOR, be sure to sign and attach all related documents as required, including FPRs, FARs, CPE Requests, and copies of PNs.

You may not submit your MOR by fax or email. We recommend that you retain proof of your submittal in the form of a certified mail receipt.

Send your completed report and related documents to:

Water Supply Division, MC-155
Attention: SWTR Coordinator
Texas Commission on Environmental Quality
PO Box 13087
Austin, TX 78711-3087

You may also submit your documents to our physical address at:

Water Supply Division, MC-155, Building F
Attn: SWTR Coordinator
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

11. Public Notification

Texas Rules require that you notify both your customers and TCEQ when certain situations or violations occur. PN requirements vary according to the violation type. This chapter explains the types of violations applicable to SWTPs and the requirements for notification.

Additional information related to PN is available on our [webpages](#)⁹.

To ensure compliance with the PN deadlines described in this chapter, you should enter data in your MOR workbook daily. As you enter data, the workbook will alert you when violations occur. In some situations, you cannot wait until the end of the month to issue a PN or you will miss the deadline.

11.1 Violation Types

The types of violations addressed in this guidance are categorized according to its risk to public health as described in the following bullets:

- Acute, treatment technique violations are Tier 1 violations. These violations could have significant potential for serious, adverse effects on public health.
- Non-acute, treatment technique violations are Tier 2 violations. These violations also have the potential to have serious adverse effects on public health.
- M/R violations are Tier 3 violations. They do not have an immediate risk to public health but still require you to notify your customers.

The PN requirements for Tier 1, Tier 2, and Tier 3 violations are defined in 30 TAC Chapter 290.122. The tier (or type) of the violation dictates how and when to issue a PN.

Treatment Technique violations

Acute Violations

As you enter daily operational and performance data into your MOR workbook, it identifies the acute violations defined in Table 11.1.

⁹ www.tceq.texas.gov/drinkingwater/public_notice.html

Table 11.1. Acute Violations Requiring 24-hr PN

Violation	Description of Violation
Daily Turbidity – conventional and cartridge filters	The turbidity level of the CFE, or finished water, exceeds 5.0 NTU at the designated reporting times.
Daily Turbidity – multibarrier failure	The turbidity level of the CFE, or finished water, exceeds 1.0 NTU at the designated reporting time while any of the following situations occur: <ul style="list-style-type: none"> • IFE turbidity exceeds 2.0 NTU at one or more filters. • Inactivation ratio is below 2.0. • There is not enough IFE or CT data to evaluate one or both scenarios above.
Daily Turbidity – membrane filters	The turbidity level of the CFE, or finished water, exceeds 1.0 NTU at any time during any day that water is being sent to distribution.
Monthly Reporting – MOR	Failure to submit an MOR for two consecutive months.
Monthly Reporting – FPR, FAR or CPE Request	Failure to submit an FPR, an FAR, or a CPE Request form for two consecutive months when required.

You must notify your customers as soon as possible and no later than 24 hours after identifying an acute violation (see Section 11.3). You must also notify us within 24 hours (see Section 11.2). As a matter of practice, we request that you contact us first. That way, we can discuss immediate threats to public health and any needed actions before you notify your customers. Acute threats may exist under conditions other than those identified in Table 11.1. Additionally, you may be required to issue a BWN as part of your PN if there has been either a multiple barrier failure to filtration facilities; or we determine it is in the best interest to public health that customers boil their water prior to consumption.

It is extremely important that you contact us immediately after identifying an acute violation to determine if a BWN is required. If you are not able to consult with us prior to issuing a PN of that magnitude, you are still required to notify your customers within 24 hours.

Non-acute Violations

Non-acute violations are treatment technique violations that do not pose an immediate risk to public health. These violations are defined in Table 11.2. Non-acute violations are based on treatment plant compliance monitoring data showing the failure of no more than one barrier of filtration or disinfection.

These violations are based on the understanding that even though a single treatment barrier exceeded a minimum compliance level, other treatment barriers at the plant did offer public health protection. An example of this is an inactivation ratio of 2.0 via disinfection means that the plant is inactivating twice the number of *Giardia* and viruses as required by our rules even if minimum combined filter effluent turbidity levels were exceeded.

Table 11.2. Non-acute Violations Requiring 30-day PN

Violation	Description of Violation
Daily Turbidity – conventional and cartridge filters	The turbidity level of the CFE, or finished water, exceeds 1.0 NTU at the designated reporting times.
Daily CT	Plant fails to meet inactivation requirements (for <i>Giardia</i> and viruses) for more than 4.0 consecutive hours.
Daily low residual	The disinfectant residual of the finished water entering the distribution system falls below the required minimum level for more than 4.0 consecutive hours.
Monthly turbidity	For the month, more than 5.0% of the CFE turbidity readings are above 0.3 NTU.
Monthly residual	For two consecutive months, more than 5.0% of the residuals in the distribution system falls below the minimum residual level (0.2 mg/L free chlorine or 0.5 mg/L total chlorine).

Non-acute violations are further broken down into daily and monthly, non-acute violations. Daily, non-acute violations are based on the results of only one or two measurements or readings obtained during a single day. Monthly, non-acute violations are based on data collected over a period of one or two months. You should report all instances of non-acute violations, both daily and monthly, to us within 24 hours of identification so we can discuss the proper method of PN. You must issue a PN to your customers for these violations as soon as possible after they are identified, but not later than 30 days. See Section 11.2 for additional information on daily and monthly, non-acute violations.

You may identify monthly, non-acute violations in the middle. In other words, the violation becomes unavoidable independent of other data collected for the rest of the month. It is extremely important that you understand the 30-day timetable for notification starts at the point of identification; otherwise, you may not meet the time requirement and incur a violation.

M/R Violations

As you enter data into your MOR workbook throughout the month, it will identify M/R violations as specified in Table 11.3. These violations have a low public health risk; therefore, you have 12 months to notify your customers. You do not have to notify us when one of these violations is identified. The monthly submission of the MOR serves as our notification.

Table 11.3. M/R Violations Requiring 12-month PN

Violation	Description of Violation
MOR submission	Failure to submit the MOR by the 10th of the month following the reporting period, or at all.
CFE turbidity	Failure to monitor or report all the required CFE turbidity readings.
Daily CT data	Failure to monitor or report all CT data needed to evaluate microbial inactivations.
Disinfectant residual at entry point	Failure to monitor or report the disinfectant residual concentration of water entering the distribution system.
Disinfectant residual in distribution	Failure to monitor or report the required number of disinfectant residual measurements in the distribution system.
Maximum IFE turbidity	Failure to monitor or report the maximum daily IFE turbidity reading.
4-hr IFE turbidity	Failure to monitor or report one or more of the turbidity readings four hours after the start of a filter run.
FPR, FAR, CPE Request	Failure to submit an FPR, an FAR, or a CPE request when required.

11.2 Notifying TCEQ

This section describes the processes for notifying us of violations. Adherence to this guidance will ensure you both notify us; and issue the required level of PN, in a timely manner.

Treatment Technique Violations

Acute Violations

Process for Notifying TCEQ

The process for notifying us of acute violations requires you to take the following actions:

- Fill out a SWTR Violation Report Form. (See following subsection.)
- Call 512-239-4691 to notify us and consult with a SWTR Coordinator. Make this call as soon as possible after identifying the violation; and no later than 24 hours. (See text box below.)
- Send the completed SWTR Violation Report Form to us via fax at 512-239-6050, or email a scanned copy to SWTR@tceq.texas.gov.

As specified in Section 11.1, you must contact both your customers and us within 24 hours after identifying an acute violation. It is important that you contact us first and as soon as possible, so we can discuss the situation before you notify your customers. We want to make sure you issue the correct type PN with all required language.

Note: The MOR workbooks only count readings that are above violation limits after rounding to the nearest 0.1. Readings of 1.001 NTU to 1.049 NTU are rounded down to 1.0 NTU. Readings from 1.050 NTU to 1.099 NTU are rounded up to 1.1 NTU.

Consequently, a reading is not counted as above 1.0 NTU unless you entered a value that was 1.050 NTU or above.

SWTR Violation Report Form

The SWTR Violation Report Form (TCEQ Form 10449) contains the information we will request when you call; therefore, it is important to complete prior to calling. A blank copy of the form is available in Appendix F. It is also located on our website with [instructions](#)¹⁰.

Non-acute Violations

Process for Notifying TCEQ

The process for notifying us of non-acute violations require the following actions:

- Fill out a SWTR Violation Report Form. (See previous subsection.)
- Call 512-239-4691 to notify us and consult with a SWTR Coordinator. Make this call as soon as possible after identifying the violation; and no later than 24 hours.
- Send the completed SWTR Violation Report Form to us via fax (512-239-6050) or email a scanned copy to SWTR@tceq.texas.gov.

Monthly and Daily, Non-acute Violations

Non-acute violations can occur on a daily or a monthly basis as indicated in Table 11.2. These two types of violations are explained in detail in the following subsections.

Daily Non-acute Violations

Daily, non-acute violations, as shown in Figure 11.2 are commonly triggered by CFE turbidity readings above 1.0 NTU, low disinfectant residual data for more than four consecutive hours, or low CT inactivation ratios. Examples of each of these situations are discussed below.

Example 1: Determining When to Notify TCEQ of a CFE Turbidity or Low Disinfectant Residual Violation

In this example, a SWTP collects the data shown in Figure 11.1 during the first week of the month. The plant feeds ammonia at some point during the treatment process and maintains a chloramine residual in the distribution system.

¹⁰ www.tceq.texas.gov/drinkingwater/swmor/swmor/violation-report-form2

PERFORMANCE DATA																		
Date	Raw Water Pumpage (MGD)	Treated Water Pumpage (MGD)	RAW WATER ANALYSES		SETTLED WATER TURBIDITY (Optional Data)						FINISHED WATER QUALITY							
			NTU	Alk.	Basin No.						Turbidity						Lowest Residual	Time=
					1	2	3	4	5	6	NTU1	NTU2	NTU3	NTU4	NTU5	NTU6		
1	2.300	2.210	45	112	1.4	1.5					X	0.03	0.05	0.13	0.21	0.19	1.2	
2	2.100	1.988	53	116	1.9	2.5					X	0.13	0.25	0.11	0.07		2.1	
3	1.900	1.658	48	111	2.2	2.4					X	0.25	0.32	0.21	0.16	0.09	2.1	
4	4.500	4.654	66	101	1.8	1.3					X	0.47	0.55	0.24	0.11	0.31	1.8	
5	3.100	2.440	56	112	3.1	2.8					X	0.54	1.16	1.03	1.40	0.42	1.3	
6	2.300	2.232	45	110	2.2	1.9					X	0.22	0.08	0.04	0.05	0.09	1.9	
7	2.500	2.445	48	115	2.5	2.7					X	0.11	0.14	0.08	0.09	0.11	0.3	2.25

Figure 11.1. Example Data to Show When to Notify TCEQ of a CFE Turbidity or Low Disinfectant Residual Violation

This figure shows two CFE turbidity readings above 1.0 NTU on Day 5 (1.16 NTU in NTU3, and 1.4 NTU in NTU5). Because there were CFE turbidity levels above 1.0 NTU, the plant was required to consult with us within 24 hours (by noon the next day) and then notify its customers accordingly. If the plant did not consult with us by noon the next day, it would have been required to notify its customers per Section 11.3.

The total chlorine residual entering the distribution system dropped as low as 0.3 mg/L on Day 7 and was below 0.5 mg/L for as long as 2 hours and 15 minutes. Since the longest period that the residual was below 0.5 mg/L was less than 4 hours, the system did not violate the treatment technique requirements and was not required to notify either us or its customers. However, if the residual had been below 0.5 mg/L for more than 4.0 hours, the system would have violated the rule and been required to notify us of the violation no later than 5 p.m. on the next business day. The system would have also been required to notify its customers as described in Section 11.3.

Example 2: Determining When to Notify TCEQ of a CT Violation

Figure 11.2 shows sections of a SWTP’s MOR which explains when to notify us of a CT violation.

PERFORMANCE DATA									
DISINFECTION PROCESS DATA									
Date	Disinfectant	C (mg/L)	Flow (MGD)	Temp (°C)	pH	Giardia Log	Virus Log	Inact. Ratio	Time
7	NA D1								
	FCL D2A	0.2	3.000	12.0	7.4				
	NA D2B					0.48	11.33	0.96	2.25
	CLA D3	0.3	3.000	14.0	7.5			(G)	
	D4								

Figure 11.2. Example Data to Show When to Notify TCEQ of a CT Violation

In this example, the plant has three disinfection zones. Zone D2 contains two, parallel treatment trains, D2A and D2B. Disinfection zones D1 and D2B were not being used for disinfection credit on Day 7. Based on the data reported, the following occurred:

- All the water had to flow through zone D1 because there was no treatment train alternative. However, there was no disinfectant used in that zone, which was denoted by NA. Due to the lack of disinfectant used in this zone, the plant would have not received CT credit; thus, no performance data set needed to be reported for this zone.
- Like zone D1, all the water must flow through zone D3, because there is no parallel treatment train alternative. The treatment plant was operating at a peak flow rate of 3.000 MGD when the sample set was collected for this zone.
- Unlike zones D1 and D3, the water can flow through either zone D2A and D2B, or both. However, it was reported that at a peak flow of 3.000 MGD, all the water flowed through zone D2A. Since there was no flow in zone D2B, the operator selected NA as the disinfectant., and was not required to report a performance data set.

When the sample set on Day 7 was collected, the inactivation ratio for both *Giardia* and viruses was 0.96. The maximum period that the inactivation ratio was below 1.0 was 2 hours, 15 minutes. Since the longest period that the inactivation ratios were below 1.0 was less than 4.0 hours, the system did not violate the treatment technique requirements and was not required to notify either us or its customers about the problem. However, if the inactivation ratio had been below 1.0 for more than 4.0 hours, the system would have had a violation that required it to notify us no later than 5 p.m. on the next regular business day. The system would have also been required to notify its customers as described in Section 11.3.

Monthly Non-acute Violations

Once a monthly violation is identified or is unavoidable, you must notify us, even if it is before the end of the month. For example, if you have an operational problem at the beginning of the month resulting in a violation, you cannot wait until the end of the month to review your records and decide whether you should contact us and notify the public. As soon as you identify a monthly violation has occurred or cannot be avoided, you have 24 hours to notify us.

Monthly violations can be triggered by having more than 5% of the distribution disinfectant residual readings fall below the minimum required level for two consecutive months, or by having more than 5% of the CFE turbidities above 0.3 NTU during a single month. See Table 11.4 to determine if the samples that trigger a violation make up more than 5% of the total number of samples you collect.

