Regulatory Analysis Form

(Completed by Promulgating Agency)

(All Comments submitted on this regulation will appear on IRRC's website)

INDEPENDENT REGULATORY REVIEW COMMISSION

(1) Agency
Department of Environmental Protection

(2) Agency Number:
Identification Number: 7-521

IRRC Number: 3177

(3) PA Code Cite: 25 Pa. Code, Chapter 109 (Safe Drinking Water)

(4) Short Title: Safe Drinking Water General Update and Fees

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(6) Type of Rulemaking (check applicable box):

- ☐ Proposed Regulation
- ☒ Final Regulation
- ☐ Final Omitted Regulation
- ☐ Emergency Certification Regulation;
  - ☐ Certification by the Governor
  - ☐ Certification by the Attorney General

(7) Briefly explain the regulation in clear and nontechnical language. (100 words or less)

The purpose of this final-form rulemaking is to:

1. Incorporate the remaining general update provisions that were separated from the proposed Revised Total Coliform Rule (RTCR) as directed by the Environmental Quality Board (EQB) on April 21, 2015, including revisions to treatment technique requirements for pathogens, clarifications to permitting requirements, and new requirements for alarms, shutdown capabilities, and system service.
2. Amend existing permit fees and add new annual fees to supplement state costs and address the funding gap ($7.5M).
3. Add new amendments to establish the regulatory basis for issuing general permits, clarify that noncommunity water systems (NCWS) require a permit or approval from the Department prior to construction and operation, and address concerns related to gaps in monitoring, reporting and tracking of back-up sources of supply.

(8) State the statutory authority for the regulation. Include specific statutory citation.

Section 4(a) of the Pennsylvania Safe Drinking Water Act (SDWA), 35 P.S. § 721.4(a), which authorizes the Environmental Quality Board (the Board) " . . .to adopt such rules and regulations of the department governing the provision of drinking water to the public, as it deems necessary for the implementation of the provisions of this act." With respect to the fees set forth in Sections 109.1401 –

109.1409, Section 4(c) of the SDWA (35 P.S. § 721.4(c) authorizes and directs the Board to "establish fees for permit applications, laboratory certification and other services" and that such fees shall "bear a reasonable relationship to the actual cost of providing a service." The rulemaking is also being made under the authority of section 1920-A of the Administrative Code of 1929, 71 P.S. § 510-20(b), which authorizes the Board to promulgate rules and regulations necessary for the performance of the work of the Department.

(9) Is the regulation mandated by any federal or state law or court order, or federal regulation? Are there any relevant state or federal court decisions? If yes, cite the specific law, case or regulation as well as, any deadlines for action.

Section 1413 of the Federal Safe Drinking Water Act, 42 U.S.C. § 300g-2a, requires that, for the state to retain primary enforcement authority (primacy), the state must adopt drinking water regulations that are "no less stringent than" the national primary drinking water regulations. This section further requires states to adopt and implement a program that is consistent with federal requirements and meets minimum program elements. The Federal drinking water primacy regulations at 40 CFR Part 142, subpart B (relating to primary enforcement responsibility) set forth the program requirements that states must meet to retain primary enforcement responsibility. Furthermore, Section 5(a) of the Pennsylvania SDWA, 35 P.S. § 721.5(a), requires the Department of Environmental Protection (DEP or Department) to adopt and implement a public water supply program which includes those program elements necessary to assume state primary enforcement responsibility under the Federal act.

The U.S. Environmental Protection Agency (EPA) has evaluated the performance of the Department in meeting the requirements necessary to retain primacy. EPA's findings were documented in a letter dated December 30, 2016. See attached letter. The findings included the following:

- Programmatic requirements are not being met in a complete and timely manner. Minimum program requirements must be met for states to maintain primacy for the Safe Drinking Water Program.
- The Department's average of 149 public water systems (PWS) per sanitarian (field inspector) is more than double the Association of State Drinking Water Administrator's (ASDWA) national average. EPA cautions the Department that this kind of excessive workload is not sustainable and program performance will continue to suffer.
- The Department failed to meet the federal requirement for sanitary surveys (full inspections). Not completing sanitary survey inspections in a timely manner can have serious public health implications as major violations could be going unidentified.
- In November 2016, EPA conducted a file review of the Department's implementation of the Lead and Copper Rule. EPA is currently reviewing the information collected; EPA's report intends to highlight insufficient program personnel in its findings and recommendations.
- EPA is encouraged by the Department's proposed rulemaking to increase program funding and is hopeful that the Drinking Water Program will receive the necessary resources to improve program performance and reduce personnel shortfalls.

A written action plan was due to EPA within 60 days of the letter (by February 28, 2017) to address the concerns raised in the letter. The Department's response was sent on February 24, 2017. See attached letter.

The Department has committed to sending routine updates to EPA with information about program performance and staffing levels until the final-form rulemaking is in place and new staff are hired and trained. Updates were sent on July 24, 2017 and January 18, 2018. Failure to meet minimum program elements may jeopardize primacy. See attached letters.

To retain primacy, the Department must ensure it receives the necessary resources to improve program performance and reduce personnel shortfalls. This regulation is necessary to address the funding gap.

Other updates to Chapter 109 are not mandated by Federal law. However, these updates are directly related to previously adopted Federal regulations and are, therefore, needed to improve compliance and provide better clarity.

(10) State why the regulation is needed. Explain the compelling public interest that justifies the regulation. Describe who will benefit from the regulation. Quantify the benefits as completely as possible and approximate the number of people who will benefit.

Part I: General Updates

Source Water Protection and New Source Permitting Requirements

The Source Water Assessment and Protection Program amendments will support the protection of public drinking water sources, which will result in maintaining the highest source water quality available. Revisions include adding definitions relating to source water protection and requiring assessments for new sources as part of the permitting process. These revisions will not only protect public health but will also help to maintain, reduce or avoid drinking water treatment costs which occur when the best available source is not selected and protected.

Source water protection represents the first barrier to drinking water contamination. A vulnerable drinking water source puts a water utility and the community it serves at risk and at a disadvantage in planning and building future capacity for economic growth. Contamination of a community water system (CWS) source is costly for the water supplier and the public. For example, it is estimated that the total cost of the May 2000 Walkerton, Ontario *E. coli* contamination incident was $64.5 million (*The Economic Costs of the Walkerton Water Crisis* by John Livernois, 2001). In addition to increased monitoring and treatment costs for the water system, there may be costs associated with containment or remediation, legal proceedings, adverse public health and environmental effects, reduced consumer confidence, diminished property values, and replacement of the contaminated source.

A case study in Texas showed that water suppliers in source water areas with chemical contaminants paid $25 more per million gallons to treat drinking water than suppliers in areas with no chemical contaminant detections. Dearmont, D., et al. (1998), "Costs of Water Treatment Due to Diminished Water Quality: A Case Study in Texas," Water Resources Research, 34(4), 849—853. A study by The Trust for Public Land showed that for every four percent increase in source water turbidity (an indicator of water quality degradation from sediment, algae and microbial pathogens), treatment costs increase by one percent. The Trust for Public Land, (2002), "The Cost of Not Protecting Source Waters." A study by the Pennsylvania Legislative Budget and Finance Committee stated, "(r)educing pollution inputs from pipes and land-based sources can reduce locality costs to treat drinking water sources to safe standards." Legislative Budget and Finance Committee (2013), "A Cost Effective Alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets." According to the Legislative Budget and Finance study, a study by the Brookings Institute suggested that a one percent decrease in sediment loading will lead to a 0.05 percent reduction in water treatment costs. Findings from source

water assessments can support and enhance emergency response, improve land use planning and municipal decisions, complement sustainable infrastructure initiatives, and help prioritize and coordinate actions by federal and state agencies to better protect public health and safety.

The amendments related to new sources of supply in §109.503 (relating to PWS construction permits) will more clearly define the existing requirements regarding the proper order of the permitting process for developing a new PWS source. These clarifications are needed to help ensure that the proper level of treatment is designed and installed in a timely manner; thereby resulting in less delay for permitting a new source that may be needed to meet public health protection requirements, or providing redundancy in the event of contamination of existing sources. These amendments should result in cost savings due to the avoidance of expensive mistakes in the permitting process.

Surface Water and Groundwater Under the Direct Influence (GUDI) Filter Plants

EPA describes turbidity as "a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (such as whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches." *National Primary Drinking Water Regulations*, EPA 816-F-09-004 (May 2009). These amendments will ensure that PWSs consistently produce water that meets turbidity standards and are able to deliver safe and potable water to all users.

The amendments are intended to reduce the public health risks related to waterborne pathogens and waterborne disease outbreaks. Costs related to waterborne disease outbreaks are extremely high. For example, as stated in the below-referenced article, the total medical costs and productivity losses associated with the 1993 waterborne outbreak of cryptosporidiosis in Milwaukee, Wisconsin was $96.2 million: $31.7 million in medical costs and $64.6 million in productivity losses. The average total cost per person with mild, moderate, and severe illness was $116, $475, and $7,808, respectively. *Cost of illness in the 1993 Waterborne Cryptosporidium outbreak, Milwaukee, Wisconsin.* Corso, et al. Emerging Infectious Diseases [serial online] 2003 April. Available from: URL: http://wwwnc.cdc.gov/eid/article/9/4/02-0417.

Filter Plant Performance Requirements

Existing regulations at § 109.301(1)(i) (relating to general monitoring requirements) require turbidity monitoring of the combined filter effluent (CFE) once every four hours. This period of intermittent sample review allows the production of significant volumes of water that are not monitored for compliance with the maximum allowable turbidity limit. The final-form amendments for CFE turbidity monitoring will require continuous monitoring and recording of the results every 15 minutes. This will also enable operators to identify problematic water quality trends and respond more quickly with necessary process control adjustments.

Individual filter effluent (IFE) monitoring ensures that filter deficiencies are identified and corrected before a CFE turbidity exceedance occurs. Existing regulations require continuous IFE turbidity monitoring at conventional and direct filtration plants. The final-form amendments for IFE monitoring include all filtration types. In recent years, the Department has documented breakdowns in treatment of individual filters at filter plants not classified as conventional or direct. The likelihood of a breakdown in treatment or physical integrity of an individual filter is a concern regardless of the specific type of filter technology used. This explains the reason for proposed amendments to expand existing requirements.

Health effects associated with microbial contaminants tend to be due to short-term, single dose exposure rather than long-term exposure. Therefore, if a short duration single turbidity exceedance of the existing maximum allowable turbidity limit occurs and goes unnoticed, consumers are at risk of exposure to microbial pathogens. By requiring continuous monitoring and recording of the results at least every 15 minutes at both CFE and IFE locations for all filter plants, water suppliers will be better able to identify problems before an exceedance occurs and determine compliance with the maximum allowable turbidity limit at all times.

While the Department favors establishing more stringent IFE and CFE turbidity compliance and trigger levels of 0.30 NTU and 1.0 NTU for surface water filtration plants, in response to numerous comments from the Small Water Systems Technical Assistance Center Advisory Board (TAC) and public commentators, the Department is deferring such amendments to §§109.202(c)(1)(i)(A) and 109.701(a) until the EPA completes its six-year review of the Federal turbidity requirements established under the Surface Water Treatment Rules. This will allow the Department to consider EPA's proposed changes before moving forward with proposed modifications to applicable state regulatory requirements. Until that time, the Department encourages filter operators to voluntarily meet optimal water quality levels and respond to trends of increasing turbidity as quickly as possible. This can be accomplished through the use of the Department's existing programs, including the Area-Wide Optimization and Filter Plant Performance Evaluation and Partnership for Safe Water programs. Through these programs, the SDW program has always dedicated significant resources towards compliance assistance / violation prevention at surface water filtration plants.

Additionally, the proposed alarm and shutdown capability amendments under § 109.602 (relating to acceptable design) remain in this final-form rulemaking, which are also targeted at surface water filtration plants. The automated plant shut down requirements are intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence. Therefore, the improved alarm and shutdown capabilities that will occur as a result of systems complying with this final-form rulemaking are a very important interim public health protection measure which will be in place while the Department awaits EPA's future actions on potentially more stringent turbidity provisions.

Proposed modifications in § 109.202(c)(1)(i)(C) (relating to state MCLs, MRDLs and treatment technique requirements) remain unchanged and include specific treatment technique requirements for membrane filtration. These standards are consistent with the results of pilot testing conducted throughout this Commonwealth, recommendations by EPA in the Membrane Filtration Guidance Manual (EPA 815-R-06-009, November 2005), as well as recommendations made by equipment manufacturers. These standards were previously applied through special permit conditions. Certified operators have consistently maintained the proposed levels of performance at membrane filter plants throughout this Commonwealth; and when deviations from this performance have occurred, follow-up investigations revealed the need for repairs to this treatment barrier. The Membrane Filtration Guidance Manual may be found by typing the title of the document into the search box at https://nepis.pa.gov or at the following direct link: https://goo.gl/horVd4

An additional revision requires all surface water filtration plants to implement a filter bed evaluation program that assesses the overall integrity of each filter to identify and correct problems before a turbidity exceedance or catastrophic filter failure occurs. Filters are the final barrier for removal of acute pathogens, and are therefore critical to public health protection. For many systems in this

Commonwealth and across the country, this infrastructure is aging, and the revision to require a physical inspection once per year is a necessary minimum preventative action item.

All of these filter plant performance provisions are part of a multi-barrier approach to ensure treatment is adequate to provide safe and potable water to all users.

Automatic Alarms and Shutdown Capabilities

Filter plants are complex and dynamic. In response to many circumstances, the water plant operator must take an immediate action to protect public health, such as when source water quality changes, chemical feed pumps malfunction, filters require backwashing, or other unforeseen circumstances occur. Water plant operators are often required to perform other duties, which leaves the operation of the water plant unattended, and which limits the operator's ability to respond immediately to treatment needs.

Automated alarms and shutdown capabilities play an important role in modern water treatment and public health protection. Many water suppliers have already taken advantage of readily available technology to reduce personnel costs while still providing safe water to their customers. The amendments will ensure that all surface water filtration plants have the minimum controls in place to ensure that operators are immediately alerted to major treatment problems. The amendments will also ensure that unmanned filter plants are automatically shut down when the plant is producing water that is not safe to drink, which prevents contaminated water from being provided to customers for extended periods of time. These alarms and shutdown capabilities will allow operators at both attended and unattended filtration plants to promptly respond to the water quality problems and treatment needs of the plant. The automated plant shut down is intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence.

Regarding the alarm and shutdown capability requirements, TAC expressed concern with the wording in § 109.602(i)(2)(iv) of the proposal which read: "any other operational parameter determined by the Department as necessary for the system to maintain compliance." TAC believed that the wording was too broad. The language has been removed. The Department will rely on appropriate water system personnel (for example, properly certified operators and consulting engineers) to carefully evaluate what additional operational parameters may require alarms for their particular filter plant. Additionally, if lack of an alarm is linked to risk of treatment breakdown, the Department will address these issues via compliance and/or permit special conditions on a case by case basis. The provision requiring an alarm for "clearwell levels" was also modified, based on comments received from TAC, to requiring an alarm for "water levels necessary to maintain Giardia CT". This was necessary because not all filter plants rely solely on their clearwell to maintain 1 log (90%) inactivation of Giardia.

Filter-To-Waste

The Department's Filter Plant Performance Evaluation (FPPE) program has evaluated approximately 1,250 filters since 1999. The results of these evaluations show that filters are most likely to shed turbidity, particles, and microbial organisms at the beginning of a filter run when the filter is first placed into service following filter backwash and/or maintenance. The amendments require all filter plants that have the ability to filter-to-waste to do so following filter backwash and/or maintenance and before placing the filter into service. Filtering to waste will reduce the likelihood of pathogens passing through filters and into the finished drinking water. The amendments do not require water suppliers without filter-to-waste capabilities or with undersized filter-to-waste capabilities to make a capital improvement. In response to TAC comments, an additional option was included in the final-form rulemaking to allow

for implementation of extended terminal sub-fluidization backwash procedures, as long as this is implemented consistently and documented in operational records.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

The amendments to system service and auxiliary power requirements will strengthen system resiliency and ensure that safe and potable water is continuously supplied to consumers and businesses. A continuous and adequate supply of safe drinking water is vital to maintaining healthy and sustainable communities.

PWS sources and treatment facilities in this Commonwealth are susceptible to emergency situations resulting from both natural and man-made disasters. Examples of emergencies from recent years include tropical storms, flooding, high winds, ice, snow, industrial chemical plant runoff, pipeline ruptures, and transportation corridor spills. These emergencies have resulted in significant impacts to consumers and businesses due to inadequate water quantity or quality, and the resulting water supply warnings and advisories. For example, in 2011, Hurricane Irene and Tropical Storm Lee caused flooding, water line ruptures, and power outages resulting in mandatory water restrictions and boil water advisories (BWA) at 32 PWSs in Pennsylvania. In 2012, Hurricane Sandy caused similar problems at 85 CWSs. Most of the impacted systems were small systems where redundancy and back-up systems were lacking. In comparison, systems with redundancy and adequate planning were able to maintain operations until the power was restored, with little negative impact to their customers. Countless incidents at individual CWSs have occurred due to localized emergencies, with interruptions in potable drinking water service that could have been prevented if adequate preparation and equipment were available.

In addition, numerous wastewater treatment plants were forced to send untreated sewage to waterways in this Commonwealth during these major weather events. PWSs that use these waterways as a source of supply for drinking water were at an increased risk due to extremely elevated turbidity levels and pathogen loading. Effectively treating drinking water during and after emergencies requires increased vigilance and operational control.

Water outages caused by power failures or other emergencies can cause additional adverse effects including:

- Lack of water for basic sanitary purposes, such as bathing, hand-washing and flushing toilets.
- Increased risk to public health when water systems experience a sharp reduction in supply, which can result in low or no pressure situations within the distribution system. Low pressure can allow intrusion of contaminants into distribution system piping from leaks, and backflow from cross connections.
- Dewatering of the distribution system can result in physical damage to pipes when the system is re-pressurized. This situation is exacerbated due to the nationwide problem with aging infrastructure.

These amendments will improve the reliability of service provided to all consumers by requiring the development of a feasible plan to consistently supply an adequate quantity of safe and potable water during emergency situations. More specifically, water suppliers will need to provide on-site auxiliary power sources (specifically, generators), or connection to at least two independent power feeds from separate substations; or develop a plan for alternate provisions, such as interconnections with neighboring water systems or finished water storage capacity. Ideally, water systems will implement a combination of options to improve their redundancy and resiliency.

In response to TAC and other public comments, the Department has made several modifications to the proposed rulemaking in the final-form rulemaking. First, the Department has expanded the alternate provision options further to include "a combination of alternate provisions", "portable generators", and a category of "other" alternate provisions; within this category, system specific alternate provisions may be proposed to insure uninterrupted system service. Additionally, due to the variety of system-specific challenges, the Department has included in a new § 109.708(c) (relating to system service and auxiliary power) the option to submit a corrective action schedule for necessary improvements which have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP. This new approach requires certification of completion of the USSP form created by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist which prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the community water supplier has not addressed those deficiencies by the deadline for USSP submittal, a schedule must be submitted within six months which includes detailed corrective actions and corresponding completion dates. These modifications will help enable the PWS to spread out the cost for compliance with these provisions over a longer period of time. Additionally, these revisions will provide water suppliers with more flexibility in choosing the approach that best fits their particular water system, and adequate time to implement that plan in the most effective manner.

Part II: Amended Permit Fees and New Annual Fees

The second major component of the amendments includes new annual fees and amended permit fees to supplement State costs and help to fill the funding gap. These fees are expected to bring in $7.5 million, which is half of the Commonwealth's portion of Safe Drinking Water Program implementation costs.

These fees are necessary to ensure adequate funding for the Department to carry out its responsibilities under the Federal and State Safe Drinking Water acts. Pennsylvania is ranked third in the nation in terms of the number of PWSs, with 8,521 PWSs across this Commonwealth. The Department is responsible for regulating all PWSs in this Commonwealth and ensuring that safe and potable drinking water is continuously supplied to the 11.3 million customers the PWSs serve.

The Department's appropriations from the General Fund for the Safe Drinking Water Program have steadily decreased in recent years while the cost of staff salaries and benefits, as well as other operation costs, have increased. The result has been an overall decrease in staffing for the Safe Drinking Water Program of 25% since 2009. As discussed in more detail below, these staff reductions have led to a steady decline in the Department's ability to perform services necessary to ensure compliance with SDWA requirements. Based on the current funding level of $19.7 million, approximately $7.5 million in additional funding is necessary to increase staffing to adequate levels and to provide necessary services.

The minimum services that the Safe Drinking Water Program must provide to administer the SDWA and its regulations include:

- Conducting surveillance activities, such as sanitary surveys and other inspections.
- Collecting and analyzing drinking water samples.
- Determining compliance with the regulations, a permit or order.
- Taking appropriate enforcement actions to compel compliance.
- Reviewing applications, plans, reports, feasibility studies and special studies.

- Issuing permits.
- Conducting evaluations, such as filter plant performance evaluations and other site surveys.
- Tracking, updating and maintaining water supply inventory, sample file, and enforcement data in various data management systems.
- Meeting and assuring compliance with all State and Federal recordkeeping and reporting requirements.
- Conducting training.
- Providing technical assistance.
- Responding to water supply emergencies.

Failure to provide these services may result in an increased risk to public health as well as the loss of approval from EPA for the Department to serve as the primary enforcement agency for the administration of the Safe Drinking Water Program in Pennsylvania under Federal law. The loss of primacy would include the loss of all Federal funding, including the infrastructure funding under the State Revolving Fund.

The Board has the authority and is directed under Section 4(c) of the SDWA (35 P.S. § 721.4(c)) to establish fees for services that bear a reasonable relationship to the actual cost of providing the services. The Board must also consider the impacts of the proposed fees on small businesses as part of the regulatory analysis required by section 5 of the Regulatory Review Act (71 P.S. § 745.5). Sixty-eight percent of the water systems in this Commonwealth are considered small businesses.

The fees in this final-form rulemaking will provide the Department with funding necessary to properly administer the SDWA while bearing a reasonable relationship to the actual cost of services provided by the Department and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost.

Recent Decline in Department Staff and Services

Program staffing and performance have steadily declined since 2009.

The number of sanitary surveys (full inspections) has steadily declined since 2009. The Federally mandated inspection frequency is every three years for CWSs and every five years for noncommunity water systems (NCWSs).

SDW Measure	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16
No. Sanitary Surveys	3,177	2,271	2,553	2,310	2,181	2,415	1,847

(Source: Governor's Office Performance Measures, data source is Environment Facility Application Compliance Tracking System (eFACTS))

The number of overdue inspections has ranged from 448 to 703 per year in the last six years. Failure to conduct routine and timely inspections may mean that serious violations are not being identified. In 2015, all six DEP regions had overdue inspections. The range of overdue inspections was 2.4 % to 11.5 %. The total number of systems with overdue inspections was 542. The Federal Public Water System Supervision (PWSS) Grant and primacy measure for inspection frequency has not been met.

SDW Measure	FY 10-11	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16
No. Overdue Inspections	703	551	458	448	492	542

(Source: eFACTS and Pennsylvania Drinking Water Information System (PADWIS))

The reduction in staffing levels and inability to conduct routine and timely inspections because of funding shortfalls may be contributing to the overall declining trend in PWS compliance rates. For the last four years, the percentage of CWSs that met health-based drinking water standards fell short of the goal of 95%.

SDW Measure:	FY 09-10	FY 10-11	FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16
% of CWSs that Meet Health-based Drinking Water Standards	97%	97%	97%	91%	92%	92%	91%

(Source: Governor's Office Performance Measures, data source is PADWIS)

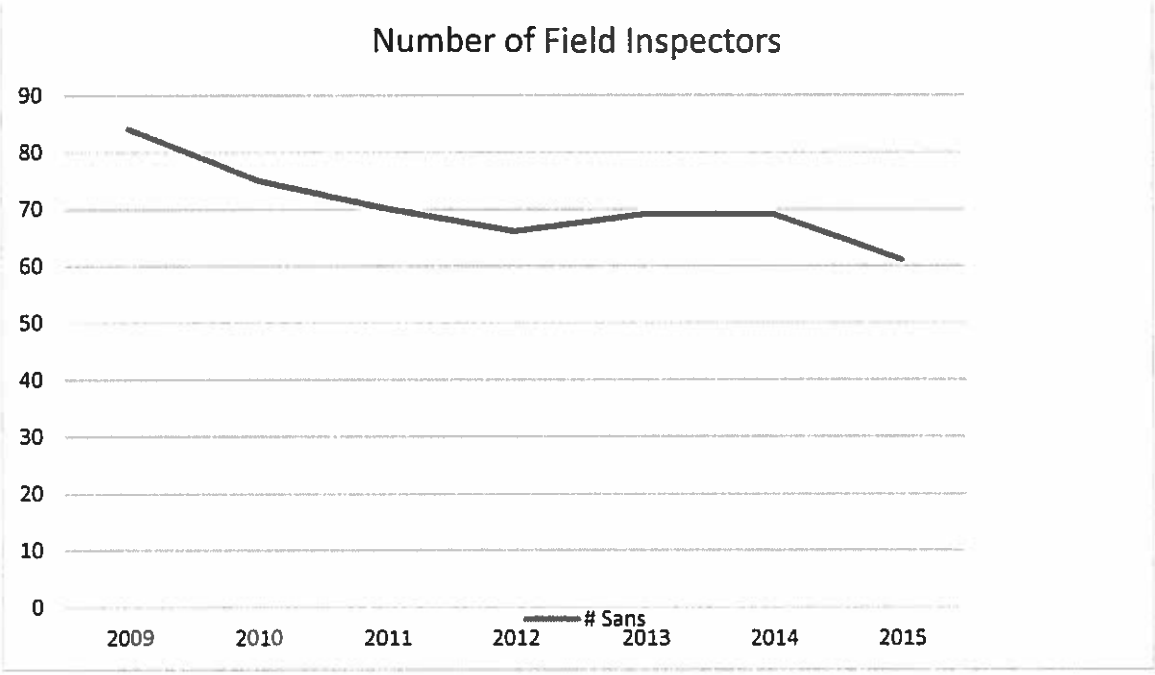
As set forth in the Department's Annual Compliance Report for 2015, PWSs continue to exceed health-based maximum contaminant levels (MCL), maximum residual disinfectant levels (MRDL), and treatment technique (TT) requirements for arsenic, radionuclides, volatile organic chemicals, disinfection byproducts, nitrate/nitrite and pathogens; and PWSs continue to fail to adequately treat drinking water for contaminants such as lead.

The number of unaddressed violations has also continued to increase. In 2015, three of six DEP regions had more than 500 violations that had not been returned to compliance within 180 days or addressed through formal enforcement. (Note: Unaddressed violations are tracked over a five-year period because it generally takes several years to return MCL violations to compliance.)

SDW Measure:	FY 05-10	FY 06-11	FY 07-12	FY 08-13	FY 09-14	FY 10-15
No. Unaddressed Violations	4,298	4,746	5,536	6,849	6,353	7,922

(Source: PADWIS)

Performance is directly tied to the mandated workload and available resources for the Safe Drinking Water Program. Overall, staffing levels are down by 25% since 2009.



Thus, the Department's workload has steadily increased since 2009. As per a workload analysis, the recommended number of PWSs/per DEP sanitarian (inspector) was determined to be 100-125 to ensure completion of mandated inspections, review of PWS self-monitoring data, compliance and enforcement determinations, maintenance of PADWIS and eFACTS and review of monitoring plans, emergency response plans, assessments, and waivers. In 2009, the Department's average workload was within the recommended range at 118 PWSs/per sanitarian. In 2015, five of six DEP regions exceeded the recommended workload. The recommended workload has been exceeded in at least four of six DEP regions for the last three years. As per a 2012 Association of Safe Drinking Water Administrators (ASDWA) survey, the national range and average of PWSs/per inspector is 45-140 and 67, respectively. All DEP regions far exceed the national average.

Region	No. PWSs			No. Sanitarians			Sanitarian Workload (No. PWSs/San)		
	2009	2014	2015	2009	2014	2015	2009	2014	2015
1 SERO	1,062	911	911	9	7	6	118	130	152
2 NERO	2,973	2,555	2,559	23	20	19	129	128	135
3 SCRO	2,596	2,400	2,408	21	14	13	124	171	185
4 NCRO	1,115	937	941	10	7	6	112	134	157
5 SWRO	879	680	694	10	8	6	88	78	105
6 NWRO	1,302	1,211	1,205	11	9	7	118	117	158
Totals	9,927	8,694	8,718	84	65	57	118 Avg.	134 Avg.	153 Avg.

Performance issues and concerns have been well documented by EPA. Please refer to Question 8 for additional information about EPA's concerns and the Department's responses.

Part III: New General Updates

General Permits
These amendments establish the regulatory basis for the issuance of general permits for high volume, low risk modifications or activities to streamline the permitting process.

Requirements for NCWSs
These amendments clarify that noncommunity water systems (NCWS) that are not required to obtain a permit must still obtain Department approval of the facilities prior to construction and operation.

Address Gaps in Monitoring, Reporting and Tracking Back-up Sources
These amendments address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As per Federal and Commonwealth regulations, 40 CFR 141.23(a), 141.24(f) and (h) and 141.26(a) and 25 Pa. Code §§ 109.301 and 109.303, respectively, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means verifiable controls are not in place to ensure that all sources and entry points meet safe drinking water standards. Some of these sources have not been used in at least five years, and, therefore, the Department does not know the water quality for these sources. In addition, the treatment facilities and other appurtenances associated with these sources may have gone unused as well, and may no longer be in good working order. These amendments will ensure that all sources and entry points are monitored at least annually, or when in use. PWSs will also be required to document in a comprehensive monitoring plan how routine compliance monitoring will include all sources and entry points.

These concerns were most recently highlighted in a 2010 report from EPA's Office of Inspector General entitled *"EPA Lacks Internal Controls to Prevent Misuse of Emergency Drinking Water Facilities"* (Report No. 11-P-0001). Note: The term "emergency" is often used to describe sources other than permanent sources. In this Commonwealth, some of these back-up sources have not been used in at least five years, and, therefore, the Department does not know the water quality for these sources.

In order to better understand the scope of the problem in this Commonwealth, the following data was retrieved from PADWIS.

Entry Points (EP)				
PWS Type	**Total No. EPs**	**No. Permanent EPs**	**No. Non-Permanent EPs**	**% Non-Permanent EPs**
CWSs	3,330	3,003	327	10%
Others	7,880	7,760	120	2%
Total	11,210	10,763	447	4%

An entry point is the place at which finished water representative of each source enters the distribution system. Routine compliance monitoring is not tracked at non-permanent entry points. Non-permanent entry points include the existing categories of seasonal, interim, reserve, and emergency entry points.

Based on the data, CWSs provide finished water to consumers through a total of 3,330 entry points, 327 (or 10%) of which are non-permanent. Therefore, as many as 10% of all entry points may not be included in all required monitoring prior to serving water to consumers.

The numbers are even higher at the individual source level.

Water Supply Sources (wells, springs, surface water intakes, etc.)				
PWS Type	**Total No. Sources**	**No. Permanent Sources**	**No. Non-Permanent Sources**	**% Non-Permanent Sources**
CWSs	5,252	4,634	618	12%
Others	8,604	8,297	307	4%
Total	13,856	12,931	925	7%

For CWSs, as many as 12% of all sources may not be included in routine compliance monitoring, yet these sources can be used at any time.

The Department also reviewed the monitoring history of the 447 non-permanent entry points mentioned above.

Non-Permanent Entry Points (EP)			
PWS Type	**No. EPs**	**No. & % of EPs with No Monitoring Data (Since 1992)**	**No. of EPs with Some Monitoring Data**
CWSs	327	143 (44%)	184 (of these EPs, 47 were sampled in 2016, 37 were sampled during the 2012 – 2015 monitoring period, and the remaining 101 were sampled prior to 2012.
Others	120	7 (6%)	113 (55 EPs have recent data (2016)).
Total	447	150 (34%)	

For CWSs, 143 (or 44%) of all non-permanent entry points have **no** monitoring data since 1992. Of the 184 entry points with some data, most of the data is 5 to 10 years old.

The use of unmonitored sources and entry points could adversely impact basic water quality, including pH, alkalinity, turbidity, corrosivity and lead solubility, dissolved inorganic carbon, and natural organic matter. Water suppliers may have limited information about how these sources or entry points will impact treatment efficacy and distribution system water quality. In addition, back-up or emergency sources may have poor water quality or MCL exceedances. The use of these sources without proper monitoring and verifiable controls could lead to an increased risk to public health.

Finally, treatment facilities and other appurtenances associated with these sources may also have gone unused, and may no longer be in good working order. Back-up sources and entry points with unknown water quality or that have not been used or are no longer in good working order provide a false sense of security in terms of system resiliency and emergency response. While the Department understands that many facilities are not used on a "24/7" basis, these amendments will ensure that all permitted sources and entry points are monitored at least annually, or when in use.

In response to public comments, the final-form rulemaking allows the use of the "reserve" designation for select sources and entry points, without conducting routine annual compliance monitoring, if documentation is provided to the Department that supports the use of this designation. Selected sources and entry points that meet these criteria will be covered by a special condition in the permit that requires Department notification and completion of compliance monitoring prior to use.

(11) Are there any provisions that are more stringent than federal standards? If yes, identify the specific provisions and the compelling Pennsylvania interest that demands stronger regulations.

There are several provisions in this final-form rulemaking that are more stringent than Federal requirements. The Department developed these provisions to better protect public health and to be consistent with existing Pennsylvania drinking water regulations.

The additional state provisions included in this regulation are designed to help reduce the occurrence of violations, treatment breakdowns, and water supply emergencies; thereby improving system resiliency and reliability, and reducing the need for staff resources to respond to these emergency situations. The provisions were developed with Department staff input and are intended to address the highest priority issues of concern. Establishing proper safeguards under specific regulatory requirements that clearly outline violation prevention expectations for the regulated community is a critical means to improve public health protection.

Turbidity and Filtration Requirements

- Amendments to Sections 109.202(c)(1)(i)(C), 109.301(1)(i) - (iv), 109.301(2)(i), 109.602(f) and (g), 109.701(a)(2) (relating to reporting and recordkeeping), 109.703(b)(1) (relating to facilities operation), and 109.703(b)(5), strengthen turbidity requirements and filtration monitoring and reporting requirements. These amendments are based on Department inspections and the evaluation of more than 1,250 filters through the Department's FPPE program. These evaluations have documented that existing requirements are not sufficient to prevent short duration turbidity spikes or the shedding of particles and microbial pathogens into the finished water, which puts consumers at risk of exposure to microbial pathogens. These amendments are part of a multi-barrier approach to ensure treatment is adequate to provide safe and potable water to all users.
- Amendments to §§109.301(1)(iv), 109.301(2)(i)(D) and 109.1305(a)(1)(iii) (relating to compliance monitoring) require systems to notify the Department within 24 hours of the failure of continuous monitoring equipment and to repair/replace continuous monitoring equipment, regardless of system size, within five working days of equipment failure. These provisions will ensure timely repair and restoration of continuous monitoring equipment necessary to maintain adequate treatment of drinking water for public health protection.

Comprehensive Monitoring Plan Requirements

The comprehensive monitoring plan requirements under §§109.303(i) (relating to sampling requirements) and 109.717 (relating to comprehensive monitoring plan) are more stringent than Federal requirements. However, the Federal requirements under 40 CFR 141.23 and 141.24 (relating to inorganic and organic chemical sampling; and analytical requirements) require water systems to ensure that monitoring is representative of each source after treatment. The Department is simply using the comprehensive monitoring plan as the means to ensure that all sources are included in routine compliance monitoring.

System Resiliency Requirements

Amendments to § 109.708(a) through (c) concerning auxiliary power are more stringent provisions that improve system resiliency and strengthen existing requirements related to the need for up-to-date and feasible emergency response plans. The frequency of unpredictable and erratic weather emergencies continues to increase. These amendments will protect customers by improving the ability of their water supplier to provide a consistent supply of safe and potable water during the various emergency situations that have occurred in the past and which will inevitably arise at some point in the future. Note that

wastewater treatment plants have been required to have a back-up power supply for many years. These amendments will provide consistency in both the drinking water and wastewater industries.

Requirements for Responding to Significant Deficiencies
Section 109.716 (relating to significant deficiencies) includes amendments to requirements for responding to significant deficiencies. This section is more stringent than Federal requirements because it combines the separate notification and corrective action requirements for surface water and ground water systems into one consistent protocol. These amendments are intended to simplify the requirements for responding to significant deficiencies, especially for systems with both surface water and groundwater sources. These amendments are also intended to ensure that corrective actions are taken as soon as possible to protect public health.

Please note, as well, that the Department amended several provisions in response to TAC and public comments. Several provisions that are more stringent were either modified or deleted, including the turbidity requirements under §§ 109.202 and 109.701, the monitoring and reporting requirements for "back-up" sources and entry points under §§ 109.301, 109.303, 109.703 and 109.717, and the system service and auxiliary power requirements under § 109.708.

(12) How does this regulation compare with those of the other states? How will this affect Pennsylvania's ability to compete with other states?

Source Water Protection and New Source Permitting Requirements
Two other states in EPA Region III, West Virginia and Virginia, also require source water assessments for new sources. In Virginia, the goal is to have a source water assessment completed by Virginia drinking water program staff before the operations permit is issued (Virginia Department of Health, November 2017, Working Memo 852 - Source Water Assessment Program Implementation). Under West Virginia's new statute on source water protection, an assessment is included as part of a local source water protection plan and must be completed by the water supplier prior to operation for a surface water source or a surface water influenced ground water source (West Virginia Senate Bill 373 of 2014 – Source Water Protection, as codified in Code of West Virginia § 16-1-9c(b)(8) (relating to required update or completion of source water protection plans)).

Regarding the development of local source water *protection* programs, Delaware and more recently, West Virginia, have requirements for source water protection by statute (Delaware Source Water Protection Law of 2001 – 7 Del. C. §§ 6081, 6082, 6083 [relating to reporting on source water protection; adoption of source water assessment, wellhead protection, and excellent groundwater recharge potential areas by counties and municipalities; and adoption of source water assessment, wellhead protection, and excellent groundwater recharge potential areas by the Governor's Cabinet Committee on State Planning Issues]; and Code of West Virginia § 16-1-9c(b)(8)). Under this final-form rulemaking, the development of a local source water protection program will remain voluntary in Pennsylvania.

The source water aspects of the final-form rulemaking should not affect this Commonwealth's ability to compete with other states.

The Commonwealth has had a permitting program in place for many years and the permitting aspects of the final-form rulemaking should not affect this Commonwealth's ability to compete with other states.

Surface Water and GUDI Filter Plants

Turbidity Monitoring, Recording, and Reporting
Thirty states responded to a survey conducted by ASDWA on behalf of this Commonwealth. Twenty states require continuous turbidity monitoring and recording of CFE and fourteen states require continuous IFE monitoring and recording for all filtration types.

Automatic Alarms and Shutdown Capabilities
Based on the ASDWA survey, twelve states responded that they require filter plants to be attended at all times while in operation. Of the twelve states that require attended operation, seven have regulations that establish standards for plant automation, alarms and shutdowns. The Commonwealth's amendments are less stringent than the twelve other states since attended operation is not being required. In addition, the amendments related to plant automation, alarms, and shutdown capabilities are less stringent than those standards suggested by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (also known as the 10 States Standards).

Annual Filter Inspection Program
All thirty states responding to the ASDWA survey require some of their filter plants to implement an annual filter inspection program. This amendment is not expected to negatively affect this Commonwealth's ability to compete with other states because most PWSs have in-house filter inspection capabilities through their existing maintenance staff or certified water operator(s).

Filter-To-Waste
All thirty states responding to the ASDWA survey require some of their filter plants to filter-to-waste. This amendment is not expected to negatively affect this Commonwealth because implementation is not expected to require any capital improvements.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions
The Department surveyed neighboring states regarding their requirements for system resiliency. Three nearby states, New Jersey, New York, and Connecticut, provided information regarding similar regulations and/or design standards they have in place. Department staff communicated with staff from these states when developing proposed regulatory language. These amendments are not expected to negatively affect this Commonwealth's ability to compete with other states because they will help ensure adequate quantity and quality are consistently provided to homeowners and businesses in this Commonwealth during emergency situations.

New Annual Fees and Amended Permit Fees
At least 26 states charge annual fees to augment the cost of their Drinking Water Programs, including the nearby states of Delaware, New Jersey, Ohio and Virginia. Some of these states charge a flat fee based on the PWS type and size. Other states charge a fee based on population served or the number of service connections.

Annual fees for these states range from $25 to $160,000 and are summarized below. The Commonwealth's fees range from $50 to $40,000.

Summary of PWS Fees Levied by Other States	
State	**Fee**
Alaska	18 AAC § 80.1910 Type: Fee for Service Examples: Sanitary survey - $398 to $585 for 1st source + $117 for each additional source, other inspections - $64/hour
Arkansas *	AC § 20-28-104(a) Type: Annual Fee CWSs and Nontransient NCWSs: Based on # connections $0.30/connection/month, minimum fee = $250 Transient NCWSs: $125
California	Title 22 CCR, Division 4, Chapter 14.5, § 64305 Type: Annual Fee CWSs: minimum $250 or $6/connection (fee per connection on declining tiered scale from $6 to $1.35) NTNCWSs: minimum $456 or $2/person TNCWSs: $800
Colorado	CRS § 25-1.5-209 Type: Annual Fee CWSs: Based on population Surface Water: ranges from $75 - $21,630 Ground Water: ranges from $75 - $4,450 Nontransient NCWSs: ranges from $75 - $4,450 Transient NCWSs: ranges from $75 - $3,960
Delaware *	16 Del. Code § 135(b)(1) Type: Annual Fee CWSs: Based on # service connections, ranges from $50 - $3,000 Nontransient NCWSs: $50 Transient NCWSs: $25
Florida	FAC § 62-4.053 Type: Annual Fee CWSs: Based on permitted design capacity Ranges from $100 – $6,000 Nontransient NCWSs: $100 Transient NCWSs: $50
Idaho	IAC § 58.01.08-010 Type: Annual Fee CWSs and Nontransient NCWSs: Based on # connections 1-20 $100 21-184 $5/connection, max. $735 185-3,663 $4/connection, max. $10,988 >3,664 $3/connection Transient NCWSs: $25

Indiana	IC § 13-18-20.5-2 Type: Annual Fee CWSs: Based on # connections - < 400 connections $350 ≥ 400 connections $0.95/connection Nontransient NCWSs: Based on population – ranges from $150 - $300 Transient NCWSs: Based on source water type – ranges from $100 - $200
Kansas	K.A.R. 28-15-12 Type: Annual Fee CWSs: Capped at $0.002 per 1,000 gallons of water sold
Louisiana *	Act 605 of 2016 Type: Annual Fee CWSs: Based on # connections, $12/connection
Maine	§ 10-144, CMR Chapter 231, § 1-A Type: Annual Fee Base Fee ($75) + ($0.45 (per capita rate) x (pop)) Cap = $30,000
Massachusetts	MGL, Chapter 21A, Section 18A Type: Annual Fee PWSs: Metered – minimum $20, $8.50/million gallons used Unmetered – $50 - $250 based on population
Michigan	MI SDWA, 1976, PA 399 Type: Annual Fee CWSs: Based on population, ranges from $400 - $134,000 Nontransient NCWSs: $575 Transient NCWSs: $135
Minnesota *	Minnesota Statutes 2009, § 144.3831 Type: Annual Fee CWSs: Based on # connections, $6.36/connection
Mississippi *	MS ST § 41-26-23 Type: Annual Fee CWSs: Based on # connections, $3.00/connection, cap = $40,000
Missouri *	RSMO § 640.100.8 Type: Annual Fee CWSs only: Based on # connections, whether connections are metered, and the size of the meters. $1.08 - $3.24/connection
Montana	ARM § 17.38.248 Type: Annual Fee CWSs: Based on # connections – $2.00/connection, Minimum fee = $100 Nontransient NCWSs: $100 Transient NCWSs: $50

New Jersey	NJAC § 7:10-15 Type: Annual Fee CWSs only: Based on population, and whether system has treatment. w/o treatment w/t 25-999 $60 $120 1,000-9,999 $360 $720 10,000-49,999 $790 $1,580 >50,000 $1,640 $3,280
North Carolina	NC ST § 130A-328 Type: Annual Fee CWSs: Based on population, fee ranges from $255 - $5,950 Nontransient NCWSs: $150
Ohio	R.C. § 3745.11 Type: Annual Fee CWSs: Based on sliding scale of # connections, min. $112 For 100 or more connections, fee ranges from $0.76 - $1.92/connection # Connections 278 (pop=750) $534 1,222 (pop=3,300) $2,346 3,704 (pop=10,000) $5,482 18,518 (pop=50,000) $20,370 92,592 (pop=250,000) $85,185 Nontransient NCWSs: ranges from $112 - $16,820 Transient NCWSs: ranges from $112 - $792
Oklahoma	OAC § 631-3-21 Type: Annual Fee All PWSs: Flat fee for inspections + Flat fee for SDWA activities + Lab costs GW $100 + $1,600 + SW $200 + $6,800 +
Rhode Island	R46-13-DWQ Type: Annual License Fee CWSs: Based on # connections – $1.50 per connection, ranges from $330 - $32,500 Nontransient NCWSs: $330 Transient NCWSs: $200
South Carolina	S.C. Code of Regulations R. 61-30.G(2) Type: Annual Fee CWSs and Nontransient NCWSs: 3 Components: Administration + Distribution Monitoring + Source Monitoring Costs for Admin only: # Connections Base amount + rate/tap Total Fee 278 (pop=750) $769 + $3.85/tap $1,839 1,222 (pop=3,300) $3,749 + $1.96/tap $6,144 18,518 (pop=50,000) $23,389 + $0.46/tap $31,907 92,592 (pop=250,000) $35,239 + $0.17/tap $50,979 Transient NCWSs: $275

Texas	30 TAC § 290.51 Type: Annual Fee CWSs and Nontransient NCWSs: Based on # connections – <25 $200 25-160 $300 ≥161 $4/connection Transient NCWSs: $100
Virginia	12VAC5-600-50 to 110 Type: Annual Fee CWSs: Based on # connections –$3/connection, cap = $160,000 # Connections 278 (pop=750) $834 1,222 (pop=3,300) $3,666 18,518 (pop=50,000) $55,554 92,592 (pop=250,000) $160,000 Nontransient NCWSs: $90
Washington	WAC 246-290-070 Type: Annual Fee Based on # connections – cap = $100,000 Base Fee + Per Connection Fee $100 + $1.05 to $1.30

* Indicates States where a portion of the annual fee goes towards monitoring costs in addition to administrative costs to run the drinking water program.

Overall, the final-form rulemaking should not put this Commonwealth at a competitive disadvantage with any other state. Water service for residential customers is generally not susceptible to competition from other states. Rather, the amendments should enhance this Commonwealth's ability to compete with other states in attracting new businesses by improving public health protection, providing a consistent supply of high quality water, and promoting healthy and sustainable communities.

(13) Will the regulation affect any other regulations of the promulgating agency or other state agencies? If yes, explain and provide specific citations.

The amendments will be incorporated into the existing language of Chapter 109. Other than this incorporation, the amendments should not affect any existing or proposed regulations of DEP or any other state agency.

(14) Describe the communications with and solicitation of input from the public, any advisory council/group, small businesses and groups representing small businesses in the development and drafting of the regulation. List the specific persons and/or groups who were involved. ("Small business" is defined in Section 3 of the Regulatory Review Act, Act 76 of 2012.)

The draft proposed rulemaking was provided to the TAC Advisory Board for review and discussion on November 14, 2016 and January 5, 2017. Comments and recommendations were received from TAC on January 23, 2017. The proposed rulemaking was also presented to stakeholders through a webinar on December 8, 2016. Email invitations to this webinar were sent to 6,248 water system owners and operators (all PWSs with an email address in PADWIS), and it was advertised on various Department

and water industry websites. 325 registered attendees participated in the webinar, with some viewing the webinar with a group of other individuals. Therefore, total attendee participation was greater than 325 individuals. The proposed rulemaking was published in the *Pennsylvania Bulletin* on August 26, 2017 with a 30-day comment period.

Revisions were made to the draft final-form rulemaking in response to the comments received. The draft final-form rulemaking was presented to the TAC on December 7, 2017. Final comments were received from TAC on December 22, 2017. The TAC Board made ten recommendations, five of which were incorporated into this final-form rulemaking:

- TAC recommended that electronic submission of Consumer Confidence Reports (CCR) to DEP be allowed as an environmentally prudent option. The Department continues to investigate options for water suppliers to submit reports electronically, and intends to move forward with promulgating a regulation to implement this recommendation as soon as a system is available to accept electronic submissions.
- TAC made three recommendations regarding NSF International (NSF) certification requirements under § 109.606 (relating to chemicals, materials and equipment). These recommendations were not incorporated because NSF certification is an existing requirement. NSF certification has been a long-standing requirement to ensure the safety and efficacy of materials and equipment. NSF certification ensures that harmful metals such as cadmium, chromium and lead do not leech from materials and equipment. NSF certification also ensures that water treatment devices can meet manufacturers' claims and effectively treat the water. However, the Department clarified in the final-form rulemaking that NSF-certification requirements apply to materials and equipment that come in contact with water. In other words, these requirements apply to the wetted parts of materials and equipment, and exclude motors, casings and the like which do not come into contact with the water. Finally, § 109.606 allows the use of other standards to meet these criteria. For example, the use of materials, such as concrete and stainless steel, which meet American Water Works Association (AWWA) standards, would be acceptable to the Department.
- TAC made recommendations regarding the elimination of the fees and whether the fees bear a reasonable relationship to the cost of services. These recommendations are addressed in Section E of the preamble.

Section E of the preamble includes more information about the TAC Board's recommendations.

(15) Identify the types and number of persons, businesses, small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012) and organizations which will be affected by the regulation. How are they affected?

One or more of these amendments will affect all PWSs as well as the people to whom they provide water. Currently, there are 8,521 PWS that serve a total population of over 11.3 million people in this Commonwealth. Of the 8,521 PWSs, approximately 2,641 are owned by a municipality, an authority, the Commonwealth, the Federal government, or another not-for-profit entity. The other 5,880 PWSs are either privately or investor owned.

A review of the U.S. Small Business Size Regulations under 13 CFR Part 121 provides a standard for determining what constitutes a small business for the NAICS category relating to PWSs. A PWS falls within NAICS category 221310, Water Supply and Irrigation Systems, which comprises establishments

primarily engaged in operating water treatment plants and/or operating water supply systems. The small size standard for this NAICS category is annual receipts of not more than $27.5 million.

For the 5,880 privately or investor owned PWSs, the Department has no way to estimate annual receipts. Therefore, the Department used the federal definition of a small water system in 40 CFR 141.2, which states that a small water system is "a water system that serves 3,300 persons or fewer". Under this regulatory package, a PWS owned by a private individual or investor serving less than or equal to 3,300 persons was considered to be a small business. In this Commonwealth, there are approximately 5,780 PWSs meeting these criteria and can be considered as a small business. 924 of these are CWSs.

The persons served by these PWSs will benefit from the amendments, because strengthened turbidity, filtration and source water protection requirements will reduce the potential risk to human health, improved resiliency will ensure a continuous supply of safe and potable water, and collectively, the amendments will enable communities and businesses to plan and build future capacity for economic growth.

Some PWSs will be affected by the need to change operations or make capital improvements to comply with some of the proposed provisions. See responses to questions (17) – (21) for more information about costs.

(16) List the persons, groups or entities, including small businesses, that will be required to comply with the regulation. Approximate the number that will be required to comply.

Source Water Protection and New Source Permitting Requirements
Regarding the amendments to the permitting requirements for new sources, based on historical permit submissions, approximately 30 CWSs per year will be required to comply.

Surface Water and GUDI Filter Plants
The 353 filter plants in this Commonwealth which are operated by 319 water systems will be required to comply with one or more of these amendments.

The approximate number of filter plants by ownership type is shown below:

181 Authorities
85 Investors
57 Municipalities
15 State Agencies
6 Water Associations
4 Other
3 Private Individuals
2 Federal Agencies

Of the 353 filter plants, 22 are considered to be small businesses. For purposes of this regulatory package, a PWS owned by a private individual or investor serving less than or equal to 3,300 persons was identified as a small business. Revisions made between the proposed and final-form rulemaking have not reduced the number of filter plants that must comply; however, deletions of proposed more stringent turbidity requirements described in the response to Question 10, have significantly reduced the extent of regulatory impacts.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions
The 1,952 CWSs in this Commonwealth will be required to comply with one or more of these amendments.

The approximate number of CWSs by ownership type is shown below:

476 Authorities
886 Investors
261 Municipalities
21 State Agencies
129 Water Associations
67 Other
106 Private Individuals
6 Federal Agencies

Of the 1,952 CWSs, 924 are considered to be small businesses. For purposes of this regulatory package, a PWS owned by a private individual or investor serving less than or equal to 3,300 persons was identified as a small business.

1,618 CWSs serving fewer than 3300 customers will have 12 months to comply
186 CWSs serving from 3,301 – 10,000 customers will have 24 months to comply
148 CWSs serving greater than 10,000 customers will have 36 months to comply

Revisions made between the proposed and final-form rulemaking have not reduced the number of CWSs required to comply; however, as described in response to question 10, significant modifications regarding the compliance implementation approach will help enable the cost for compliance with these provisions to be spread out over a longer period of time.

New Annual Fees and Amended Permit Fees
All 8,521 PWSs will be required to comply with one or more of these amendments. Of the 8,521 PWSs, approximately 5,780 may be considered to be small businesses. For purposes of this regulatory package, a PWS owned by a private individual or investor serving less than or equal to 3,300 persons was identified as a small business.

(17) Identify the financial, economic and social impact of the regulation on individuals, small businesses, businesses and labor communities and other public and private organizations. Evaluate the benefits expected as a result of the regulation.

The expected benefits of this final-form rulemaking are (1) the avoidance of a full range of adverse health effects from the consumption of contaminated drinking water such as acute and chronic illness, endemic and epidemic disease, waterborne disease outbreaks, and death; and (2) healthy and sustainable communities.

This final-form rulemaking will provide a positive economic impact to individuals, small businesses and businesses that provide services to the drinking water industry.

Source Water Protection and New Source Permitting Requirements

PWSs will incur a cost when completing the source water assessment portion of the permitting process for new sources. However, the initial cost is minor compared to the ongoing costs that would result if the best available source were not developed or inadequate treatment is installed.

Source water protection represents the first barrier to drinking water contamination. A vulnerable drinking water source also puts a water utility and the community it serves at risk and at a disadvantage in planning and building future capacity for economic growth. Contamination of a CWS source is costly for the water supplier and the public. For example, it is estimated that the total cost of an *E. coli* contamination incident in Walkerton, Ontario was $64.5 million (*The Economic Costs of the Walkerton Water Crisis* by John Livernois, 2001). In addition to increased monitoring and treatment costs for the water system, there may be costs associated with containment and/or remediation, legal proceedings, adverse public health and environmental effects, reduced consumer confidence, diminished property values and replacement of the contaminated source.

A case study in Texas showed that water suppliers in source water areas with chemical contaminants paid $25 more per million gallons to treat drinking water than suppliers in areas with no chemical contaminant detections. Dearmont, D., et al. (1998), "Costs of Water Treatment Due to Diminished Water Quality: A Case Study in Texas," Water Resources Research, 34(4), 849—853. A study by The Trust for Public Land showed that for every four percent increase in source water turbidity (an indicator of water quality degradation from sediment, algae and microbial pathogens), treatment costs increase by one percent. The Trust for Public Land, (2002) "The Cost of Not Protecting Source Waters." A study by the Pennsylvania Legislative Budget and Finance Committee stated, "(r)educing pollution inputs from pipes and land-based sources can reduce locality costs to treat drinking water sources to safe standards". Legislative Budget and Finance Committee (2013), "A Cost Effective Alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets." According to the Legislative Budget and Finance study, a study by the Brookings Institute suggested that a one percent decrease in sediment loading will lead to a 0.05 percent reduction in water treatment costs. Findings from the source water assessments can support and enhance emergency response, improve land use planning and municipal decisions, complement sustainable infrastructure initiatives and help prioritize and coordinate actions by federal and state agencies to better protect public health and safety.

Surface Water and GUDI Filter Plants

The financial impact to PWSs with filter plants includes the cost associated with installation of continuous monitoring equipment, installation of alarm and shutdown capabilities, implementation of a filter bed inspection program, and the cost associated with filtering to waste.

The amendments are intended to reduce the public health risks and associated costs related to waterborne pathogens and waterborne disease outbreaks. Costs related to waterborne disease outbreaks are extremely high. For example, as stated in the below-referenced article, the total medical costs and productivity losses associated with the 1993 waterborne outbreak of cryptosporidiosis in Milwaukee, Wisconsin was $96.2 million: $31.7 million in medical costs and $64.6 million in productivity losses. The average total cost per person with mild, moderate, and severe illness was $116, $475, and $7,808, respectively. *Cost of illness in the 1993 Waterborne Cryptosporidium outbreak, Milwaukee, Wisconsin. Corso PS, Kramer MH, Blair KA, Addiss DG, Davis JP, Haddix AC. Emerg Infect Dis [serial online] 2003 April. Available from: URL: http://wwwnc.cdc.gov/eid/article/9/4/02-0417*

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

The financial impact to CWSs will depend on which option they determine to be most feasible to comply with this rulemaking. This may include the cost associated with installation of an emergency generator, developing an independent power feed from an alternate substation, developing interconnections with neighboring water systems, or designing and/or constructing additional finished water storage. Furthermore, cost estimates for each specific action will vary significantly depending on the size of the water system, as well as the level of deficiency of their existing capability to consistently provide an adequate quantity and quality of water.

These amendments will help reduce or avoid the significant impacts to consumers that result from inadequate water quantity or quality and the associated cost of consumption advisories and/or bulk water hauling. For example, in 2011 Hurricane Irene and Tropical Storm Lee caused flooding, water line ruptures, and power outages resulting in mandatory water restrictions and BWAs at 32 PWSs in Pennsylvania. In 2012, Hurricane Sandy caused similar problems at 85 CWSs. Most of the impacted systems were small systems where redundancy and back-up systems were lacking. In comparison, systems with redundancy and adequate planning were able to maintain operations until the power was restored, with little negative impact to their customers. Countless smaller incidents at individual CWSs have occurred due to localized emergencies, such as flooding, with interruptions in potable drinking water service that could have been prevented if adequate preparation and equipment were available.

Of the 1,952 CWSs expected to comply with the final-form rulemaking, 1,618 serve less than 3,300 customers, and are therefore considered small businesses.

Cost savings of avoiding interruption of continuous supply of safe and potable water were evaluated using the Water Health and Economic Analysis Tool (WHEAT) software developed by EPA. The Department ran the model for a scenario of a water system serving 2,500 customers and experiencing a water outage for two days. The model outcomes regarding economic consequences are summarized as follows:

- The value of water sales that would have occurred if there was no disruption in water service is estimated to be $2,891.
- The value of additional operating costs incurred during the event, which may include bottled/replacement water, equipment, other remediation, or miscellaneous costs is estimated at $24,775.
- Total economic impact on the water utility due to the two-day outage (sum of the above losses) is estimated at $27,666.
- Regional economic consequences for this same event are estimated at $926,486. This is the total value of economic activity lost among businesses directly affected by the water service disruption, due to the contraction in business activity during the two-day event.

If the water utility complies with the revisions, the potential cost savings for this two-day outage, offsetting the costs to install additional auxiliary power, emergency interconnections with neighboring water systems, and/or finished water storage, are summarized above. These costs would increase with each additional day that the water outage continues.

Additional costs savings to water systems and customers will be the prevention of dewatering of the distribution system piping and protection from damage to collapsed water lines (due to lack of ability to provide adequate quantity water to maintain positive pressure).

It is estimated that 250 boil water advisories (BWA) occur in Pennsylvania each year and that 25% or 63 BWAs are caused by water supply disruptions. The total annual cost savings to the regulated water systems is estimated at $1,742,958. However, the regional economic cost savings to businesses is estimated at more than $58 million. These cost savings will offset the costs of improving system resiliency.

(18) Explain how the benefits of the regulation outweigh any cost and adverse effects.

Source Water Protection and New Source Permitting Requirements
The amendments will support the protection of public drinking water sources resulting in maintaining the highest source water quality available. Protected source water reduces or avoids drinking water treatment costs.

Surface Water and GUDI Filter Plants
The amended filtration requirements are designed to identify and correct problems at the plant before a CFE turbidity exceedance occurs or escalates. The alarm and shutdown capability amendments will ensure that operators are immediately alerted to major treatment problems. A plant producing water that is not safe to drink will automatically shut down when an operator is not immediately available. These requirements will prevent violations, which will protect public health, avoid PWS costs related to correcting violations, and reduce costs to the community.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions
The amendments to system service and auxiliary power requirements will strengthen system resiliency and ensure that safe and potable water is continuously supplied to consumers and businesses. A continuous and adequate supply of safe drinking water is vital to maintaining healthy and sustainable communities.

This Commonwealth's PWS sources and treatment facilities are susceptible to emergency situations resulting from both natural and man-made disasters. Examples of emergencies from recent years include tropical storms, flooding, high winds, ice, snow, industrial chemical plant runoff, pipeline ruptures, and transportation corridor spills. These emergencies have resulted in significant impacts to consumers and businesses due to inadequate water quantity or quality, and in water supply warnings and advisories.

Please refer to Question 17 for additional information.

(19) Provide a specific estimate of the costs and/or savings to the **regulated community** associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

Source Water Protection and New Source Permitting Requirements
The Department's records show that approximately 30 new CWS sources are permitted each year. The Department estimates that an additional eight hours of work completed by a professional geologist on behalf of the CWS will be needed to comply with the new source permitting requirements. This additional work will amount to approximately $1,176 per source permitted, based on current hourly rates charged by consulting firms. The total estimated cost is $35,280 ($1,176 x 30 new sources).

Surface Water and GUDI Filter Plants

Turbidity Monitoring, Recording, and Reporting

Costs have been derived from vendors of HACH brand turbidimeters; the most commonly used turbidimeter in this Commonwealth. If the water supplier prefers a different brand of equipment, the cost may change. There could be some per instrument cost savings when multiple instruments are purchased. The following table, provided for illustrative purposes, shows costs related to installing and maintaining one HACH continuous monitoring and recording device:

White Light Turbidimeter (analog) and Chart Recorder (analog)

Items	Initial Cost for First Turbidimeter and Recorder	Estimated Annual Calibration and Maintenance Cost	Additional Turbidimeter and Recorder
HACH 1720E and SC200 (analog signal)	$2,881		$2,881
Calibration Cylinder	$ 89		
20 NTU StablCal x (4) Calibrations		$556	
Lamp Assembly Replacement		$ 62	
Chart Recorder- Duel Pen	$1,657		$1,657
Chart Recorder Paper		$ 60	
Chart Recorder Replacement Pens		$ 79	
Installation	$1,000		
Total (not including tax and shipping)	**$5,627**	**$757**	**$4,538**

Laser Turbidimeter (digital) and Chart Recorder (analog)

Items	Initial Cost for First Laser Turbidimeter and Recorder	Estimated Annual Calibration and Maintenance Cost	Additional Turbidimeter and Recorder
HACH TU5400 Laser Turbidimeter (includes flow sensor RFID, and System Check)	$6,142		$6,142
HACH SC200 (includes flow sensor input, RFID, and Modbus))	$2,596		$2,596
Maintenance/Calibration Kit (includes primary standards)		$1,100 ($349 to replace the primary standards that are included in the kit)	
Replacement Desiccant Cartridge		$ 17	

Chart Recorder- Duel Pen	$1,657		$1,657
Chart Recorder Paper		$ 60	
Chart Recorder Replacement Pens		$ 79	
Installation	$1,000		
Total (not including tax and shipping)	**$11,395**	**$1,256 (1st year) $ 505 (subsequent year)**	**$10,395**

Individual Filter Effluent (IFE) Monitoring

There are 353 filter plants in this Commonwealth of which 263 are currently required to continuously monitor and record their IFE and already have instrumentation installed. The amendments require the remaining 90 filter plants to comply with the IFE monitoring requirements of which 69 already have the needed instrumentation. Therefore, 21 filter plants will need to install one or more monitoring and recording device. The majority of these 21 filter plants only have two filters. The estimated cost, for a water supplier having two filters, to install IFE monitoring and recording equipment is expected to be $10,165 for white light turbidimeters or $21,790 for laser turbidimeters. The annual maintenance cost for the monitoring and recording equipment on two filters is estimated to be $757 for the white light turbidimeters or $505 for laser turbidimeters. The cumulative cost for the installation of the IFE monitoring and recording equipment at all 21 filter plants is estimated to be $213,465 for white light turbidimeters or $457,590 for laser turbidimeters, for an average cost of $335,527. The cumulative cost for maintaining the monitoring and recording equipment at all 21 filter plants is estimated to be $15,897 per year for white light turbidimeters and $10,605 per year for laser turbidimeters, for an average annual cost of $13,251. (Note: Significant regulatory proposals relating to turbidity monitoring were deleted between proposed and final rulemaking, as described in responses to Questions 10 and 11. As a result, the number of additional PWSs that will be required to install IFE turbidimeters is reduced further to only those PWSs that do not currently have IFE turbidimeters and are unattended during operation.)