Table 11.4. Number of Samples that Trigger a Monthly Violation

Total Number of Samples Collected	Number of Samples Collected hat will put you over 5%
0–19	1
20–39	2
40–59	3
60–79	4
80–99	5
100–118	6
119–138	7
139–158	8
159–178	9
179–198	10
199–217	11

Note: The MOR workbooks only count readings that are above violation limits after rounding to the nearest 0.1. This means that all readings of 0.301 NTU to 0.349 NTU are rounded down to 0.30 NTU. Any reading from 0.350 NTU to 0.399 NTU are rounded up to 0.4 NTU. Consequently, a reading is not counted as above 0.3 NTU unless you enter a value that is 0.350 NTU or above.

M/R Violations

The MOR workbooks automatically report M/R violations. You do not have to take any special steps to notify us of an M/R violation prior to your MOR submission; however, you still need to notify to your customers. (See Section 11.3.)

Proof of Public Notification

You are required to send us copies of any PNs distributed to your customers within 10 days of issuance. Each copy must be accompanied with a signed COD.

Email copies of PNs and CODs to PWSPN@tceq.texas.gov, or mail them to:

Drinking Water Inventory, MC-155
 Attn: Public Notice
 TCEQ
 PO Box 13087
 Austin, TX 78711-3087

Additional information including COD templates is on our [Public Notification webpage](#)¹¹.

¹¹ www.tceq.texas.gov/drinkingwater/public_notice.html/#SWTR

11.3 Notifying Customers

PN protects your customers by informing them of potential health risks associated with improperly treated water. Notifying your customers within required timeframes is an important step in protecting public health. Each PN must conform to specific requirements and contain mandatory information. The customer notification requirements for the different types of violations are explained in this section.

It is important to be mindful of the type and severity of the violation so that you can quickly identify the level of PN required and take the proper actions. Visit our PN webpage at www.tceq.texas.gov/drinkingwater/public_notice.html/#SWTR to access the mandatory language that must be included with your PN.

Treatment Technique Violations

Acute Violations

Acute violations require that you issue PN to your customers within 24 hours of the identified violation. In some cases, you will also be required to issue a BWN along with the PN. The requirements for how to notify customers of acute violations vary for community and non-community water systems.

Community Water Systems

Community Water Systems must distribute acute violation notices within 24 hours of identification (with or without the BWN) in one or more of the following ways which are reasonably calculated to reach everyone served by the PWS in the required time period:

- Furnish a copy to radio and television stations serving the PWS service area.
- Publish in a local newspaper serving the PWS service area. If the area is not served by a newspaper in general circulation, the notice may be distributed in one of the following ways:
 - Deliver directly to customers.
 - Continuously post in conspicuous places within affected PWS service area.
 - Deliver electronically or use alert systems (e.g., reverse 911).

Non-community Water Systems

Non-community water systems are not required to publish acute violation notices on the radio or television; or publish it in a local paper. However, they must be distributed within 24 hours of identification in one of the following ways:

- Deliver directly to customers.
- Continuously post in conspicuous places within affected PWS service area.
- Deliver electronically or use alert systems (e.g., reverse 911).

Additional Notice

You must keep your customers informed about the status of the violation until the problem is resolved. Following the initial notice, you must comply with each of the following requirements:

- Notify your customers of the status of the violation no later than 45 days after the violation. You can request that this requirement be waived if you have corrected the violation within the 45-day period; however, we must give the waiver, in writing, prior to the 45-day deadline.
- Reissue the notice at least every 90 days as long as the violation exists.
- Rescind BWNs by following the BWN guidance on our [public notice to boil water webpage](#)¹².

If the original notice was issued by mail or direct delivery, we recommend you issue any follow-up notices using the same method.

Non-acute Violations

Non-acute violations require that you issue PN to your customers within 30 days of the identified violation. The requirements for how to notify customers of non-acute violations also vary for community and non-community water systems.

Community Water Systems

Community water system must distribute non-acute violation notices within 30 days of identification in one of the following ways:

- Mail to each customer receiving a bill, and to other service connections to which water is delivered.
- Deliver directly to each customer receiving a bill, and to other service connections to which water is delivered.

Additionally, you are required to distribute the non-acute violation notice within 30 days of identification, in one or more of the following ways reasonably calculated to reach other persons served by the PWS:

- Publish in a local newspaper.
- Deliver multiple copies for distribution to others (i.e. apartment building owners, large private employers).
- Continuously post in conspicuous public places within the area served.
- Publish on the Internet.
- Deliver directly or use alert systems (e.g., reverse 911).
- Deliver to community centers.

Continuous posting must remain in place for at least seven days or as long as the violation exists, whichever is longer.

¹² www.tceq.texas.gov/goto/pws/notices

Non-community Water Systems

Non-community water systems are not required to publish non-acute violation notices on the radio or television, or in a local paper. However, they must be distributed within 30 days in one of the following ways:

- Continuously post the notice in conspicuous places within the affected PWS's service area.
- Mail or deliver directly to each customer or service connection.

Additionally, you must distribute the notice by any of the following ways reasonably calculated to reach other people served by the PWS:

- Publish in a local newspaper or newsletter distributed to customers.
- E-mail to notify employees or students.
- Deliver electronically or use alert systems (e.g., reverse 911).
- Deliver multiple copies to central locations (e.g., community centers).

Updating Customers Following the Initial Notice

You must keep your customers informed about the status of the violation until the problem is resolved. Following the initial notice, you must reissue the PN at least every 90 days as long as the violation exists.

If the original notice was issued by mail or direct delivery, it is recommended any follow-up notices be issued using the same method.

M/R Violations

Monitoring or reporting (M/R) violations require that a PN be issued to customers within 12 months of the identified violation. The requirements for noticing customers of these violations vary for community and non-community water systems.

Community Water Systems

Community water system must issue M/R violation notices within 12 months of identification. You must distribute the notice in one of the following ways:

- Mail or directly deliver to each customer receiving a bill and to other service connections to which water is delivered.
- Report in your annual CCR as long as it is issued within the 12-month time of the violation or situation.

Additionally, you are required to distribute the notice with 12 months by one or more of another method reasonably calculated to reach other persons served by the PWS such as:

- Deliver multiple copies for distribution to others (i.e. apartment building owners, large private employers).
- Continuously post in conspicuous public places within the area served.
- Publish on the Internet.

- Deliver electronically or use alert systems (e.g., reverse 911).
- Deliver to community organizations.

Continuous posting must remain in place for at least seven days or as long as the violation exists, whichever is longer.

Non-community Water Systems

Non-community water systems are not required to issue their non-acute violation notices using electronic media or to publish them in a local paper. However, you must distribute the notice within 12 months in one of the following ways:

- Continuously post the notice in conspicuous places within affected PWS or service area.
- Mail or directly deliver the notice to each customer or service connections.

You must also distribute the notice within 12 months in one or more the following ways reasonably calculated to reach other persons served by the PWS such as:

- Publish in a local newspaper or newsletter distributed to customers.
- E-mail to notify employees or students.
- Deliver electronically or use alert systems (e.g., reverse 911).
- Deliver multiple copies to central locations (e.g., community centers, large employers).
- Publish on the Internet.

Updating Customers Following the Initial Notice

You must keep your customers informed about the status of the violation. Following the initial notice, you must reissue the notice at least every 12 months as long as the violation exists. If the original notice was issued by mail or direct delivery, any follow-up notices must be issued using the same method.

Glossary

Term	Definition
Air flow-based test	Membrane filter, direct integrity test (DIT) in which air flow rate in L/min is measured to directly determine the removal efficiency of the membrane barrier by identifying any breaches/leaks larger than three microns.
Alternative compliance criteria (ACC)	Group of eight options from which a SWTP can choose to demonstrate that optimum TOC removal has been achieved even though the plant was unable to achieve a Step 1 removal ratio of at least 1.0.
Alternative technology	Any SWTP treatment process, like membrane filtration, UV disinfection, and bag/cartridge filtration, that does not have specific design requirements specified in 30 TAC Chapter 290.42(a). Alternative technologies allow SWTPs to receive pathogen removal or inactivation credit for non-conventional treatment.
Approved laboratory	A TCEQ-approved laboratory that uses EPA allowable methods to analyze water samples to determine compliance with state and federal regulations.
Baffling characteristics	Design features of a disinfection contact basin that influence how effectively the basin limits water from passing through it before being adequately disinfected.
Bag filter	Pressure driven separation device that removes particulate matter larger than one micron using an engineered porous filtration media. They are typically constructed of a non-rigid, fabric filtration media housed in a pressure vessel in which the direction of flow is from the inside of the bag to the outside.
Bin classification	Classification and minimum treatment requirements assigned to a SWTP based on the amount of <i>Cryptosporidium</i> detected in a source water sample.
Boil Water Notice (BWN)	Notice sent by a PWS informing their customers to boil their drinking water before consumption. BWNs are typically issued when an unexpected condition has caused a potential for biological contamination of potable water.
Calculated dose approach (CDA)	UV disinfection method for calculating the UV dose using an equation based on operating conditions like flow rate, UV intensity, and UVT.

Term	Definition
Cartridge filter	Pressure driven separation device that removes particulate matter larger than one micron using an engineered porous filtration media. They are typically constructed of a non-rigid, fabric filtration media housed in a pressure vessel in which the direction of flow is either from the outside of the cartridge to the inside, or the inside to the outside.
Clearwell	A storage unit, usually located at a treatment facility that contains treated water before it is pumped to the distribution system. Some SWTPs refer to their clearwell as a ground storage tank.
Combined filter effluent (CFE)	Water produced by all filters at a SWTP after it has been blended.
Comment box	Note attached to a single cell in a worksheet. MOR workbook comment boxes contain useful information to help you with entering proper data in the cell.
Community water system	A PWS which has a potential to serve at least 15 residential service connections on a year-round basis, or serves at least 25 residents on a year-round basis. Most municipalities meet this definition, as do some boarding schools and prisons.
Comprehensive Evaluation Request (CPE Request)	TCEQ Form-10277 that SWTPs must complete and submit to TCEQ to request an mCPE. This is required after an individual filter, or any combination of filters has a confirmed effluent turbidity reading above 2.0 NTU on two separate occasions during any consecutive two months.
Concentration time (CT)	The result when the disinfection concentration at the end of a disinfection zone, C is multiplied by the contact time, T_{10} within the disinfection zone.
Corrective Action Plan (CAP)	Written plan that TCEQ develops following an mCPE at a PWS. The purpose of a CAP is to improve design, operational, maintenance, or administrative problems. It includes specific actions a water system must take to correct problems as well as a schedule for implementing the actions.
CT Study	Evaluation performed by a SWTP of its disinfection protocols to identify the number of disinfection zones at a plant; determine the effective contact time, T_{10} available in each zone; and define the minimum level of disinfection that must be provided at the plant.

Term	Definition
CT Study approval letter	Letter that TCEQ sends approving a PWS's proposed disinfection protocol. The letter identifies the approved disinfection zones and establishes the relationship between the flow rate through that zone and the T_{10} within the zone.
CT Study template	Form that SWTPs complete and submit to TCEQ to request approval for a new or revised CT Study.
Data validation	Data checking features programmed into MOR workbooks that control the accuracy and quality of data entered.
Direct integrity test (DIT)	Physical test applied to a membrane unit to identify and isolate integrity breaches or leaks that could result in contamination of the filtrate.
Disinfection	Process by which pathogenic organisms in the water are inactivated by chemical oxidants or equivalent agents.
Disinfection byproduct (DBP)	Chemical compound formed in water by the reaction of a disinfectant with naturally occurring organic matter.
Disinfection zone	Segment of the treatment plant that includes one or more treatment units and associated piping where disinfection occurs. The segment begins at a disinfectant injection point and ends at the associated monitoring point. Every injection point is the start of a new injection zone, even if it is not used. Every injection point must have an associated monitoring point. However, a plant may have only one disinfectant point and choose to monitor at more than one point, creating multiple disinfection zones.
Dissolved organic carbon	Portion of total organic carbon (TOC) that is present in the dissolved form. Dissolved organic carbon is difficult or impossible to remove using coagulation, flocculation, and sedimentation. Elevated levels may interfere with the effectiveness of disinfection processes and react with chlorine to form DBPs.
Distribution system	System of pipes that delivers treated water to customers. Typically, the distribution system begins after the water leaves the treatment plant and before the first customer connection.
Drinking water	Water distributed by any agency or individual, public or private, for the purpose of human consumption or which may be used in the preparation of foods or beverages or for the cleaning of any utensil or article used in the course of preparation or consumption of food or beverages for human beings. The term drinking water includes all water supplied for human consumption or used by any institution catering to the public.

Term	Definition
Drinking Water Watch (DWW)	Searchable database located on TCEQ web site that contains analytical results, schedules, and violations related to Texas PWSs.
Effluent	The point where water leaves a treatment unit, such as a filter.
Entry point	Any point where a source of treated water, or water purchased from another supplier first enters the distribution system. The entry point is also called water “leaving the plant.”
Event	Period of time when a treatment facility is operating outside their established compliance criteria. An event begins when monitoring data indicate noncompliant conditions and ends when compliant conditions are reestablished.
Filter assessment	An in-depth evaluation of the design, maintenance, operation, and performance of an individual filter which includes the development of a filter profile, and the preparation of a FAR. SWTPs must perform a filter assessment when an individual filter has a confirmed effluent reading above 1.0 NTU on three separate occasions during any consecutive three months.
Filter Assessment Report (FAR)	Report SWTPs must prepare using TCEQ Form 10277 and submit to TCEQ following the completion of a filter assessment.
filter exceedance	An event when water produced by an individual filter has a turbidity level above the performance goal established by TCEQ for two consecutive 15-min. readings. A filter exceedance is not the same thing as a treatment technique violation, but a severe exceedance on one or more filters may cause the plant to violate a treatment technique requirement for treated water turbidity levels.
Filter profile	Graphical representation of individual filter performance to show the turbidity levels, or particle counts of the filtered water versus time for an entire filter run. A SWTP must perform a filter profile when an individual filter has effluent turbidity reading above 1.0 during two consecutive 15-min. readings. The evaluation must explain the cause of the elevated turbidity readings.
Filter Profile Report (FPR)	Report SWTPs must prepare using TCEQ Form 10276 and submit to TCEQ following the completion of a filter profile.
Finished water	The water leaving a treatment plant that has passed through all treatment units. Finished water is sometimes called treated water.

Term	Definition
Groundwater under the direct influence of surface water (GUI)	Any water beneath the surface of the ground with (1) significant occurrence of microorganisms, algae, or large diameter pathogens such as <i>Giardia</i> or <i>Cryptosporidium</i> ; (2) significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions; or (3) site-specific characteristics including measurements of water quality parameters, well construction details, existing geological attributes, and other features that are similar to groundwater sources that have been identified as being under the direct influence of surface water.
Haloacetic acids (HAA5)	Set of five haloacetic acid species formed when naturally occurring organic material is exposed to halogenated chemical disinfectants such as chlorine. Haloacetic acids include monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid.
Inactivation ratio	Method used to determine if a SWTP has met the daily minimum disinfection requirements. The value of an inactivation ratio is determined by dividing the value of CT_{actual} by that of CT_{required} . An inactivation ratio of 1.0 or above for both virus and <i>Giardia</i> is required to meet the disinfection requirements.
Indirect integrity test (IIT)	The monitoring of an aspect of filtrate water quality, such as turbidity that is indicative of particulate matter removal.
Individual filter	Filtration unit that has its own influent and its own effluent.
Individual filter effluent (IFE)	Water produced by a single filter.
Influent	The point where water enters a treatment unit, such as a filter.
Intensity setpoint approach (ISA)	UV disinfection method that relies on certain UV intensity setpoints, as measured by UV sensors, to ensure disinfection is effective.
Interim Enhanced Surface Water Treatment Rule	Federal regulation to require SWTPs serving 10,000 or more persons to begin enhanced treatment and monitoring.
Log removal credit (LRC)	Predetermined <i>Cryptosporidium</i> and <i>Giardia</i> removal amounts TCEQ assigns to treatment units, such as filters, based on manufacturer testing and data. SWTPs may claim this removal credit if compliance data proves the unit is operating within TCEQ-approved parameters.

Term	Definition
Log removal value (LRV)	Measure of the removal efficiency for a target organism, particulate, or surrogate expressed as the log10 of the influent organism concentration minus the log10 of the effluent organism concentration.
Long Term 1 Enhanced Surface Water Treatment Rule	Federal regulation that required treatment plants serving fewer than 10,000 people to meet essentially the same monitoring and performance requirements as larger treatment plants.
Long Term 2 Enhanced Surface Water Treatment Rule (LT2 Rule)	Federal regulation that required additional treatment by plants with elevated <i>Cryptosporidium</i> levels in their source water.
Macro	Small computer program that automatically executes specific tasks when prompted. There are several macros in MOR workbooks that do things like update menu options based on how a workbook is optimized, circle empty cells that should contain data, and populate certain cells to match entered data.
Mandatory Compliance Performance Evaluation (mCPE)	Extensive, on-site analysis of the design, operation, maintenance, and administrative practices of a SWTP. Mandatory CPEs are conducted to identify the factors limiting a facility's ability to produce high quality drinking water.
Marker-based test (MBT)	Membrane filter, direct integrity test (DIT) in which a marker or particle, three microns or smaller, is introduced into the influent water to directly measure the removal efficiency of the membrane barrier.
Master file workbook	An MOR workbook that has been customized by an SWTP operator with data and information specific to the plant. An operator can save time and prevent overwriting daily compliance data by a creating a master file workbook and using it to save a new, monitoring period workbook file each month.
Maximum contaminant level (MCL)	The maximum concentration of a regulated contaminant that is allowed in drinking water before a PWS is cited for a violation. MCLs for regulated contaminants are defined in various sections of 30 TAC Chapter 290, Subchapter F.

Term	Definition
Membrane filtration	Pressure or vacuum driven separation process in which particulate matter larger than one micron is rejected by an engineered barrier, primarily through a size exclusion mechanism, and which has a measurable removal efficiency of a target organism that can be verified through the application of direct integrity test.
Missing data (MD)	Abbreviation entered in a data entry cell of an MOR workbook when a plant collected some, but not all, of the required compliance data and none exceeded the minimum or maximum value defined for the data set.
Monitoring Plan	Water system document that describes its sampling locations and frequency. It also identifies its testing laboratory(ies) and analytical methods used to comply with regulatory monitoring requirements within all drinking water compliance areas. All PWSs must maintain current monitoring plans per 30 TAC Chapter 290.121.
Monitoring requirement	Required test, measurement, or observation to meet minimum state and federal rules, regulations, or standards.
Monitoring/Reporting (M/R) violations	Result of a PWS's failure to comply with certain monitoring and reporting requirements as defined in 30 TAC Chapter 290.122(c).
Monthly average	Number obtained by dividing the sum of a set of values obtained during a given month by the number of values.
Monthly operating report (MOR)	Report due by the tenth day of the month following the end of the reporting period, containing all compliance data collected from a treatment plant during one calendar month.
Nephelometric turbidity unit	Unit of measurement for turbidity.
No data (ND)	Abbreviation entered in a data entry cell of an MOR workbook when a plant failed to collect the required compliance data for that portion of the MOR.
Nontransient noncommunity water system	A PWS that is not a community water system and regularly serves at least 25 of the same persons at least six months out of the year. Many factories, schools, camps, recreational vehicle parks with long-term residents, and other businesses may fit this definition. Businesses that purchase and redistribute potable water may also fall under this definition.

Term	Definition
Point of diminishing returns (PODR)	Point at which an additional 10 mg/L of chemical coagulant, usually alum, results in the removal of no more than 0.3 mg/L of TOC when conducting a Step 2 jar test. The percentage of TOC removed in the jar where the PODR is reached is the percentage used to establish the target TOC removal requirement for the treatment plant.
Pressure-based test (PBT)	Membrane filter, direct integrity test (DIT) in which enough pressurized air is applied to a filter to detect a three micron or larger defect in the membrane barrier. The decay rate (psi/min) of the pressurized air must not exceed the approved rate to show that there is no membrane defect large enough to allow <i>Cryptosporidium</i> contamination in the filtrate.
Public Notice	A notice sent to customers served by a PWS that failed to meet drinking water quality requirements. The notice contains the cause of the violation, potential health effects associated with the violation (if any), and steps being taken to correct the problem.
Public notification (PN) tier	One of three classifications assigned to a rule violation as defined in 30 TAC Chapter 290.122. Assigned tiers indicate the level of potential public health impact the violation may have; and dictate how, and in what timeframe PWS must deliver a public notice.
Proof of notification	Documentation that a PWS distributed a public notice required by 30 TAC Chapter 290.122 to its customers. A copy of both the distributed public notice and the completed Certificate of Delivery (COD) must be submitted to TCEQ within 10 days of distribution.
Public water system (PWS)	A system that provides water for human consumption through pipes or other constructed conveyances, which includes all uses described under the definition for drinking water. Such a system must have at least 15 service connections or serve at least 25 individuals at least 60 days out of the year.
Quarterly average	Average of all compliance results obtained in a calendar quarter. For tests run on a daily or monthly basis, the quarterly average is determined by first calculating each monthly average, and then calculating an average of them.
Raw Water	Untreated water entering a treatment plant prior to any chemical injection.
Reclaimed water	Water used during the treatment process for a purpose that results in diminished water quality, such as filter backwashing. This water is reintroduced at the beginning stages of the treatment process to recycle and supplement source water.

Term	Definition
Recycling Practices Report	Report SWTPs must prepare using TCEQ Form 20100, and submit to TCEQ, as required by the Filter Backwash Rule. This Rule ensures recycled streams are adequately controlled and minimize interference with the treatment process.
Reporting month	The month during which you collected the data being reported in an MOR.
Running annual average (RAA)	Average of all the results obtained during four consecutive calendar quarters. For tests run quarterly, monthly, or daily, the RAA is calculated by summing the quarterly averages for four consecutive quarters and then dividing the sum by four. In the absence of quarterly results, the RAA is calculated based on the available data.
Settled water	The water leaving a sedimentation basin before it passes through the filter.
Specific ultraviolet light absorbance (SUVA)	Indirect indicator of whether the organic carbon in a water sample is humic or fulvic in origin. SUVA is calculated by dividing a sample's ultraviolet absorption at a wavelength of 254 nm (UV254) (in inverse meters) by its concentration of dissolved organic carbon (in milligrams per liter). It is more difficult to remove the TOC in water that has a SUVA value less than or equal to 2.0 L/mg-m.
Stage 1 Disinfectants and Disinfectants Byproduct Rule (Stage 1 DBR)	Federal rule that established maximum residual disinfectant level goals and maximum residual disinfectant levels for three types of disinfectants and DBPs in an effort to reduce consumer exposure. This rule applied to all PWSs serving fewer than 10,000 persons and added a disinfectant to the water at any point in the treatment process.
Stage 2 Disinfectants and Disinfectants Byproduct Rule (Stage 2 DBR)	Federal rule that strengthened public health protections of the Stage 1 DBR by tightening the compliance monitoring requirements for TTHMs and HAA5.
Step 1 removal ratio	Ratio determined by dividing the percentage of the raw water TOC that a plant removed by the percentage of TOC that the plant should be able to remove using enhanced coagulation. The result is used to evaluate the TOC removal efficiency of the treatment process.

Term	Definition
Step 2 removal ratio	Ratio determined by dividing the percentage of the raw water TOC that a plant removed by the percentage of TOC the plant should be able to remove based on the PODR of a Step 2 jar test. This is an alternative method used to evaluate the TOC removal efficiency of the treatment process.
Supervisory Control and Data Acquisition (SCADA)	Data communication that connects with peripheral measurement devices to collect and manage water quality data and information at SWTPs and other treatment facilities.
Surface water	Water that has accumulated on the surface of the ground including water in lakes, rivers, streams, wetlands, and oceans.
Surface water treatment plant (SWTP)	Facility where surface water, or groundwater under the influence of surface water is treated to make drinking water.
Surface Water Treatment Rule (SWTR)	Federal rule that establishes filtration and disinfection requirements for SWTPs.
SWTR Coordinator	TCEQ employee responsible for determining treatment technique and M/R compliance for PWSs required to adhere to SWTR standards. TCEQ SWTR Coordinators can be contacted at 512-239-4691 or SWTR@tceq.texas.gov.
Texas Optimization Program (TOP)	Voluntary, non-regulatory program managed by TCEQ. The TOP helps improve the performance of SWTPs without major capital improvement by identifying and correcting performance limiting factors at each major treatment unit. The goal is to lower the risk of waterborne disease by reducing the number of pathogenic organisms passing through the treatment plant.
T ₁₀	Amount of time it takes for ten percent of the water that enters a disinfection zone at a given time to pass through the treatment units within that zone.
Total organic carbon (TOC)	The organic carbon, both humic and fulvic, present in a water source. TOC can interfere with disinfection processes at water treatment facilities and react with chlorine to form DBPs.

Term	Definition
TOC sample set	Group of two samples that SWTPs using conventional treatment must collect and analyze. The raw water sample must be collected from a site before any chemicals are injected, and be analyzed for both TOC and alkalinity. The treated water sample must be collected from a site after the filters and be analyzed for just TOC. Sample collection should be timed such that both samples are representative of the same water. In other words, the treated water sample should be collected at least an hour after the raw water sample to allow time for water to flow through the plant.
Total trihalomethane (TTHM)	Group of chlorinated DBPs formed during the production of drinking water when naturally occurring organic and inorganic matter is exposed to halogenated chemical disinfectants, such as chlorine. Regulated trihalomethane species consist of chloroform, bromoform, bromodichloromethane, and dibromochloromethane.
Train	Treatment units that operate in a series within a treatment plant. SWTPs may contain one or more treatment trains that operate side by side.
Transient noncommunity water system	A PWS that is not a community water system and regularly serves at least 25 persons at least 60 days out of the year, yet, by its characteristics does not meet the definition of a nontransient noncommunity water system. Gas stations and campgrounds often meet this definition.
Treated water	Water leaving a treatment plant that has passed through all treatment units. Treated water is sometimes called finished water.
Treatment technique requirement	Minimum treatment level that a PWS must achieve before drinking water is compliant with state and federal standards. Treatment technique requirements indirectly limits the risk posed by specific contaminants like <i>Cryptosporidium</i> and <i>Giardia</i> without setting limits on them directly. Instead, another treatment parameter, like turbidity must be monitored to indirectly assess the potential for contamination.
UV Transmittance (UVT)	A measure of the fraction, or percentage of incident light transmitted through a water column without being reflected.
Violation Report Form	Report that SWTPs must prepare using TCEQ Form 10449, and submit to TCEQ as soon as an operator identifies a treatment technique, a maximum contaminant level, or a maximum residual violation.
Wholesale system	PWS that delivers water to another public water system.

Term	Definition
Workbook	Spreadsheet forms created by TCEQ and used by SWTPs to report monthly data. Each workbook form is comprised of numerous worksheets, identified by tabs at the bottom of each page, which contain information for reporting aspects of plant operations and performance.
Worksheet	An individual page, or tab in a workbook. Each worksheet contains numerous cells organized in rows and column for SWTPs to report data specific to plant operations and performance.

Appendix A: Example CT Study Approval Letter

Jon Niermann, Chairman
Emily Lindley, Commissioner
Toby Baker, Executive Director



PWS_1234567_CO_2010325_CTSTUDY

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

March 25, 2019

Mr. Robert Smith, Chief Operator
City of Everywhere
110 Main Street
Everywhere, Texas 19997

Subject: City of Everywhere Public Water System - PWS ID No. 1234567
Public Drinking Water System Concentration Time Study - Revision
Plant 2 Surface Water Treatment Plant - TP9999
ABC County, Texas
CN600543211; RN101777600

Dear Mr. Smith:

On March 1, 2019 the Texas Commission on Environmental Quality (TCEQ) received your submittal dated February 28, 2019, requesting a revised Concentration Time (CT) Study for the City of Everywhere, Plant 2 Surface Water Treatment Plant (SWTP), TCEQ Plant ID TP9999. The revised CT Study is necessary for the addition of two racks of hollow fiber (HF) microfiltration (MF) membranes to Plant 2 at the City of Everywhere public water system (PWS) (TCEQ PWS ID No. 1234567). The PWS has procured and will install two racks of HF MF membranes downstream of the two clarifiers. The CT study is necessary to assess the disinfection process at the facility to ensure compliance with the disinfection requirements of the Surface Water Treatment Rule. **The information in this letter will replace, not supplement, all previous CT study approval letters for the City of Everywhere Plant 2 TP9999 SWTP and should be reflected on the PWS's Surface Water Monthly Operating Report-Alternative Technologies (SWMOR-ALT).**

The City of Everywhere Plant 2 SWTP has the capacity to treat 1.151 million gallons per day (MGD). Raw water from the approved source on Lake Good (TCEQ Source ID No. S1234567A) is conveyed to the SWTP. The raw water is piped to two (2) upflow solids contact clarifiers, followed by ten (10) gravity filters with granular activated carbon (GAC) media, this is for Total Organic Carbon (TOC) removal, a filter effluent sump and then to the two racks of HF MF membranes. The filtrate flows to two clearwells, a 0.12-million gallon (MG) and a 0.048-MG, which operate in parallel. Finally, the finished water is pumped into the distribution via the high service pump station.