Combined Filter Effluent (CFE) Monitoring

The majority of filter plants in this Commonwealth already continuously monitor and record their CFE. The exact number of filtration plants without this capability is not known, but based on a review of 90 filtration plants, it is estimated to be 15% of the 353 filter plants in this Commonwealth. The estimated cost to install CFE monitoring and recording equipment is $5,627 per plant for white light turbidimeters and recorders or $11,395 per plant for laser turbidimeters and recorders. The annual maintenance cost for the monitoring and recording equipment is estimated to be $757 for the white light turbidimeters or $505 for laser turbidimeters. The cumulative cost for an estimated 52 filter plants to install continuous monitoring and recording equipment is estimated to be $292,604 for white light or $592,540 for laser turbidimeters, for an average cost of $442,572. The cumulative cost for maintaining the monitoring and recording equipment at all 52 filter plants is estimated to be $39,364 per year for white light turbidimeters or $26,260 per year for laser turbidimeters, for an average annual cumulative cost of $32,812.

Annual Filter Inspection Program

No additional costs are expected to be associated with implementation of a filter inspection program as this will be included in the duties of existing PWS staff.

Filter-To-Waste
No expected costs are associated with the proposed filtering to waste amendments.

Automatic Alarms and Shutdown Capabilities
The following information is provided as example cost estimates related to adding automated alarm and shutdown capabilities at a small surface/GUDI water filtration plant. The costs include the monitor/controller and alarm dial-out system. It is assumed that the existing filtration plant will already have the chlorine residual analyzer, turbidity analyzer and clearwell level transmitter. An estimated cost for the equipment installation is provided. However, systems could save costs if they install using in-house staff or local contract electrician.

The controller/monitor will include adjustable alarm set-points with time delay for a relay output which can be wired to the plant for shut down of the filter system upon the following conditions:

- High or Low Clear Well Level
- High or Low Entry Point Chlorine Residual
- High CFE Turbidity

The monitor/controller can be configured to send a pre-shut down warning to allow operators the opportunity to go to the plant to try to resolve the problem before reaching the shut-down set-point. If the process value reaches the shut-down set-point, the filter plant shut-down command will occur and a shut-down alarm message will be sent to the plant operator by text message, email or voice message. If the facility already has an alarm dialer with capacity for three additional alarm inputs, the alarm dialer can be eliminated from the package. A deduction is shown for this on each equipment option. If the system is staffed continuously, then only alarm capabilities are necessary. This can be accomplished for a lower cost, possibly no additional cost depending on the capability of existing filter plant supervisory control and data acquisition (SCADA) equipment. A description of the options follows, with associated estimated costs.

Option A – Monitor/Alarm System with Standard Dialup Phone Line and Phonetics Alarm Dialer
1) One alarm control device with analog inputs for the following:

- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One Phonetics eight-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.

6) Four Operation and Maintenance (O&M) Manuals with complete Instruction Manuals for the above system.

Total System Price: $8,860
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000
Deduct for use of Owner Furnished Alarm Dialer: ($1,400)

Option B – Monitor/Alarm System with Standard Dialup Phone Line and Alarm Dialer
1) One alarm control device with analog inputs for the following:

- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One eight-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.
6) Four O&M Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,980
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000
Deduct for use of Owner Furnished Alarm Dialer: ($2,500)

Option C – Monitor/Alarm System with Cellular Alarm Dialer
1) One alarm control device with analog inputs for the following:

- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One cellular alarm notification system with eight-channel alarm input with power supply and battery backup. No dial-up telephone line is required. Provides text and email alarm notification.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.

6) Four O&M Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,700
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000

The Department estimates that 10% of the 353 filter plants in this Commonwealth will need to install a controller. The cumulative installation cost for an estimated 35 filter plants to comply with automated alarms and shutdown capability is estimated to be between $380,100 and $419,300.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

All CWSs will be expected to review their existing emergency response plan and equipment to specifically develop an Uninterrupted System Service Plan (USSP) using the form developed by the Department to provide a consistent supply of adequate quantity and quality of water during emergency situations. The Department estimates that 400 CWSs do not have an updated emergency response plan. CWSs that do not have a functional generator or do not have existing capability to meet this requirement using the alternate provision options may need to purchase a generator. The generator should be adequately sized such that it can supply power to critical treatment components necessary to supply safe and potable water. Therefore, the cost of the generator will be proportional to the size of the system (in other words, less expensive for small systems). It is difficult to predict system specific costs because of the various options to comply with the amendments. Estimates for small systems are $3,000 - $4,000 per system for the installation of a transfer switch, generator and concrete pad. With revisions made in response to comments, small systems may also explore the lower cost option to rent a portable generator for the following costs: Compact portable generator = $70/per day for single day use or $35/day for a weekly rental cost; Mobile towable generator = $320/per day for single day use or $140/day for a weekly rental cost. Costs for medium and large systems could range from $50,000 - $200,000 per treatment plant. Not all systems will require auxiliary power. Some systems may already meet reliability criteria through storage or interconnections. Several mid-Atlantic states have already moved forward with mandatory requirements for auxiliary power supply including New Jersey, New York and Connecticut.

In order to accommodate the variety of system specific differences that must be addressed in this provision, the Department has included the option for the submission of a schedule for necessary improvements which have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP. More specifically, this new approach requires certification of completion of the USSP form created by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist which prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the community water supplier has not addressed those deficiencies by the deadline for USSP submittal, a schedule will need to be submitted within six months which includes detailed corrective actions and corresponding completion dates. These significant regulatory modifications will help enable the cost for compliance with these provisions to be spread out over a longer period of time. Additionally, these revisions will provide water suppliers with even more

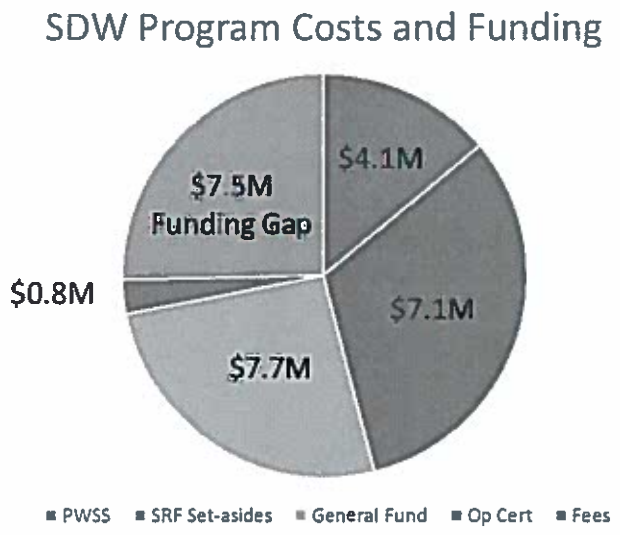
flexibility in choosing the approach that best suits their particular water system, and adequate time to implement that plan in the most effective manner.

An estimated 30% of small systems (<3,300) or 485 systems may need to use rental services for a portable generator, or install a back-up power supply. Assuming that 50% of these small systems will rent a generator and 50% will install their own equipment, the cumulative cost is estimated to be $1,115,620. The estimate for medium and large systems is that 20% or 65 systems may need to install a back-up power supply at a cumulative cost of $8,125,000. Between proposed and final rulemaking, the Department expanded the combination of alternate provisions systems may use, and included more flexibility to potentially spread the cost of compliance over a longer period of time. As such, the costs have been spread out over an anticipated five-year period.

Please see Question 17 for additional information, including information related to potential cost savings.

New Annual Fees and Increased Permit Fees

The current funding available to administer the Safe Drinking Water Program from State and Federal sources is $19.7 million (see chart below). The new fees will generate approximately $7.5 million, which would allow the Safe Drinking Water Program to restore staffing levels and reverse the decline in services that has occurred since 2009. The new fees will provide nearly 50% of the Commonwealth's share of funding for the Safe Drinking Water Program. The remaining portion of the Commonwealth's share ($7.7 million) is expected to be provided through annual General Fund appropriations. If appropriations from the General Fund do not keep pace with program costs, a funding gap could remain even with this final-form rulemaking regulation.



Federal sources currently provide approximately $11.2 million to fund the Pennsylvania Safe Drinking Water Program, including:

- Public Water System Supervision (PWSS) grant ($4.1 million) – used for personnel costs; lab costs; staff training
- State Revolving Fund Set-asides grant ($7.1 million) – used for personnel costs; capability enhancement programs (training, technical assistance, optimization programs); source water assessment and protection; PADWIS; assistance grants/contracts

The Commonwealth currently provides approximately $8.5 million to fund the program through the following sources:

- General Fund appropriations (~$7.7 million) – used for personnel costs
- Operator Certification fees ($0.8 million) – used for Operator Certification Program implementation costs

With the addition of the $7.5 million expected to be generated from this final-form rulemaking, the funds available for the Safe Drinking Water Program should total $27.2 million.

The new fees apply to all 8,521 PWSs, which include 1,952 CWSs, 6,397 noncommunity water systems (NCWSs) and 172 bottled and vended water systems, retail water facilities, and bulk water hauling systems (BVRBs). The new annual fees range from $250 - $40,000 for CWSs, $50 - $1,000 for NCWSs, and $1,000 - $2,500 for BVRBs. If passed on to their customers, these annual fees would result in an increase in cost ranging from $0.35 to $10 per person per year, depending on the water system size. These new annual fees, as well as the increases in permit fees (explained further below), are expected to generate the $7.5 million necessary to restore staffing levels and to provide services required under the SDWA to the 8,521 public water systems in the Commonwealth and the 11.3 million customers they serve.

Section 109.1413 (relating to evaluation of fees) of the final-form rulemaking provides for a review of the fee structure every three years to ensure that the fees continue to adequately supplement the cost of maintaining the program.

As provided in section 14 of the SDWA (35 P.S. § 721.14), all fees would be paid into the State Treasury into a special restricted revenue account in the General Fund known as the Safe Drinking Water Account administered by the Department. The funds may only be used for such purposes as are authorized under the SDWA.

Annual Fees for CWSs

The following table summarizes the annual fees for CWSs, which are based on population and range from $250 to $40,000. The per-person costs range from $0.35 to $10/person/year.

CWS Annual Fees (Based on Population)		
Population Served	**Annual Fee**	**Cost/Person/Year**
100 or less	$250	$2.50 - $10.00
101 – 500	$500	$1.00 - $4.95
501 – 1,000	$1,000	$1.00 - $2.00
1,001 – 2,000	$2,000	$1.00 - $2.00
2,001 – 3,300	$4,000	$1.21 - $2.00
3,301 – 5,000	$6,500	$1.30 - $1.97
5,001 – 10,000	$10,000	$1.00 - $2.00
10,001 – 25,000	$20,000	$0.80 - $2.00
25,001 – 50,000	$25,000	$0.50 - $1.00
50,001 – 75,000	$30,000	$0.40 - $0.60
75,001 – 100,000	$35,000	$0.35 - $0.47
100,001 or more	$40,000	≤ $0.40

The Department analyzed the cost of providing services to administer the SDWA and its regulations. The cost of some services can be estimated, while the cost of other services depends on the specific

circumstances and will vary widely. The table below summarizes the Department's costs of providing those services that can be estimated for CWSs serving various populations. The hourly rate was provided by the Department's fiscal office and includes salary, benefits, and in-direct costs (such as supplies).

DEP Cost of Services That Can Be Estimated				
Activity	**Hours/Activity/Year for CWSs Serving the Following Population**			
	<750	**750-5,000**	**5,000-50,000**	**>50,000**
Conduct sanitary surveys	7.5	10	25	37.5
Conduct other inspections	2.5	3.3	5	10
Determine compliance	12	12	15	15
Maintain PADWIS/eFACTS	7.5	7.5	10	10
Review plans/reports	7.5	10	15	15
Provide technical assistance/ training	7.5	7.5	10	10
Total Hours	**44.5**	**50.3**	**80**	**97.5**
@ $49/hr =	**$2,180**	**$2,465**	**$3,920**	**$4,778**

Examples of other services and costs that involve variable circumstances and preclude a single estimate for the services include the following:

- Sanitary surveys that take longer to conduct due to the complexity or size of the water system. Examples of actual hours expended and costs to complete more complicated sanitary surveys at large water systems (namely, those serving populations > 50,000) are as follows:
  - System A (population = 57,000): 40.5 hours at a cost of $1,984
  - System B (population = 66,500): 40 hours at a cost of $1,960
  - System C (population = 87,000): 49 hours at a cost of $2,401
  - System D (population = 105,000): 60 hours at a cost of $2,940
  - System E (population = 120,000): 60 hours at a cost of $2,940
  - System F (population = 747,500): 103 hours at a cost of $5,047
  - System G (population = 1.6 million): 124 hours at a cost of $6,076

- Additional follow-up actions taken by the Department in response to a violation. When a drinking water standard is exceeded, Department staff are responsible for consulting with and providing direction to the water system; ensuring that public notice is complete, timely and repeated as needed; tracking, reviewing and approving follow-up and corrective actions (such as collecting confirmation or additional samples, repairing/replacing/installing water treatment, or taking contaminated sources off line); and determining when the system has returned to compliance.

  For example, in 2016, monitoring results for a large Pennsylvania water system indicated the 90th percentile lead value exceeded the action level established in the Lead and Copper Rule. This triggered lead service line replacement actions. Department staff spent at least 116.5 hours working to address this important issue. Services provided by the Department to achieve compliance included meetings, file reviews, drafting compliance documents, follow up action reviews and letters. The approximate cost for these services was $5,708.

- Additional follow-up, corrective and emergency actions taken by the Department in response to a water supply emergency. Water supply emergencies occur each year and require substantial

resources from the Department. The following are examples of emergencies and associated costs for services provided by the Department:

- In the Spring of 2011, unexpected damage to a very large water main resulted in a major leak, loss of significant water quantity and pressure. The result was closure of multiple businesses and government agencies in a large city within this Commonwealth for three days due to lack of a potable water supply. This emergency spanned approximately five consecutive days with approximately 66,500 customers impacted. The Department provided a variety of onsite support services at the site of the break, and at the drinking water filtration plant. Department cost for services provided during this event equates to approximately160 hours of staff time and a cost of $7,840.
- During the Summer of 2012, significant construction delays in completing critical renovations and upgrades to a water filter plant threatened the ability to provide an adequate quantity of drinking water to approximately 210,000 customers. Department staff provided a variety of specialized engineering and operational support services over the course of several weeks. Total cost estimate of Department services provided during this event includes 600 hours of staff time costing approximately $29,400.
- In the Summer of 2015, runoff from a large fire at an industrial facility severely contaminated the intakes for two PWSs thereby rendering their normal source of surface water untreatable for almost three months. Together, the two public water suppliers impacted provided drinking water to approximately 43,000 customers. Several Department staff were involved in providing a wide variety of emergency support services, over the course of several months, to the water suppliers affected. Department cost estimates for this event include 515 staff hours ($25,235) and emergency sampling costs ($17,818). The total cost of Department services provided was approximately $43,053.
- In the winter of 2016, an equipment failure resulted in flooding at a surface water filtration plant which provides water to approximately 20,000 customers. This immobilized treatment and pumping capabilities for six consecutive days. The filter plant did not resume normal operations for approximately two weeks. Without combined efforts by the water system, the Department and neighboring water systems, 20,000 customers could have endured consecutive days without an adequate supply of water. Department services included coordination with neighboring water systems to identify alternate sources of water, emergency permit considerations, site assessments, engineering and operational support. Additionally, the Department loaned the public water system critical water quality monitoring equipment (valued at approximately $24,000) for approximately 10 weeks to help verify that safe water was consistently provided. The total cost estimate of Department services provided during this event also includes 300 hours of staff time, which cost approximately $14,700.

- The cost of samples collected by the Department during inspections and FPPEs, in response to complaint investigations, and to assess water quality and protect public health during water supply emergencies. These sampling costs range from $30 for inorganic analyses to $400 for pesticides to $1,200 for analysis of *Cryptosporidium* and Giardia to $2,968 for a complete emergency sampling suite. Total Department lab costs average approximately $680,000 per year.
- The costs associated with additional training when new regulations are promulgated. One example is the numerous training sessions that were developed and delivered in 2015 - 2016 to

roll-out implementation of the Revised Total Coliform Rule (RTCR) adopted to conform to Federal requirements. This training included eight different training courses, workshops and webinars; that were presented 160 times across the Commonwealth; for a total of 482 hours of training. The cost to deliver 482 hours of training was $23,618.

- The costs associated with specific follow-up actions established in new regulations. The Federal RTCR became effective on April 1, 2016, and the Department and EPA shared enforcement of the Federal rule until the Commonwealth's regulations were published as final on September 24, 2016. As part of the Department's enforcement responsibilities during this interim period, staff conducted Level 2 assessments at public water systems. A Level 2 assessment is triggered when a public water supply has an *E. coli* MCL violation or when two total coliform triggers occur during a 12-month period. During this interim period, Department staff completed 94 Level 2 Assessments at more than 85 regulated public water systems. These assessments identified over 400 defects that have already been, or are being, corrected, thereby improving public health protection. Estimated costs for services provided by the Department were approximately $3,000 per assessment for a total cost of $282,000.

The additional costs described in the first four bulleted items above are more evident in medium and large water systems due to their size, age, complexity, and number of customers at risk. Because these additional costs are variable, it is not possible to establish an average cost for these services. However, these additional costs were considered when determining the annual fees for the medium and large water systems because these costs are for services that the Department provides as part of its administration of the Safe Drinking Water Program.

The annual fees could have been based solely on the costs for the services that could be estimated above. However, that approach would have resulted in a disproportionate impact on the smallest CWSs and would have failed to account for the additional costs incurred by the Department to provide services that cannot be readily estimated, such as those described above, which result in substantially higher costs for medium and large water systems. Thus, the annual fees were developed to bear a reasonable relationship to the actual costs of the services provided while achieving a reasonable cost to the 11.3 million customers served.

Other Annual Fees

Regarding the other annual fees, fees for nontransient noncommunity water systems (NTNCWS) range from $100 to $1,000; annual fees for transient noncommunity water systems (TNCWS) range from $50 to $500; annual fees for bottled water systems are $2,500; and annual fees for BVRBs are $1,000.

These fees were determined using the same criteria as discussed above and are illustrated in the following table. The total hours for services that can be estimated were as follows:

- For NTNCWSs, the total hours ranged from 16 to 22 hours.
- For TNCWSs, the total hours ranged from 8 to 13 hours.
- For BVRBs, the total hours ranged from 21 to 26 hours.

Annual Fees vs. Cost Per Person Per Year				
Population Served	**Annual Fee**	**Cost Per Person Per Year**	**Estimated Cost of Services**	**Cost Per Person Per Year**
NTNCWSs:				
–100 or less	$100	$1.00 - $4.00	$784	$7.84 - $31.36
101 – 500	$250	$0.50 - $2.48	$784	$1.57 - $7.76
501 – 1,000	$500	$0.50 - $1.00	$784	$0.78 - $1.56
1,001 – 3,300	$750	$0.23 - $0.75	$1,078	$0.33 - $1.08
3,301 or more	$1,000	$0.30 or less	$1,078	$0.33 or less
TNCWSs:				
100 or less	$50	$0.50 - $2.00	$392	$3.92 - $15.68
101 – 500	$100	$0.20 - $0.99	$392	$0.78 - $3.88
501 – 1,000	$200	$0.20 - $0.40	$392	$0.39 - $0.78
1,001 or more	$500	$0.50 or less	$392	$0.39 or less
BVRBs:				
Bottled	$2,500	N/A	$1,274	N/A
Vended	$1,000	N/A	$1,029	N/A
Retail	$1,000	N/A	$1,029	N/A
Bulk	$1,000	N/A	$1,029	N/A

The number of customers served is based on the Department's public water system inventory, PADWIS, at the time of billing for annual fees.

The Department will allow quarterly payments for fees of $6,500 or more.

Permitting Fees for Community and Noncommunity Water System and for BVRBs

The increased permit fees range from $100 to $10,000 depending on the population served and whether the permit is for major or minor construction.

The permitting fees were determined using a workload analysis. Costs were assigned based on the relative complexity of the permit review. Permit fees have not been increased since they were originally adopted in 1984.

The Department used the following milestones or steps in the permit review process (with time ranges in hours) to calculate the fees in the final-form rulemaking:

- Administrative completeness review (1 hour)
- Technical review (range of 1 – 153 hours, average of 32 hours)
- Preparation of the construction permit (2 hours)
- Pre-operational inspection (1 – 3 hours)
- Preparation of the operation permit (1 hour)

A figure of $64 per hour was used for technical staff time.

The amended permit fees are indicated below:

Title	Permit Fees
Permitting Fees (CWSs and NCWSs):	
Permit/Major Amendment	$300 - $10,000
Minor Amendment	$100 - $5,000
Operations Permit	$50
Emergency Permit	$100
Change in Legal Status	$100
Permitting Fees (BVRBs):	
Permit/Major Amendment	$500 - $10,000
Minor Amendment	$100 - $1,000
Operations Permit	$50
Change in Legal Status	$100
Out-of-State Bottled Water	$1,000
Emergency Permit	$100
Noncommunity Water System	
Application for Approval	$50
4-log Permit	$50
Feasibility Study Fees:	
Feasibility Study	$300 - $10,000
Monitoring Waiver Fees/Source:	
VOC Use	$100
SOC Use	$100
SOC Susceptibility	$300
IOC	$100

Permitting Fees for General Permits

Fees for general permits will be established in the general permit and will not exceed $500. The fee for each general permit will be based on a workload analysis prepared prior to issuance of a draft of the general permit for public comment and will reflect the Department's estimated cost for reviewing and approving coverage under the general permit.

Failure to Remit Fees

As requested by TAC, 6% interest will be added for systems that do not pay their annual fees in a timely manner.

The interest charges are extra costs associated with the collection of overdue fees. Section 4(c) of the SDWA provides that Department fees are to ". . . bear a reasonable relationship to the actual cost of providing a service." The interest charges relate to extra services necessary to collect overdue fees such as reminder notice mailings, NOV mailings, phone calls and emails to delinquent payers. The amount of interest actually charged will depend on how long it takes for the PWS to pay the overdue amount. The longer it takes to collect the fee, more services will be required of the Department to collect the overdue fee and the interest charges associated with that service.

This regulation also allows the Department to suspend technical services, such as issuing monitoring waivers, plan approvals or permits, for water systems with delinquent fees in excess of 180 days.

(20) Provide a specific estimate of the costs and/or savings to the **local governments** associated with compliance, including any legal, accounting or consulting procedures which may be required. Explain how the dollar estimates were derived.

The only costs to local government will be costs incurred by systems that are owned and/or operated by local government. The cost estimates are based on the figures in Question 19.

Source Water Protection and Permitting

Of the 30 new sources permitted each year, approximately 19 are expected to occur at local-government-owned systems. The cumulative cost paid by the 19 systems to professional geologists will amount to approximately $22,344 per year. These amendments should result in cost savings due to the avoidance of unnecessary water treatment (when sources are adequately protected), and the avoidance of costly mistakes in the permitting process.

Surface Water and GUDI Filter Plants

Approximately two-thirds of all filter plants are owned and/or operated by local governments. The total cost to local government for the revisions associated with filter plants are as follows:

- There are approximately nine plants that need to add equipment to comply with the IFE requirements. The initial expected cumulative cost for the nine plants is $91,485, or $10,165 per plant with a cumulative annual maintenance cost of $6,813, or $757 per plant.
- There are approximately 35 plants that need to add equipment to comply with the CFE requirements. The initial expected cumulative cost for the 35 plants is $196,945, or $5,627 per plant with a cumulative annual maintenance cost of $26,495, or $757 per plant.
- There are approximately 24 plants that need to add equipment to comply with the alarm and shutdown requirements. The initial expected cumulative cost for the 24 plants is $260,640, or $10,860 per plant.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

All 1,952 CWSs are expected to review their existing emergency response plans to determine the adequacy of consistently providing adequate quantity and quality of water during emergency situations. Approximately 737 CWSs are owned and operated by local governments.

Please see Question 17 for additional information.

(21) Provide a specific estimate of the costs and/or savings to the **state government** associated with the implementation of the regulation, including any legal, accounting, or consulting procedures which may be required. Explain how the dollar estimates were derived.

The costs to state government will be those incurred by systems that are owned and/or operated by state government and the costs to the Department associated with implementing and administering the rule. The cost estimates are based on the figures in Question 19.

Source Water Protection and New Source Permitting Requirements

State costs associated with administering these revisions are not expected to substantially increase or decrease.

Of the 30 new sources permitted each year, no more than one is expected to occur at any state-owned system. The approximate cost paid to a professional geologist will amount to approximately $1,176 per year.

Surface Water and GUDI Filter Plants

State costs associated with administering these revisions are not expected to substantially increase or decrease. The amendments are intended to identify Tier 1 violations that previously would have gone unnoticed. As a result, staff time related to compliance and enforcement could increase. However, the amendments are also intended to identify and correct water system deficiencies before they worsen to the point of a Tier 1 violation, which would result in a reduction of staff time spent on compliance and enforcement. Overall, the amendments are expected to result in more efficient use of staff time.

Fifteen filter plants are owned and/or operated by the Commonwealth. The total cost to the Commonwealth for these systems is estimated as follows:

- There are no IFE costs, because all state-owned filter plants already have IFE instrumentation.
- There are approximately three plants that need to add equipment to comply with the CFE requirements. The initial expected cost is $16,881, or $5,627 per plant with an annual maintenance cost of $2,271, or $757 per plant.
- There are approximately two plants that need to add equipment to comply with the alarm and shutdown requirements. The initial expected cost is $21,720, or $10,860 per plant.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

After evaluation of both state costs and savings associated with administering these revisions, costs are not expected to substantially increase or decrease. The amendments are intended to strengthen the capability of a water supplier to consistently provide an adequate quantity and quality of water during emergency situations. As a result, staff time related to reviewing the revised portion of emergency response plans related to this requirement may increase during the initial inspection cycle following the rule. However, by reducing the frequency and duration of emergency situations and associated health advisories, the amendments should also decrease staff time responding to these types of events in the long run.

Approximately 21 CWSs are owned and/or operated by the Commonwealth, 18 of which serve less than 3,300 customers.

(22) For each of the groups and entities identified in items (19)-(21) above, submit a statement of legal, accounting or consulting procedures and additional reporting, recordkeeping or other paperwork, including copies of forms or reports, which will be required for implementation of the regulation and an explanation of measures which have been taken to minimize these requirements.

Source Water Protection and New Source Permitting Requirements

CWSs will only be required to update their source water assessment report if the annual water system evaluation identifies changes to actual or potential sources of contamination. To minimize the reporting burden, these reports are not required to be submitted to the Department. Also, wherever possible, modifications to existing report forms were used as a method to comply rather than creation of additional report forms.

Surface Water and GUDI Filter Plants

- PWSs that exceed the lower IFE triggers will have additional reporting requirements using existing forms.
- PWSs that experience a failure of alarm or shutdown equipment will be required to report the failure to the Department within 24 hours. This can be done verbally and using existing forms.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

CWSs will be required to update their existing emergency response plans to include specific information on how they will meet the resiliency requirements. To minimize the reporting burden and for maintaining security of sensitive documents, the system specific plans for providing a continuous supply of safe and potable water (Uninterrupted System Service Plan – USSP) will not be required to be reported to the Department; rather, this information will be kept onsite for Department review during inspections and/or emergencies. A USSP template will be provided which water suppliers must complete. Water suppliers must also submit a certification form (also provided by the Department) to verify that the USSP has been completed and is available for Department review upon request.

Comprehensive Monitoring Plan

PWSs will be required to submit a comprehensive monitoring plan using a template provided by the Department or an equivalent form.

(22a) Are forms required for implementation of the regulation?
Yes.

(22b) If forms are required for implementation of the regulation, **attach copies of the forms here.** If your agency uses electronic forms, provide links to each form or a detailed description of the information required to be reported. **Failure to attach forms, provide links, or provide a detailed description of the information to be reported will constitute a faulty delivery of the regulation.**

In most cases, information necessary for this regulation will not need to be reported using forms. Rather, systems will need to maintain information on-site for Department review during inspections. In the cases where new information will need to be reported, existing forms (already required) will be modified wherever possible to reduce reporting burden, as opposed to creating new forms.

§109.503(a)(1)(iii)(A) - Requires source water assessment of each new raw water source. Reporting forms will not be required. Source water assessment information will be included in a technical report (existing requirement) submitted as part of the permit application.

§109.503(a)(1)(iii)(B) – Requires pre-drilling plan for new groundwater sources. Reporting forms will not be required. Submittal of the individual components of a pre-drilling plan is an existing requirement (per § 109.503(a)(1)(iii) and Module 3 of the permit application) to obtain a permit. The modification in the final-form rulemaking simply clarifies when this information will need to be reported—prior to drilling the well.

§109.503(a)(1)(iii)(E) – Requires a hydrogeologic report for new groundwater sources. Reporting forms will not be required. A hydrogeologic report is an existing requirement of the permit application process. The modification simply clarifies when this information will need to be reported.

§109.705(a)(1)(iii) (relating to system evaluations and assessments) – Requires revision of the source water assessment if inspection of a source water protection area identifies changes to actual/potential

sources of contamination. In order to reduce the reporting burden, water suppliers will not have to report information to the Department on a routine basis but would retain the information on-site for review during inspections.

§109.713(b) (relating to source water protection program) – Requires submission of annual update for any CWS electing to obtain DEP approval of a voluntary local source water protection program. This does require a form. The existing form, Annual Wellhead Protection Program Update, will be revised for use with surface-water systems. An updated draft is attached.

The Uninterrupted System Service Plan (USSP) draft template is attached.

The Comprehensive Monitoring Plan draft template is attached.

(23) In the table below, provide an estimate of the fiscal savings and costs associated with implementation and compliance for the regulated community, local government, and state government for the current year and five subsequent years.

	Current FY 2017/18	FY +1 2018/19	FY +2 2019/20	FY +3 2020/21	FY +4 2021/22	FY +5 2022/23
SAVINGS:	**$**	**$**	**$**	**$**	**$**	**$**
Regulated Community	$00.00	$1,742,958	$1,742,958	$1,742,958	$1,742,958	$1,742,958
Local Government	See note #1	See note #1	See note #1	See note #1	See note #1	See note #1
State Government	See note #1	See note #1	See note #1	See note #1	See note #1	See note #1
Total Savings	$00.00	$1,742,958	$1,742,958	$1,742,958	$1,742,958	$1,742,958
COSTS:						
Regulated Community	$00.00	$3,126,866	$1,929,467	$1,927,467	$1,929,467	$1,929,467
Local Government	$00.00	$1,188,209	$733,198	$733,198	$733,198	$733,198
State Government	$00.00	$31,268	$19,295	$19,295	$19,295	$19,295
Total Costs	$00.00	$3,126,866	$1,929,467	$1,929,467	$1,929,467	$1,929,467
REVENUE LOSSES:						
Regulated Community	$0	$0	$0	$0	$0	$0
Local Government	$0	$0	$0	$0	$0	$0
State Government	$0	$0	$0	$0	$0	$0
Total Revenue Losses	$0	$0	$0	$0	$0	$0

Notes:

1. Cost savings include the potential water outages and/or boil water advisories (BWA) that may be avoided through increased system resiliency (installation of back-up power supply or other measures). The regional economic cost savings would be more than $58 million annually, and include the total value of economic activity lost among businesses directly affected by the water service disruption, due to contraction in business activity during the water outage and/or BWA.

Cost savings to the regulated community include PWSs that are owned/operated by local or state government. Please refer to Question 17 for additional information about cost savings.

2. These provisions will not affect all systems every year. For the purposes of the table above, the one-time capital improvement/installation costs are included in the year in which installation is expected. For example, the back-up power supply costs are spread out over years FY +1 to FY +5. FY +1 year includes all other one-time costs. Annual costs are included for each FY.
3. The new annual fees are not included in this table. The annual fees are expected to be passed on to consumers as a user fee.
4. Costs for the regulated community are the costs for all PWSs, which include the cost to local and state government PWSs.
5. State government costs are the portion of the total costs for state government-owned PWSs (1% of all PWSs).
6. Local government costs are the portion of the total costs for local government-owned PWSs (38% of all PWSs).

(23a) Provide the past three-year expenditure history for programs affected by the regulation.

Program	FY -3 2014/15	FY -2 2015/16	FY -1 2016/17	Current FY 2017/18
Environmental Program Operations	$6,972,000	$6,803,000	$7,079,000	$2,525,000
Environmental Program Management	$296,000	$334,000	$366,000	$208,000
General Government Operations	$0	$0	$0	$0
Safe Drinking Water Act	$51,000	$62,000	$55,000	$50,000

(24) For any regulation that may have an adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), provide an economic impact statement that includes the following:

(a) An identification and estimate of the number of small businesses subject to the regulation.
(b) The projected reporting, recordkeeping and other administrative costs required for compliance with the proposed regulation, including the type of professional skills necessary for preparation of the report or record.
(c) A statement of probable effect on impacted small businesses.
(d) A description of any less intrusive or less costly alternative methods of achieving the purpose of the proposed regulation.