The disinfection protocol involves the injection of chlorine (Cl₂) upstream of the clarifiers and in the filter effluent sump. The final disinfectant injection site, upstream of the 0.12-MG clearwell, are for Cl₂ and liquid ammonium sulfate (LAS) to form chloramines (CLA). Free chlorine residual is monitored in the settled water line, downstream of the gravity filters and in the filtrate line. Total chlorine residual will be monitored downstream of the clearwells, prior to entry into the distribution system.

P.O. Box 13087 - Austin, Texas 78711-3087 - 512-259-1000 - www.tceq.texas.gov

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A disinfection zone is a segment of the treatment process which begins at a disinfectant application point and ends at the subsequent disinfectant application or residual sampling point. Each disinfectant application point, regardless of the frequency of use, represents the beginning of a separate disinfection zone. However, a plant may have only one disinfectant application point and choose to monitor at more than one point, creating multiple disinfection zones.

Based on the information we had at the time of our review, we have identified four (4) disinfection zones at the City of Everywhere Plant 2 SWTP. The first disinfection zone, D1, consists of the two upflow solids contact clarifiers. The second disinfection zone, D2, consists of the 10 gravity filters with granular activated carbon (GAC) media. The next disinfection zone, D3, contains the filter effluent sump and the filtrate line. The final disinfection zone, D4, contains the 0.12-MG and 0.048-MG clearwells which operate in parallel.

Concentration Time (CT) calculations are used to evaluate the disinfection process. Since T_{10} values are required to calculate the CT for the treatment process, Table 1 was developed for the City of Everywhere Plant 2 SWTP. The T_{10} values are based on the information provided in your CT template dated February 28, 2019 and the most recent TCEQ-approved CT Study dated February 14, 2004.

TABLE 1: T_{10} TABLE FOR THE CITY OF EVERYWHERE SWTP CT STUDY

DISINFECTION ZONE	TREATMENT UNIT	VOLUME (GAL)	FLOW RATE (MGD)	BAFFLING FACTOR	T_{10} (MIN)	
					Unit	Sum
D1	Upflow Solids Contact Clarifiers (2)	138,000 ⁽¹⁾	0.575 ⁽⁸⁾	0.3 ⁽⁸⁾	103.913	103.91
D2	Gravity Filters (10)	2,600 ⁽²⁾	0.115 ⁽⁸⁾	0.7 ⁽⁹⁾	22.723	22.72
D3	Filter Effluent Sump	3,200 ⁽³⁾	1.151 ⁽⁷⁾	0.3 ⁽¹⁰⁾	1.214	1.56
	MF Filtrate Line	274 ⁽⁴⁾		1.0 ⁽¹¹⁾	0.343	
D4	0.12 and 0.048 MG Clearwells	82,100 ⁽⁵⁾	1.151 ⁽⁷⁾	0.1 ⁽¹⁰⁾	10.283	10.28

Notes: The T_{10} values are based on the information provided in your CT template dated February 28, 2019 and the most recent TCEQ-approved CT Study dated February 14, 2004.

1. Based on a 34-foot by 34-foot solids contact upflow clarifier with a side water depth of 16 feet.
2. Based on a 6-foot by 6-foot gravity filter with a media depth of 3.75 feet, an underdrain of 1.25 feet and a minimum of water over media of 6.5 feet. A porosity of 50% is assumed.
3. Based on an 8-foot by 6-foot filter effluent sump with minimum operating level of 9 feet, 69%.
4. Based on 105 LF of 8-inch filtrate line.
5. Worst operating volume for each clearwell is based on the overflow pipe height, resulting in a 119,000-gallon and a 45,250-gallon clearwells, with a nominal operating capacity of 50%.
6. Based on even flow split between like treatment units.
7. Treatment capacity of the HF MF membranes, 1.151 MGD.
8. Based on the assumption of "poor" baffling characteristics for clarifiers.
9. Based on the assumption of "superior" baffling characteristics for a gravity filter.

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- 10. Based on the assumption of "poor" baffling characteristics for storage tank top entry with 2.0-foot air gap.
- 11. Based on the assumption of "perfect" baffling characteristics for pipe.
- 12. Based on the assumption of "unbaffled" baffling characteristics for storage tank without baffles.

We have prepared Disinfection Process Parameters in Table 2 to help operators complete their Surface Water Monthly Operating Report-Alt (SWMOR-alt). We have also provided the operators with the disinfection requirements that they must meet on a continual basis. Based on Water systems using surface water or groundwater under the influence of surface water must achieve a 3.0-log reduction of *Giardia*, a 2.0-log reduction for *Cryptosporidium*, and a 4.0-log reduction of viruses under the provisions of the Surface Water Treatment Rule. **With pretreatment being applied upstream of the membranes (defined as coagulation, flocculation and clarification), the City of Everywhere Plant 2 SWTP (TP9999) must provide a 2.0-log inactivation of viruses through the disinfection process.**

TABLE 2: DISINFECTION PROCESS PARAMETERS

APPROVED CT STUDY PARAMETERS						PERFORMANCE STANDARDS	
Parameters	Disinfection Zones					Log Inactivation	
	D1	D2	D3	D4	D5	Giardia	Viruses
Flow Rate (MGD)	0.575	0.115	1.151	1.151	NA	0.0	2.0
T ₁₀ (minutes)	104.0	22.7	1.6	10.3	NA		

If your monitoring plan has changed as a result of this CT study, please submit an updated monitoring plan to the monitoring plan coordinator at the address below. Further information can be found in Regulatory Guidance (RG) 384 "How to Develop a Monitoring Plan for a Public Water System" or at TCEQ's website:

https://www.tceq.texas.gov/drinkingwater/monitoring_plans

Monitoring Plan Coordinator (MC - 155)
 Texas Commission on Environmental Quality
 P.O. Box 13087
 Austin, TX 78711

Please note that City of Everywhere Plant 2 SWTP (TP9999) is **required** to meet all of the process monitoring requirements found in Title 30 of the Texas Administrative Code (TAC) §290.42(e)(7), as well as the "Chloramine Effectiveness" monitoring requirements as per 30 TAC §290.110(C)(5).

CT STUDY

**FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)**

Description Worksheet

PUBLIC WATER

SYSTEM NAME: City of Everywhere **PWS ID No.:** 1234567

PLANT NAME

OR NUMBER: Plant 2 TP9999 **Month:** March

Day: 13

Year: 2019

Enter a detailed narrative description of the plant treatment processes and disinfection protocol.

The City of Everywhere SWTP will have the capacity to treat 1.15 million gallons per day (MGD). Raw water from the approved source on Lake Good (TCEQ Source ID No. S1234567A) is conveyed to the SWTP. The raw water is piped to two (2) upflow solids contact clarifier, followed by ten gravity filters with granular activated carbon (GAC) media for TOC removal, a filter effluent sump and then to the Hollow Fiber (HF) Microfiltration (MF) Membranes. The filtrate flows to two clearwells, 0.32 MG and 0.048 MG. Finally, the finished water is pumped into distribution via the high service pump station.

There are optional chlorine injection sites upstream of the clarifiers and filter effluent sump. Chlorine and Liquid Amminium Sulfate (LAS) are injected upstream of the clearwells. Chlorine residual is monitored downstream of the clarifers, filters and the membrane filtrate line . Total chlorine is monitored downstream of the clearwells, prior to entry to the distribution system.

City of Everywhere CT Study contains four (4) disinfection zones:

D1 contains the upflow solids contact clarifiers;
 D2 consists of gravity filters with GAC media for TOC removal;
 D3 encompasses the filter effluent sump and the filtrate line; and
 D4 are the two clearwells (0.120-MG and 0.048-MG).

Reviewed By: TCEQ, WSD, TROT Staff

Submitted by: Mr. Robert Smith, Chief Operator, City of Everywhere

Contact

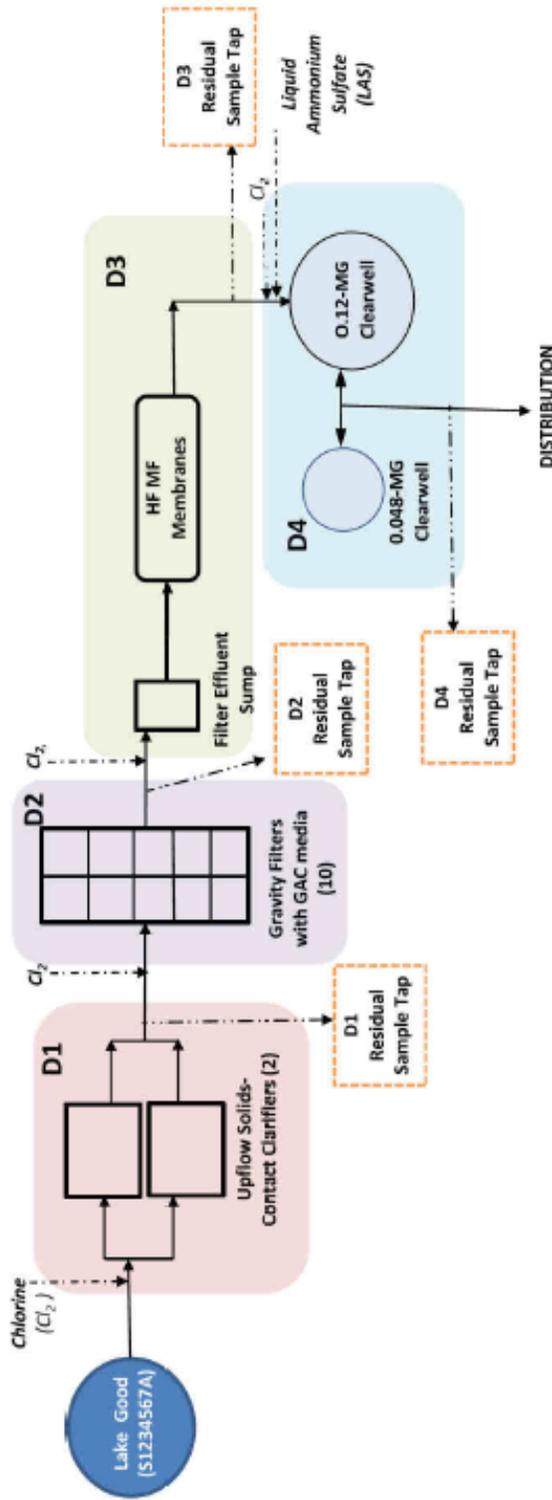
Information: 915.555.4321

CT STUDY

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)
Schematic Worksheet

PUBLIC WATER SYSTEM NAME: _____ PLANT NAME: Plant 2 TP9999
 City of Everywhere _____ OR NUMBER: _____
 PWS ID No.: 1234567 _____ Date: March 13, 2019

Use this worksheet to create your plant schematic with the Microsoft Drawing Tools.
 If you are not familiar with the drawing tools, you may create your schematic using any other suitable medium.
 Please refer to Section 3.3 of the Guidance Manual for instructions and guidance.



CT STUDY

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)

T10 Details Worksheet

PUBLIC WATER SYSTEM NAME: City of Everywhere **PWS ID No.:** 1234567

PLANT NAME OR NUMBER: Plant 2 TP9999 **Date:** March 13, 2019

Treatment Plant Capacity 1.151 mgd
799 gpm

Disinfection Zone: D1 **Disinfectant:** Free Chlorine

Unit - 1 Type: Clarifier Shape: Rectangular

Further Description: Upflow Clarifier

Characteristic		Comments
Number of Units	2	Based on TCEQ approved CT Study dated 1/14/2004
Length	34 ft	
Width	34 ft	
Side Water Depth	16 ft	
Volume (each)	138,378 gal	Even flow split between like units;
Flow Rate (each)	400 gpm	
Detention Time	346.2 min	
Baffling Factor	0.3	Baffling Characteristics: <u>Poor</u>
T₁₀	103.9 min	Approved Baffling Factor: _____
D1 FLOW RATE		0.576 mgd
T10 SUM FOR D1		103.9 min

Disinfection Zone: D2 **Disinfectant:** Free Chlorine

Unit - 1 Type: Filter Shape: Rectangular

Further Description: Gravity Filters with GAC media

Characteristic		Comments
Number of Units	10	Based on TCEQ approved CT Study dated 1/14/2004
Length	6 ft	
Width	6 ft	

CT STUDY

**FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)**

T10 Details Worksheet

Media Depth	3.75 ft	<hr/>
Underdrain Depth	1.25 ft	<hr/>
Minimum Water Depth Over Media	6.5 ft	<hr/>
Average Porosity	50 %	<hr/> Assumed <hr/>
Volume (each)	2,592 gal	
Flow Rate (each)	80 gpm	<hr/> even flow split between like units <hr/>
Detention Time	32.4 min	
Baffling Factor	0.7	
		Baffling Characteristics: <hr/> Superior <hr/>
		Approved Baffling Factor: <hr/> <hr/>
T ₁₀	22.7 min	
D2 FLOW RATE		0.115 mgd
T10 SUM FOR D2		22.7 min

Disinfection Zone: D3 Disinfectant: Free Chlorine

Unit - 1 Type: Transfer Well Shape: Rectangular

Further Description: Filter Effluent Sump

<u>Characteristic</u>		<u>Comments</u>
Number of Units	1	<hr/>
Length	8 ft	<hr/> Based on TCEQ approved CT Study dated 1/14/2004 <hr/>
Width	6 ft	<hr/>
Side Water Depth	13.1 ft	<hr/>
Maximum Volume (each)	4,704 gal	<hr/>
Minimum Operating Level	9 ft	<hr/> Minimum operating level <hr/>
Worst Case Volume (each)	3,232 gal	<hr/>
Percent of Maximum Volume	69 %	<hr/>
Worst Case Volume (each)	3,232 gal	<hr/>
Flow Rate (each)	799 gpm	<hr/> Pall Mobile MF treatment plant capacity <hr/>
Detention Time	4.0 min	<hr/>
Baffling Factor	0.3	<hr/> Top entry with a 2 ft air gap to the top of the water. <hr/>
		Baffling Characteristics: <hr/> Poor <hr/>
		Approved Baffling Factor: <hr/> <hr/>
T ₁₀	1.2 min	

Unit - 2 Type: Piping Shape: Pipe

Further Description: MF Filtrate Line

<u>Characteristic</u>		<u>Comments</u>
Number of Units	1	<hr/>

CT STUDY

**FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)**

T10 Details Worksheet

		Based on CT Study submitted by Mr. Robert Smith, Chief Operator 2/28/2019
Diameter	8 in	_____
Length	105 ft	_____
Volume (each)	274 gal	
Flow Rate (each)	799 gpm	_____ membrane treatment capacity
Detention Time	0.3 min	
Baffling Factor	1.0	
		Baffling Characteristics: _____ Perfect
		Approved Baffling Factor: _____
T ₁₀	0.3 min	
D3 FLOW RATE 1.151 mgd		
T10 SUM FOR D3 1.6 min		

Disinfection Zone: D4 Disinfectant: Chloramines

Unit - 1 Type: Clearwell Shape: Other

Further Description: 0.12-MG and 0.048-MG Cleawells

<u>Characteristic</u>		<u>Comments</u>
Number of Units	1	Using the overflow pipe as the top of the tanks, the large tank is 119000 gallons and the small tank 45,250 gallons.
Maximum Volume (each)	164,250 gal	Based on CT Study submitted by Mr. Robert Smith, Chief Operator 2/28/2019
Worst Case Volume (each)	82,125 gal	_____ minimum operating level
Percent of Maximum Volume	50 %	_____
Worst Case Volume (each)	82,125 gal	
Flow Rate (each)	799 gpm	_____ membrane treatment capacity
Detention Time	102.7 min	
Baffling Factor	0.1	
		Baffling Characteristics: _____ Unbaffled
		Approved Baffling Factor: _____
T ₁₀	10.3 min	
D4 FLOW RATE 1.151 mgd		
T10 SUM FOR D4 10.3 min		

Disinfection Zone: D5 Disinfectant: _____

Disinfection Zone: D6 Disinfectant: _____

CT STUDY

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES
OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER (cont.)

Summary Worksheet

PUBLIC WATER SYSTEM NAME: City of Everywhere **PWS ID No.:** 1234567

PLANT NAME OR NUMBER: Plant 2 TP9999 **Date:** March 13, 2019

Disinfection Zone	Treatment Unit	Volume* (each) (gal)	Flow Rate* (each) (MGD)	Baffling Factor*	T ₁₀ * (min)	
					Unit	Zone
D1	Upflow Clarifier (2)	138,378	0.576	0.3	103.873	103.87
D2	Gravity Filters with GAC media (10)	2,592	0.115	0.7	22.703	22.70
D3	Filter Effluent Sump (1)	3,232	1.151	0.3	1.213	1.56
	MF Filtrate Line (1)	274	1.151	1	0.343	
D4	0.12-MG and 0.048-MG Cleawells (1)	82,125	1.151	0.1	10.274	10.27

* These values are calculated on the T10 Details Sheet

Appendix B: Example SOP

Conducting a Routine Filter Inspection

Date Adopted:

Date Revised:

Reason for Revision:

Manager Approval: _____ Date: _____

Background

This SOP for conducting a filter inspection is seventh in a series that detail operations at the City of Everywhere SWTP. All staff conducting routine filter inspections must follow the procedures and safety precautions contained in this SOP. Filter inspections require a team of at least two licensed water works operators, and at least one must hold a valid Class C Surface Water license. Failure to comply with the requirements of this SOP is grounds for disciplinary action up to and including termination.

Summary

The following list summarizes the steps of a routine filter inspection:

1. Prepare a filter diagram.
2. Partially drain the filter and measure the filtration rate.
3. Observe the pre-backwash condition of the filter media surface.
4. Look for unusual conditions during a routine filter backwash.
5. Drain the filter.
6. Observe the post-backwash condition of the filter media surface.
7. Make filter bed measurements.
8. Excavate the media to identify unusual filter conditions.
9. Backwash the filter again, re-stratify and return it to service.

Important Safety Precautions

A routine filter inspection requires that an operator climb down into the filter. Operators must take the following precautions during a filter inspection to avoid injury and filter damage:

- At least two operators must be present any time someone enters a filter. One of the operators carefully enters the filter and make the measurements while the other remains outside the filter to record the data. Class D operators may not enter a filter.

- Filter surfaces are often wet and slippery. Wear slip-resistant shoes when entering.
- Be extra careful when working in the large filters at Plant No.2 where high backwash water flow rates exist. Plant No. 2 filter boxes are designated as “confined spaces” because they are very deep and some of them are partially covered. Consequently, any operator who enters those filters must comply with the following requirements:
 - Get a signed Confined Space Entry Request Form signed by your supervisor prior to entering the filter
 - Wear a safety harness securely anchored to the filter wall or some other immovable object. The safety rope must be short enough to prevent the operator from becoming submerged in the filter bed, backwash trough, or spent backwash water channel.
- Do not stand or walk in the fiberglass backwash troughs at Plant No. 1 because they can be severely damaged. Use ¼-inch plywood boards to distribute and support weight whenever walking or standing on the filter media submerged in the filter bed, backwash trough, or spent backwash water channel.

Equipment and Supplies

The following equipment, as applicable, is needed to implement this procedure:

- Filter probe.
- 1-inch-wide tape measure or a 1-inch-wide yardstick.
- 2 ft × 2 ft pieces of ¼-inch plywood (4 pieces needed).
- 2 ft × 3 ft piece of ⅜-inch plywood.
- Stopwatch.
- 8 ft to 10 ft length of 2 × 4 plank.
- 1 ft × 1 ft × 2.5 ft (H) plexiglass excavation box.
- 2-inch diameter PVC filter-coring tool if special studies will be conducted following the routine inspection.

Procedure

1—Prepare a Filter Diagram

Make or obtain a diagram that shows the location of filter inlets, outlets, and backwash trough. Although the diagram does not have to be to scale, the diagram should be drawn as large as possible and look like the filter.

2—Partially Drain the Filter and Measure the Filtration Rate

Follow the steps below:

1. Close the filter influent valve completely.

2. Leave the filter effluent valve open.
3. Record the filtered-water flow rate from the filter's flowmeter.
4. Measure and record the amount of time it takes for the water level to fall 6 inches. If possible, make this measurement while the water level is at least 6 inches above the top of the backwash trough. If it isn't, wait until the water level is below the top of the trough to begin the measurement.
5. Leave the filter effluent valve open until the water reaches the surface of the filter media.
6. When the water reaches the surface of the filter media, do the following per the plant:
 - Plant No. 1 does not have filter-to-waste facilities. Leave the filter effluent valve open for three minutes after the water level reaches the surface of the filter media, and then completely close the valve.
 - Plant No. 2 has filter-to-waste facilities. Completely close the filter effluent valve and then open the filter-to-waste valve for eight minutes.
7. Determine and record the wetted surface area of the filter. If the drawdown was measured above the wash water trough, calculate the surface area of the filter. If the drawdown was measured below the top of the trough, determine the total area between the troughs.
8. Calculate the filtration rate using Equation 1.
9. Compare the calculated filtration rate with the filtration rate shown on the filtered water flowmeter.

$$\begin{aligned}
 \text{Filtration rate (gpm)} &= \frac{\text{drawdown (inches)} \times \text{surface area (ft}^2) \times \left[\frac{\text{ft}}{12 \text{ in}} \right] \times \left[\frac{7.48 \text{ gal}}{\text{ft}^3} \right]}{\text{time (minutes)}} \\
 &= \frac{\text{drawdown (inches)} \times \text{surface area (ft}^2) \times 0.6233}{\text{time (minutes)}}
 \end{aligned}$$

Equation 1: Calculating the filtration rate

3— Observe the Pre-backwash Condition of the Filter Media Surface

Enter the Filter

Plant No. 1: The lightweight fiberglass backwash troughs at Plant No. 1 will not support an individual's weight. Follow the steps below to enter Filters No. 1-4:

1. Lower the $\frac{3}{8}$ -inch piece of plywood into the filter and place it directly on the filter media near the wall where the operator will enter. This board will then be used as the support footing for the ladder.

2. Lower the ladder into the filter and center its feet on the piece of plywood.

Plant No. 2: The concrete backwash troughs at Plant No. 2 will support an individual's weight. When inspecting Filters No. 5-8, operators can either use the steps described for Filters No. 1-4 or they can lower a securely positioned ladder directly into the backwash trough as follows:

1. Secure the top of the ladder to the top of the filter or the filter railing using a strong rope or chain.
2. If a safety harness is being used, secure the end of the lanyard to the filter railing at a location where the operator standing outside the filter can reach it.
3. The operator making the measurements must carefully enter the filter. The operator recording the data must remain outside the filter as a safety precaution.
4. Lower the tape measure, the ¼-inch plywood pieces, the straight 2 × 4, and other equipment into the filter.

Filter Media Surface Documentation

Observe the surface of the filter media or measure the following as needed, paying attention to specific conditions:

- **Thickness of the floc mat:** Measure the thickness of the floc mat at several locations throughout the filter.
- **Distribution of floc mat:** Look for areas where the floc has accumulated to an unusual depth or has not accumulated to the same degree as in the rest of the filter.
- **Mudballs:** Look for areas where mudballs appear to be accumulating on the surface of the media.
- **Significant media mounds or depressions:** Look for areas where the depressions or mounds exceed 1½ inches in depth or height.
- **Filter cracks:** Look for cracks that are more than 6 inches long, more than ¼-inch wide, or more than ½-inch or so deep. Some small cracks may form as the filter dewater, but larger cracks suggest that the filter media has been coated with an excessive coagulant layer.
- **Separation from filter wall:** Look for areas where the media has separated from the wall more than ¼ inch, the length of the separation exceeds 6-8 inches, or the separation is more than 1 inch deep. Some separation from the filter wall may occur as the filter dewater, but separations that exist before the filters dewater suggest that the filter media has been coated with an excessive coagulant layer.

Record the location of any unusual conditions seen on the media surface and describe the conditions in detail on a separate sheet of paper.

After making and recording your observations, remove any equipment taken into the filter. Exit the filter and remove the ladder and the ¼-inch plywood piece if used.

4— Look for Unusual Conditions During a Routine Filter Backwash

Follow the steps below:

1. Open the filter backwash valve slightly and allow the water to rise to 6-8 inches below the bottom of the backwash-water trough.
2. Complete a routine backwash of the filter following the facility's SOP - *Routine Filter Backwash Procedure*. During the backwash cycle, observe the filter for the following unusual backwash conditions and the specific ways each one may present:
 - **Levelness of the backwash trough:** Look at the top of the backwash water troughs to determine if water flows over some sections of the trough sooner than others.
 - **Trough flooding:** Look for areas where flooding is occurring in one or more of the troughs.
 - **Media boils and jets:** Look for areas where the backwash is producing a significantly more vigorous rolling action in the media. Pay particular attention to areas along the filter wall.
 - **Media loss:** Look for media carryover into the backwash water troughs. Pay close attention to areas where the carryover appears to be localized.
 - **Lack of media agitation:** Look for areas where the media is moving very little. Again, pay close attention to the areas along the filter wall and in the corners of the filter.

Record the location of any undesirable backwash conditions on the filter diagram, and describe the condition in detail on a separate sheet of paper. Also, record the turbidity of the spent backwash water at the end of the backwash cycle.

5—Drain the Filter

Make sure that the influent and filter backwash are completely closed. Open the filter effluent valve and wait approximately 45 minutes to allow the filter to completely discharge to the clearwell.

At Plant No. 2 which is equipped with filter-to-waste facilities, open the filter-to-waste valve after 15 minutes.

6—Observe the Post-backwash Surface of the Filter Media

Repeat the filter surface inspection process described in Step 3. Using the filter diagram, record the location of any unusual conditions on the media surface, and describe the condition in detail on a separate sheet of paper.

7—Make Filter Bed Measurements

Follow the steps below:

1. Close the filter effluent valve.

2. Follow the procedures described in Step 3 and all required safety precautions.
3. Carefully lower the filter probe (i.e., do not drop), the straight 2 × 4, the ¼-inch plywood pieces, and other equipment into the filter. Lay the straight 2 x 4 across the tops of adjacent troughs so that it spans the space between the troughs and provides a reference point for the measurements between the filter troughs.
4. Keeping the probe perpendicular, probe the filter at two-foot intervals. Do not stand or walk directly on the filter media surface. At Plant No. 1, stand on the ¼-inch plywood pieces placed directly on the filter bed. At Plant No. 2 you can either make measurements while standing and walking in the troughs or by using the method described for Plant No. 1. However, if the operator cannot reach the area between the troughs, the Plant No. 1 method must be used.
5. Determine the levelness of the media surface by measuring the distance from the top of the filter trough to the surface of the media.
6. Lower the probe until it just touches the top of the filter media.
7. Record the distance (to the nearest inch or less) directly on the filter diagram.
8. Measure the depth of the media bed to the top of the gravel support layer or, if the filter uses a gravel-less underdrain, to the top of the underdrain.
9. Press the probe down into the media until a change in resistance is felt or until the sound of the probe passing through the media changes. Do not push the probe into the gravel layer. Be extremely careful not to press the probe so far down that it damages the filter underdrain.
10. Record the depth (to the nearest inch or less) directly on the filter diagram.
11. Determine the levelness of the support gravel or underdrain by one of the following methods:
 - Measure the distance from the top of the backwash trough to the surface of the support gravel or gravel-less underdrain.
 - Measure the depth of the media layer and the distance from the media surface to the top of the backwash trough and add the two readings.
12. Record the result directly on the filter diagram.
13. Reduce the interval if significant differences are detected between adjacent measurements for either (1) the distance to the media surface, or (2) the media depth.
14. If the distance or depth between adjacent measurements varies by more than two inches vertically, make an additional set of measurements at the midpoint of the two points.
15. If the distance or depth continues to vary by more than two inches vertically, continue to measure at midpoints until the distance between the measurements is only three inches horizontally.
16. Probe the filter at each site where an undesirable filter backwash or media-surface condition was identified.