Source Water Protection and New Source Permitting Requirements

(a) Of the 30 CWSs expected to permit at least one new source each year, 13 may be considered as being owned by a small business (as defined in Question 15).
(b) Administrative costs associated with these revisions are not expected to substantially increase.
(c) It is estimated to cost an additional $1,176.00 per source to be permitted.

(d) For the source water protection and permitting provisions, no alternative regulatory schemes were considered because the amendments are being made to clarify existing requirements.

Surface Water and GUDI Filter Plants

(a) Of the 353 filter plants, 22 plants are considered as being owned by a small business (as defined in Question 15).
(b) Administrative costs associated with these revisions are not expected to substantially increase. Existing certified operators currently employed by these small systems can comply with the requirements.
(c) Most small systems with filter plants in this Commonwealth already have the instrumentation being required in these provisions. It is estimated that 3 plants will need to install some equipment to monitor for IFE and/or CFE or to meet the alarm requirements. If a system must install equipment for each of these requirements, the cost would equal $25,563 and have an annual maintenance cost of $757.
(d) For the surface water and GUDI provisions, no alternative regulatory schemes were considered because the amendments are being made to clarify existing requirements.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

(a) Of the 1,952 CWSs within this Commonwealth, 924 are considered to be owned by a small business (as defined in Question 15).
(b) Administrative costs associated with these revisions are not expected to substantially increase.
(c) All small CWSs will be expected to review their existing emergency response plan and equipment to specifically develop a plan to provide a consistent supply of adequate quantity and quality of water during emergency situations. CWSs that do not have a functional generator or do not have existing capability to meet this requirement under the alternate provision options, will need to rent or purchase a generator. The generator should be adequately sized such that it can supply power to critical treatment components necessary to supply safe and potable water. Therefore, the cost of the generator will be proportional to the size of the system (namely, less expensive for small systems). It is difficult to predict system specific costs because of the various options to comply with the revisions. Estimates for small systems are $3,000 - $4,000 per system for the installation of a transfer switch, generator and concrete pad. Small systems may also be able to rent a portable generator at the following costs: Compact portable generator = $70/day for single use day or $35/day for a weekly rental cost; Mobile towable generator = $320/day for single use day or $140/day for a weekly rental cost. Not all systems will require auxiliary power. Some systems may already meet reliability criteria through storage or interconnections.
(d) The final-form regulation includes alternative regulatory schemes based on TAC and other public comments. In order to accommodate the variety of system specific differences that must be addressed in this provision, the Department has included the option to submit a schedule for necessary improvements that have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP. More specifically, this new approach requires certification of completion of the USSP form created by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist which prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the CWS has not addressed those deficiencies by the deadline for USSP submittal. The CWS must submit to DEP a schedule within six months which includes detailed corrective actions and corresponding completion dates. These significant regulatory modifications will help enable the PWS to spread out the costs for compliance with these provisions over a longer period of time. Additionally, these revisions will provide water suppliers with even more flexibility in choosing the approach

that best suits their particular water system, and adequate time to implement that plan in the most effective manner. Other lower cost alternatives were added, such as the use of rental generators.

(25) List any special provisions which have been developed to meet the particular needs of affected groups or persons including, but not limited to, minorities, the elderly, small businesses, and farmers.

The amendments should have no effects on one particular group relative to another since it will apply to most of this Commonwealth's population served by PWSs. However, the Safe Drinking Water Program is prepared to develop special provisions or provide special services to accommodate any such group as the need arises.

The Department offers many technical assistance programs that are targeted towards small systems and disadvantaged communities. The Department's Capability Enhancement (CE) program helps small drinking water systems operate more effectively and efficiently by improving the technical, managerial and financial capability of the water system. The CE program provides a mechanism to address the needs of small drinking water systems by evaluating a system's current needs, and then developing an assistance plan to meet those needs. The CE program provides facilitation among all of the parties needed to implement the assistance plan. CE program staff deliver this free on-site assistance through facilitators in conjunction with wage payroll peer water operators employed by the Department. These assistance providers are practicing operators and administrators in local water systems. This program is designed to:

- Enhance the capabilities of system operators to operate their systems in the most professional, effective and efficient manner.
- Enhance the financial and managerial expertise of system owners and operators.
- Empower PWS personnel by providing them with knowledge or access to information that allows them to address any factor that limits the PWS's capability to produce quality and quantity of water in a reliable and efficient manner.
- Ensure that this Commonwealth's water systems are sustainable and are able to meet current and future drinking water demand while protecting public health and the environment and ensuring continued economic growth and development.

For more information about the Department's CE program, please visit DEP's website at: http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/default.aspx

(26) Include a description of any alternative regulatory provisions which have been considered and rejected and a statement that the least burdensome acceptable alternative has been selected.

Annual Fees - Other Alternatives Considered

One approach considered, based on how some other states have established annual fees, is establishing the fee based on the number of service connections associated with the CWS. The two options considered were:

1. Option #1: Annual fee based on the number of service connections (estimating the number of service connections, using a flat rate per connection, and no minimum or maximum fees).

2. Option #2: Annual fee based on the number of service connections (estimating the number of service connections, using a sliding scale rate per connection, and a minimum fee).

Alternate Option #1: Annual Fees Based on Flat Rate Per Number of Connections

The Department does not currently have accurate data on the number of service connections in PWSs in this Commonwealth. This is not a required field in the Federal or Commonwealth databases. To estimate the number of service connections, the population served by the CWS was divided by 2.7 persons per household. The estimated number of connections associated with CWSs within the Commonwealth range from 9 to almost 600,000 per PWS, with total connections estimated to exceed 4.4 million. To base an annual fee on the number of connections, the $7.5 million needed was divided by the estimated number of total connections to derive a per connection fee of $1.70. This per connection fee would equate to an estimated per person cost of $0.63. When the per connection fee was multiplied by the estimated number of CWS connections, the total annual fee paid by CWSs would range from $15.30 to over $1 million (see table below). While this approach may have achieved approximately the same cost per person, the annual fees would not bear a reasonable relationship to the actual cost of providing services to the CWSs. Therefore, this alternative approach to developing the proposed annual fee was not recommended.

Option #1: Annual Fees Based on Flat Rate/Connection vs. Cost of Providing Services				
Population Served	**# Service Connections**	**Annual Fee**	**Minimum Cost of Services**	**% of Cost of Minimum Services**
25	9	$15.30	$2,180	<1 %
125	46	$78.20	$2,180	4 %
750	278	$472.60	$2,180	22 %
3,300	1,222	$2,077.40	$2,465	84 %
10,000	3,704	$6,296.80	$3,920	160 %
50,000	18,518	$31,480.60	$3,920	803 %
100,000	37,037	$62,962.90	$4,778	1,318 %
120,000	45,052	$76,588.40	$4,778	1,603 %
160,000	59,259	$100,740.30	$4,778	2,108 %
250,000	92,592	$157,406.40	$4,778	3,294 %
660,000	244,444	$415,554.80	$4,778	8,697 %
820,000	303,704	$516,296.80	$4,778	10,806 %
1,600,000	592,593	$1,007,408.10	$4,778	21,084 %

Alternate Option #2: Annual Fees Based on Sliding Rate with Minimum Fee

A second per connection option considered was to use a sliding scale fee per connection. As illustrated in the table below, the annual fees generated using a sliding scale would not bear a reasonable relationship to the actual costs of the services provided. Therefore, this alternative approach to developing the proposed annual fees was not recommended.

	Option #2: Annual Fees Based on Sliding Scale/Connection vs. Cost of Providing Services				
Population Served	**# Service Connections**	**Sliding Scale Fee Per Connection**	**Annual Fee**	**Minimum Cost of Services**	**% of Cost of Minimum Services**
25	9	Flat fee	$250.00	$2,180	11 %
125	46	Flat fee	$250.00	$2,180	11 %
750	278	$3.20	$889.60	$2,465	36 %
3,300	1,222	$3.20	$3,910.40	$2,465	150%
10,000	3,704	$3.00	$11,112.00	$2,465	450 %
50,000	18,518	$1.70	$31,480.60	$3,920	803%
100,000	37,037	$1.50	$55,555.50	$4,778	1,163 %
120,000	45,052	$1.50	$67,578.00	$4,778	1,414 %
160,000	59,259	$1.50	$88,888.50	$4,778	1,860 %
250,000	92,592	$1.50	$138,888.00	$4,778	2,907 %
660,000	244,444	$1.00	$244,444.00	$4,778	5,116 %
820,000	303,704	$1.00	$303,704.00	$4,778	6,356 %
1,600,000	592,593	$1.00	$592,593.00	$4,778	12,402 %

Source Water Protection and New Source Permitting Requirements
No alternative regulatory schemes were considered because the amendments are being made to clarify existing requirements.

Surface Water and GUDI Filter Plants
Consideration was given to requiring plants to be manned during all hours of operation and to mandate shutdown capabilities for all filter plants. Based on feedback from TAC, plants are not being required to be manned at all times. And automatic alarms and shutdown capabilities are only being required for plants that are not attended 24/7.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions
The final-form rulemaking includes alternate provisions that resulted from TAC and other public comments. Please refer to Question 24 for more information.

(27) In conducting a regulatory flexibility analysis, explain whether regulatory methods were considered that will minimize any adverse impact on small businesses (as defined in Section 3 of the Regulatory Review Act, Act 76 of 2012), including:

a) The establishment of less stringent compliance or reporting requirements for small businesses;
b) The establishment of less stringent schedules or deadlines for compliance or reporting requirements for small businesses;
c) The consolidation or simplification of compliance or reporting requirements for small businesses;
d) The establishment of performance standards for small businesses to replace design or operational standards required in the regulation; and
e) The exemption of small businesses from all or any part of the requirements contained in the regulation.

a) Many small businesses will be able to meet the alternate power supply requirements through the use of rental generators.
b) Several of the provisions in the final-form rulemaking have less stringent schedules or deadlines, giving them more time to comply; including the provisions to strengthen resiliency.
c) Neither consolidation nor simplification of compliance or reporting requirements for small businesses was considered.
d) No performance standards for small businesses to replace design or operational standards required in the regulation were considered.
e) No exemptions for small businesses from all or any part of the requirements contained in the regulation were considered because the rules of this Commonwealth and the Federal rules do not allow exemptions simply based on system size. All consumers of PWSs deserve the same quality of drinking water, whether they get their water from a system that serves 25 people or a system that serves 1.6 million people.

Other regulatory methods, beyond those mentioned above, were not considered for this rulemaking as the amendments included in the final-form rulemaking will apply to most of this Commonwealth's population served by PWSs. Further, the impact of this rulemaking – the provision of safe drinking water to this Commonwealth's populace – is unrelated to whether the regulation is implemented by small or large businesses. Ultimately, regulatory compliance puts all of the regulated community in the best position to prove that water they provide is safe to drink, thereby providing necessary protection of public health.

(28) If data is the basis for this regulation, please provide a description of the data, explain in detail how the data was obtained, and how it meets the acceptability standard for empirical, replicable and testable data that is supported by documentation, statistics, reports, studies or research. Please submit data or supporting materials with the regulatory package. If the material exceeds 50 pages, please provide it in a searchable electronic format or provide a list of citations and internet links that, where possible, can be accessed in a searchable format in lieu of the actual material. If other data was considered but not used, please explain why that data was determined not to be acceptable.

Surface Water and GUDI Filter Plants
Historical Department inspection reports and FPPE evaluations of more than 1,250 filters.

The following items are included or attached:

References related to Turbidity Standards
(1) Huck, P.M. et al, 2002. *Effects of Filter Optimization on Cryptosporidium Removal.* Jour. AWWA, 94:6:97.
(2) Emelko, M.B. et al, 2003. *Cryptosporidium and Microsphere Removal During Late in Cycle Filtration.* Jour. AWWA, 95:5:173.

Documentation related to Continuous Turbidity Monitoring and Recording
(3) The link to HACH's product website from which cost information was gathered: http://www.hach.com/1720e-turbidimeter-with-sc200-controller-2-channel/product?id=7640457955
(4) A PowerPoint slide showing a filter profile which demonstrates that turbidity particles and pathogenic cysts that are stored during a filter run can be discharged during a very short period of time as a result of a hydraulic surge. This slide demonstrates the need for continuous turbidity monitoring as this type of filter break through would normally not be identified during 4-hour grab sampling.

(5) EPA Turbidity Provisions; Chapter 7 *Importance of Turbidity* cites and summarizes data, research, and case studies which demonstrate: outbreaks have occurred when turbidity values did not exceed 0.17 NTU or during short increases in turbidity; microbial organisms can be shielded from disinfection by larger organism or particles; and that most pathogens are removed when filter performance is less than 0.10 NTU.

Documentation related to Filter Plant Automation, Alarms and Shutdowns

(6) The results from an ASDWA survey of other states related to turbidity monitoring and plant automation.
(7) Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers *Policy Statement on Automated/Unattended Operation of Surface Water Treatment Plants*.
(8) West Virginia Department of Health's requirements on filter plant automation, alarms and shutdowns.
(9) The link to Raco Verbatim's product website from which cost information was gathered for alarms, phone dialers, and shutdown controllers: http://www.racoman.com/verbatim.html
(10) Cost proposal from Allied Control Services for equipment and installation cost for alarm and shutdown capabilities.
(11) HACH turbidimeter and recorder cost list.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions

Data regarding the number of CWSs without an up-to-date emergency response plan was obtained from PADWIS.

(12) The Department reviewed the back-up power supply requirements for New York, Connecticut and New Jersey.

NSF Requirements

NSF International (2016), "Survey of ASDWA Members on the Use of NSF/ANSI Standards," available at http://www.nsf.org/newsroom_pdf/water_asdwa_survey.pdf

New Annual Fees

Fees were reviewed for all 50 states. The summary of other states' fees is incorporated into this regulatory analysis form in response to Question 12.

(29) Include a schedule for review of the regulation including:

A. The length of the public comment period: 30 days

B. The date or dates on which any public meetings or hearings will be held: N/A

C. The expected date of delivery of the final-form regulation: Quarter 2, 2018

D. The expected effective date of the final-form regulation: Quarter 3, 2018

E. The expected date by which compliance with the final-form regulation will be required: Some provisions are effective upon publication of the final-form rulemaking, other provisions are deferred for up to 3 years.

F. The expected date by which required permits, licenses or other approvals must be obtained: From 1 to 3 years after the publication date of the final-form rulemaking, unless an alternate schedule is approved by the Department.

(30) Describe the plan developed for evaluating the continuing effectiveness of the regulations after its implementation.

Certain provisions in § 109.301(1) and (2) are proposed to sunset in one year. Otherwise, the Board is not establishing a sunset date for this regulation, since it is needed for the Department to carry out its statutory authority. The Department will continue to closely monitor this regulation for its effectiveness and recommend updates to the Board as necessary. Under the final rulemaking, the Department will evaluate the fees every three years and recommend regulatory changes to address any disparity between the program income generated by the fees and the Department's cost of administering the program.

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

Date Received_____

ANNUAL SOURCE WATER PROTECTION PROGRAM UPDATE

THIS FORM SHOULD BE COMPLETED IN ORDER TO MAINTAIN ACTIVE STATUS OF AN APPROVED LOCAL SOURCE WATER PROTECTION (SWP) PROGRAM.

Report for Calendar Year: Jan. 1 To Dec. 31, _____ (Fill in Previous Year)

Source Water Protection Plan Approval Date: _____

RETURN BY MARCH 31 TO THE SAFE DRINKING WATER PROGRAM REGIONAL SOURCE WATER PROTECTION MANAGER AT THE REGIONAL OFFICE THAT SERVES YOUR COUNTY (See page 4).

System Name		System Address
PWSID #	Municipality	System Phone #
Source ID(s) #		County
Contact Person Name & Title		Contact Person Address
Contact Person Phone #		Contact Person E-mail Address

Please answer the following questions as completely as possible, and include additional pages as necessary.

1. **What are your source water protection goals? Please check all that apply.**

   ☐ Protection of existing source water quality.
   ☐ Improvement of existing source water quality.
   ☐ Protection of potential future drinking water source quality (i.e., possible new well locations).
   ☐ Other: _____

2. **Did you have at least one steering committee meeting during the reporting year?**

   ☐ Yes. Please indicate when and attach list of meeting attendees and meeting minutes.
   ☐ No. Please describe what barriers prevented you from having a meeting this year.

   _____

3. **Were there any changes to your drinking water system with respect to your source(s)?**

   ☐ Yes, increases or decreases in withdrawals. Please describe. _____
   ☐ Yes, changes in usage patterns. Please describe. _____
   ☐ Yes, sources abandoned or new sources added. Please describe. _____
   ☐ No.

4. Were there any changes to your drinking water system with respect to land use?

☐ Yes, land use changes in SWP zones. Please describe and attach map.

_____

☐ Yes, system changes driven by land use. Please describe and attach map.

_____

☐ No. (*Verified by previous and current Annual Sanitary Survey (Chapter 109.705) by water supplier)*

5. Which of the following land uses do you consider to be the biggest threat to source water quality? Please check all that apply.

☐ Agricultural
☐ Residential
☐ Industrial
☐ Commercial
☐ Transportation Corridors
☐ Oil and Gas Development
☐ Private or Public Forest Land (timbering)
☐ Other: _____

➢ ***Is this a change from the land use analysis in your Source Water Protection Plan?***

☐ Yes. Please describe.

_____

☐ No. (*Verified by previous and current Annual Sanitary Survey (Chapter 109.705) by water supplier)*

6. Please list your current top three (3) potential sources of contamination (PSOCs):

1. _____
2. _____
3. _____

➢ ***Is this a change from the PSOCs listed in your Source Water Protection Plan?***

☐ Yes. Please describe. _____
☐ No.

➢ ***Are there any new PSOCs?***

☐ Yes. Please list the type, amount, and distance from each water source. Locate the contaminant source(s) on a map as well as the water source and attach to this form.

Type: _____

Amount: _____

Distance: _____

☐ No. (*Verified by previous and current Annual Sanitary Survey (Chapter 109.705) by water supplier)*

7. Is implementation of SWP area management measures in accordance with the implementation schedule in your plan? If not, please explain.

☐ Yes.

☐ No. Please describe parts of plan not on schedule and provide revised implementation dates.

➢ ***Which of the following management options have you implemented this year or already have in place/maintain? Please describe briefly.***

☐ Public Education.

☐ PSOC Outreach.

☐ Projects with Partner Groups.

☐ Coordination with Emergency Responders.

☐ Land Purchase.

☐ Overlay Zoning.

☐ Ordinances.

☐ Other:

➢ ***Please describe future plans and implementation dates for the upcoming year.***

8. What resources you have applied to your program? Please describe briefly.

☐ Personnel Time.

☐ Volunteer Time.

☐ Grants.

_____

☐ Direct Funding.

_____

☐ Other:

_____

9. What partners have you worked with? Please describe briefly.

☐ County Conservation District.

_____

☐ County Planning.

_____

☐ Emergency Responders.

_____

☐ Watershed Association.

_____

☐ Conservation Organization.

_____

☐ Other:

_____

10. Have you updated and coordinated your emergency response plan to include responses to additional incidents that may impact the quality of your drinking water source?

☐ Yes. ☐ No.

11. Have you updated your contingency plan for providing an alternate supply of drinking water as a result of an actual or recently realized potential drinking water source contamination event?

☐ Yes. ☐ No.

12. What barriers, if any, are preventing you from implementing your Source Water Protection Plan in a manner that meets all of your source water protection goals? Please describe briefly.

☐ Lack of Personnel Time.

_____

☐ Lack of Funding.

_____

☐ Lack of Interest by Local Officials.

_____

☐ Lack of Volunteer or Partner Interest.

_____

☐ Lack of Knowledge.

_____

☐ Other:

_____

13. Please add any addition comments you may have.

Comments:

_____
_____
_____
_____
_____
_____
_____
_____

14. Has the Source Water Protection Plan ever been amended?

☐ Yes, and an addendum has been submitted to the Department. Revision Date: _____
☐ Yes, and an addendum will be submitted to the Department. Revision Date: _____
☐ No.

15. Please sign and date.

Signature: _____ Date: _____

DEP REGIONAL OFFICES SAFE DRINKING WATER PROGRAM		
Northwest Region 230 Chestnut St. Meadville, PA 16335-3481 814-332-6899 Counties: Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren	**Northcentral Region** 208 W. Third St., Suite 101 Williamsport, PA 17701 570-327-3636 Counties: Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union	**Northeast Region** 2 Public Square Wilkes-Barre, PA 18711-0790 570-826-2511 Counties: Carbon, Lackawanna, Lehigh, Luzerne, Monroe, Northampton, Pike, Schuylkill, Susquehanna, Wayne and Wyoming
Southwest Region 400 Waterfront Drive Pittsburgh, PA 15222-4745 412-442-4051 Counties: Allegheny, Armstrong, Beaver, Cambria, Fayette, Greene, Indiana, Somerset, Washington and Westmoreland	**Southcentral Region** 909 Elmerton Ave. Harrisburg, PA 17110 717-705-4708 Counties: Adams, Bedford, Berks, Blair, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry and York	**Southeast Region** 2 E. Main Street Norristown, PA 19401 484-250-5900 Counties: Bucks, Chester, Delaware, Montgomery and Philadelphia

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSULVANIA
DEPARTMENTOF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

Comprehensive Monitoring Plan

Complete and submit a copy of this form to the appropriate local DEP office by the dates specified in § 109.717(a).

Safe Drinking Water Program local DEP district offices phone numbers (including 24/7 numbers), mailing addresses and FAX numbers are at this link: http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-117702/3930-FM-BSDW0560.pdf

PART 1: GENERAL SYSTEM INFORMATION

PWS Name:			PWSID:
PWS Type:	☐ CWS ☐ NTNCWS	Population Served:	
Mailing Address:			
Contact Person:			
Phone:		Email:	
Source Types: (check *all* that apply)	☐ **Surface Water** ☐ **Ground Water** ☐ **GUDI – GW under direct influence of SW**	☐ **Purchased Surface Water** ☐ **Purchased Ground Water** ☐ **Purchased GUDI – GW under direct influence of SW**	**Is PWS selling finished water to any other public water system?** ☐ **Yes** ☐ **No**

PART 2: SOURCE TREATMENT PLANT (TP) & ENTRY POINT (EP) INFORMATION

Availability and Type Codes

Availability Codes	Source Type Codes	
P = Permanent R = Reserve *(must be identified in permit)* E = Emergency *(purchased sources only)*	G = Groundwater W = Purchased GW S = Surface Water P = Purchased SW	GUDI = Groundwater Under Direct Influence (of SW) Z = Purchased GUDI

Table 2A – System-owned Sources

Source ID	Source Name	Source Availability	Source Type	Associated TP ID	EP ID	EP Name	EP Availability

Table 2B – Purchased Sources

Source ID	Source Name	Source Availability	Source Type	EP ID	EP Availability	Seller's PWS ID	Distribution Disinfectant Used by Seller

Comprehensive Monitoring Plan

PWD ID# ________

PART 3: NUMBER OF SAMPLES REQUIRED

EP ID	No. Sources	Source Contribution	Description of How Sources Are Used	No. Samples Req'd
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		
		☐ Alternated ☐ Blended ☐ Both ☐ N/A		

NOTES:

- If only 1 source contributes to EP or sources are blended at a consistent ratio, then only 1 sample/EP is needed for each set of compliance monitoring.
- If multiple sources are used that are alternated where each source is operated by itself, then the number of samples needed for each set of compliance monitoring is equal to the number of sources at that EP.
- If multiple sources are used that are alternated differently or that are blended at different ratios then describe how the sources are used and identify the number of samples that will be required for each set of compliance monitoring to ensure all sources are included.
    - If alternated, what conditions determine when the sources are switched (such as a set schedule)? Is the switchover automatic or manual?
    - If blended, how are the sources used and what conditions determine the blending ratio?

PART 4: TREATMENT INFORMATION

For *each* EP ID, check the appropriate box(es) for the contaminant(s) for which treatment has been installed. If no treatment has been installed, check the N/A box for that contaminant group. *(Copy or print additional pages as needed.)*

EP ID	IOCs ☐ N/A		VOCs ☐ N/A		SOCs ☐ N/A	
	☐ Antimony	☐ Cyanide	☐ 1,1-Dichloroethylene*	☐ Benzene	☐ 2,4-D	☐ Endrin
	☐ Arsenic	☐ Fluoride	☐ cis-1,2-Dichloroethylene	☐ Carbon Tetrachloride	☐ 2,4,5-TP	☐ EDB
	☐ Asbestos	☐ Mercury	☐ trans-1,2-Dichloroethylene*	☐ Dichloromethane	☐ Alachlor	☐ Glyphosate
	☐ Barium	☐ Nitrate	☐ 1,2-Dichloroethane*	☐ Ethylbenzene	☐ Atrazine	☐ Heptochlor
	☐ Beryllium	☐ Nitrite	☐ 1,1,1-Trichloroethane*	☐ Monochlorobenzene	☐ Benzo(a)pyrene	☐ Heptachlor epoxide
	☐ Cadmium	☐ Selenium	☐ 1,1,2-Trichloroethane*	☐ Styrene	☐ Carbofuran	☐ Hexachlorobenzene
	☐ Chromium	☐ Thallium	☐ 1,2,4-Trichlorobenzene	☐ Toluene	☐ Chlordane	☐ Hexachlorocyclopentadiene
			☐ 1,2-Dichloropropane	☐ Trichloroethylene*	☐ Dalapon	☐ Lindane
	RADs ☐ N/A		☐ o-Dichlorobenzene	☐ Tetrachloroethylene*	☐ Di(ethylhexyl)adipate	☐ Methoxychlor
	☐ Gross Alpha		☐ para-Dichlorobenzene	☐ Xylenes (total)	☐ Di(ethylhexyl)phthalate	☐ Oxamyl (Vydate)
	☐ Radium 226		☐ Vinyl Chloride		☐ DBCP	☐ PCBs
	☐ Radium 228				☐ Dinoseb	☐ Pentachlorophenol
	☐ Uranium				☐ Dioxin	☐ Picloram
	☐ Gross Beta				☐ Diquat	☐ Simizine
					☐ Endothall	☐ Toxaphene

EP ID	IOCs ☐ N/A		VOCs ☐ N/A		SOCs ☐ N/A	
	☐ Antimony	☐ Cyanide	☐ 1,1-Dichloroethylene*	☐ Benzene	☐ 2,4-D	☐ Endrin
	☐ Arsenic	☐ Fluoride	☐ cis-1,2-Dichloroethylene	☐ Carbon Tetrachloride	☐ 2,4,5-TP	☐ EDB
	☐ Asbestos	☐ Mercury	☐ trans-1,2-Dichloroethylene*	☐ Dichloromethane	☐ Alachlor	☐ Glyphosate
	☐ Barium	☐ Nitrate	☐ 1,2-Dichloroethane*	☐ Ethylbenzene	☐ Atrazine	☐ Heptochlor
	☐ Beryllium	☐ Nitrite	☐ 1,1,1-Trichloroethane*	☐ Monochlorobenzene	☐ Benzo(a)pyrene	☐ Heptachlor epoxide
	☐ Cadmium	☐ Selenium	☐ 1,1,2-Trichloroethane*	☐ Styrene	☐ Carbofuran	☐ Hexachlorobenzene
	☐ Chromium	☐ Thallium	☐ 1,2,4-Trichlorobenzene	☐ Toluene	☐ Chlordane	☐ Hexachlorocyclopentadiene
			☐ 1,2-Dichloropropane	☐ Trichloroethylene*	☐ Dalapon	☐ Lindane
	RADs ☐ N/A		☐ o-Dichlorobenzene	☐ Tetrachloroethylene*	☐ Di(ethylhexyl)adipate	☐ Methoxychlor
	☐ Gross Alpha		☐ para-Dichlorobenzene	☐ Xylenes (total)	☐ Di(ethylhexyl)phthalate	☐ Oxamyl (Vydate)
	☐ Radium 226		☐ Vinyl Chloride		☐ DBCP	☐ PCBs
	☐ Radium 228				☐ Dinoseb	☐ Pentachlorophenol
	☐ Uranium				☐ Dioxin	☐ Picloram
	☐ Gross Beta				☐ Diquat	☐ Simizine
					☐ Endothall	☐ Toxaphene

PART 5: WAIVER INFORMATION

For *each* EP ID, check the appropriate box(es) for the contaminant(s) for which a waiver has been approved. If no waivers have been approved for that contaminant group, check the N/A box. *(Copy or print additional pages as needed.)*

EP ID	IOCs ☐ N/A	VOCs ☐ N/A		SOCs ☐ N/A	
	☐ Antimony	☐ 1,1-Dichloroethylene*	☐ Benzene	☐ 2,4-D	☐ Endrin
	☐ Arsenic	☐ cis-1,2-Dichloroethylene	☐ Carbon Tetrachloride	☐ 2,4,5-TP	☐ EDB
	☐ Asbestos	☐ trans-1,2-Dichloroethylene*	☐ Dichloromethane	☐ Alachlor	☐ Glyphosate
	☐ Barium	☐ 1,2-Dichloroethane*	☐ Ethylbenzene	☐ Atrazine	☐ Heptochlor
	☐ Beryllium	☐ 1,1,1-Trichloroethane*	☐ Monochlorobenzene	☐ Benzo(a)pyrene	☐ Heptachlor epoxide
	☐ Cadmium	☐ 1,1,2-Trichloroethane*	☐ Styrene	☐ Carbofuran	☐ Hexachlorobenzene
	☐ Chromium	☐ 1,2,4-Trichlorobenzene	☐ Toluene	☐ Chlordane	☐ Hexachlorocyclopentadiene
	☐ Cyanide	☐ 1,2-Dichloropropane	☐ Trichloroethylene*	☐ Dalapon	☐ Lindane
	☐ Fluoride	☐ o-Dichlorobenzene	☐ Tetrachloroethylene*	☐ Di(ethylhexyl)adipate	☐ Methoxychlor
	☐ Mercury	☐ para-Dichlorobenzene	☐ Xylenes (total)	☐ Di(ethylhexyl)phthalate	☐ Oxamyl (Vydate)
	☐ Selenium	☐ Vinyl Chloride		☐ DBCP	☐ PCBs
	☐ Thallium			☐ Dinoseb	☐ Pentachlorophenol
				☐ Dioxin	☐ Picloram
				☐ Diquat	☐ Simizine
				☐ Endothall	☐ Toxaphene

EP ID	IOCs ☐ N/A	VOCs ☐ N/A		SOCs ☐ N/A	
	☐ Antimony	☐ 1,1-Dichloroethylene*	☐ Benzene	☐ 2,4-D	☐ Endrin
	☐ Arsenic	☐ cis-1,2-Dichloroethylene	☐ Carbon Tetrachloride	☐ 2,4,5-TP	☐ EDB
	☐ Asbestos	☐ trans-1,2-Dichloroethylene*	☐ Dichloromethane	☐ Alachlor	☐ Glyphosate
	☐ Barium	☐ 1,2-Dichloroethane*	☐ Ethylbenzene	☐ Atrazine	☐ Heptochlor
	☐ Beryllium	☐ 1,1,1-Trichloroethane*	☐ Monochlorobenzene	☐ Benzo(a)pyrene	☐ Heptachlor epoxide
	☐ Cadmium	☐ 1,1,2-Trichloroethane*	☐ Styrene	☐ Carbofuran	☐ Hexachlorobenzene
	☐ Chromium	☐ 1,2,4-Trichlorobenzene	☐ Toluene	☐ Chlordane	☐ Hexachlorocyclopentadiene
	☐ Cyanide	☐ 1,2-Dichloropropane	☐ Trichloroethylene*	☐ Dalapon	☐ Lindane
	☐ Fluoride	☐ o-Dichlorobenzene	☐ Tetrachloroethylene*	☐ Di(ethylhexyl)adipate	☐ Methoxychlor
	☐ Mercury	☐ para-Dichlorobenzene	☐ Xylenes (total)	☐ Di(ethylhexyl)phthalate	☐ Oxamyl (Vydate)
	☐ Selenium	☐ Vinyl Chloride		☐ DBCP	☐ PCBs
	☐ Thallium			☐ Dinoseb	☐ Pentachlorophenol
				☐ Dioxin	☐ Picloram
				☐ Diquat	☐ Simizine
				☐ Endothall	☐ Toxaphene

PART 6: ENTRY POINT SAMPLING INFORMATION

Monitoring Status & Frequency Codes

Monitoring Status Codes	Monitoring Frequency Codes	
I = Initial/Increased	A = Annual	3 = Triennial (every 3 years)
S = Standard/Routine	Q = Quarterly	9 = Every 9 years
R = Reduced	W = Waiver Approved	6 = Every 6 years (RADs only)

NOTE: Samples may be composited for IOCs, VOCs and SOCs (RADs samples may *not* be composited). If the population is greater than 3,300, compositing may only be done at sampling points within a single system. If the population is less than or equal to 3,300, samples may be composited among different systems. No more than 5 samples may be included in the composite sample.

Table 4A – Inorganic Chemicals (IOCs) *Year Waiver Expires:*_____

EP ID	Monitoring		Year Due	Sampling Schedule	Included in Composite?	EPs Included in Composite Sample
	Status	Frequency				

NOTE: Compliance monitoring for contaminants for which treatment has been installed must be conducted at least annually, unless increased monitoring is required. For *each* EP, identify in a separate row any individual contaminants that are on a monitoring frequency that is different from the group frequency.

Table 4B – Volatile Organic Chemicals (VOCs) *Year Waiver Expires:*_____

EP ID	Monitoring		Year Due	Sampling Schedule	Included in Composite?	EPs Included in Composite Sample
	Status	Frequency				

NOTE: Compliance monitoring for all VOCs must be conducted at least annually if any VOC removal treatment has been installed or if any VOCs were previously detected, unless increased monitoring is required.

Table 4C – Synthetic Organic Chemicals (SOCs) *Year Waiver Expires:*_____

EP ID	Monitoring		Year Due	Sampling Schedule	Included in Composite?	EPs Included in Composite Sample
	Status	Frequency				

NOTES: Compliance monitoring for contaminants for which treatment has been installed or that were previously detected must be conducted at least annually unless increased monitoring is required. For *each* EP, identify in a separate row any individual contaminants that are on a monitoring frequency that is different from the group frequency.

Table 4D – Radiological Chemicals (RADs)

EP ID	Contaminant	Monitoring		Year Due	Sampling Schedule
		Status	Frequency		
	Gross Alpha				
	Ra 226/228				
	Uranium				
	Gross Alpha				
	Ra 226/228				
	Uranium				
	Gross Alpha				
	Ra 226/228				
	Uranium				
	Gross Alpha				
	Ra 226/228				
	Uranium				
	Gross Alpha				
	Ra 226/228				
	Uranium				

NOTE: Compliance monitoring for contaminants for which treatment has been installed must be conducted at least annually, unless increased monitoring is required.

PART 7: DISTRIBUTION SYSTEM SAMPLING INFORMATION

Question 7A: Describe how sources that are not used at least once/week are represented in disinfection byproducts sampling:

_____

_____

NOTE: If additional sampling locations are needed or additional monitoring (at existing compliance sampling locations) is needed, update the *Disinfectants/Disinfection Byproducts Monitoring Plan* and attach a copy of the revised plan with this form.

Question 7B. Describe how all sources that are not used at least once/week are captured in coliform and disinfectant residual sampling.

_____

_____

NOTE: If additional sampling locations are needed or additional monitoring (at existing compliance sampling locations) is needed, update the *Coliform Sample Siting Plan & the Distribution Disinfectants Monitoring Plan* and attach a copy of each revised plan with this form.

Question 7C: Describe how all sources that are not used at least once/week are captured in lead and copper and water quality parameter sampling.

_____

_____

NOTE: If additional sampling locations are needed, update the *Lead & Copper Sample Siting Plan* and attach a copy of the revised plan with this form. If additional monitoring (at existing compliance sampling locations) is needed, consult with the appropriate local DEP office to discuss your monitoring requirements.

PART 8: ATTACHMENTS

Attachment 1 – *Coliform Sample Siting Plan*, dated _____ (date of last revision)

Attachment 2 – *Disinfectants/Disinfection Byproducts Monitoring Plan*, dated _____ (date of last revision)

Attachment 3 – *Lead & Copper Sample Siting Plan*, dated _____ (date of last revision)

***Note**: CWS should incorporate this template into their existing Emergency Response Plan.*

DRAFT
Uninterrupted System Service Plan (USSP) Template

Pennsylvania's Community Water System (CWS) sources and treatment facilities are susceptible to emergency situations resulting from both natural and man-made disasters. Examples of emergencies include tropical storms, flooding, high winds, ice, snow, industrial chemical plant runoff, pipeline ruptures, and transportation corridor spills. Chapter 109.708 (a) – (d) amendments are focused on improving the reliability of service provided to all consumers by requiring the development of a feasible plan to consistently supply an adequate quantity of safe and potable water during emergency situations. This Uninterrupted System Service Plan (USSP) Template must be used to develop this important plan. To minimize the reporting burden and for maintaining security of sensitive documents, the completed USSP will not be required to be reported to the Department; rather, this information should be incorporated into existing Emergency Response Plans and kept onsite for Department review upon request. However, as per 109.708 (a) the accompanying certification form must be submitted which verifies completion of this plan, and identifies whether deficiencies have been identified which prevent uninterrupted system service. If applicable deficiencies have not been corrected by the deadlines specified in 109.708 (a), then a detailed corrective action plan and corresponding completion date schedule must be submitted to the Department within 6 months of the dates specified in 109.708(a)(1) – (3). Proposed corrective action schedule for each deficiency should be commensurate with the complexity of associated corrective actions. Once deficiencies are corrected, USSPs should be updated to document the associated improvements and SOPs.

I.General Information

PWS Name:	**PWSID #:**	
Critical Facility Name:	**Critical Facility Capacity:**	MGD
Critical Facility Description:	**Average Daily Demand:**	MGD
Critical Facility Address:	**Available Finished Storage:**	MG
Completed By (Name):	**Hours of Finished Storage:**	
Date Completed:	**Date(s) Updated:**	

II. Plan to Provide Uninterrupted System Service

Please complete all of the below sections based on which provisions your CWS is prepared to utilize to provide adequate quantity and quality of water during emergency situations. Systems are encouraged to be prepared to utilize as many methods as possible to maximize their capability to provide uninterrupted system service for each critical operational facility. It is necessary to carefully consider both the duration of time needed to switchover to a particular system service option as well as the efficacy of each option to provide adequate quantity of safe and potable water. Developing detailed Standard Operating Procedures (SOPs) for utilizing each alternate is critical to insuring efficient and effective implementation during emergency situations. When determining hours of operation or adequacy of finished water storage, systems should consider finished water volumes necessary to maintain adequate operating pressures throughout all portions of the distribution system. A separate template should be completed for each critical facility utilized by the CWS. For the purposes of this template, "critical facility" is defined as any facility necessary to supply adequate quantity and quality of water (e.g. water treatment plants, raw and finished water pump stations, finished water storage tanks, booster chlorination facilities, etc).

(A) Auxiliary Power	Connection to at least two independent power feeds from separate substations
Description of Auxiliary Power	**SOP to Utilize Auxiliary Power**

Additional production capacity provided via this auxiliary power:	MGD
Additional hours of operation provided by this auxiliary power:	Hours
Amount of time needed to switchover to this auxiliary power option:	Hours
Date this auxiliary power was last tested:	
Critical CWS staff needed to utilize this option:	
Critical external staff needed to utilize this option: **24/7 phone numbers for all critical staff:** 1. Name and Number 2. Name and Number 3. Name and Number	

(B) Auxiliary Power	On-site auxiliary power sources – permanent generators
Description of Equipment	**SOP to Utilize Equipment**

Additional production capacity provided via this auxiliary power:	MGD
Additional hours of operation provided by this auxiliary power:	Hours
Amount of time needed to switchover to this auxiliary power option:	Hours
Date this auxiliary power was last tested:	
Critical CWS staff needed to utilize this option:	
Critical external staff needed to utilize this option: **24/7 phone numbers for all critical staff:** 1. Name and Number 2. Name and Number 3. Name and Number	

(C) Auxiliary Power	Off-site auxiliary power sources – reserved access to portable generators (PaWARN, Portable, or Rental)
Description of Equipment	**SOP to Utilize Equipment**

Additional production capacity provided via this auxiliary power: MGD
Additional hours of operation provided by this auxiliary power: Hours
Amount of time needed to obtain/transport/setup this auxiliary power option: Hours
Date this auxiliary power was last tested:
Critical CWS staff needed to utilize this option:
Critical external staff needed to utilize this option: What efforts were made to help insure that during an area wide emergency your system will be a priority to obtain this portable generator before another user (e.g. rental contract)? 24/7 phone numbers for all critical staff: 1. Name and Number 2. Name and Number 3. Name and Number

(D) Alternate Provisions	Finished Water Storage Capacity
Description of Storage	**SOP to Utilize Storage**

Additional quantity finished water provided via this storage tank (consider pressure zones): MGD
Additional hours of finished water supply provided by this alternate provision: Hours
Amount of time needed to switchover (valves) to this alternate provision: Hours
Date finished water storage capacity was last relied upon during an emergency:
Critical CWS staff needed to utilize this option:
Critical external staff needed to utilize this option: Are pumps needed to utilize this finished water storage? 24/7 phone numbers for all critical staff: 1. Name and Number 2. Name and Number 3. Name and Number

(E) Alternate Provision	Interconnection #1 with neighboring water system
Description of Interconnection	**SOP to Utilize Interconnection**

Additional finished water supply provided via this interconnection: gpm and psi

Additional hours of operation provided by this interconnection: Hours

Amount of time needed to switchover (valves) to this interconnection: Hours

Date this interconnection was last tested under actual operating pressures:

Critical CWS staff needed to utilize this option:

Critical external staff needed to utilize this option:

24/7 phone numbers for all critical staff:

1. **Name and Number**
2. **Name and Number**
3. **Name and Number**

(F) Alternate Provision	Interconnection #2 with neighboring water system
Description of Interconnection	**SOP to Utilize Interconnection**

Additional finished water supply provided via this interconnection: gpm and psi

Additional hours of operation provided by this interconnection: Hours

Amount of time needed to switchover (valves) to this interconnection: Hours

Date this interconnection was last tested under actual operating pressures:

Critical CWS staff needed to utilize this option:

Critical external staff needed to utilize this option:

24/7 phone numbers for all critical staff:

1. **Name and Number**
2. **Name and Number**
3. **Name and Number**

(G) Alternate Provision	"Other" - CWS should include any *other* alternate system specific provision(s) they have identified as valuable to maintaining uninterrupted system service
Description of Alternate Provision	**SOP to Utilize Alternate Provision**

Additional production capacity provided via this option:	MGD
Additional hours of operation provided by this option:	Hours
Amount of time needed to switchover to this option:	Hours
Date this option was last tested:	
Critical CWS staff needed to utilize this option:	
Critical external staff needed to utilize this option: 24/7 phone numbers for all critical staff: 1. Name and Number 2. Name and Number 3. Name and Number	

III. USSP Form Review and Certification of Completion

After completing the USSP form, all applicable system personnel should meet to review the overall USSP, evaluate all options and corresponding SOPs related to how the options will be utilized to provide uninterrupted system service, and reach a consensus regarding whether the overall plan is considered adequate to provide uninterrupted system service for all critical facilities.

The corresponding USSP completion certification form must be submitted to the Department by the dates specified in 109.708 (a). If applicable, a detailed corrective action plan and corresponding completion date schedule must be submitted to the Department within 6 months of the dates specified in 109.708(a)(1) – (3).

IV. Training Review and Update

The following staff have been trained on implementation of the USSP:

- Name/ Training Date

During the training, the SOPs to implement were reviewed and updated as necessary, along with the overall USSP.

Next scheduled training / update: Date:

USSP Completed By Signature:	Date:
USSP Reviewed By Signature:	Date:

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SAFE DRINKING WATER

UNINTERRUPTED SYSTEM SERVICE PLAN (USSP) CERTIFICATION FORM

Public Water System Name: _____ PWSID Number: _____

Date of Completion of USSP: _____

After completing the USSP form, all applicable system personnel should meet to review the overall USSP, evaluate all primary and alternate options included within the plan, and corresponding SOPs related to how the options will be utilized to provide uninterrupted system service, and reach a consensus answer to the following question:

Are additional corrective actions needed in order for this plan to be considered adequate to provide uninterrupted system service for all critical facilities?

NO: ☐

YES: ☐ By answering "Yes", a detailed corrective action plan and corresponding completion date schedule must be submitted to the Department within 6 months of the dates specified in § 109.708(a)(1) – (3).

If you answered "Yes" above, briefly summarize deficiencies identified that still require corrective actions:

Deficiency 1: _____

Associated Critical Facility: _____

Deficiency 2: _____

Associated Critical Facility: _____

Deficiency 3: _____

Associated Critical Facility: _____

Deficiency 4: _____

Associated Critical Facility: _____

Certified by:
As a representative of the Public Water System (PWS) indicated above, I certify that the Uninterrupted System Service Plan was completed in accordance with the requirements outlined in § 109.708 of the Department of Environmental Protection (DEP)'s regulations.

Signature: _____ Date: _____

Print Name & Title: _____

Phone Number: _____

Complete and submit this form to the appropriate local DEP office ***by the dates specified in § 109.708(a)(1) – (3).***

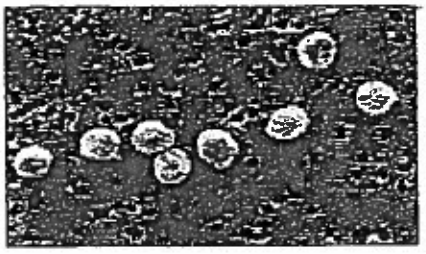
Safe Drinking Water Program local DEP district offices phone numbers (including 24/7 numbers), mailing addresses and FAX numbers are at this link:

http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-117702/3930-FM-BSDW0560.pdf

***For DEP Use Only* - Checked by:** _____ **Date:** _____

microbial pathogens

Physicochemical removal of protozoan pathogens is receiving increased attention because of the difficulty of chemically inactivating these organisms, particularly *Cryptosporidium parvum*. Most research examining the removal of these and other pathogens by filtration has been conducted under steady-state conditions with optimized pretreatment. This study evaluated the removal of *Cryptosporidium* and changes in surrogate parameters at various points in the filter cycle and under nonoptimal conditions at two pilot plants with different coagulation regimes. The study found a reproducible 2-log difference in *Cryptosporidium* removals between the two locations under optimal conditions, with similar low effluent turbidity levels and particle counts. Either suboptimal coagulation or the early stages of breakthrough at the end of a filter run produced substantial deterioration of *Cryptosporidium* removal capability. Filter ripening or the imposition of a hydraulic step generally had much less effect on removals.



EFFECTS OF filter operation on *Cryptosporidium* removal

BY PETER M. HUCK, BRADLEY M. COFFEY, MONICA B. EMELKO, DANIELLE D. MAURIZIO, ROBIN M. SLAWSON, WILLIAM B. ANDERSON, JOHN VAN DEN OEVER, IAN P. DOUGLAS, AND CHARLES R. O'MELIA

The primary goal of drinking water suppliers is to protect public health by providing water that is free of microbial and chemical contaminants. The emergence of parasitic protozoa such as *Giardia lamblia* and *Cryptosporidium parvum* as etiological agents of waterborne disease has prompted renewed evaluation of the efficacy of water treatment processes. Increasingly stringent regulations for drinking water quality will require effective removal of these organisms. Although disinfection or inactivation plays a crucial role in this regard, physical removal is also important. The multibarrier approach to pathogen removal suggests that where granular media filtration is used, it must be effective.

It is well-known that filter effluent turbidity and particle counts may vary in the different phases of a typical filter cycle and as a result of operational events. During ripening, both turbidity and particle counts are elevated. As the filter becomes loaded toward the end of a cycle, particles may begin to break through. Hydraulic surges can increase filter effluent turbidity and particle counts. Coagulation upsets result in suboptimal pretreatment and may consequently cause an increase in filter effluent turbidity and particle concentrations.

A full report of this project, Filter Operation Effects on Pathogen Passage *(catalog number 90874), is available from AWWA Customer Service (1-800-926-7337). Reports are free to AWWA Research Foundation subscribers by calling 303-347-6121.*

TABLE 1 Major raw water quality and operating parameters at Ottawa and MWDSC*

Parameter†	Ottawa	MWDSC
Raw water quality		
Alkalinity—*mg/L as $CaCO_3$*	19–23	107–134
pH	7.1–7.4	7.7–8.4
Temperature—*°C*	1–24	13–25
TOC—*mg/L*	~5	2.6–2.9
Turbidity—*ntu*	1.0–2.7	0.4–2.4
Coagulant dose		
Alum‡—*mg/L*	38	5
SiO_2—*mg/L*	2	NA§
Cationic polymer—*mg/L*	NA	1.5
Coagulation/filtration pH	5.9–6.1	7.7–8.0
Rapid mix		
G—s^{-1}	in-line	600
HDT—min	NA	1.7
Flocculation		
G for stages 1, 2, and 3—s^{-1}	60, 40, 20	75, 50, 25
HDT—*min*	30	20
Sedimentation		
HDT—*min*	100	80
Filtration		
Filtration rate—*gpm/sq ft (m/h)*	2.6 (6.35)	4.0 (9.8)
Media depth		
Anthracite—*mm (in.)*	457 (18)	508 (20)
Sand—*mm (in.)*	279 (11)	203 (8)
Media size		
Anthracite—*mm*	1.07	1.0–1.1
Sand—*mm*	0.52	0.43–0.50
Media uniformity and coefficient		
Anthracite	1.35	<1.65
Sand	1.32	<1.65

*MWDSC—Metropolitan Water District of Southern California
†$CaCO_3$—calcium carbonate, TOC—total organic carbon, SiO_2—activated silica, *G*—velocity gradient, HDT—hydraulic detention time
‡As dry alum
§NA—not applicable

The objective of this study was to establish whether known increases in filter effluent turbidity and particles under these nonoptimal conditions also implied elevated *C. parvum* oocyst levels in filter effluents. Specifically, the study assessed the degree of pathogen and surrogate removal that can be reasonably expected from "benchmark" filtration systems (i.e., relatively standard design) under optimized operation and the following conditions: suboptimal coagulation, filter ripening, turbidity and particle breakthrough (end-of-run), and hydraulic surges.

BACKGROUND

The literature on *C. parvum* removal by filtration (particularly under nonoptimal conditions) is relatively limited, but studies on the removal of surrogates and of *Giardia* offer useful insights.

Influence of operational factors. Adequate chemical pretreatment during coagulation and flocculation is critical for maintaining good particle removal during filtration (Patania et al, 1995; Tobiason & O'Melia, 1988). For *Giardia* cysts, several investigations have demonstrated little (<1 log) to no removal by granular activated carbon filters (Patania et al, 1995), sand and dual-media filters (Al-Ani et al, 1986), and tri-media filters (Horn et al, 1988) during no-coagulation conditions. A study of a pilot-scale direct filtration plant found that mean *Giardia muris* cyst removals decreased by ~ 1–2.5 log during suboptimal and minimal coagulation, compared with removals under optimal operating conditions (Logsdon et al, 1981). Similar decreases in cyst removal as a result of suboptimal coagulation have been demonstrated at other direct (Ongerth & Percoraro, 1995) and conventional pilot plants (Patania et al, 1995).

Other researchers showed that large changes in flow rate caused deterioration of filtered water quality by the detachment of previously retained particles (Tuepker & Buescher, 1968; Cleasby et al, 1963). The degree of deterioration was related to the magnitude and rapidity of the rate change and was independent of the duration of the disturbance. Effects of increased flow rates on *Giardia* removal have been observed; however, the increases in cyst passage were considerably higher than the increases in turbidity (Logsdon et al, 1981).

Logsdon and colleagues (1981) reported that *Giardia* cyst passage through filters was significantly higher during ripening than during stable operation, even at low effluent turbidity levels. Similar findings were obtained at two pilot plants (Patania et al, 1995), but the differences between stable filter operation and ripening were less dramatic. At a third pilot plant, *Giardia* removals during ripening were comparable to those achieved during stable filter operation (Patania et al, 1995).

Possible sources of breakthrough in filters include particles that pass through directly from the influent (nonattachment) or particles that become detached (Lawler et al, 1995). According to some researchers (Moran et al, 1993; Ginn et al, 1992), both nonattachment and detachment occur during breakthrough conditions. As particle detachment and nonattachment

increase, increased pathogen passage through filters would also be expected.

Logsdon et al (1981) demonstrated that turbidity breakthrough at the end of a filter cycle (when filter effluent turbidity was > 0.4 ntu) could be accompanied by a substantial passage of *Giardia* cysts, even if the cysts were not present in the filter influent. A considerable increase in cyst passage was also observed during early breakthrough conditions when filter effluent turbidity was just above 0.2 ntu. Patania et al (1995) also reported lower *Giardia* removal through filters during breakthrough.

Removal of surrogates. Several pilot- and full-scale studies have demonstrated that organism-sized particles and turbidity are approximate indicators of pathogen removal but not reliable surrogates (Nieminski & Ongerth, 1995; LeChevallier & Norton, 1992). Plummer and co-workers (1995) reached similar conclusions about turbidity, as well as ultraviolet absorbance at 254 nm and dissolved organic carbon. Patania and colleagues (1995) indicated that achieving a goal of 0.1 ntu was indicative of effective cyst–oocyst removal. Although the risk of *Cryptosporidium* passage appeared to increase with increasing filtrate turbidity in several studies (Hall & Croll, 1996; Hall et al, 1995; Nieminski & Ongerth, 1995), other researchers did not observe significant oocyst passage during the first hour of operation after backwash when filter effluent turbidity was high (filter ripening) (Fuller et al, 1995).

Bacillus spores were found to demonstrate a significant correlation with *Cryptosporidium* removal at both pilot and full scale (Scott et al, 1997). Other studies also found that aerobic spores were indicative of treatment efficiency but did not conclude that the spores were adequate surrogates for oocyst removal (Swertfeger et al, 1999; Nieminski & Bellamy, 1998; Lytle et al, 1996).

Removal of *C. parvum*. A number of studies have investigated *C. parvum* oocyst removals by granular media filtration at or near optimized stable operating conditions. Full-scale removals have been reported at levels from 2–3 log (e.g., Kelley et al, 1995; Nieminski & Ongerth, 1995) to > 4 log (e.g., Baudin & Lainé, 1998). Pilot-scale data have suggested that filters can achieve oocyst removals of 2–3 log (e.g., Fox et al, 1998; Kelley et al, 1995; West et al, 1994), 3–4 log (Yates et al, 1997a), and > 5 log (e.g., Patania et al, 1995; LeChevallier et al, 1991a). Differences in analytical reliability, processed sample volume, method detection limits, and influent microorganism concentrations can all contribute to the reported differences in the *Cryptosporidium* removal capacities of filters.

Patania et al (1995) examined conventional filtration, low-rate surface filtration, and in-line filtration at pilot scale and demonstrated that filtration was ineffective for oocyst removal without chemical pretreatment. Other pilot-scale studies also indicated that suboptimal coagulation conditions decrease oocyst removal by filters by

Inactivated *Cryptosporidium* oocysts and *Bacillus subtilis* spores seeded in the experiments were enumerated in the laboratory.

at least 1 log (e.g., Dugan et al, 1999; Charles et al, 1995; Ongerth & Pecoraro, 1995). Results reported earlier from the current study showed a substantial negative effect of suboptimal coagulation (Coffey et al, 1999).

Cryptosporidium removals of > 3 log have been maintained during filter ripening, despite a decrease in removals when compared with stable operation (e.g., Swaim et al, 1996). Several pilot-scale studies have indicated that oocyst removals decrease by ~ 0.5–1 log during filter ripening (e.g., Swaim et al, 1996; Hall et al, 1995; Patania et al, 1995). These findings were confirmed at full scale by Baudin and Lainé (1998), who demonstrated ~ 1-log deterioration in oocyst removals during ripening.

Two studies concluded that oocyst removals are comparable during turbidity breakthrough and stable filter operation (Baudin & Lainé, 1998; Patania et al, 1995). Patania and co-workers (1995) noted that the filter effluent turbidity increased by only ~ 0.1 ntu during their evaluation of breakthrough. Those authors speculated that oocyst removal might have deteriorated if sampling had continued beyond this point. Huck et al (1999) reported a substantial deterioration in performance during breakthrough.

Bench-scale studies have indicated that formalin-inactivated oocysts and viable oocysts of *C. parvum* are comparably removed by both dual- and tri-media filters (Emelko, 2001). This finding is significant, because studies in which oocysts are spiked (typically pilot-scale investigations) use inactivated oocysts for safety reasons.

METHODS AND RESEARCH PLATFORMS

Experimental design. The experiments in this study were conducted at two pilot plants—one in Ottawa, Ont., and the other at the Metropolitan Water District of Southern California (MWDSC) treatment plant in La Verne, Calif. These locations represented two basic types of

TABLE 2 Summary of removals and filter effluent quality during stable operation

Date	Research Platform	Log Removal Mean ± Standard Deviation			Filter Effluent Value Mean ± Standard Deviation	
		C. parvum	*B. subtilis*	Particles*	Particles *number/mL*	Turbidity *ntu*
8/6/98	Ottawa	4.9 ± 0.21		3.2 ± 0.29	3.7 ± 2.9	0.02 ± 0.00
9/9/98	Ottawa	5.7 ± 0.06		3.8 ± 0.10	0.9 ± 0.2	0.02 ± 0.00
9/23/98	Ottawa	5.8 ± 0.03		2.8 ± 0.24	8.7 ± 5.6	0.03 ± 0.00
10/6/98	Ottawa	5.8 ± 0.15		4.6 ± 0.18	0.2 ± 0.1	0.02 ± 0.00
3/9/99	Ottawa	5.2 ± 0.38	2.1 ± 0.14	4.1 ± 0.10	0.4 ± 0.1	0.03 ± 0.00
5/31/99	Ottawa	5.6 ± 0.20	4.6 ± 0.05	3.7 ± 0.18	1.2 ± 0.6	0.03 ± 0.00
7/27/99	Ottawa	5.6 ± 0.02	4.5 ± 0.24	3.0 ± 0.22	5.1 ± 1.5	0.04 ± 0.00
1/19/00	Ottawa	5.3 ± 0.36	4.2 ± 0.01	†	4.8 ± 0.8	0.03 ± 0.00
7/15/98	MWDSC‡	2.6 ± 0.07	2.0 ± 0.13	2.2 ± 0.09	6.3 ± 1.2	0.05 ± 0.00
7/28/98	MWDSC	3.3 ± 0.07	2.7 ± 0.26	2.6 ± 0.04	4.5 ± 0.4	0.05 ± 0.00
8/18/98	MWDSC	4.1 ± 0.65	2.3 ± 0.17	3.4 ± 0.04	1.5 ± 0.2	0.05 ± 0.00
9/22/98	MWDSC	3.8 ± 0.16	1.9 ± 0.46	2.8 ± 0.01	5.2 ± 0.2	0.05 ± 0.00
9/29/98	MWDSC		3.2 ± 0.37	3.3 ± 0.14	3.1 ± 0.4	0.05 ± 0.00
10/27/98	MWDSC	3.2 ± 0.15	2.3 ± 0.17	2.5 ± 0.14	10 ± 3.2	0.05 ± 0.00
11/24/98	MWDSC		2.1 ± 0.86	2.0 ± 0.02	32 ± 1.4	0.05 ± 0.00
12/15/98	MWDSC	2.9 ± 0.11	1.8 ± 0.06	1.8 ± 0.02	37 ± 1.8	0.05 ± 0.00
2/9/99	MWDSC	2.1 ± 0.15	1.9 ± 0.07	2.2 ± 0.01	21 ± 1.7	0.06 ± 0.00
3/9/99	MWDSC	2.4 ± 0.18	1.9 ± 0.04	2.9 ± 0.07	3.9 ± 0.6	0.05 ± 0.00
4/27/99	MWDSC	2.9 ± 0.29	1.9 ± 0.06	2.2 ± 0.02	27 ± 1.2	0.05 ± 0.00
	Ottawa average	5.5 ± 0.37	3.8 ± 1.07	3.6 ± 0.63	3.1 ± 3.5	0.03 ± 0.01
	MWDSC average	3.0 ± 0.66	2.2 ± 0.52	2.6 ± 0.50	13.8 ± 12.6	0.05 ± 0.00

*Log net decrease from raw water to filter effluent
†Plant influent data not available
‡MWDSC—Metropolitan Water District of Southern California

coagulation: a relatively high dosage for combined total organic carbon (TOC) and particle removal (Ottawa River water) and a relatively low dosage optimized for particle removal (MWDSC-treated Colorado River water). Inactivated *C. parvum* oocysts and pure-cultured *Bacillus subtilis* spores were seeded at both locations. Removals of turbidity and particles were also monitored. These experiments were designed to document pathogen removal from benchmark systems and were part of a larger study (Huck et al, 2001). In the investigations reported in this article, no attempt was made to improve pathogen removal or mitigate adverse conditions.

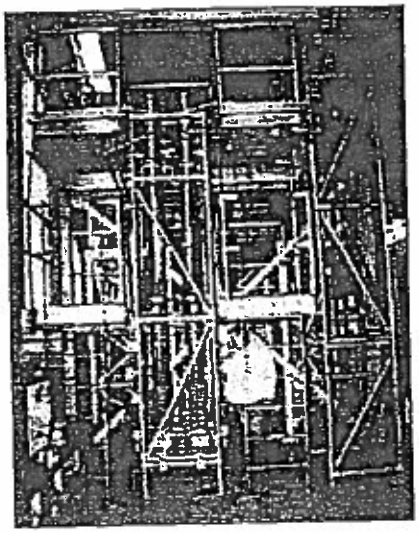
The conditions investigated were stable filter operation, suboptimal coagulation, ripening, breakthrough, and hydraulic step. In addition, control experiments were performed to evaluate losses of seeded organisms to the pilot-plant filters and appurtenances. The study also examined several subconditions within suboptimal coagulation and breakthrough. End-of-run experiments were performed at MWDSC because it was not possible to actually achieve breakthrough in that pilot plant. Experiments for each of the principal conditions were conducted at least in triplicate at each location.

Research platforms and experimental approach. Table 1 summarizes major raw water quality and operating parameters for the two locations. Both of the pilot plants received water that was low in turbidity and particles, with averages in the range of ~ 5,000 particles/mL (>2 µm). Major differences between the raw waters included alkalinity and temperature (Ottawa's lowest temperature was much colder than MWDSC's). Each pilot plant was operated to mimic as closely as possible the full-scale treatment plant at the same location.

The filters at both pilot plants featured media depths and sizes typical of the utilities' full-scale plants (and typical of many existing treatment plants). The operational mode chosen was conventional treatment with dual-media filtration. At MWDSC, the benchmark filter design contained 508 mm (20 in.) of anthracite over 203 mm (8 in.) of sand. At Ottawa, the filter design contained 457 mm (18 in.) of anthracite over 279 mm (11 in.) of sand. At MWDSC, the backwashing regime consisted of chlorinated water with surface wash. At Ottawa, chlorinated water and air-scouring were used.

The Ottawa pilot plant used a high coagulant dose of ~ 40 mg/L alum and 2 mg/L activated silica to achieve

removal of both TOC and particles. The MWDSC pilot plant used a low coagulant dose of 5 mg/L alum and 1.5 mg/L cationic polymer for particulate removal only. At both pilot plants, chlorine (~2 mg/L) was added at rapid mix as a preoxidant. Because of Ottawa's higher coagulant dosage and lower alkalinity, coagulation pH was lower (~ 6 compared with ~ 8 at MWDSC). The optimized coagulation conditions were selected to meet the 0.1-ntu turbidity goal of the Partnership for Safe Water, a voluntary treatment optimization program sponsored by AWWA and the US Environmental Protection Agency.



Pilot-scale dual-media filters were used in this research.

At each pilot plant, rapid mix was followed by three-stage tapered flocculation. The overall flocculation hydraulic detention times (HDTs) were 30 min at Ottawa and 20 min at MWDSC. HDTs of the sedimentation step were 100 min at Ottawa and 80 min at MWDSC. Further operating details for the pilot plants are described in Huck et al (2001).

The pilot-scale filters in both locations were seeded with jar-coagulated suspensions of ~ 10^8 formalin-inactivated *C. parvum* and ~ 10^7–10^9 *B. subtilis* spores. Except for three experiments described separately, microorganisms were seeded into the filter influent, using a procedure established by members of the project team in previous investigations (Yates et al, 1997a; Yates et al, 1997b). This seed location was selected to minimize significant losses of microorganisms in upstream unit processes and to better characterize their removal during filtration. The data collected from the seeding experiments consisted of replicate samples (either four or five) taken from the filter influent and filter effluent at each location. The filter influent and filter effluent data were normally collected over a 1-h period when the seed suspension was added at the filter influent. A single-factor, analysis of variance (ANOVA) statistical test[1] was used to interpret the data, which were pooled from the replicate experiments at each location.

Detailed study data and the results of limited seeding of *G. lamblia*, MS-2 bacteriophage, and *Escherichia coli* at MWDSC are described elsewhere (Huck et al, 2001). In this article, the authors calculate and discuss changes (i.e., net decrease) in particle counts as a result of treatment. The changes are not referred to as particle removals because they are calculated using the plant influent (rather than the filter influent as in the case of the seeded microorganisms) and the filter effluent. (Filter influent particle counts were not measured for technical reasons.) Because coagulation, flocculation, and sedimentation can all affect particle counts, a general quantitative relationship would not necessarily be expected between the change in particle counts from raw to finished water and the removal of seeded microorganisms by filtration alone.