8— Excavate the Media to Identify Unusual Filter Conditions

Follow the steps below:

1. Make sure that all filter bed measurements required in Step 7 have been completed.
2. Place the ¼-inch plywood pieces on the filter media about a foot from the area to be excavated.
3. Clean a 3 ft² area on the opposite side of the excavation site by scraping off the top ¼-inch of filter media and placing it in a pile on one end of the scraped area.
4. Excavate a 6 to 8-inch diameter hole in the filter bed.
5. Excavate the top 3 to 6 inches of the media bed.
6. If mudballs are present, note their size and shape and the depth of penetration.
7. Place the excavated media in a pile at one end of the scraped area.
8. Excavate the remainder of the upper media layer.
9. If mudballs are present, note their size and shape and the depth of penetration. For example, “pancake-shaped mudballs with a diameter of ½ to ¾ inches have penetrated three inches into the anthracite layer.”
10. Place this layer of excavated media in a pile adjacent to the previous pile.
11. If the filter contains multiple media materials, describe the interface between the layers. For example, “14 inches of clean anthracite is located above a 2-inch layer of intermixed sand and anthracite that contains about 40% sand and 60% anthracite.”
12. If the filter bed contains more than one media layer, continue the excavation by repeating Step 5 until all the layers between the surface of the media and the upper gravel layer have been excavated and described. Stop the excavation as soon as the samples contain more than about 10% gravel; do not excavate the gravel layer.
13. Replace the media after completing the excavation.
14. Return the media to the hole in the opposite order that it was removed.
15. Pack each layer slightly by hand as it is replaced.
16. If there is media left over after filling the excavation hole, spread it around in the general area of the excavation site and the cleared area.
17. Repeat these steps in any area where unusual backwash or media conditions were observed during the media probing.
18. Collect “Core Samples” as described in the facility’s SOP *How to Perform Special Filter Studies* if any special studies are to be done on the filter media.
19. Remove the filter probe, tape measure, plywood squares, and any other equipment from the filter.
20. Close the filter to waste valve.
21. During the filter excavation, note and record the following information:

- If mudballs are present, note their size and shape and how far they've penetrated into the media bed.
- If the filter contains more than one media type, note how distinct the interface is between the different media layers or the degree of stratification.
- If the filter contains more than one media type, note how much intermixing of the media layers is present.

During excavation, operators must comply with all of the following precautions to avoid injury and filter damage.

- Do not disturb the gravel support bed when excavating the media at each site.
- Stop the excavation at each site as soon as the operator detects small gravel (1/4 to 1/8-gravel).
- Excavate the upper 75% of the filter bed either by hand or with a small shovel. The lower 25% of the filter bed must be excavated by hand.
- Do not walk or stand directly on the filter media.
- Do not attempt excavation, if the design does not allow the filter to be completely drained below the remaining water level without an excavation box.
- If the excavation cannot be completed because of the presence of subsurface standing water or other conditions that cause the walls of the excavation hole to collapse, it may be useful, or even necessary, to use an excavation box. Do not force the excavation box into the gravel layer.

9—Backwash the Filter Again, Re-stratify, and Return it to Service

Follow the steps below:

1. Make sure that all the filter excavation activities required in Step 8 have been completed.
2. Find a place to stand that has good footing and use the lanyard to secure the safety harness to the filter wall or other similar, immovable object.
3. Remove the ladder and the 3/8-inch plywood piece if it was used.
4. Complete a routine filter backwash following the backwash procedure in this example facility's SOP - *Routine Filter Backwash Procedure*.
5. Determine if there are still any of the unusual backwash conditions observed in Step 4. If there are, record their location on the filter diagram.
6. Measure the height of the fluidized or expanded media bed at the maximum backwash flow rate routinely used during the backwash cycle.
7. Lower a Secchi disk into the filter media until a small amount of filter media from the expanded bed begins collecting on the top of the disk.
8. Measure the distance from the top of the filter wall to the surface of the fluidized or expanded media bed.
9. Record the result on the filter diagram.

10. Measure the maximum backwash-water flow rate routinely used to backwash the filters.
11. At the maximum backwash-water flow rate, record the flow rate that is being shown on the backwash-water flowmeter.
12. At the maximum backwash-water flow rate, close the backwash waste drain valve.
13. Measure and record the amount of time that it takes for the water level to rise 6 inches.
14. Open the backwash waste valve.
15. Complete the backwash cycle as described in the facility's SOP - *Routine Filter Backwash Procedure*.
16. Return the filter to service using the procedure described in the facility's SOP - *Routine Filter Backwash Procedure*.
17. Measure the height of the unexpanded filter bed using the same process as described in Step 7.
18. Lower the ladder using the procedures detailed in Step 3.
19. Secure the top of the ladder to the top of the filter or the filter railing using a strong rope or chain.
20. Take the Secchi disk, carefully exit the filter, and remove the ladder and the 3/8-inch plywood piece if it was used.
21. Calculate backwash water flow rate using Equation 2.
22. Calculate the percent bed expansion using Equation 3.

$$\begin{aligned}
 \text{Backwash rate (gpm)} &= \frac{\text{rise (inches)} \times \text{surface area (ft}^2) \times \left(\frac{\text{ft}}{12 \text{ in}} \right) \times \left(\frac{7.48 \text{ gal}}{\text{ft}^3} \right)}{\text{time (minutes)}} \\
 &= \frac{\text{rise (inches)} \times \text{surface area (ft}^2) \times 0.6233}{\text{time (minutes)}}
 \end{aligned}$$

Equation 2: Calculating the Backwash Water Flow Rate

$$\% \text{ Expansion} = \frac{\text{"height" of unexpanded bed (inches)} - \text{"height" of expanded bed (inches)}}{\text{total depth of media bed (inches)}} \times 100$$

Equation 3: Calculating the Percent Bed Expansion

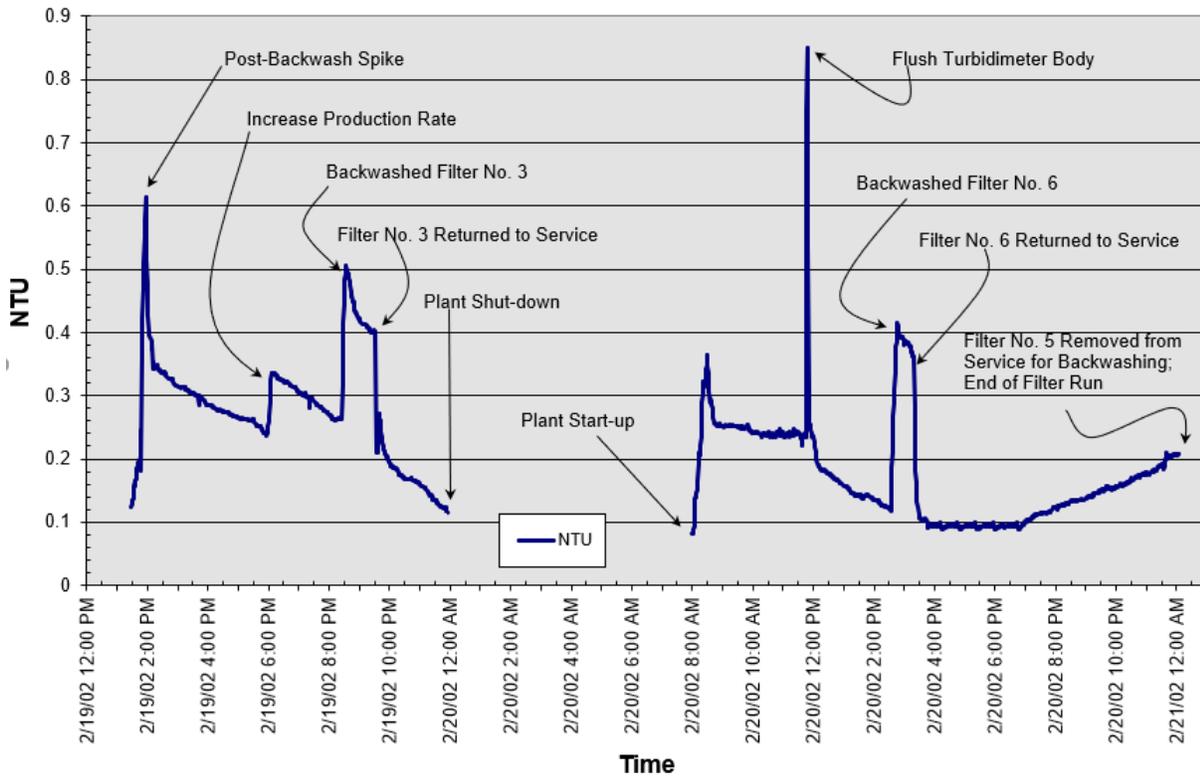
During this step, large volumes of water are used and high-water velocities exist in the backwash troughs and spent backwash water channel. Whenever possible, the evaluation team should collect required data for this step without being in the filter during the backwash cycle. However, if an operator needs to be in the filter during a backwash cycle, the safety precautions described in this SOP very carefully. The operator who records the measurements must remain outside the filter.

Appendix C: Example FPR

FILTER PROFILE REPORT FOR INDIVIDUAL FILTERS			
FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT ADDITIONAL INDIVIDUAL FILTER MONITORING			
PUBLIC WATER SYSTEM NAME: <u>City of Example</u> PWS ID No.: <u>1234567</u>	PLANT NAME OR NUMBER: <u>Treatment Plant</u> Month: <u>February</u> Year: <u>2002</u>		
OBVIOUS REASONS			
	FILTER NO.: <u>1</u> DATE: <u>02-04-02</u> TIME: <u>10:00 AM</u> DURATION: <u>45.00</u> TURBIDITY: <u>1.23</u>	FILTER NO.: <u>1</u> DATE: <u>02-04-02</u> TIME: <u>4:15 PM</u> DURATION: <u>15.00</u> TURBIDITY: <u>0.57</u>	FILTER NO.: <u>5</u> DATE: <u>02-04-02</u> TIME: <u>11:45 AM</u> DURATION: <u>15.00</u> TURBIDITY: <u>1.05</u>
OBVIOUS REASONS (Check all that apply) NONE IDENTIFIED - A Filter Profile must be submitted <input type="checkbox"/> (See Profile No. <u> </u>) <input type="checkbox"/> (See Profile No. <u> </u>) <input type="checkbox"/> (See Profile No. <u> </u>)			
Filter Problems			
Post-Backwash Turbidity Spike	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Prolonged Filter Run Time	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excessive Filter-Loading Rate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rate-of-Flow Control Valve Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Media Defects (insufficient depth, mudballs, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inadequate Surface Wash or Backwash Facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Backwash Artifact	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Turbidimeter Errors			
Incorrect Calibration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air Bubble	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical Feed Equipment Failure			
Coagulant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coagulant Aid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Filter Aid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poor Raw Water Quality			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Major Unit Process Failures/Maintenance Activities Specify: _____			Backwash Filter No. <u>1</u>
OBVIOUS REASONS			
	FILTER NO.: <u>5</u> DATE: <u>02-13-02</u> TIME: <u>2:15 PM</u> DURATION: <u>15.00</u> TURBIDITY: <u>1.24</u>	FILTER NO.: _____ DATE: _____ TIME: _____ DURATION: _____ TURBIDITY: _____	FILTER NO.: _____ DATE: _____ TIME: _____ DURATION: _____ TURBIDITY: _____
OBVIOUS REASONS (Check all that apply) NONE IDENTIFIED - A Filter Profile must be submitted <input checked="" type="checkbox"/> (See Profile No. <u>1</u>) <input type="checkbox"/> (See Profile No. <u> </u>) <input type="checkbox"/> (See Profile No. <u> </u>)			
Filter Problems			
Post-Backwash Turbidity Spike	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prolonged Filter Run Time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Excessive Filter-Loading Rate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rate-of-Flow Control Valve Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Media Defects (insufficient depth, mudballs, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Inadequate Surface Wash or Backwash Facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Backwash Artifact	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Turbidimeter Errors			
Incorrect Calibration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air Bubble	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chemical Feed Equipment Failure			
Coagulant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coagulant Aid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Filter Aid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Poor Raw Water Quality			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other Major Unit Process Failures/Maintenance Activities Specify: _____			
SUBMITTED BY: <u><i>John Smith</i></u>		Certificate No. and Grade: <u>WS1234567, A</u>	Date: <u>2/24/2002</u>
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FILTER PROFILE REPORT FOR INDIVIDUAL FILTERS <small>FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT ADDITIONAL INDIVIDUAL FILTER MONITORING</small>		
PUBLIC WATER SYSTEM NAME: <u>City of Example</u>	PLANT NAME OR NUMBER: <u>Treatment Plant</u>	
PWS ID No.: <u>1234567</u>	Month: <u>February</u> Year: <u>2002</u>	
NARRATIVE DESCRIPTION OF FILTER PROFILE		
FILTER NO.: _____ PROFILE NO.: _____	DATE OF PROFILE: _____	
DETAILS: The filter profile on Filter No. 5 began at 1:28 pm on Tuesday, February 19, 2002 following a routine backwash and our typical 45-minute idle time that we allow for filter pre-rinsing. The filter profile ended at 12:30 am on Thursday, February 21, 2002, when the plant was taken offline for the day. Filter No.5 was backwashed and returned before the plant was returned to service the following morning. Some specific observations we made during the filter profile include:		
1) there was a significant increase in the IFE turbidity level at 6:00 pm on the 19th when the plant's production rate was increased from 9.6 MGD to 13.2 MGD. 2) the 4-hr IFE turbidity level on Filter No. 5 was recorded at 12:20 pm and was 0.262 NTU. 3) a turbidity spike was observed when Filter No. 3 was taken offline and backwashed at 8:28 pm on the 8th. 4) the maximum daily 15-minute IFE reading from Filter No. 5 occurred at 8:30 pm on the 19th while we were backwashing Filter No. 3 5) the plant was shut off for the night at 11:55 pm and was not started up again until 8:00 am on Wednesday, February 20th. 6) the short, but severe, turbidity spike that occurred at 11:46 am on the 20th was an unusual reading that occurred when we flushed the turbidimeter body as part of our routine maintenance. 7) the 4-hr IFE reading for Filter No. 5 occurred at 12:00 pm and was 0.235 NTU 8) at 2:35 pm on the 20th, we took Filter No. 6 offline for backwashing 9) the maximum daily 15-minute reading for the 20th (on Filter No. 5) was 0.394 NTU and occurred while Filter No. 6 was still offline.		
NARRATIVE DESCRIPTION OF FILTER PROFILE		
FILTER NO.: _____ PROFILE NO.: _____	DATE OF PROFILE: _____	
DETAILS:		
SUBMITTED BY: <u><i>John Smith</i></u>	Certificate No. and Grade: <u>WS1234567, A</u>	Date: <u>3/31/11</u>
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Filter No. 5 Profile