Seeding protocols. The seed suspension of oocysts or spores was diluted to 1.5 L with preoxidized influent water and jar-coagulated under coagulant and mixing conditions that mimicked pilot-scale treatment. The jar-coagulated organisms were then seeded directly into the influent of the filter by a peristaltic pump for 60 min. During seeding, the seed suspension was constantly agitated with a magnetic stirrer to ensure steady distribution of the organisms during the procedure.

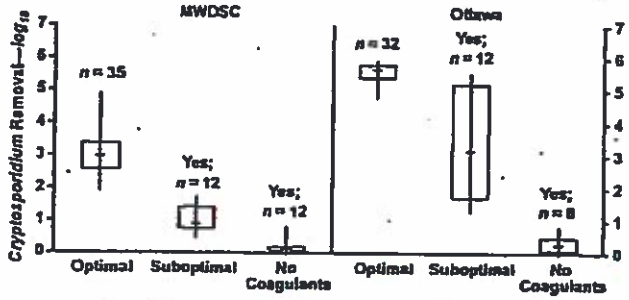
The targeted seeded influent concentration for *Cryptosporidium* was ~ 10^5 oocysts/L. Samples were collected in sterile bottles containing sodium thiosulfate. Filter effluent samples were collected in 1-L Wheaton bottles from the continuously running effluent line. Filter influent samples were collected in 250-mL amber bottles from the water column directly above the filter media using a continuous recirculation peristaltic pump.

Analytical methods. ***C. parvum.*** *C. parvum* oocysts were obtained from a commercial laboratory.[2] For each test, ~ 10^8 oocysts were obtained—already inactivated with 5% formalin. Prior to seeding, a small portion of the stock suspension was removed for enumeration using a hemacytometer.[3]

Filter influent samples were analyzed in sample volumes of 10 mL and filter effluent samples in volumes of 500 mL (or less if the filter effluent turbidity was elevated). Oocysts were collected by direct vacuum filtration of the sample through 27 mm (1.06 in.) diameter, 0.45-µm-pore-size polycarbonate membranes. Standard immunofluorescent assay techniques were used to stain the samples. Slides of Ottawa samples were analyzed at the University of Waterloo, Ont.; slides from MWDSC were shipped to a commercial laboratory[4] for presumptive microscopic analysis. As a procedural check, recovery experiments were performed at both locations using both filter influent and effluent water matrixes. The measured *Cryptosporidium* levels reported here were not adjusted by the recovery.

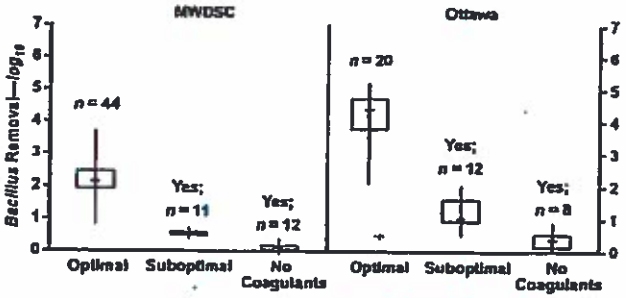
B. subtilis. The analysis for *B. subtilis*[5] was performed according to a previously described method (Rice et al, 1996). This method generally consisted of filtration of samples onto 47 mm (1.8 in.), 0.45-µm gridded cellulose acetate membranes[6] and growth at 37°C for 24 h on plates of nutrient agar with trypan blue (0.015 g/L).

FIGURE 1 Effect of coagulation on filters' removal of *Cryptosporidium parvum*



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level.

FIGURE 2 Effect of coagulation on filters' removal of *Bacillus subtilis*



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level.

Spores were identified by their blue color. Typically, duplicate sample volumes of 0.1 and 1.0 L were used to enumerate filter influent and effluent, respectively.

Particle counting. Each particle-counting instrument was calibrated by the manufacturer according to ASTM (American Society for Testing and Materials) F 658-87 and met the resolution requirements of USP (US Pharmacopeia) 788. The calibration was verified on site using commercially available, calibrated, monodisperse polymer microspheres.[7] The particle counters[8] measured total particles from 2 to 150 µm, with the data reported as cumulative particles ≥ 2 µm.

Turbidity. Turbidity was monitored using online turbidimeters that were calibrated using dilute formazin solutions as specified by the manufacturer. Calibration was checked by comparison with a bench-top turbidimeter with an accuracy of ± 2%, using standards of 0.80 and 6.6 ntu. MWDSC and Ottawa testing used the same model of turbidimeter[9] at plant influent, filter influent, and filter effluent locations. An additional turbidity meter[10] was used at the filter effluent sampling location in Ottawa. Filter influent turbidity at Ottawa was measured by grab samples analyzed with a handheld turbidimeter.[11]

Head loss. Differential pressure transducers continuously measured head loss at the MWDSC and Ottawa pilot plants. Additional details about methods and the quality assurance–quality control program may be found elsewhere (Huck et al, 2001).

RESULTS

Controls. As noted previously, a control experiment was performed at each location to quantify the possible losses of seeded microorganisms to the pilot-plant systems. In these experiments, no media were in the filters, and no coagulant was added. As was standard practice, the microorganisms were seeded in the filter influent. Thus, these experiments were designed to give an indication of possible adsorption of seeded microorganisms on surfaces within the pilot plant, including any sample tubing.

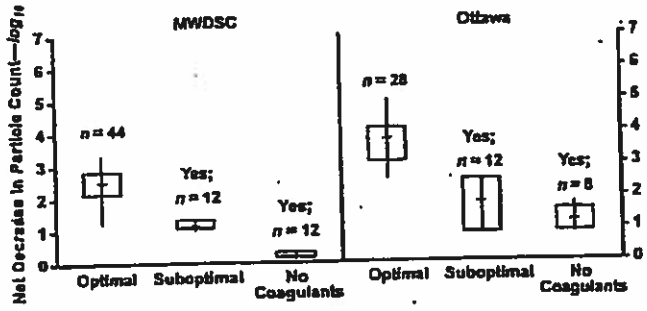
In both locations, the removals of *C. parvum* and *B. subtilis* in the control experiments without media were < 0.10-log units (Huck et al, 2001). These results convincingly demonstrated that losses of seeded microorganisms to the pilot-plant apparatus were essentially negligible. Therefore, the removals attributed to filtration under each of the tested operating conditions could be attributed to the filters themselves.

Stable filter operation. The purpose of these experiments was to document the best removals that could be obtained under optimal conditions in each location. Seeding and sampling were conducted in the early-to-middle portion of the filter cycle, after ripening was complete. Because these experiments provided a baseline for comparison, they were conducted periodically throughout the experimental program. In all, eight stable operation experiments were conducted at Ottawa and eleven at MWDSC. In addition, several stable operation experiments were conducted in which seeding was performed at the rapid mix. These results are discussed separately.

Table 2 summarizes the results for the stable operation experiments. The most striking finding was the > 2-$\log_{10}$ difference in *C. parvum* removals between the two locations, despite essentially the same effluent turbidity values and very similar (and low) filter effluent particle counts. At Ottawa, 5.5 ± 0.4 $\log_{10}$ removal of *C. parvum* was obtained, whereas at MWDSC, 3.0 ± 0.7 $\log_{10}$

removal was observed. The filter influent concentrations in both locations were similar: approximately 10^6/L in Ottawa and 10^5–10^6/L at MWDSC. *C. parvum* was always found in the filter effluent samples at MWDSC, typically at concentrations of at least 100 oocysts/L. At Ottawa, filter effluent *C. parvum* concentrations were usually < 10 oocysts/L. Often a count of zero was obtained for the 500-mL sample volume normally examined. Because of the high observed removals, the Ottawa experimental protocols and data were carefully scrutinized during the study, and nothing was found to suggest that the results were anomalous.

FIGURE 3 Effect of coagulation on net decrease in particle count from raw water to filter effluent



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level.

The reasons for the difference in *C. parvum* removals between the two locations are not definitively known, and the experimental program was not designed to identify them. Differences in raw water quality and coagulation may be important. Although the two filter designs were quite similar, small differences may play a role. The matter merits further investigation.

Although there was some variation in removals calculated on the basis of individual influent–effluent sample pairs, the calculated removals from run to run were quite reproducible, as indicated by the relatively low overall standard deviations. The Ottawa experiments included runs at low temperature. No deterioration in performance was observed at temperatures as low as 1°C (Huck et al, 2001).

Removals of *B. subtilis* were 3.8 ± 1.1 $\log_{10}$ in Ottawa and 2.2 ± 0.5 $\log_{10}$ at MWDSC; in both locations, removals were lower than those for *C. parvum*. Although *B. subtilis* removals were substantially higher in Ottawa, the difference between the two locations was not as great as the difference for *C. parvum*. In both locations, the seeded concentration of *B. subtilis* was lower than that of *C. parvum*. Although *B. subtilis* spores were invariably detected in the filter effluent samples at Ottawa and always at MWDSC, it is possible that the lower seeded concentrations contributed to lower observed removals.

However, it appears that *B. subtilis* gives a conservative indication of a filter's ability to remove *C. parvum* under stable operating conditions. It also appears that to at least some extent, differences in *B. subtilis* removals in different filters indicate variations to be expected in *C. parvum* removals. Furthermore, the removals of *B. subtilis* during stable operation in Ottawa, which were 1.6 $\log_{10}$ higher than removals at MWDSC, lend credence to the substantially higher removals of *C. parvum* observed in Ottawa. Overall reproducibility of the calculated *B. subtilis* removals was almost as good as for *C. parvum*.

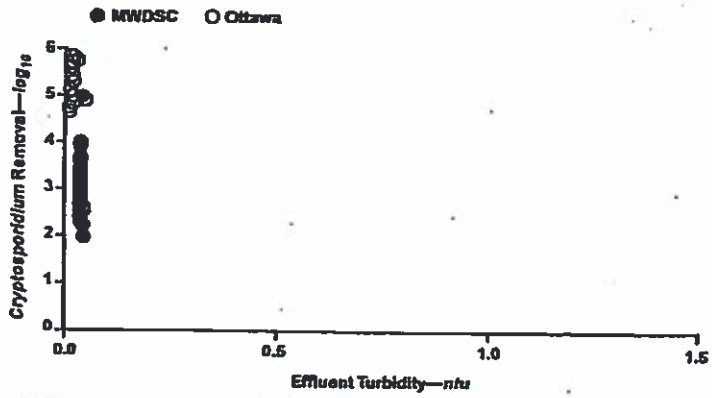
Table 2 also summarizes changes in particle count (≥ 2 µm) and particle filter effluent concentrations for the two locations. In Ottawa, the mean net decrease in particle count (from raw water to filter effluent) during the stable operation experiments was 3.6 ± 0.6 $\log_{10}$, whereas at MWDSC, it was 2.5 ± 0.5 $\log_{10}$. Mean filter effluent particle numbers in the two locations were approximately 3/mL in Ottawa and 14/mL at MWDSC. The MWDSC average was influenced by several runs with effluent particle numbers > 20/mL. Although raw water values were roughly similar in both locations (on the order of 5,000/mL), it should be noted that different particle counters were used. Furthermore, many of the filter effluent particle counts were at or near the detection limit of the instrument, particularly in Ottawa.

Given these qualifications, it is not possible to quantitatively compare the net decrease in particle count determined for stable operation in this study to *C. parvum* removals under the same conditions. However, different observed net decreases in particle counts in different filters (with roughly similar influent particle counts) may be indicative of differences in *C. parvum* removals by these filters.

It is questionable whether the observed different filter effluent particle counts in Ottawa and MWDSC represent a real difference. Given the substantial difference in *C. parvum* removal at the two locations, however, it is possible that small differences in particle counts may be indicative of measurable differences in the *C. parvum* removal capability of the two treatment systems. Certainly in the breakthrough experiments discussed later in this article, small increases in effluent particle counts late in the run in Ottawa signaled a much greater deterioration in the filter's ability to remove *C. parvum*.

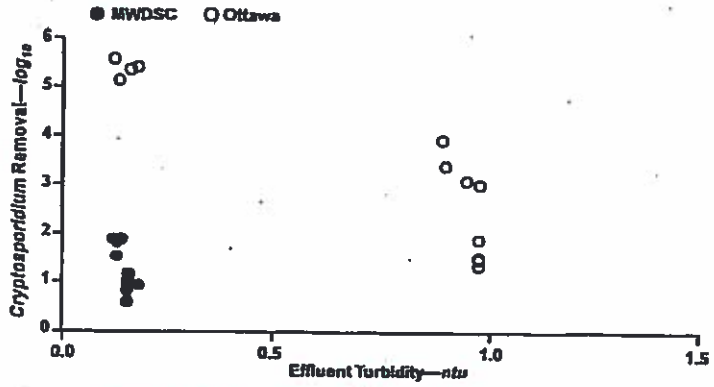
Table 2 also shows filter effluent turbidity values for the two locations. As with the particle data, the values shown correspond to the times at which the microorganism samples were taken. Log removals for turbidity are

FIGURE 4 *Cryptosporidium parvum* removal versus filter effluent turbidity (optimal coagulation conditions)



MWDSC—Metropolitan Water District of Southern California

FIGURE 5 *Cryptosporidium parvum* removal versus filter effluent turbidity (suboptimal coagulation conditions)



MWDSC—Metropolitan Water District of Southern California

not calculated because they are limited by the relatively low influent values and also by the fact that many filter effluent values are very close to the instrument detection limit. In all but one stable operation experiment, filter effluent turbidity was ≤ 0.05 ntu. The mean filter effluent turbidity was 0.03 ntu in Ottawa and 0.05 ntu at MWDSC. Both of these values were considered to be indicative of excellent filtration performance; in fact, it could be argued that there is no meaningful difference between the overall average values obtained in the two locations. If there is a real difference, it is extremely subtle and could not be reliably used to predict the differences in *C. parvum* removal observed at the two locations.

In two experiments at MWDSC and one at Ottawa, microorganisms were seeded at the rapid mix in the pilot plant rather than being jar-coagulated offline and seeded at the filter influent. In these experiments, filter influent concentrations of *C. parvum* at both locations were at least several orders of magnitude lower than usual because of substantial losses through the sedimentation step and because the seed was dispersed over a longer period of time. In these runs, *C. parvum* removals were much lower (1.3 $\log_{10}$) at MWDSC, although reproducibility there was not good (Huck et al, 2001). Oocysts were detected in all filter effluent samples.

Removals could not be quantified in Ottawa, because a count of zero oocysts was obtained for all filter effluent samples. Filter influent oocyst counts increased and then decreased during the experiment, as would be expected, with a maximum value of 710 oocysts/L. On the basis of the maximum influent value, removal at Ottawa was at least 2.6 $\log_{10}$. Filter influent concentrations of *B. subtilis* spores were low in Ottawa and close to normal levels at MWDSC. In Ottawa, removals were much lower than normal (1.1 $\log_{10}$), and low numbers of spores were detected in the filter effluent. At MWDSC, the calculated removals were the same as for normal stable operation. Overall, the results of the small number of experiments involving seeding at the rapid mix are not considered an accurate reflection of oocyst removal capabilities of the filters in either pilot plant.

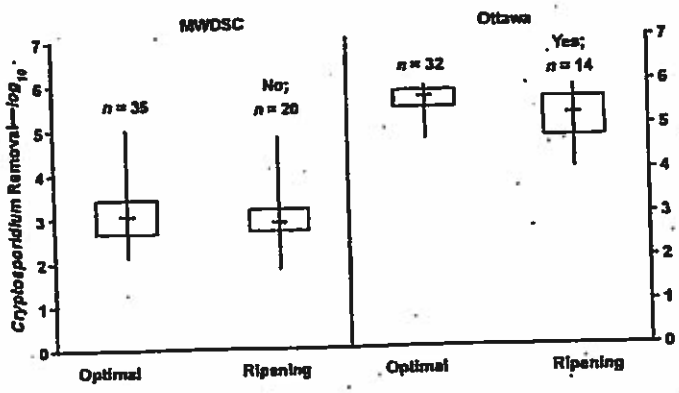
Coagulation impairment. Two basic types of impaired coagulation experiments were performed: no coagulation and suboptimal coagulation. Results were then compared with the stable operation (i.e., optimal) results discussed earlier. As noted previously, the optimum coagulant dosage in Ottawa was nearly eight times greater than at MWDSC, and the coagulation pH was lower (~ 6 at Ottawa versus ~ 8 at MWDSC).

No coagulation. These experiments simulated a worst-case condition of total coagulant failure. They also served as additional controls to determine microorganism losses through the pilot-plant facilities. In these tests, coagulation was discontinued; the filter was then backwashed prior to beginning the no-coagulant run in which microorganisms (which also received no coagulant) were seeded. Previous seeding of *C. parvum* oocysts at MWDSC's pilot plant had indicated a loss of ~ 0.3 log (50%) of oocysts when no chemicals were added to the water (Yates et al, 1997a; Yates et al, 1997b).

At Ottawa, an additional experiment was conducted in which the activated silica feed was discontinued, but otherwise coagulation remained as normal. This run simulated a coagulant aid failure and was conducted to investigate whether the use of activated silica was an important factor in the high observed removal of *C. parvum* oocysts under optimal coagulation conditions. Several different short-term loss-of-coagulant scenarios were also tested in Ottawa (Huck et al, 2001).

Suboptimal coagulation. These experiments determined how pathogen passage was affected by changes in coagulation conditions (without a change in raw water quality). The coagulant dosage (alum and polymer at MWDSC; alum and activated silica at Ottawa) was reduced 40–65% from optimum in an attempt to achieve a targeted suboptimal turbidity of 0.2–0.3 ntu. In some tests, however, the target effluent turbidity was exceeded. The suboptimal coagulant dosage was also applied in the jar coagulation of the microorganism seed suspensions.

FIGURE 6 Effect of ripening on filters' removal of *Cryptosporidium parvum*



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level; "No" indicates the mean was not statistically different.

Figures 1 and 2 summarize the removal of seeded *C. parvum* and *B. subtilis* at Ottawa and MWDSC. Figure 3 summarizes the net decrease in particles at both locations. The box-and-whisker plots in these figures represent the minimum, 25th percentile, median, 75th percentile, and maximum values for removals. Results for the various partial coagulation scenarios in Ottawa are discussed later.

Each removal is expressed as the $\log_{10}$ difference between paired sets of data taken at the filter influent and filter effluent. The net decrease for particle counts was calculated the same way, using raw water and filter effluent values, as noted previously. The number of data points used in the statistical comparisons (single-factor ANOVA) is shown on the figures. The "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level.

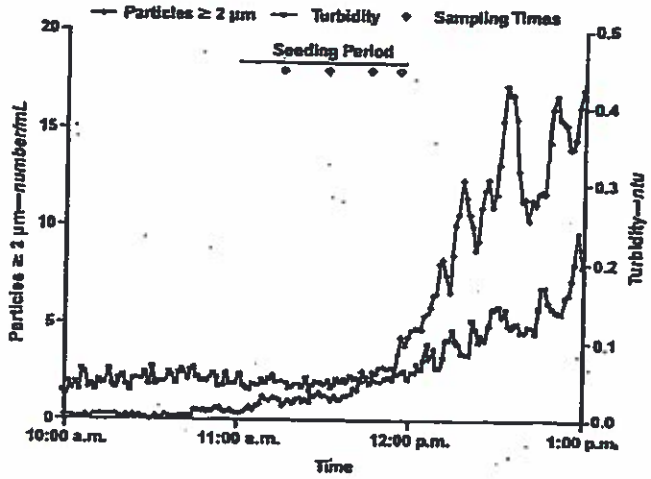
In general, similar trends were seen for all three parameters at both locations. Suboptimal coagulation had a substantial adverse effect on removal or net decreases. At both MWDSC and Ottawa, significantly greater $\log_{10}$ removals or net decreases were obtained during optimized coagulation (i.e., 2–4 h into the filter cycle when effluent turbidity was ≤ 0.10 ntu) than during suboptimal coagulation or coagulant failure. At both locations, average *C. parvum* removals were reduced by just over 2 $\log_{10}$ under suboptimal coagulation.

All differences were statistically significant at the 1% level ($\alpha = 0.01$) as well as at the 5% level. Removals of *C. parvum* were higher than those of *B. subtilis* under suboptimal conditions, as was the case under optimal conditions. The differences in *B. subtilis* removals between suboptimal and optimal conditions were also substantial and were statistically significant ($\alpha = 0.01$). The difference in net decrease in particle counts in both locations was also statistically significant compared with optimal conditions. The essentially zero removals of both organisms for the no-coagulant condition again confirmed that seeded organisms were not being lost in the pilot plants and demonstrated the crucial importance of at least some level of coagulation for rapid filters.

At MWDSC, suboptimal coagulation resulted in an average effluent turbidity of 0.16 ntu, well below the level of 0.3 ntu specified by the Interim Enhanced Surface Water Treatment Rule. (IESWTR). At Ottawa, the coagulant reduction resulted in an average effluent turbidity of 0.56 ntu. The suboptimal coagulation experiments at Ottawa varied more substantially than at MWDSC, most noticeably in terms of *C. parvum* removal and filter effluent turbidity. This reflected the greater difficulty in hitting the target suboptimal conditions in Ottawa and may indicate that such regimes are very vulnerable to underdosing (close to the coagulant demand).

The relationship between seeded *C. parvum* or *B. subtilis* and net decrease in particle count was examined under all of the coagulation conditions (Coffey et al, 1999). At MWDSC, *C. parvum* and *B. subtilis* removals were highly correlated to decrease in particles (R^2 values of 0.87 and 0.82, respectively). At Ottawa, the strength of the correlation was not as high (R^2 values of 0.60 for

FIGURE 7 Turbidity and particle response of filter during onset-of-breakthrough experiment at Ottawa pilot plant on Jan. 21, 1999



C. parvum and 0.25 for *B. subtilis*). The elevated filter effluent particle counts observed under suboptimal coagulation conditions are tabulated in Huck et al (2001).

Figures 4 and 5 show the effect of coagulation condition on filter effluent turbidity and *C. parvum* removal; *C. parvum* removals are shown for individual influent–effluent data pairs. In Figure 4 (optimal conditions), turbidity was always < 0.1 ntu. Although Ottawa's *C. parvum* removals were almost always greater than MWDSC's, in each location the removals calculated from individual influent–effluent sample pairs varied considerably, a fact that underlines the need for replication in this type of work.

As shown in Figure 5 (suboptimal coagulation conditions), filter effluent turbidity was in the range of 0.1–0.2 ntu in all MWDSC experiments of this type. Some Ottawa data were available for this range, but in other Ottawa experiments, the effluent turbidity was closer to 1 ntu. When turbidity was 0.1–0.2 ntu, Ottawa *C. parvum* removal did not appear to decrease, whereas MWDSC *C. parvum* removal did. This would suggest that the sensitivity of turbidity for monitoring coagulation effects on *C. parvum* removal may be site-specific and perhaps dependent on the coagulation regime used. It is possible that particle counts may be a more sensitive indicator of poor coagulation performance.

When coagulant was absent for only a short duration in Ottawa (several hours prior to and during seeding), *C. parvum* removals were seriously impaired (by several log units) but at least 2-log removal did occur (Huck et al, 2001). *B. subtilis* removals were reduced by about the same extent under this condition. The absence of activated silica for the entire run had essentially no effect on the removal of either organism (Huck et al, 2001). Although it is possible that some silica remained in the filter from previous runs, this finding suggests that the use of silica (which was one difference between Ottawa and MWDSC) was not responsible for the very high *C. parvum* removals seen under optimal coagulant conditions in Ottawa.

Results of these experiments indicate that even at filter effluent turbidity levels < 0.3 ntu, substantial deterioration of filtration performance may result if coagulation is not optimized. *C. parvum* removals were more sensitive to coagulation conditions than turbidity removals were. The sensitivity of turbidity for measuring coagulation effects on *C. parvum* removal may depend on the coagulation regime. Filter effluent particle monitoring may provide a more sensitive measure of coagulation performance and *C. parvum* removal. Plants using a relatively high alum dose (such as Ottawa) may be able to provide some reduced level of *C. parvum* removal by filtration during a short-term (several-hour) coagulant feed failure. (A short-term coagulation failure was not tested at MWDSC.)

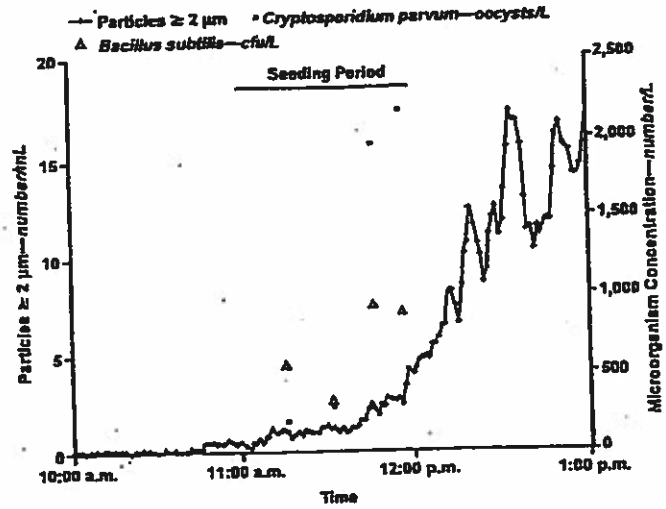
Ripening. Ripening experiments were conducted at both locations. The seeding period in Ottawa was only 30 min because the filter typically ripened to stable operating conditions of filter effluent turbidity levels < 0.1 ntu and particle concentrations < 5–10 particles/mL during that time. The duration of ripening in the MWDSC filter was similar (~30–40 min). Microorganisms were seeded for 1 h at MWDSC. In Ottawa, samples were collected at 5-min intervals during ripening, whereas at MWDSC samples were generally taken at 10, 20, 40 and 60 min.

As expected, both traditional performance measures (turbidity and particle counts) and filter effluent microorganism concentrations varied during the ripening period. At Ottawa, peak filter effluent turbidity and particle counts during ripening ranged from 0.41 to 0.69 ntu and 91 to 840 particles/mL, respectively, and the durations of the ripening period were generally comparable among the three experiments conducted. The ripening pattern at MWDSC was generally similar to that in Ottawa. For the most part, *C. parvum* trends tracked changes in filter effluent turbidity and particle counts, i.e., filter effluent oocyst levels decreased as the ripening period progressed. However, specific particle count or turbidity values were not necessarily correlated with specific filter effluent *C. parvum* concentrations (Huck et al, 2001).

The box-and-whisker plots and statistical comparisons for *C. parvum* (Figure 6) were based on the entire

ripening period. On this basis, ripening did not result in dramatic differences in overall removals relative to stable (optimized) filtration. At Ottawa, *C. parvum* removals during ripening were 5.1 ± 0.7 $\log_{10}$ (mean ± standard deviation); at MWDSC, they were 2.9 ± 0.6 $\log_{10}$. Ottawa removals were 0.5 $\log_{10}$ lower than during stable operation, whereas at MWDSC, removals were only 0.1 $\log_{10}$ lower. At Ottawa, the difference was statistically significant at the 5% level, whereas at MWDSC, it was not. The Ottawa result was consistent with previous studies (Swaim et al, 1996; Hall et al, 1995; Patania et al, 1995), which demonstrated a 0.5–1.0-$\log_{10}$ deterioration in oocyst removal during filter ripening. The MWDSC result was consistent with other studies (e.g., LeChevallier et al, 1991b) that did not yield statistically different oocyst removals between ripening and stable filter operation.

FIGURE 8 Particle and microorganism response of filter during onset-of-breakthrough experiment at Ottawa pilot plant on Jan. 21, 1999



However, when only early ripening at MWDSC was considered (sample times of 10, 20, and 40 min), the difference in oocyst removals between stable filter operation and ripening became statistically significant at the 5% level (results not shown). In general, the ripening data in this investigation suggest a brief, minimal-to-moderate increase in *C. parvum* passage through the filters that was concurrent with elevated filter effluent turbidity and particle counts. It should be noted that these experiments were designed to evaluate the passage of oocysts present in the filter influent during ripening, not the passage of oocysts that might be present in the backwash remnant water. The latter would be significant on a site-specific basis but could lead to increased oocyst passage during ripening in some instances.

Trends in *B. subtilis* removal during ripening were qualitatively comparable to those observed for *C. parvum* (Huck et al, 2001). At Ottawa, *B. subtilis* removals during ripening were lower and significantly different (5% level) from those achieved during stable operation. The same result was found for *B. subtilis* at MWDSC, where the difference for *C. parvum* had not been statistically significant at the 5% level. For *B. subtilis*, however, the differences between stable operation and ripening were substantially greater than for *C. parvum* in both locations. This suggests that *B. subtilis* spores are probably not good quantitative surrogates for *C. parvum* oocyst removal by filtration.

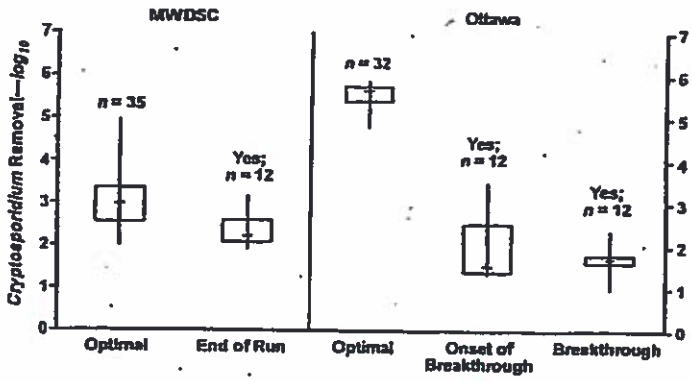
The net decrease in particle counts was also lower during ripening at both Ottawa and MWDSC, when compared with stable filter operation. Although not large, this difference (based on the entire ripening period) was statistically significant at the 5% level at both locations. The actual differences (0.5 $\log_{10}$ at Ottawa and 0.2 $\log_{10}$ at MWDSC) were comparable to the decreases in *C. parvum* removal.

Breakthrough. All of the breakthrough experiments conducted at MWDSC and Ottawa were performed after periods of stable operation. In both locations, jar-coagulated *C. parvum* oocysts and *B. subtilis* spores were seeded into the filters for 1h; samples were collected at 15, 30, 45, and either 55 or 60 min after the start of seeding.

At MWDSC, neither turbidity nor particle breakthrough could be achieved for technical reasons. Therefore, the experiments were performed as "end-of-run" experiments at ~ 72 h into the filter cycle. In Ottawa, breakthrough experiments were originally intended to be conducted when filter effluent turbidity exceeded 0.2 ntu. Because breakthrough was difficult to predict, seeding and sampling commenced in all cases when filter effluent turbidity levels were greater than ~ 0.4 ntu.

An additional set of experiments, termed "onset-of-breakthrough," was conducted at Ottawa. Filter effluent turbidity levels of < 0.3 ntu were targeted because the IESWTR requires filter effluent turbidity levels < 0.3 ntu in greater than 95% of measured samples. The first onset-of-breakthrough experiment at Ottawa was conducted on Jan. 21, 1999, when filter effluent turbidity levels were increasing but were still < 0.1 ntu. (In fact, this experiment was intended to be a stable operation experiment and only captured onset-of-breakthrough fortuitously.) Because of the striking results obtained in this experiment, two additional such experiments were performed at Ottawa on Dec. 20 and Dec. 22, 1999. In these two runs, filter effluent turbidity levels were 0.2–0.3 ntu. In these latter

FIGURE 9 Effect of breakthrough, onset-of-breakthrough, and end-of-run conditions on filters' removal of *Cryptosporidium parvum*



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level.

experiments, jar-coagulated *B. subtilis* spores were seeded for 1 h, and then *C. parvum* oocysts were seeded for 1 h as breakthrough commenced. Samples were collected only during the hour of *C. parvum* seeding.

Filter effluent turbidity and particle concentrations during the end-of-run experiments at MWDSC were similar to those obtained during the stable filter experiments. Furthermore, the filter effluent turbidity levels and particles remained constant throughout the end-of-run seeding period at MWDSC.

In contrast, the onset-of-breakthrough that occurred in Ottawa was a very dynamic period, particularly for *C. parvum*. In the January 1999 breakthrough experiment (Figure 7), the filter effluent turbidity was 0.04–0.07 ntu, and particle counts ranged from 0.3 to 4.3 particles/mL during the seeding and sampling period. Although these might be considered modest changes, they were accompanied by a drastic reduction in the filter's ability to remove incoming *C. parvum* oocysts (Figure 8). An increase in filter effluent *B. subtilis* concentrations was also observed, but it was not as severe as the increase in filter effluent oocyst concentrations (Figure 8). In general, the onset-of-breakthrough experiments at Ottawa demonstrated a relatively modest degradation of the traditional performance parameters that was accompanied by tremendous increases in filter effluent *C. parvum* concentrations. These data suggested that small increases in particle counts during early breakthrough could signal substantially increased noncapture of oocysts.