Appendix D: Example FAR

FILTER ASSESSMENT REPORT FOR INDIVIDUAL FILTERS

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT AN INDIVIDUAL FILTER ASSESSMENT

PUBLIC WATER SYSTEM NAME: <u>TCEQ WSC</u>	PLANT NAME OR NUMBER: <u>PDWS Water Treatment Plant</u>
PWS ID No.: <u>1234567</u>	FILTER NUMBER: <u>Filter No. 5</u>

First Event: December 24, 2015 Second Event: January 6, 2016 Third Event: February 12, 2016

DESIGN SPECIFICATIONS						
FILTER TYPE	Gravity		OPERATING MOD: Constant Rate/Variable Level			
	Diameter (ft)	Length (ft)	Width (ft)	Surface Area (ft ²)	Freeboard (ft)	Max Head Loss (ft)
MEDIA BED DIMENSIONS		12.00	24.00	288.00	3.25	13.00
MEDIA TYPE	Multiple Media					
MEDIA SPECS	Material	Depth (inches)	Min. Size (mm)	Max. Size (mm)	UC	Specific Gravity
Layer 1 Material	Anthracite	24.00	0.90	1.20	1.60	Unknown
Layer 2 Material	Sand	12.00	0.45	0.55	1.40	Unknown
Layer 3 Material	Garnet	3.00	0.20	0.35	1.40	Unknown
Layer 4 Material						
TOTAL DEPTH (inches)	39.00					
L/D RATIO	1206.4					
UNDERDRAIN TYPE	Type-S with gravel					
	No. of Grades	Min. Size (in)	Max. Size (in)	Total Depth (in)		
SUPPORT GRAVEL	4	0.25	1.50	12.00		
TROUGHES	SUPPL. BACKWASH: Air Scour (retrofit)					
Number	5					
Separation (inches)	39.00					
	FILTER-TO-WASTE			No		
	Regulatory Std	Design	Typical	During Backwash	Maximum	App'd Exception
FILTER FLOW RATE (gpm)	1440	1400	1111	1333	1833	None
LOADING RATE (gpm/ft ²)	5.0	4.86	3.86	4.63	6.36	None
BW FLOW RATE (gpm)	3600 - 6278	5000	3800		5000	
BW LOADING RATE (gpm/ft ²)	12.5 - 21.8	17.36	13.19		17.36	
	Source	Controller	Meter	Turbidimeter		LOHG
FILTER INFLUENT	Fix. weir Splitter		Proportional	None		
FILTER EFFLUENT	None		None	Hach 1720D		Water Lvl Indicator
BACKWASH WATER	Filters & Pump	Mot. Valve (Auto.)	Ultrasonic	None		

ADDITIONAL REMARKS: There flow distribution to the filter is controlled with a fixed-weir splitter box and a valve that is completely opened when the filter is on-line and is completely closed when the filter is out of service during backwash and the subsequent idle period.

OPERATING PROCEDURES						
CALIBRATION	Flow Meter	Backwash Meter	Mech. ROFC	NTU (Primary)	NTU (Secondary)	
Method	Ultrasonic	Ultrasonic		Formazin	Comparison	
Frequency	Annual	Annual		Quarterly	Weekly	
Date of Last	June 13, 2015	June 13, 2015		January 24, 2016	February 14, 2016	
DATA CONSISTENCY	Frequency and Span	Date	NTU Meter Display	SCADA Display	Data Recorder	Grab Sample
Test Data	every 5 min, 0.00 - 5.00	02/19/2016 14:35	0.271	0.269	0.269	0.29
BACKWASH	Turbidity (NTU)	LOH (ft)	Run Time (hr)	Run Volume (gal)	Filtration Rate	
Criteria	1.0 NTU	10.00	48.00	NA	NA	
Monitoring Interval	5 min	8 hrs	Each Shift			
WRITTEN SOPs		ADDITIONAL REMARKS: We are creating a Filter Inspection SOP as part of this Filter Assessment.				
Plant Start-up	Complete					
Filter Start-up	Complete					
Plant Shutdown	Partial					
Filter Shutdown	Partial					
Filter Backwash	Complete					
Filter Inspection	None					

I certify that I am familiar with the information contained in this report and that, to the best of my knowledge, the information is true, complete, and accurate.

Operator's Signature: Más Papeleo

Operator's Name (printed): Más Papeleo

Certificate No. and Class: 987-65-4321 Date: February 23, 2016

Submit Report to TCEQ/Water Supply Division/Public Drinking Water Section(MC-155), ATTN: Monthly Reports, P.O. Box 13087, Austin, TX 78711-3087
The report is due the 10th of the following month

FILTER ASSESSMENT REPORT FOR INDIVIDUAL FILTERS

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT AN INDIVIDUAL FILTER ASSESSMENT

PUBLIC WATER SYSTEM NAME: TCEQ WSC PLANT NAME OR NUMBER: PDWS Water Treatment Plant
 PWS ID No.: 1234567 FILTER NUMBER: Filter No. 5

FILTER PROBE	
NUMBER OF SITES	121
MEDIA	
Max. Thickness (inches)	37.00
Min. Thickness (inches)	26.00
Typ. Thickness (inches)	34.00
SUPPORT MATERIAL	
Max. Elevation	70.00
Min. Elevation	77.00
Typ. Elevation	75.00

ADDITIONAL REMARKS: One relatively large gravel mound was detected in the northeast corner of the filter.

FILTER EXCAVATION						
	REFERENCE	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
SITE CHARACTERISTIC	Normal	Normal	Normal	Media Mound	Gravel Mound	Crack
LAYER 1 (Top Layer)	18.00	19.00	18.00	21.00	14.00	18.00
INTERFACE 1	2.50	2.00	2.00	1.50	1.25	2.50
LAYER 2	11.00	12.00	11.00	11.00	10.00	12.00
INTERFACE 2	0.75	0.50	0.75	0.50	0.50	
LAYER 3	4.00	4.00	3.75	3.00	0.00	
INTERFACE 3						
LAYER 4						
MUDBALLS	Few	None	None	Few	None	Few
Max. Size (inches)	0.75			0.50		0.50
Min. Size (inches)	0.25			0.13		0.25
Max. Depth (inches)	4.00			5.00		3.00
		SITE 7	SITE 8	SITE 9	SITE 10	SITE 11
SITE CHARACTERISTIC	Retraction	Jetting				
LAYER 1 (Top Layer)	18.00	18.00				
INTERFACE 1	2.00	4.75				
LAYER 2	12.00	8.00				
INTERFACE 2	1.00	2.50				
LAYER 3	3.00	2.00				
INTERFACE 3						
LAYER 4						
MUDBALLS	Several	None				
Max. Size (inches)	0.75					
Min. Size (inches)	0.25					
Max. Depth (inches)	7.00					

ADDITIONAL REMARKS: The sand and garnet seemed in very good shape. The anthracite seemed slightly worn and encrusted. The anthracite grains did not seem very uniform in shape or size.

ADDITIONAL STUDIES	
FILTER PROFILE ATTACHED?	Yes
<i>Note: A Filter Profile must be attached to this report.</i>	
PERCENT MUDBALLS	
Media Volume (ml)	1680
Mudball Volume (ml)	14
% Mudballs	0.8%

ADDITIONAL REMARKS: Several of the mudballs were placed in a chlorine solution (200 ppm, pH=4.5) for 12 hours and the mudballs dissolved. A representative sample of filter media was dried in an oven, weighed, and then placed in the acidified chlorine solution. After 12 hours, the media was removed, rinsed several times, dried and reweighed. The media lost 12% of its mass. The chlorine solution had a brownish tint so we neutralized the chlorine with thiosulfate and ran iron and manganese tests on the material. The manganese result was 0.55 mg/L and the iron result was 0.2 mg/L.

CONCLUSIONS					
<p>CONCLUSIONS: We have lost 5-6 inches of our anthracite and the anthracite that remains seems to no longer meet manufacturer's specifications. There is also a large gravel mound in one area of the filter. The presence of the severe backwash jet and the degree that the media layers were intermixed suggests that there is some underdrain damage in that part of the filter. The filter profile that was run on February 19th suggests that the performance of Filter No. 5 is adversely affected by sudden flow rate changes.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">CORRECTIVE ACTION PLAN ATTACHED?</td> </tr> <tr> <td style="text-align: center;">Yes</td> </tr> <tr> <td style="text-align: center;">WOULD YOU LIKE SOME TECHNICAL ASSISTANCE FROM THE TCEQ?</td> </tr> <tr> <td style="text-align: center;">No</td> </tr> </table>	CORRECTIVE ACTION PLAN ATTACHED?	Yes	WOULD YOU LIKE SOME TECHNICAL ASSISTANCE FROM THE TCEQ?	No
CORRECTIVE ACTION PLAN ATTACHED?					
Yes					
WOULD YOU LIKE SOME TECHNICAL ASSISTANCE FROM THE TCEQ?					
No					

Submitted by: Más Papeleo Date: February 23, 2016
 TCEQ - 10277 (02-15-17) PAGE 3 Filter Assessment Report

FILTER ASSESSMENT REPORT FOR INDIVIDUAL FILTERS

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT AN INDIVIDUAL FILTER ASSESSMENT

PUBLIC WATER SYSTEM NAME: TCEQ WSC

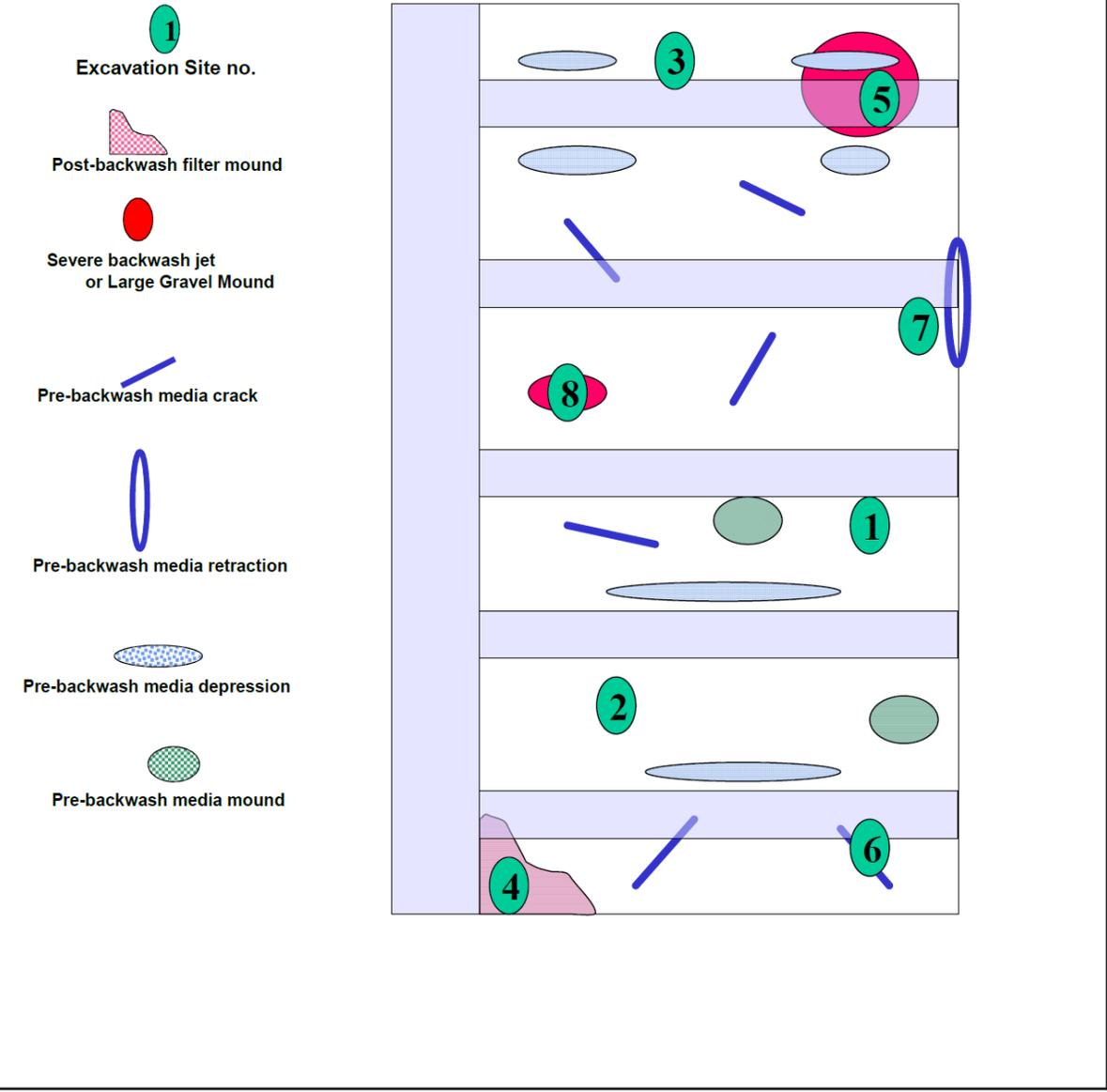
PLANT NAME OR NUMBER: PDWS Water Treatment Plant

PWS ID No.: 1234567

FILTER NUMBER: Filter No. 5

FILTER SCHEMATIC

PREPARE A SIMPLE FILTER SCHEMATIC SHOWING THE LOCATION OF BACKWASH WATER TROUGHS, OBSERVED ANOMOLIES, AND EXCAVATION SITES.



Submitted by: Más Papeleo

Date: February 23, 2016

FILTER ASSESSMENT REPORT FOR INDIVIDUAL FILTERS

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT AN INDIVIDUAL FILTER ASSESSMENT

PUBLIC WATER SYSTEM NAME: TCEQ WSC

PLANT NAME OR NUMBER: PDWS Water Treatment Plant

PWS ID No.: 1234567

FILTER NUMBER: Filter No. 5

NARRATIVE DESCRIPTION OF FILTER PROFILE

DESCRIBE THE FILTER PROFILE, INCLUDING THE CAUSE OF ANY TURBIDITY SPIKES GREATER THAN 0.1 NTU AND ANY INTERRUPTION IN THE DATA

See Attached Excel Graph

Submitted by: _____

Date: February 23, 2016

FILTER ASSESSMENT REPORT FOR INDIVIDUAL FILTERS

FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT AN INDIVIDUAL FILTER ASSESSMENT

PUBLIC WATER SYSTEM NAME: TCEQ WSC PLANT NAME OR NUMBER: PDWS Water Treatment Plant

PWS ID No.: 1234567 FILTER NUMBER: Filter No. 5

CORRECTIVE ACTION PLAN (OPTIONAL)

DESCRIBE THE CORRECTIVE ACTIONS THE SYSTEM WILL TAKE, INCLUDING THE PROPOSED COMPLETION DATA FOR EACH CORRECTIVE ACTION

Proposed Completion Date	Proposed Action
May 1, 2016	Order replacement media for Filter No. 5
July 12, 2016	Remove media from Filter No. 5 and inspect support gravel layer and underdrain system for evidence of damage
July 15, 2016	Install new media, backwash, and superchlorinate the filter
July 18, 2016	Submit coliform samples to the lab
July 22, 2016	Return the Filter No. 5 to service

Note: This action plan is subject to delays if the filter underdrain is damaged. In this case, we plan on having our engineering firm evaluate potential corrective actions.