In the breakthrough experiments at Ottawa, both filter effluent turbidity and particle counts continued to change rapidly (Huck et al, 2001). The elevated turbidity and particle counts were accompanied by high filter effluent *C. parvum* concentrations (generally > 10^4 oocysts/L).

By seeding *B. subtilis* first and then *C. parvum* during the actual sampling, the December 1999 onset-of-breakthrough experiments at Ottawa were designed to investigate whether the passage of oocysts through the filter during early breakthrough conditions was largely a function of nonattachment. (The high effluent oocyst concentrations observed would suggest this.) Although the high concentration of spores observed in the filter effluent pointed to some detachment, this interpretation was unclear because during sampling more spores were present in the filter influent than in the effluent.

Median removals of *C. parvum* during end-of-run conditions were significantly different (at the 5% level) than during stable operation at MWDSC (Figure 9). However, no significant differences in net decrease in particle count were observed (Figure 10).

At Ottawa, median *C. parvum* removals during the onset-of-breakthrough and breakthrough experiments were substantially lower and statistically different (5% level) than during stable operation (Figure 9). These results were consistent with the statistically significant differences (5% level) observed for the net decrease in particle counts (Figure 10).

In Ottawa, results for *B. subtilis* paralleled those for *C. parvum*, with removals during the onset-of-breakthrough and breakthrough periods significantly lower (at the 5% level) than during stable operation (Huck et al, 2001). At MWDSC, the end-of-run *B. subtilis* removals, although also statistically different from those for stable operation at the 5% level, were actually somewhat higher (0.5 $\log_{10}$) than during stable operation. The reason for this result is not known, but it may be because of the fact that very low filter effluent *B. subtilis* numbers were observed in one of the three end-of-run experiments.

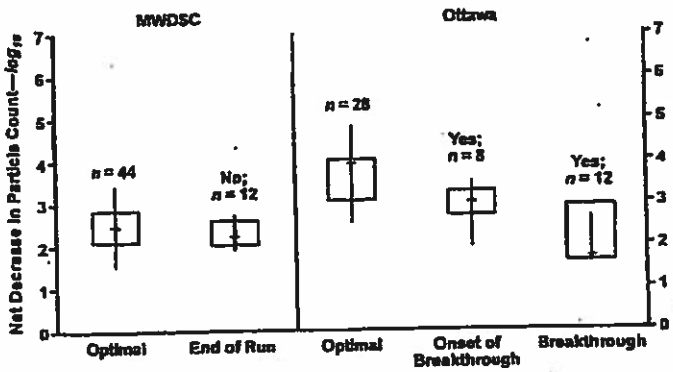
Oocyst removal during end-of-run conditions at MWDSC was ~ 0.6 $\log_{10}$ lower than during stable operation. In Ottawa, the onset-of-breakthrough and breakthrough oocyst removals were ~ 3.5 $\log_{10}$ and 4 $\log_{10}$ lower, respectively, than during stable operation. Ottawa results were in general agreement with other research (Logsdon et al, 1981) demonstrating that turbidity breakthrough at the end of a filter cycle could be accompanied by considerable passage of *Giardia* cysts. The Ottawa onset-of-breakthrough results were very different from those obtained by other researchers (Patania et al, 1995). In that study of *Giardia* and *C. parvum* passage through filters during breakthrough, effluent turbidity levels increased from 0.1 to 0.2 ntu or higher. Those researchers found that whereas *Giardia* removal was ~ 0.5 $\log_{10}$ lower during breakthrough, no difference was observed

in *C. parvum* removals during stable operation versus breakthrough. It is possible that other factors, such as chemical pretreatment, may affect the degree of pathogen passage that occurs during early breakthrough filtration.

Hydraulic step. Each of the hydraulic step experiments consisted of a 25% increase in filtration rate that took place over a period of < 1 min and was imposed during stable (optimized) operating conditions. This higher rate was maintained throughout the remainder of the filter cycle.

C. parvum and *B. subtilis* were seeded in the filter influent over an extended period of time (5 h at Ottawa and 8 h at MWDSC), and the hydraulic step was imposed immediately after the seeding period. Thus, oocysts appearing in the effluent would result from detachment rather than noncapture. Results from these experiments (three replicates in each location) were variable, even though the protocol remained the same, including the point in the filter cycle at which the step was applied. Because of space limitations, results are discussed only briefly here.

FIGURE 10 Effect of breakthrough, onset-of-breakthrough, and end-of-run conditions on net decrease in particle count from raw water to filter effluent



MWDSC—Metropolitan Water District of Southern California, n—number of data points. "Yes" designation indicates that the mean for a given condition was statistically different from the optimal or stable operation condition at the 5% level. "No" indicates the mean was not statistically different.

In the first experiment in Ottawa, the filter effluent turbidity and particle concentration temporarily increased to 0.37 ntu and 297 particles/mL, respectively. This increase was accompanied by a substantial increase in oocyst levels, with effluent concentrations of *C. parvum* reaching 4,412 oocysts/L (Huck et al, 2001).

The hydraulic step had much less effect in the second experiment. Although particle concentration peaked at ~ 400/mL, the filter effluent turbidity increased only slightly and no appreciable changes in filter effluent *C. parvum* concentrations were observed. A third hydraulic step experiment was performed, but turbidity and particle data were not available because of difficulties with the data acquisition system. Filter effluent oocyst concentrations were slightly elevated (a maximum value of 76 oocysts/L).

The similar experiments at MWDSC were more reproducible. In general, filter effluent turbidity was ~ 0.05 ntu, and the particle concentration ranged from 8 to 24 particles/mL. The filter effluent *C. parvum* concentrations generally decreased after the completion of seeding, despite the implementation of the hydraulic step. Thus, the hydraulic step for the most part had little effect on filter effluent concentrations at MWDSC.

B. subtilis results in both locations generally followed the same trend as for *C. parvum* (Huck et al, 2001). Except for the one experiment in Ottawa, the data suggested that little detachment of microorganisms occurred as a result of a 25% increase in flow. The reasons for the lack of effect and for the variable results in Ottawa are not understood. It may be that the effect of the flow change was sensitive to the exact way in which it was imposed. This variability may be higher at pilot scale than at full scale.

Ottawa results showed that particle counts were not directly indicative of oocyst passage through filters as a result of a hydraulic step (Huck et al, 2001). The results also suggested that turbidity might be a better indicator of the effect of a hydraulic step, but the authors believe firm conclusions cannot be based on these limited experiments.

The variation in observed results underlines the need for further investigation, so that the potentially severe effects of hydraulic changes on *C. parvum* passage (as observed during the first Ottawa experiment) can be minimized.

CONCLUSION

The authors' detailed investigation of *Cryptosporidium* removal by granular media filtration in two different waters led to the following conclusions.

- Under optimal operating conditions, *Cryptosporidium* removals exhibited a 2-log difference between two pilot plants operated to produce similar low effluent turbidity values (< 0.1 ntu) and particle counts (< 20/mL). Removals in one location were ~ 5 log_{10} units, whereas those in the other location were ~ 3 log_{10} units. Coagulation regimes at the two plants differed significantly, but the reasons for the 2-log variation are not completely understood.
- At the end of a filter run, the authors observed a substantial deterioration (several log_{10} units) in oocyst removal capability, even in the early stages of breakthrough when filter effluent particle counts had just begun to rise. At this stage, turbidity had not always increased.

This period appeared to be a particularly vulnerable one for filter operation.

• Suboptimal coagulation also substantially reduced *Cryptosporidium* oocyst removals (again by an average of several $\log_{10}$ units), even at turbidity levels that were < 0.3 ntu.

• Under the conditions of this study, a hydraulic step (sudden increase in loading) had little effect on filter effluent oocyst concentrations, except in one out of the six experiments performed. These differing results occurred despite the fact that the same percentage increase in flow was always imposed. However, turbidity and particle counts did increase in some experiments. It was expected that the hydraulic step would have a greater effect on oocyst concentrations. The reasons for the observed variability are not currently understood. Therefore, hydraulic step effects should be investigated further.

• Compared with suboptimal coagulation or breakthrough, only minimal or moderate deterioration (0.5 $\log_{10}$ units or less) of *Cryptosporidium* removal was observed during filter ripening under the conditions of these experiments.

• Various surrogate parameters (i.e., turbidity, particle counts, and *B. subtilis* spores) provided only qualitative indications of the filters' ability to remove *C. parvum* oocysts under the various conditions tested. However, for a given plant or filter, increases in turbidity or particularly particle counts during a filter cycle or as a result of an operational event may signal substantial deterioration in *Cryptosporidium* removal capability. This was evident, for example, in the early breakthrough experiments at Ottawa.

On the basis of the findings of this study, the authors have also developed specific guidance for water providers.

• To avoid deterioration of pathogen removals attributable to suboptimal coagulation conditions, utilities should carefully consider the effects of reducing coagulant dosage. Utilities should not accept filter effluent turbidity levels of 0.2–0.3 ntu.

• To avoid breakthrough, plants should specify a maximum head loss and run time for washing filters and consider using particle counters to monitor for early breakthrough.

• Water providers need to minimize the effect of ripening. Strategies could include filter-to-waste, recycling filter effluent during ripening, storing filter effluent produced during ripening for backwash water (if facilities are available), or adding coagulants to backwash water or filter influent during ripening.

• To avoid the effect of a hydraulic step (sudden increase in loading), utilities should minimize the magnitude and rate of filter flow changes.

ACKNOWLEDGMENT

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FOOTNOTES

[1]Microsoft Excel 97, Version SR-2, Microsoft Corp., Redmond, Wash.

[2]Waterborne Inc., New Orleans, La.

[3]Petroff-Hausser Bacterial Counting Chamber, Hausser Scientific Corp., Horsham, Pa.

[4]CH Diagnostic & Consulting Services Inc., Loveland, Colo.

[5]ATCC 6051, obtained from American Type Culture Collection, Rockville, Md.

[6]66278, Pall Gelman Corp., Ann Arbor, Mich.

[7]Duke Scientific Corp., Palo Alto, Calif.

[8]At MWDSC, PCX particle counter, Met One, Grants Pass, Ore.; at Ottawa, IBR particle counter, IBR, Grass Lake, Mich.

[9]Hach 1720C, Hach Co., Loveland, Colo.

[10]Model 7997/203, ABB, Calgary, Alta.

[11]Hach 2100P, Hach Co., Loveland, Colo.

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BY MONICA B. EMELKO,
PETER M. HUCK,
AND IAN P. DOUGLAS

Pilot-scale studies were performed to evaluate *Cryptosporidium parvum* oocyst removal by a dual-media filter during optimized, end-of-run, and breakthrough operating conditions. Oocyst-sized polystyrene microspheres were also evaluated as surrogates for *C. parvum* removal by filtration. At optimal conditions, the pilot-scale filter consistently achieved ~5-log removal of *C. parvum* and microspheres. During end-of-run operation when filter effluent turbidity levels were <0.1 ntu, median oocyst removals deteriorated to ~3 log. During early (0.1–0.3 ntu) and late (>0.3 ntu) breakthrough, filtration oocyst removals deteriorated to ~2.1 and ~1.4 log, respectively. Microsphere removals by filtration were similar to oocyst removals during both stable and challenged operating periods, suggesting that microspheres are useful surrogates for investigating *C. parvum* removal.

Cryptosporidium and microsphere removal during late in-cycle filtration

Water samples are processed for *Cryptosporidium* analysis.

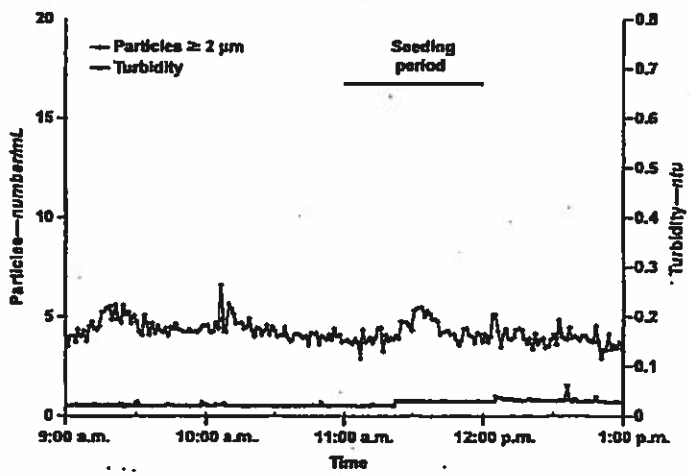
Several types of surrogates for viable *Cryptosporidium parvum* oocysts have been evaluated, including surrogates for occurrence, disinfection, and removal. Parameters that have been investigated as potential surrogates for cyst and oocyst removal by drinking water treatment processes have included turbidity, particle counts, heterotrophic plate counts, aerobic spores (typically *Bacillus subtilis*), ultraviolet absorbance at 254 nm, dissolved organic carbon, and polystyrene microspheres. Many of these parameters, such as turbidity and particle counts are reliable indicators of treatment performance, but they do not aid in quantitatively assessing oocyst removal by water treatment processes (Huck et al, 2002; Huck et al, 2001; Emelko, 2001; Hall et al, 1995; Nieminski & Ongerth, 1995; Ongerth & Pecoraro, 1995). Oocyst-sized fluorescent polystyrene microspheres have shown promise as surrogates for oocyst removal by filtration (Emelko et al, 1999; Swertfeger et al, 1999); however, further information is necessary to determine the range of conditions during which microsphere removal is a reliable surrogate for oocyst removal.

Filtration is an inherently dynamic process. Several studies have indicated that *C. parvum* removal by filtration deteriorates during vulnerable periods of operation such as suboptimal coagulation (Huck et al, 2002; Huck et al, 2001; Emelko et al, 1999; Patania et al, 1995). The Interim Enhanced Surface Water Treatment Rule (IESWTR) requires that combined filter effluent turbidity must be ≤0.3 ntu in at least 95% of the measurements taken each month (USEPA, 1998). The Long-term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) may offer 0.5-log credit for treatment systems that maintain 95th percentile combined filter effluent turbidity levels <0.15 ntu (USEPA, 2000). Limited infor-

TABLE 1 Summary of experimental conditions

Experimental Condition	Description
Stable operation	Period of consistent filter effluent turbidity, <30 h of filter operation, filter effluent turbidity levels: ~0.05 ntu consistently
End-of-run	Period at the end of a filter cycle during which subtle changes in filter effluent turbidity are noticed, filter effluent turbidity levels: <0.1–0.1 ntu
Early breakthrough	Period at the end of a filter cycle during which increasing filter effluent turbidity levels are observed, filter effluent turbidity levels: 0.1–0.3 ntu
Late breakthrough	Period at the end of a filter cycle during which increasing filter effluent turbidity levels are observed, filter effluent turbidity levels: >0.3 ntu

FIGURE 1 Filter effluent turbidity and particle concentration ≥2 µm during a stable filter operation experiment



mation is available regarding pathogen passage through filters during end-of-run and early breakthrough filtration when filter effluent turbidity levels are increasing but remain <0.15 and 0.3 ntu, respectively (as specified by the LT2ESWTR and IESWTR, respectively).

One study demonstrated that turbidity breakthrough at the end of a filter cycle (when filter effluent turbidity was >0.4 ntu) can be accompanied by considerable passage of *Giardia* cysts through a filter (Logsdon et al, 1981). A considerable increase in cyst passage was observed during early breakthrough conditions when filter effluent turbidity was just >0.2 ntu (Logsdon et al, 1981). Another study also investigated *Giardia* passage through filters during breakthrough when effluent turbidity levels increased from 0.1 to 0.2 ntu or higher. Those researchers found that *Giardia* removal was ~0.5 log lower during breakthrough than during stable operation (Patania et al, 1995). These data suggested that increased *C. parvum* passage could also be expected during breakthrough, especially at filter effluent turbidity levels exceeding 0.2 ntu.

Pilot-scale investigations of *C. parvum* removal by filtration during turbidity breakthrough when filter effluent turbidity levels increased from 0.1 to 0.2 ntu or higher did not yield substantial differences between oocyst removals during stable operation and breakthrough (Patania et al, 1995). In replicate experiments, oocysts were detected in almost all of the samples collected during the stable operation and breakthrough experiments at the particular pilot plant where turbidity breakthrough was investigated (Patania et al, 1995). Similar results were obtained during two full-scale investigations, which showed little, if any, deterioration in oocyst removals during filter breakthrough at either of the plants investigated (Baudin & Lainé, 1998). Those authors indicated that oocyst removal during breakthrough at both plants depended on the filtration rate. Fluctuating filter influent oocyst concentrations during the stable operation experiment, unspecified filter effluent turbidity levels during the breakthrough experiments, and insufficient oocyst recovery information made it difficult to draw inferences from the oocyst removal data collected during these breakthrough and stable operation experiments (Baudin & Lainé, 1998).

The removal of *C. parvum* oocysts and oocyst-sized fluorescent polystyrene microspheres during end-of-run, early breakthrough, and late breakthrough filtration (as defined in Table 1) relative to optimized filtration was investigated during the research reported in this article. The stable experiments were performed to determine the maximum removals that could be obtained by pilot-scale filtration under optimal conditions (filter effluent turbidity levels consistently ~0.05 ntu). They also provided a baseline against which the other operating conditions were compared. Included in these baseline data are *C. parvum* removal data from stable operation experiments that are reported elsewhere (Huck et al, 2002; Huck et al, 2001). End-of-run operation describes the period from which subtle changes in the baseline filter effluent turbidity (~0.05 ntu) and particle counts were noticed and filter effluent turbidity increased to ~0.1 ntu. The next part of the filter

cycle was early breakthrough filtration during the period when filter effluent turbidity levels were increasing from ~0.1 to ~0.3 ntu. The last investigated portion of the filter cycle was late breakthrough, during which filter effluent turbidity levels continued to increase from ~0.3 ntu. With the exception of late breakthrough, all of the experimental conditions occurred during periods of filter operation that were in compliance with the IESWTR. The current research is from a study (Emelko, 2001) focused on defining oocyst removals by filtration during vulnerable periods and relating them to removals during optimal treatment.

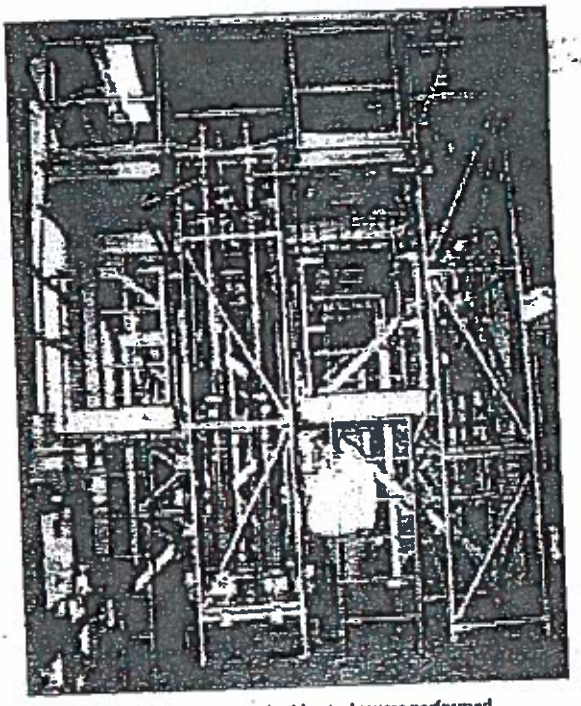
MATERIALS AND METHODS

Pilot-scale investigations were performed at the Britannia Pilot Plant in Ottawa, Ont. The pilot plant was conventionally operated with in-line coagulant injection, three-stage mechanical flocculation (velocity gradient [G] of 60, 40, and 20 s^{-1} in stages 1, 2, and 3, respectively), and plate settling. The raw water was from the Ottawa River and required a relatively high coagulant dose (~40 mg/L alum and 2 mg/L activated silica) for combined total organic carbon (5–7 mg/L) and particle removal (~3 ntu, ~5,000 particles ≥2µm/mL). Chlorine (2 mg/L) was added at rapid mix as a preoxidant.

One of the pilot-scale, dual-media filters of 152 mm (6 in.) diameter was seeded with jar-coagulated suspensions of 10^8 formalin-inactivated *C. parvum* oocysts and 10^8 carboxylated polystyrene microspheres. The filter contained media depths and sizes typical of many existing treatment plants. The design included 457 mm (18 in.) of anthracite (effective size [ES] = 1.07 mm [0.042 in.], uniformity coefficient [UC] = 1.35) and 279 mm (11 in.) of sand (ES = 0.515 mm [0.02 in.], UC = 1.32). The filter was operated in a constant rate mode at 6.6 m/h (2.7 gpm/sq ft). The backwashing regime consisted of chlorinated water and air-scour applied in a collapse-pulsing mode (Amitharajah et al, 1991).

The optimized coagulation conditions were selected to meet the 0.1-ntu turbidity goal of the Partnership for Safe Water, a voluntary treatment optimization program sponsored by the US Environmental Protection Agency and AWWA. The nonoptimal conditions targeted turbidity levels at the upper range of compliance with the IESWTR requirements of 0.3 ntu. The pilot-scale studies were performed to evaluate the oocyst removal capacity of a dual-media filter during optimized (period of consistent filter effluent turbidity of ~0.05 ntu), end-of-run (period at the end of filter cycle during which filter effluent turbidity increases from <0.1 to 0.1 ntu), early turbidity and particle breakthrough (period at the end of filter cycle during which filter effluent turbidity increases from 0.1 to 0.3 ntu), and late turbidity and particle breakthrough (period at the end of filter cycle during which filter effluent turbidity is >0.3 ntu) operation.

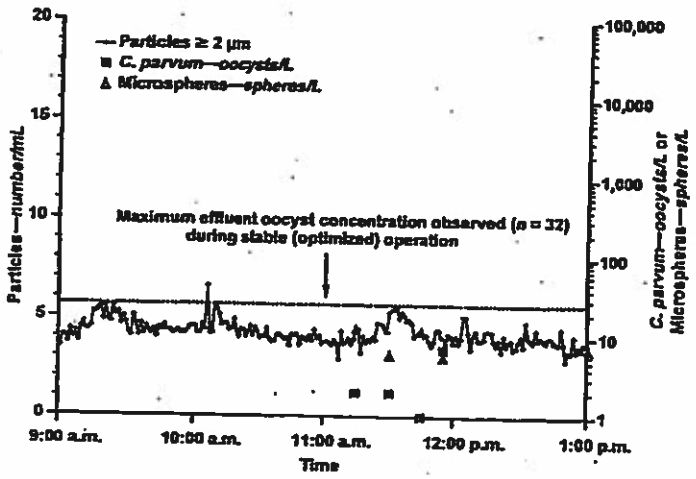
Seeding protocol. Both formalin-inactivated oocysts (mean concentration of 6.5×10^5 oocysts/L at filter influent) and oocyst-sized fluorescent polystyrene microspheres (mean concentration of 6.1×10^5 microspheres/L at filter influent, 4.675-µm diameter[1]), were jar-coagulated in a 2-L beaker. The coagulant dosages and rapid-mixing/flocculation times (1.2 s/30 min) were the same as those used in the pilot plant. The microspheres and oocysts were jar-coagulated in the same container and were therefore concurrently added to the filter influent. A peristaltic pump[2] was used to add the feedstock to the pilot-plant filter influent water. The seed suspensions were introduced into the filter influent water ~75 cm (2.5 ft) above the filter media. To facilitate filter influent sampling while minimizing losses to the sampling device, a second peristaltic pump[2] was continuously operated to recirculate filter influent water from ~5 cm (2 in.) above the surface of the filter media to the top of the water column within the filter.



The pilot-scale investigations in this study were performed at a pilot plant that was conventionally operated with in-line coagulant injection, three-stage mechanical flocculation, and plate settling.

Sample collection. Samples for microorganism and microsphere analyses were collected at the filter influent and effluent locations. The filter influent location was 5 cm (2 in.) above the surface of the filter media; the effluent was collected at the column exit immediately after passage through the support gravel (upstream of the turbidimeter and particle counter). Prior to the seeding experiments, 1-L negative controls were collected at the filter influent and effluent locations. The influent and effluent samples were collected in 250-mL and 1-L glass bottles, respectively. All sampling containers were washed, auto-

FIGURE 2 Filter effluent particle (≥2 µm), *C. parvum*, and microsphere concentrations during a stable filter operation experiment



claved, and rinsed with a buffered detergent solution (1× phosphate-buffered saline [PBS] with final concentrations of 0.1% sodium dodecyl sulfate, 0.1% polyoxyethylene sorbitan monooleate,[3] and 0.01% silicone polymer foam depressor,[4] and final pH of 7.4) prior to use.

The pilot-scale experiments evaluating optimal operation were performed during the early to mid-portion of the filter cycle after at least 4 h of filter operation. The end-of-run, early breakthrough, and late breakthrough experiments were conducted after periods of stable operation during which filter effluent turbidity levels were continuously <0.1 ntu. Filter influent and effluent samples were collected at 15, 30, 45, and 55 min after the start of seeding.

***C. parvum* analysis.** The *C. parvum* oocysts used during the seeding experiments were obtained from a commercial laboratory,[5] were bovine in origin, and were provided in a clean, purified form. For each experiment, 10^8 oocysts were obtained. They were inactivated with 5% formalin (final concentration) in 1× PBS with 0.01% polyoxyethylene sorbitan monolaureate[3] to prevent oocyst clumping. All microorganism stocks were refrigerated at 4°C in the dark until use.

Prior to *C. parvum* seeding, the stock suspension was vortexed, and a small portion of the suspension (<100 µL total) was removed to enumerate the oocyst concentration. The stock concentration was determined by averaging triplicate counts with a hemocytometer[6] and light microscopy.[7] The entire grid (1 mm^2 [0.001 sq in.]) was used for oocyst enumeration.

C. parvum oocysts were measured in the feedstock suspensions and the filter influent and effluent samples. Filter influents were analyzed in 10-, 5-, and 2.5-mL volumes. Filter effluents were analyzed in volumes ranging from 5 mL to 1 L, depending on the operating condition studied. Sample volumes were chosen to yield between 10 and 2,000 oocysts.

All of the samples were filtered through 25-mm, 0.40-µm polycarbonate membranes.[8] The filter membranes were placed on top of 25-mm, 8.0-µm nitrocellulose support membranes[9] placed on a manifold[10] and maintained at a vacuum of 125 mm (5 in.) of mercury. Weights held the membranes in place. Two millilitres of 1% bovine serum albumen (BSA) were passed through the filter membranes. Samples were then directly filtered on the manifold. The glassware that had contained the samples was then rinsed with the buffered detergent solution. The detergent rinse was followed by an additional 2 mL of BSA that was also filtered through the membranes; this was followed by a standard immunofluorescence assay.[11] If necessary, the membranes were kept wet with 1× PBS and covered until sample mounting on slides. Presumptive microscopic analysis for *C. parvum* enumeration was performed at 400× magnification at the University of Waterloo.[7] Recovery data from the filter influent and effluent water matrixes yielded a mean oocyst recovery of 75% and a relative standard deviation of 16%.

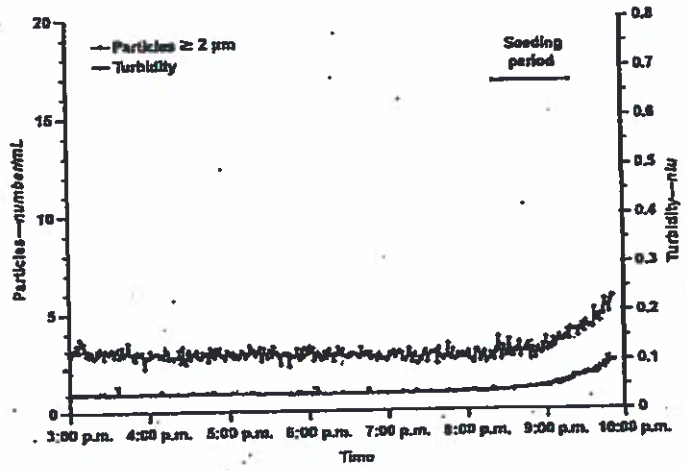
Microsphere analysis. Oocyst-sized fluorescent polystyrene microspheres[1] were used as nonbiological surrogate indicators for *C. parvum* removal. The microspheres had an average diameter of 4.675 ± 0.208 µm and a density of 1.045 g/mL. The dye is a proprietary chemical that is hydrophobic (to prevent dye leaching from the particles into the aqueous phase) and has maximum excitation at 458 nm and maximum emission at 540 nm, similar to fluorescein isothiocyanate (FITC), which is used for *C. parvum* analysis. Material provided by the manufacturer indicated that the microspheres did not contain any hazardous components.

The manufacturer provided the polystyrene microspheres in suspensions of 2.5% aqueous solids in deionized water. Neither biocides nor stabilizers were added to the suspensions. The microspheres were stored at 4°C until use. The weight-to-volume packaging allowed for the calculation of the particle concentration by a method provided by the manufacturer. The concentration of a stock suspension of 4.675-µm microspheres was 4.5×10^8 spheres/mL.

Microspheres were concentrated and enumerated by the same filtration method used for *C. parvum* (described earlier). The microspheres were readily distinguishable from the FITC-stained oocysts. Although they were approximately the same diameter, the microspheres appeared larger than the oocysts because of the halo effect associated with the strong intensity of the dye, which

permitted for microsphere enumeration at 100× magnification. Microspheres were enumerated concurrently with *C. parvum* oocysts at 400× magnification (FITC-stained oocysts did not fluoresce with enough intensity for enumeration at 100× magnification). Experiments previously reported (Emelko et al, 1999) indicated >90% recovery of microspheres using the concentration and enumeration method described earlier. It is hypothesized that the >90% recoveries originally reported (from seven replicate samples in a recovery study) were due to retention of microspheres on the micropipette tip used to dose the suspension for the recovery study. Given the very small volumes of stock microsphere suspensions (<200 µL) necessary for the seeding investigations, small droplets of the stock suspensions could affect recovery study outcomes. During the current investigation, three recovery experiments each included five high-microsphere concentrations (typical of filter influent samples) and 10 low-microsphere concentrations (typical of filter effluents) for a total of 45 samples. Although the microsphere recovery data demonstrated slightly higher variation than oocyst recovery data, mean microsphere recoveries were 75%.

FIGURE 3 Filter effluent turbidity and particle concentration ≥2 µm during an end-of-run experiment



Particle counts and turbidity. A standard protocol was used to verify the calibration of the particle counters using commercially available, calibrated, monodisperse polymer microspheres.[12] Each particle-counting instrument was calibrated by the manufacturer. The particle counters[13] measured total particles from 2 to 150 µm, with the data reported as total particles ≥2 µm. Turbidity was monitored at plant and filter influent and filter effluent locations using online turbidimeters[14] that were calibrated using dilute formazin solutions. An additional turbidimeter[15] was also used at the filter effluent location.

RESULTS

One experiment evaluating stable (i.e., optimized) filtration conditions was performed; it included concurrent seeding of polystyrene microspheres and *C. parvum*. Two experiments investigated end-of-run operation, three investigated early breakthrough filtration, and two were performed during late breakthrough filtration. These results are discussed together with seven additional stable operation experiments that were performed without polystyrene microspheres and from which *C. parvum* removals were reported elsewhere (Huck et al, 2002; Huck et al, 2001).

As shown in Figure 1, filter effluent turbidity and particle concentrations ≥2µm were consistently low (~0.04 ntu and <6 particles/mL, respectively) during the stable operation experiment investigating oocyst and microsphere removals; this type of performance was observed during all of the stable operation experiments. The stable experiments were performed to determine the best removals that could be obtained under optimal conditions at the Ottawa pilot plant; they also provided a baseline against which the other operating conditions were compared. Eight experiments (32 samples) of *C. parvum* removal are discussed; as indicated previously, one of these experiments (four samples) also investigated microsphere removal.

C. parvum removals by the pilot filter during stable (optimized) operation ranged from 4.7 to 5.8 log, with a median oocyst removal of 5.6 log (32 paired samples). Filter effluent particle (≥2µm), oocyst, and microsphere concentrations during the stable operation experiment are provided in Figure 2. Microsphere removals during stable operation ranged from 4.7 to 5.1 log, with a median microsphere removal of 4.9 log. The filter influent oocyst and microsphere concentrations during the stable operation experiment were similar, 4.6×10^5 oocysts/L and 6.5×10^5 microspheres/L on average. Overall, *C. parvum* concentrations in the filter effluent were typically <10 oocysts/L during stable operation, with several nondetects during the experiments performed with oocysts only.

Two experiments (eight samples total) investigating *C. parvum* and microsphere removal during end-of-run filtration were performed. The filter effluent turbidity and particle concentration ≥2 µm during an end-of-run experiment are provided in Figure 3. The filter effluent turbidity was low (~0.04 ntu) at the start of these experiments, increased to 0.13 ntu by the end of the seeding period in the first experiment, and was 0.06 ntu at the end of the second experiment.