Submitted by: _____

Date: February 23, 2016

Appendix E: Example CPE Request

COMPREHENSIVE PERFORMANCE EVALUATION REQUEST FORM
 FOR PUBLIC WATER SYSTEMS THAT ARE USING SURFACE WATER SOURCES OR GROUND WATER SOURCES UNDER
 THE INFLUENCE OF SURFACE WATER THAT ARE REQUIRED TO CONDUCT A COMPREHENSIVE PERFORMANCE EVALUATION

PUBLIC WATER SYSTEM NAME: City of Example PWS ID No.: 1234567
 PLANT NAME OR NUMBER: Treatment Plant

EVENTS THAT TRIGGERED THE CPE REQUEST			
EVENT NUMBER 1		EVENT NUMBER 2	
Filter Number:	<u>5</u>	Filter Number:	<u>3</u>
Date of Event:	<u>5-Jan-02</u>	Date of Event:	<u>13-Feb-02</u>
FAR Prepared?	<u>Yes</u>	FAR Prepared?	<u>No</u>
CAP Prepared?	<u>Yes</u>	CAP Prepared?	<u>No</u>

PUBLIC WATER SYSTEM PREFERENCES	
PREFERRED DATES FOR CPE:	
(1) Week of:	<u>March 10, 2002</u>
(2) Week of:	<u>March 15, 2002</u>
(3) Week of:	<u>April 15, 2002</u>
ADMINISTRATIVE CONTACT INFORMATION:	
Name:	<u>Lisa Brown</u>
Title:	<u>Operations Manager</u>
Phone:	<u>123-456-7890</u>
Fax:	<u>123-456-1010</u>
Address:	<u>City Hall</u> <u>100 Main St.</u> <u>Example, TX</u> <u>78699</u>
PLANT CONTACT INFORMATION:	
Name:	<u>John Smith</u>
Title:	<u>Lead Operator</u>
Phone:	<u>123-456-9078</u>
Fax:	<u>123-456-1010</u>
Address:	<u>Water Plant</u> <u>901 Water Rd.</u> <u>Example, TX</u> <u>78699</u>

I certify that I am familiar with the information contained in this report and that, to the best of my knowledge, the information is true, complete, and accurate.

Operator's Signature: *John Smith* Date: February 15, 2002

Name (printed): John Smith

If applicable, Certificate No. and Class: WS123456, A

The request must be submitted with your Monthly Operational Report and a copy should be faxed to the Drinking Water Section at (512) 239-6050 as soon as it is signed. TCEQ/WSD/Public

Reserved for TCEQ Use Only

TCEQ - 10278 (01-22-02)
CPE Request Form

Appendix F: Violation Report Form



TCEQ Water Supply Division

Public Drinking Water Violation Report

Operators are to complete this form to report violations in public drinking water treatment at facilities that provide treatment for surface water or groundwater under the direct influence of surface water. This form is not to be used to report to the public.

System Information

Public Water System Name:

PWS ID #:

Treatment Plant Name or Number:

Operator Name:

Operator Signature: _____

Date Signed:

Operator Telephone Number:

Violation Information

Type of Violation(s): (e.g., turbidity above 5.0 NTU, turbidity between 1.0 NTU and 5.0 NTU, turbidity above 0.3 NTU, low CT value, low residual leaving the plant, low distribution system residual, ClO₂ residual above 0.8 mg/L, in distribution, failed to achieve Crypto credit required, etc.)

Date/Time that the violation was detected:

Duration of the Violation (if known): (i.e., 5 hours, 1 day, 2 months)

Describe corrective action taken including dates:

Other Data, for SWTPs only

Finished Water Turbidity (in NTU) [DURING THE EVENT]:

Highest IFE Turbidity Level (in NTU) [DURING THE EVENT]:

Giardia Inactivation (log) [DURING THE EVENT]:

Viral Inactivation (log) [DURING THE EVENT]:

Submit Completed Form

Please note that email often is the fastest, most reliable method of communicating a violation.

- Email to: SWTR@tceq.texas.gov
- Mail to: SWTR Coordinator, MC-155, PO BOX 13087, Austin, TX 78711
- Fax to: TCEQ, Water Supply Division 512-239-6050

Appendix G: Equipment Calibration

SWTP Calibration Requirements and Procedures

SWTPs are responsible for ensuring the accuracy of data used for monthly compliance reporting. One extremely important way to ensure accuracy is to properly calibrate your instruments and equipment. Proper calibration includes written calibration procedures, acceptance criteria, traceable standards, good record keeping, and corrective action, when necessary.

This document describes the calibration requirements for instruments and equipment used to generate data for monthly reporting. It also provides or references procedures to implement the requirements. In addition to the requirements and procedures described herein, all calibration procedures and acceptance criteria must comply with manufacturer instructions, applicable EPA approved methods of analysis, and other standards, as applicable.

The calibration requirements and acceptance criteria specified in this document reflect the minimum requirements defined by 30 TAC Chapter 290, Subchapter F, Section 290.46(s). More stringent or detailed requirements may be specified in the analytical methods, manufacturer instrument instructions, QA Standards, SOPs, etc. To ensure you meet all applicable requirements, follow the most stringent requirements.

Flowmeters

Flowmeters and other flow monitoring devices must be calibrated at least once every 12 months. The flowmeters may be checked using a pitot tube, a calibrated ultrasonic flowmeter, or similar calibration device. The accuracy of the meters may also be checked by filling or draining a known volume with water into (or from) a basin. If the meter does not read within the accuracy range specified by the manufacturer, recalibrate the unit, or implement corrective action.

pH Meters

Benchtop pH Meters

Bench top pH meters must be calibrated at least once each day according to manufacturer specifications. Each time you run a batch of samples you must verify the calibration with at least one buffer. If the pH meter does not accurately read the buffer, per the manufacturer instructions or analytical method, recalibrate the unit or implement other corrective action.

Online pH Meters

Online pH meters must be calibrated at least once every 30 days. The calibration must also be verified at least once each week with one of the following:

- Primary standard.
- Comparing the results from the online unit with the results from a properly calibrated benchtop unit.

If necessary, recalibrate the unit with primary standards or implement corrective action.

Turbidity Meters

Benchtop Turbidity Meters

Benchtop turbidity meters must be calibrated using primary standards at least once every 3 months. Each time you calibrate your meter with primary standards, you must standardize your secondary standards again.

Each time you run batch samples, you must verify the calibration with secondary standards. If the unit does not produce an acceptable reading, per the analytical manufacturer's instructions or analytical method, then recalibrate with primary standards or implement corrective action.

Online Turbidity Meters

Once every three months, you must calibrate online turbidity meters using primary standards.

Once every week you must verify the calibration of online turbidity meters with one of the following:

- Primary standards.
- Secondary standards.
- Manufacturer proprietary confirmation device.
- Comparing the results with a properly calibrated benchtop turbidity meter. (See next section.)

Regardless of which method you use to verify the calibration of the online turbidity meter, you must recalibrate the unit using primary standards if the unit does not provide an acceptable reading.

Calibration Verification Procedure

To verify the calibration of an online turbidity meter against a bench top meter, we recommend the following procedure:

1. Ensure your benchtop turbidity meter is properly calibrated by verifying it against a primary or secondary standard.
2. Record a turbidity reading shown on the online turbidity meter.

3. Immediately collect a sample from the inlet or outlet of the online turbidity meter.
4. Measure and record the turbidity of the sample from the online turbidity meter with the benchtop turbidity meter.
5. Compare the turbidity readings from the two instruments. If the values differ by 0.10 NTU or less, a complete calibration of the online meter is not required.
6. If the values differ by more than 0.10 NTU, follow the manufacturer's instructions and recalibrate both the online monitor using primary turbidity standards.
7. Repeat Steps 1-6. If the values still differ by more than 0.10 NTU, implement corrective action which may include contacting the instrument manufacturer for further instructions.
8. If a continuous recorder is used, compare the value reported by the recorder with the value reported by the monitor. No adjustment of the recorder is needed if the values differ by 0.05 NTU or less.
9. Adjust the recorder, if the values differ by more than 0.05 NTU.

Note: If the calibration is conducted when turbidity levels are above 1.0 NTU, you may accept differences of up to 10% when comparing the results of two turbidity meters and of up to 5% when comparing the recorder results with that of the turbidity meter.

Chemical Disinfectant Residual Analyzers

Manual Method

If you are using a manual method to test for chemical residuals, you must verify the instrument's calibration at least once every 90 days using a solution with a known concentration. If the instrument or method does not produce an accurate reading (i.e., within 15% of the expected value) you must recalibrate the instrument or take other corrective actions.

Continuous Monitoring Method

If you are using a continuous chemical analyzer, you must verify the instrument's accuracy at least once every 7 days using one of the following:

- Solution of known concentration.
- Comparing the results with a calibrated benchtop instrument (see next subsection).

Calibration Verification Procedure

If you compare the results with a calibrated bench top instrument, we recommend the following procedure:

1. Ensure your benchtop meter is properly calibrated by verifying its accuracy against a solution of known concentration.

2. Collect a sample from the inlet of the online monitor.
3. Measure and record the residual of the sample collected from the online monitor using an EPA-approved drinking water method listed.
4. Compare the two residual readings. If the values differ by 15% or less, a complete calibration of the online monitor is not required.
5. If the values differ by more than 15%, follow the manufacturer's instructions and recalibrate the online residual monitor.
6. Repeat Steps 1-3. If the values still differ by more than 15%, implement corrective action which may include contacting the instrument manufacturer for further instructions.
7. If a continuous recorder is used, compare the value reported by the recorder with the value reported by the monitor. If the values differ by 0.10 mg/L or less, no adjustment of the recorder is needed.
8. If the values differ by more than 0.10 mg/L, adjust the recorder.

UV Meters

Normal duty UV sensors must be properly calibrated. The calibration must be verified once per month using a reference UV sensor that has been calibrated by the manufacturer within the last year or sooner. UVT analyzers must be calibrated once each week per the manufacturer instructions.

Conductivity Meters

Conductivity or TDS instruments used for reverse osmosis and nanofiltration membrane systems should be calibrated at least once every 12 months.

Thermometers

Thermometers and other temperature monitoring devices must be properly calibrated and verified according to manufacturer instructions and method requirements. Calibration requirements include but not limited to periodic (e.g., annual) calibration against a NIST traceable thermometer, use of correction factors, etc. Otherwise, as applicable, we recommend you verify the accuracy of thermometers once each 90 to 180 days by stirring the thermometer in an ice bath. After two minutes, the thermometer should read 0°C or 32°F.

Pressure Sensors

Devices used to measure pressure during integrity tests must be calibrated once every 12 months, at a minimum.

Note: If the manufacturer of your pressure sensor(s) uses a different calibration or verification schedule, please provide us with the manufacturer's documentation. We will consider manufacturer documentation and may alter your pressure sensor calibration schedule accordingly.

Calibrations Records

Calibration records must be kept by the organization performing the calibration and be accessible for verification upon request, or during an evaluation. When applicable, hard copy or electronic calibration records include the following items:

- Manufacturer's name, serial number, or any other unique identity of items being calibrated.
- Name or initials of person performing calibration.
- Documentation of reference material.
- Calibration dates, results of calibrations, adjustments, correction factors, acceptance criteria, comments.
- Due date of the next calibration or the calibration interval.
- Details of any damage, malfunction, modification to, or repair of, the instrument or equipment.
- Corrective actions.

The calibration records addressed must be retained for at least three years, at a minimum (see Chapter 1.4.)

Appendix H: Membrane Filters – How to Report $P_{initial}$ DIT Pressure Data

This Appendix contains guidance for reporting monthly $P_{initial}$ DIT pressure data on the SWQM-Alt Workbook’s Membrane Worksheet.

Note: Beginning in 2021, DIT pressure data reporting related to PBTs and QBTs is transitioning from $P_{initial}$ to P_{min} . If we have not instructed you to make this change, or have not sent you an updated, blank SWMOR-At form, you should continue to report $P_{initial}$ DIT pressure data as described in this Appendix. If you are unsure whether you should report $P_{initial}$ or P_{min} , contact a SWTR coordinator.

DIT Data - PBT

Figure 1 shows the **DIT Data** section of the **Performance Data** table for PBT membranes.

DIT Data			
$P_{initial}$	$\Delta P_{test}/\Delta t$	DIT	C/A
psi	psi/min	pass?	success?
		-	-

Figure 1. DIT Data Table for PBT Membranes

$P_{initial}$ psi

Enter one of the following:

- {Initial test pressure (in psi)} recorded at the beginning of the DIT. Enter the lowest of all initial pressure values if more than one DIT was performed during the day.
- {X} if the unit was offline for the entire day.
- {ND} if you did not conduct a DIT when one was required; or you conducted one or more DITs on the unit but failed to record any initial pressure data.

Leave the cell blank if a DIT was not performed on the unit because it was not required.

DIT Data - QBT

Figure 2 shows the **DIT Data** section of the **Performance Data** table for QBT membranes.

DIT Data			
$P_{initial}$	Q_{air}	DIT	C/A
psi	L/min	pass?	success?
		-	-

Figure 2. DIT Data Table for QBT Membranes

P_{initial} psi

Enter one of the following:

- {Pressure (in psi)} recorded at the beginning of the DIT. Enter the lowest of all the initial pressure values if more than one DIT was performed during the day.
- {X} if the unit was offline for the entire day.
- {ND} if you did not conduct a DIT when one was required; or, you conducted one or more DITs on the unit, but failed to record any initial pressure data.

Leave the cell blank if a DIT was not performed on the unit because it was not required.



Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*

Toby Baker, *Executive Director*

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