FIGURE 4 Filter effluent particle (≥2 µm), *C. parvum*, and microsphere concentrations during an end-of-run experiment

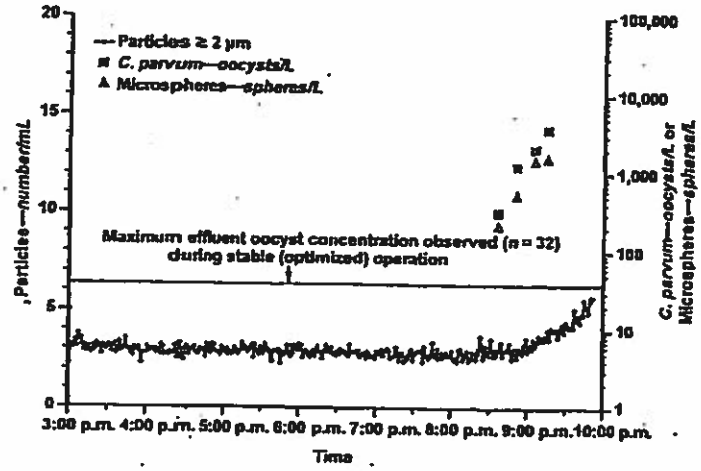
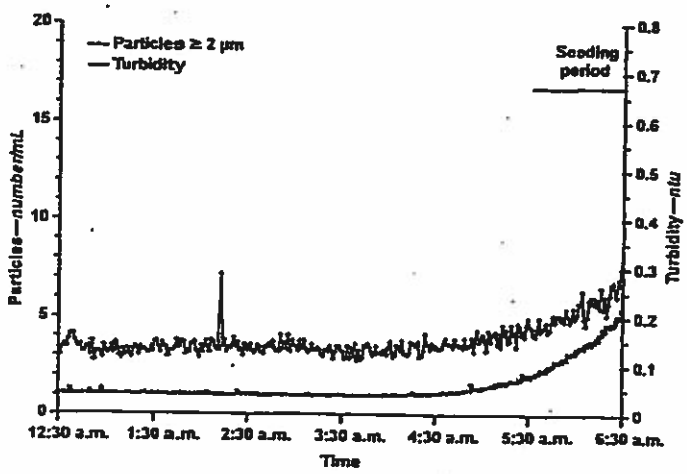


FIGURE 5 Filter effluent turbidity and particle concentration ≥2 µm during an early breakthrough experiment



Although the filter effluent turbidity levels and particle concentrations increased only slightly during the end-of-run experiments, they were accompanied by considerably elevated filter effluent *C. parvum* and microsphere concentrations relative to those obtained during stable operation. Filter effluent particle (≥2 µm), oocyst, and microsphere concentrations during an end-of-run experiment are given in Figure 4. *C. parvum* removals by the pilot filter during end-of-run filtration ranged from 1.8 to 3.3 log, with a median oocyst removal of 2.4 log (eight samples). Microsphere removals during end-of-run ranged from 1.8 to 3.1 log, with a median microsphere removal of 2.4 log. The filter influent oocyst and microsphere concentrations during the end-of-run experiments were similar, with mean concentrations of 6.8×10^5 oocysts/L and 5.6×10^5 microspheres/L. Both *C. parvum* and microspheres were found in all of the filter effluent samples during the end-of-run experiments.

Three experiments (12 samples) investigating *C. parvum* and microsphere removal during early breakthrough were performed; the seeding period and filter effluent turbidity and particle concentrations ≥2µm during one of these experiments are provided in Figure 5. The filter effluent turbidity was low (0.04–0.08 ntu) at the start of these experiments and increased to ~0.2 ntu by the end of the experiments. The increased filter effluent turbidity levels and particle concentrations during early breakthrough at Ottawa were also accompanied by increased filter effluent *C. parvum* and microsphere concentrations relative to those obtained during stable operation.

Typical filter effluent oocyst and microsphere data for an early breakthrough experiment are given in Figure 6. *C. parvum* removals by the pilot filter ranged from 1.7 to 2.8 log during early breakthrough, with a median oocyst removal of 2.1 log (12 samples). Microsphere removals during early breakthrough also ranged from 1.7 to 2.8 log, with a median microsphere removal of 2.1 log. The filter influent oocyst and microsphere concentrations during the early breakthrough experiment were similar, with mean concentrations of 6.6×10^5 oocysts/L and 5.7×10^5 microspheres/L. Both *C. parvum* and microspheres were found in all the filter effluent samples collected during the early breakthrough experiments.

The seeding period and filter effluent turbidity, and oocyst and microsphere concentrations during one of the late breakthrough experiments are shown in Figure 7. Two experiments (eight samples) investigating *C. parvum* and microsphere removal during late breakthrough were performed. The filter effluent turbidity was consistently 0.25–0.3 ntu at the start of these experiments. The elevated filter effluent turbidity levels during late breakthrough were accompanied by high filter effluent *C. parvum* and

microsphere concentrations relative to those obtained during the stable operation experiments. *C. parvum* removals by the pilot filter during the late breakthrough experiments ranged from 1.3 to 1.8 log, with a median oocyst removal of 1.4 log (eight samples). Microsphere removals during late breakthrough ranged from 1.3 to 2.0 log, with a median microsphere removal of 1.5 log. The filter influent oocyst and microsphere concentrations during these experiments were similar, with mean concentrations of 6.9×10^5 oocysts/L and 6.8×10^5 microspheres/L. Both *C. parvum* and microspheres were found in all of the filter effluent samples during the late breakthrough experiments.

The *C. parvum* and polystyrene microsphere removal data are summarized in a box-and-whisker plot (Figure 8). These data clearly indicate a substantial deterioration in both oocyst and microsphere removals during end-of-run, early breakthrough, and late breakthrough filtration; moreover, overall oocyst and microsphere removals generally continued to decrease as filter effluent turbidity levels and particle concentrations increased during these successive operating periods.

The box-and-whisker plot also indicates a relatively good correlation between *C. parvum* oocyst and polystyrene microsphere removals during the variety of operating conditions investigated (Figure 8). The relationship between oocyst and microsphere removals by the pilot filter was highly linear, as indicated in Figure 9, with a coefficient of determination (R^2) of 0.96. There are considerably fewer data points in the >4-log removal range that corresponds to the stable operation investigations. Although the data in Figure 9 clearly indicate a linear relationship between *C. parvum* and oocyst-sized microsphere removals in the 1.0–3.5-log removal range, more data are necessary to confidently extend this relationship into the 3.5–5.5-log removal range. Although the stable operation oocyst and microsphere removals were not as similar as those obtained during the other operating conditions, the data in Figure 8 and Figure 9 suggest that polystyrene microsphere removals were good and often conservative indicators of *C. parvum* removals by filtration. Further investigations are necessary to determine whether this relationship holds during stable operation and other nonoptimal operating periods such as suboptimal coagulation.

FIGURE 6 Filter effluent particle (≥2 µm), *C. parvum*, and microsphere concentrations during an early breakthrough experiment

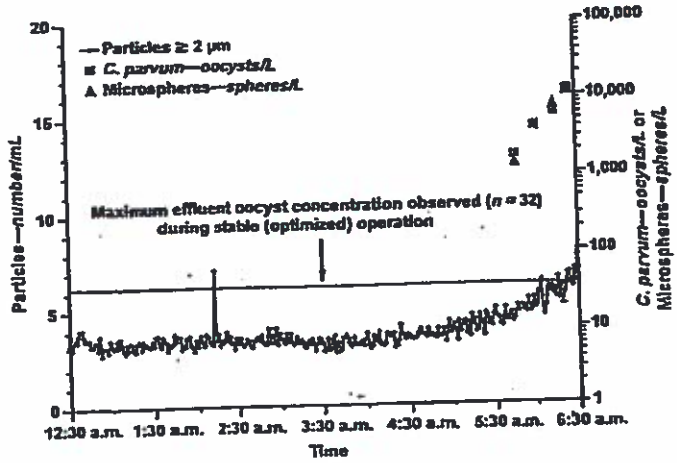
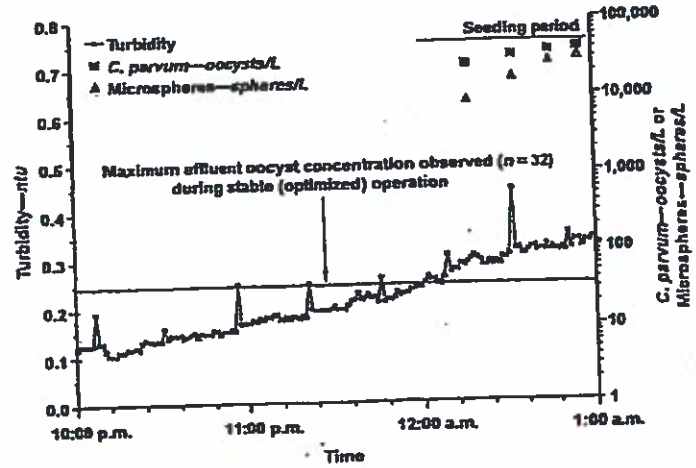


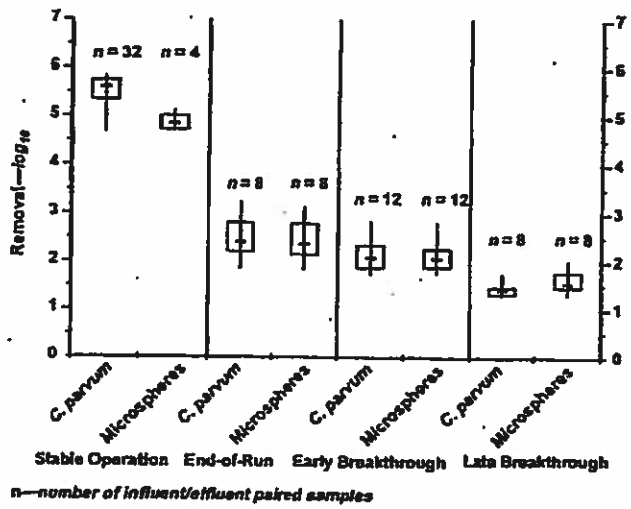
FIGURE 7 Filter effluent turbidity, seeding period, *C. parvum*, and microsphere concentrations during a late breakthrough experiment



DISCUSSION

Considerable deterioration in *C. parvum* and polystyrene microsphere removal during end-of-run filtration when filter effluent turbidity levels were increasing but still <0.1 ntu was not expected given other data that have been provided in the literature (Baudin and Laîné, 1998; Patania et al, 1995). Nonetheless, the data collected dur-

FIGURE 8 Box-and-whisker plot of *C. parvum* and microsphere removal by the pilot-scale dual-media filter



n—number of influent/effluent paired samples

ing this research indicated that end-of-run, early breakthrough, and late breakthrough filtration all represent operating periods during which *C. parvum* removals can be substantially compromised relative to those obtained during optimized filtration (Figure 8). This result is in agreement with the late breakthrough filtration performance deterioration reported by Huck et al (2002; 2001). In the current investigation, the pilot-scale dual-media filter consistently achieved ~5-log removal of *C. parvum* oocysts during stable (optimized) filtration; similar levels of oocyst-sized polystyrene microspheres were observed during stable operation. During end-of-run operation when filter effluent turbidity levels demonstrated the first signs of increasing (but still were <0.1 ntu), *C. parvum* removal deteriorated to ~3 log. Oocyst and microsphere removals decreased to even lower levels during early breakthrough and late breakthrough filtration. The deterioration in removals of incoming *C. parvum* and oocyst-sized microspheres during end-of-run and breakthrough filter operation relative to stable operation is quite obvious in Figure 8. A relative deterioration between removals during end-of-run and early or late breakthrough is less obvious. More experimentation would help to elucidate whether these differences are significant.

The high *C. parvum* and microsphere concentrations that were found in the filter effluents even after only 15 min of seeding suggested that the passage of oocysts through the filter during the end-of-run, early breakthrough, and late breakthrough filtration periods is largely a function of nonattachment rather than of detachment. This conclusion, though far from incontrovertible, is in general agreement with other studies that suggest nonattachment is an important mechanism of particle passage through filters during breakthrough operation (Moran et al, 1993; Ginn et al, 1992). The current experiments, however, were designed to assess the removals of microorganisms that were introduced to the filter from the influent water late in the filter cycle. The experiments were not designed to investigate detachment during end-of-run and breakthrough filtration.

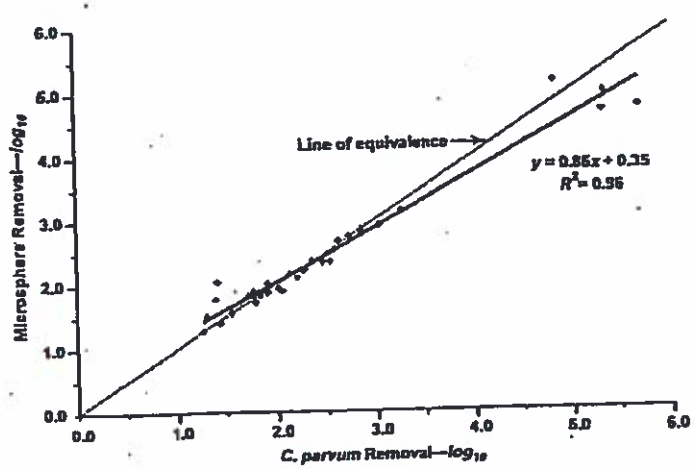
The end-of-run and early breakthrough filtration data clearly indicated a substantial deterioration in *C. parvum* removal by filtration during operating conditions that were in compliance with the 0.3-ntu filter effluent turbidity requirement of the IESWTR. From an operational perspective, these data might challenge the appropriateness of an upper turbidity limit of 0.3 ntu for all points in the filter cycle. This work suggests merit in placing filters out of service at an earlier point in the filter cycle (perhaps when effluent turbidity levels are still <0.1 ntu) to ensure maximum pathogen removal. An important question not answered by the current investigation is when the deterioration in *C. parvum* removal (relative to stable operation) "begins" during a filter cycle. Is it an ongoing, slow deterioration, or does it happen somewhat abruptly toward the end of a filter cycle? An equally important, related question is whether filter effluent turbidity and particle concentration measurements indicate when this deterioration in *C. parvum* removal commences.

The substantial reduction in *C. parvum* removal during the end-of-run and breakthrough experiments relative to the optimized filtration experiments should be considered in the context of the experimental conditions. Because filter influent *C. parvum* concentrations are not typically in the range of the 10^5 oocysts/L used during these experiments, the removal data collected during this investigation should not be used to quantitatively predict differences in oocyst removals at various points in the filter cycle in full-scale plants. However, they do indicate the potential for substantial deterioration in the removal of incoming *C. parvum* oocysts as early as the end-of-run period.

The largest deterioration in oocyst and microsphere removals was expected during the later portions of the filter cycle when filter effluent turbidity levels were high (~0.3 ntu). The early and late breakthrough findings were in general agreement with the findings of other researchers that showed that turbidity breakthrough at the end of a filter cycle could be accompanied by considerable passage of *Giardia* cysts (Logsdon et al, 1981). The early breakthrough

results, however, were different from those obtained during other investigations of *Giardia* and *C. parvum* passage through filters during breakthrough when effluent turbidity levels increased from 0.1 to 0.2 ntu or higher. Patania et al (1995) found that although *Giardia* removal was ~0.5 log lower during breakthrough relative to stable operation, no difference between *C. parvum* removals during stable operation and breakthrough was observed. It is possible that other factors such as chemical pretreatment, which has been demonstrated as critical for optimizing *C. parvum* removal by filtration (Huck et al, 2002; Huck et al, 2001; Patania et al, 1995), may affect the degree of pathogen passage that occurs during early breakthrough filtration.

FIGURE 9 Relationship between *C. parvum* and microsphere removal by the pilot-scale dual-media filter



Commensurate with the findings of several other studies (Nieminski & Ongerth, 1995; Patania et al, 1995), the elevated filter effluent *C. parvum* concentrations during operation late in the filter cycle (i.e., end-of-run, early breakthrough, and late breakthrough) were generally associated with increasing filter effluent total particle counts ≥2 µm and turbidity. This relationship does not hold for all operating conditions, however. As well, the current investigation supported the general conclusions of previous studies that suggested that oocyst-sized polystyrene microsphere removals may be good surrogates for *C. parvum* removal by filtration (Emelko et al, 1999; Swertfeger et al, 1999). A good linear relationship between oocyst and microsphere removals by filtration was provided in Figure 9. From this figure, it is clear that the relationship between oocyst and microsphere removals by filtration is weakest at the highest removals that occurred during stable (optimized) filtration. Only limited *C. parvum* and microsphere data in the 3.5–5.5-log removal range were available. Only one stable operation experiment could be performed with microspheres and should be repeated to better discern whether this apparent deviation from an otherwise highly linear relationship is due to experimental drift. The slightly more variable microsphere recovery also might have affected these results.

As has been discussed previously, the microsphere findings are particularly important because no reliable surrogates for the removal of *C. parvum* during water treatment exist at this time. The microspheres offer several advantages for use over oocysts in treatment process evaluations such as those reported in this study. The microspheres cost substantially less than oocysts, do not require antibody staining, do not pose the public health threats of *C. parvum* (although they could not necessarily be introduced into full-scale plants), are resilient during treatment, and may possibly lend themselves to automated enumeration. As shown earlier, the microspheres also appear to be removed at levels that are comparable to oocyst removals (or slightly lower in the case of stable operation), thereby suggesting that they are generally conservative surrogates that can be used for investigating *C. parvum* removals in treatment process evaluations.

CONCLUSIONS

1. Microsphere removals by filtration were comparable to oocyst removals during both stable and challenged operating periods, suggesting that microspheres may be useful surrogates for investigating *C. parvum* removal.

2. At optimal conditions, the pilot-scale filter consistently achieved >4.5-log removal of *C. parvum* and microspheres. These results were similar to previously reported *C. parvum* removal data (Huck et al, 2002; Huck et al, 2001).

3. During end-of-run operation when filter effluent turbidity levels were <0.1 ntu, median oocyst removals deteriorated to ~3 log.

4. Relative to stable operation, substantial deterioration in *C. parvum* removal can occur during early (operating conditions that were in compliance with the 0.3-ntu filter effluent turbidity requirement of the IESWTR) and late breakthrough filtration. During these periods, observed oocyst removals were 2.1 and 1.4 log, respectively. The early breakthrough data demonstrated that oocyst removals of <2 log could be obtained when in compliance with the 0.3-ntu filter effluent turbidity requirement of the IESWTR. These findings suggested that placing filters out of service prior to reaching a 0.3-ntu (or even lower) filter effluent turbidity is one opera-

tional strategy for maximizing *C. parvum* and potentially other pathogen removal by filtration.

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FOOTNOTES

[1]Fluoresbrite™ carboxylated YG microspheres, Polysciences Inc., Warrington, Pa.

[2]Masterflex Standard Drive and Easy Load II Pump Head With PharMed™ Precision Tubing, Labcor, Concord, Ont.

[3]Tween 80, Tween 20, J.T. Baker Chemical Co., Philadelphia, Pa.

[4]Sigma Antifoam A, Sigma-Aldrich Corp., St. Louis, Mo.

[5]University of Arizona, Dept. of Veterinary Science, Tucson, Ariz.

[6]Petroff-Hausser Bacterial Counting Chamber, Hausser Scientific Corp., Horsham, Pa.

[7]Zeiss Axioskop 2, Empix Imaging, Mississauga, Ont.

[8]Nuclepore Polycarbonate Membranes, Corning, Acton, Mass.

[9]MF Millipore Membrane Filters, Millipore Canada Ltd., Nepean, Ont.

[10]320 NM Filter Assembly, Hoefer Scientific, San Francisco, Calif.

[11]HydroFluor™ Combo *Cryptosporidium* and *Giardia* kit, Strategic Diagnostics, Newark, Del.

[12]Duke Scientific Corp., Palo Alto, Calif.

[13]IBR Water Particle Counting System Model PWCSD, Inter Basic Resources Inc., Grass Lake, Mich.

[14]Hach Model 1720C, Hach Co., Loveland, Colo.

[15]ABB Model 7997/201, ABB, Calgary, Alta.

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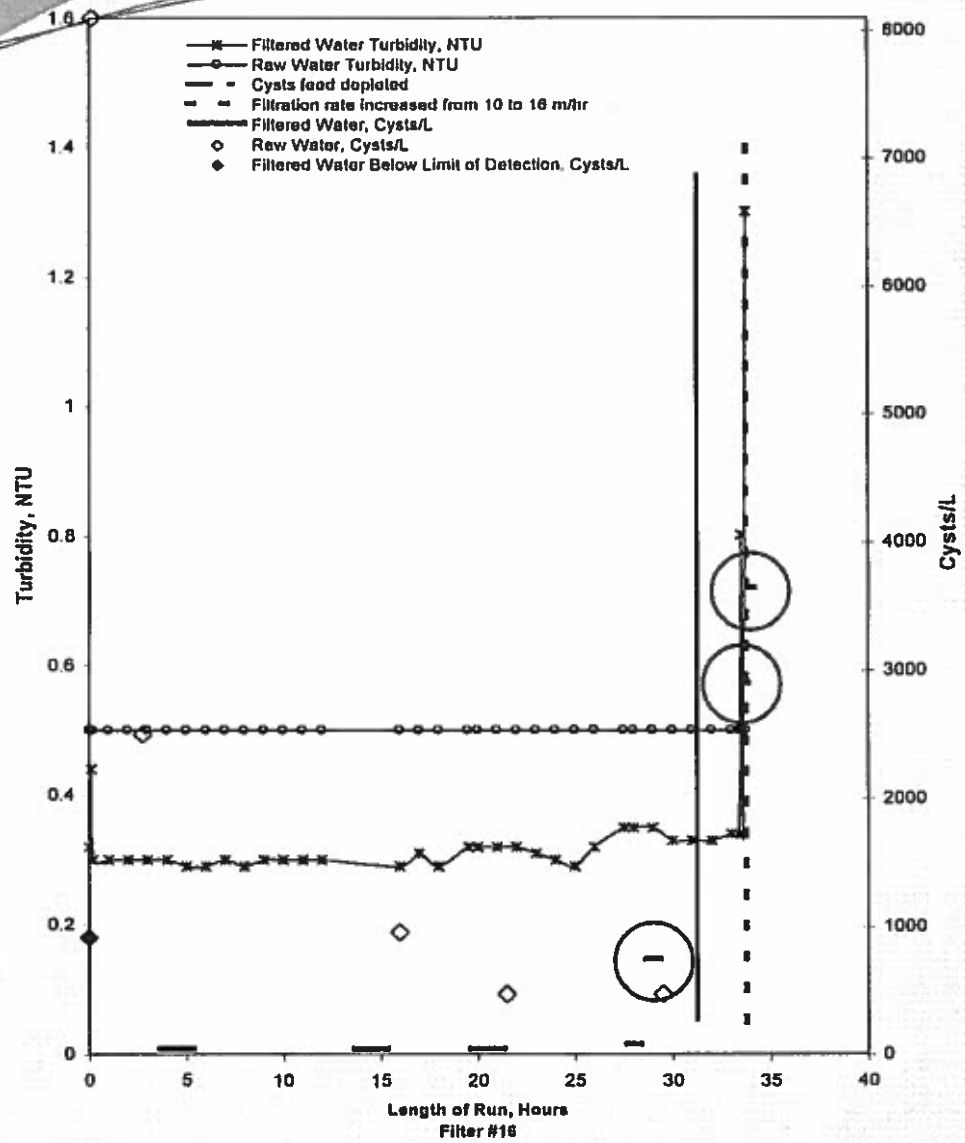


Turbidity breakthrough at the end of a filter run discharges cysts stored during the entire run. (Source: "Filter Operations and Maintenance Guidance Manual" [2002] adapted from Logsden et. al. 1981)

7. IMPORTANCE OF TURBIDITY

7.1 Overview

Section 2 of this guidance manual is included to present an overview on the definition and sources of turbidity. Understanding turbidity, its causes and sources, and the significance to human health will provide the background on which the new turbidity standards are based.

7.2 Turbidity: Definition, Causes, and History as a Water Quality Parameter

Turbidity is a principal physical characteristic of water and is an expression of the optical property that causes light to be scattered and absorbed by particles and molecules rather than transmitted in straight lines through a water sample. It is caused by suspended matter or impurities that interfere with the clarity of the water. These impurities may include clay, silt, finely divided inorganic and organic matter, soluble colored organic compounds, and plankton and other microscopic organisms. Typical sources of turbidity in drinking water include the following (see Figure 7-1):

- Waste discharges;
- Runoff from watersheds, especially those that are disturbed or eroding;
- Algae or aquatic weeds and products of their breakdown in water reservoirs, rivers, or lakes;
- Humic acids and other organic compounds resulting from decay of plants, leaves, etc. in water sources; and
- High iron concentrations which give waters a rust-red coloration (mainly in ground water and ground water under the direct influence of surface water).
- Air bubbles and particles from the treatment process (e.g., hydroxides, lime softening)

Simply stated, turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption and in many manufacturing uses. Once considered as a mostly aesthetic characteristic of drinking water, significant evidence exists that controlling turbidity is a competent safeguard against pathogens in drinking water.

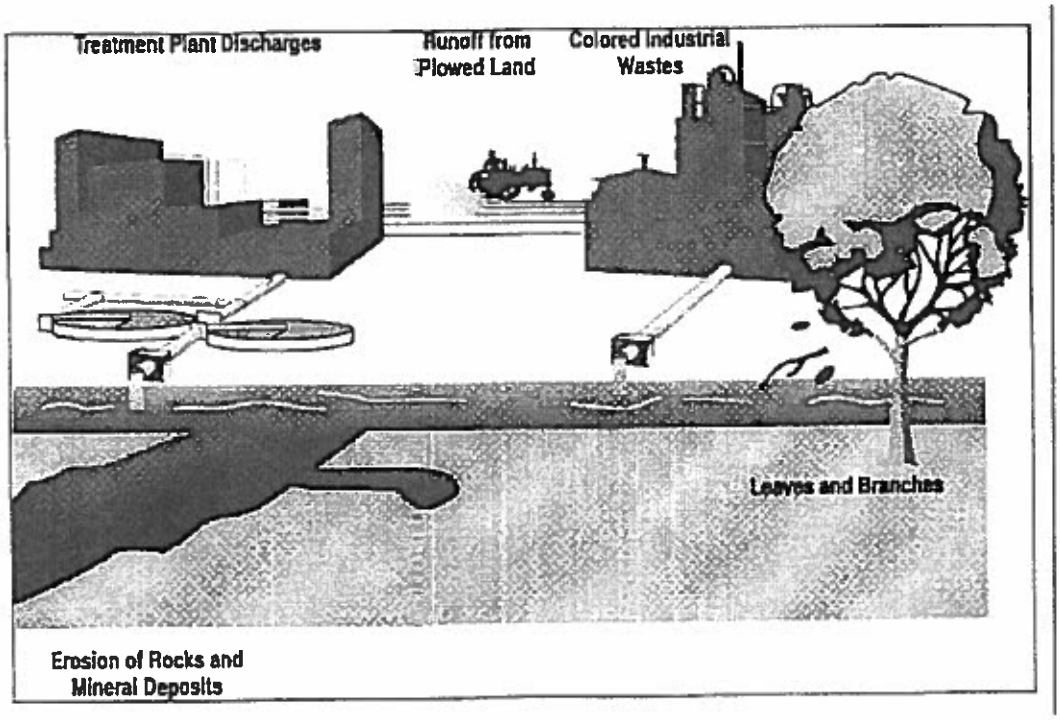
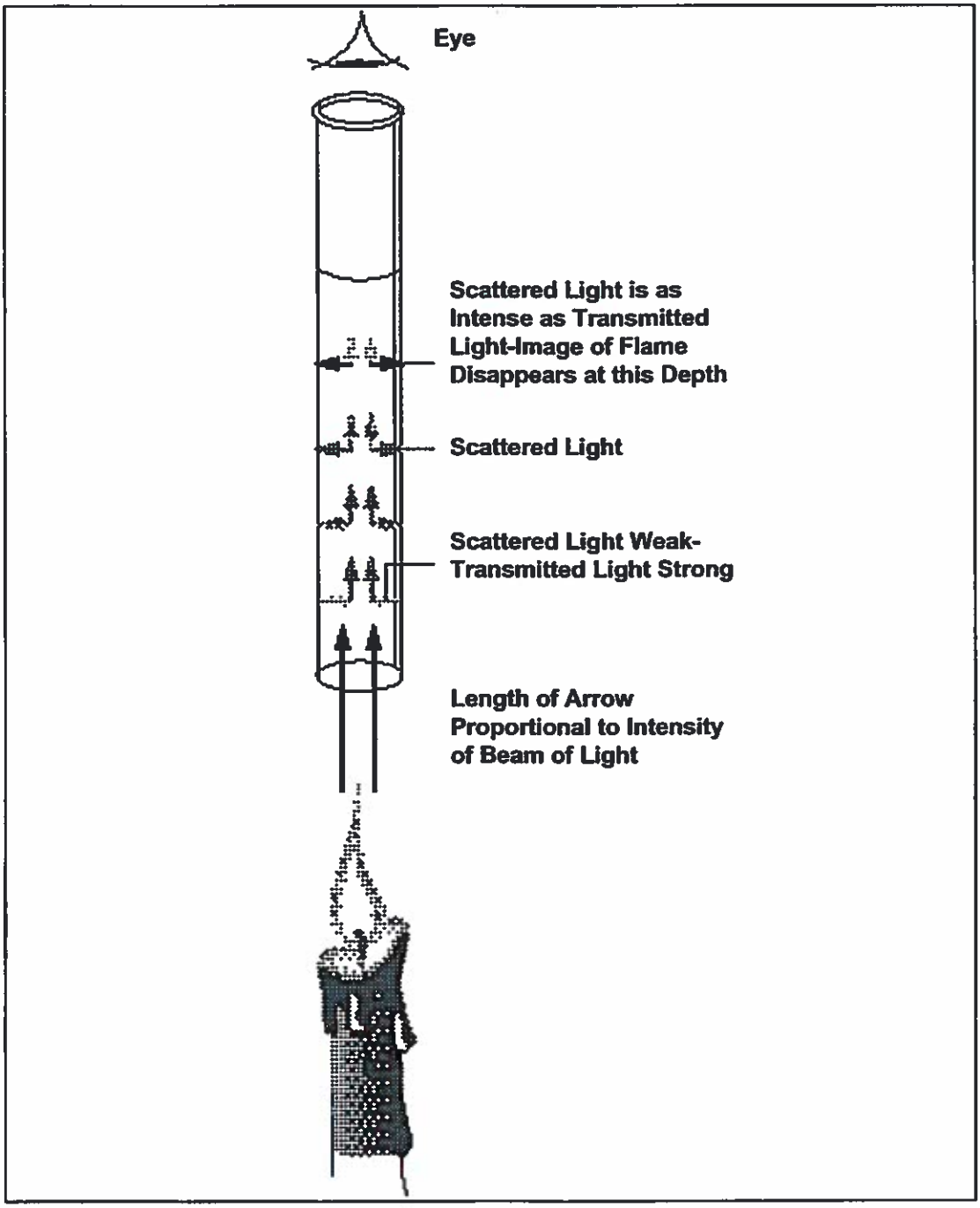


Figure 7-1. Typical Sources of Turbidity in Drinking Water

The first practical attempts to quantify turbidity date to 1900 when Whipple and Jackson developed a standard suspension fluid using 1,000 parts per million (ppm) of diatomaceous earth in distilled water (Sadar, 1996). Dilution of this reference suspension resulted in a series of standard suspensions, which were then used to derive a ppm-silica scale for calibrating turbidimeters.

The standard method for determination of turbidity is based on the Jackson candle turbidimeter, an application of Whipple and Jackson's ppm-silica scale (Sadar, 1996). The Jackson candle turbidimeter consists of a special candle and a flat-bottomed glass tube (Figure 7-2), and was calibrated by Jackson in graduations equivalent to ppm of suspended silica turbidity. A water sample is poured into the tube until the visual image of the candle flame, as viewed from the top of the tube, is diffused to a uniform glow. When the intensity of the scattered light equals that of the transmitted light, the image disappears; the depth of the sample in the tube is read against the ppm-silica scale, and turbidity was measured in Jackson turbidity units (JTU). Standards were prepared from materials found in nature, such as Fuller's earth, kaolin, and bed sediment, making consistency in formulation difficult to achieve.



Source: Sadar, 1996.

Figure 7-2. Jackson Candle Turbidimeter

In 1926, Kingsbury and Clark discovered formazin, which is formulated completely of traceable raw materials and drastically improved the consistency in standards formulation. Formazin is a suitable suspension for turbidity standards when prepared accurately by weighing and dissolving 5.00 grams of hydrazine sulfate and 50.0 grams of hexamethylenetetramine in one liter of distilled water. The solution develops a white hue after standing at 25°C for 48 hours. A new unit of turbidity measurement was adopted called formazin turbidity units (FTU).

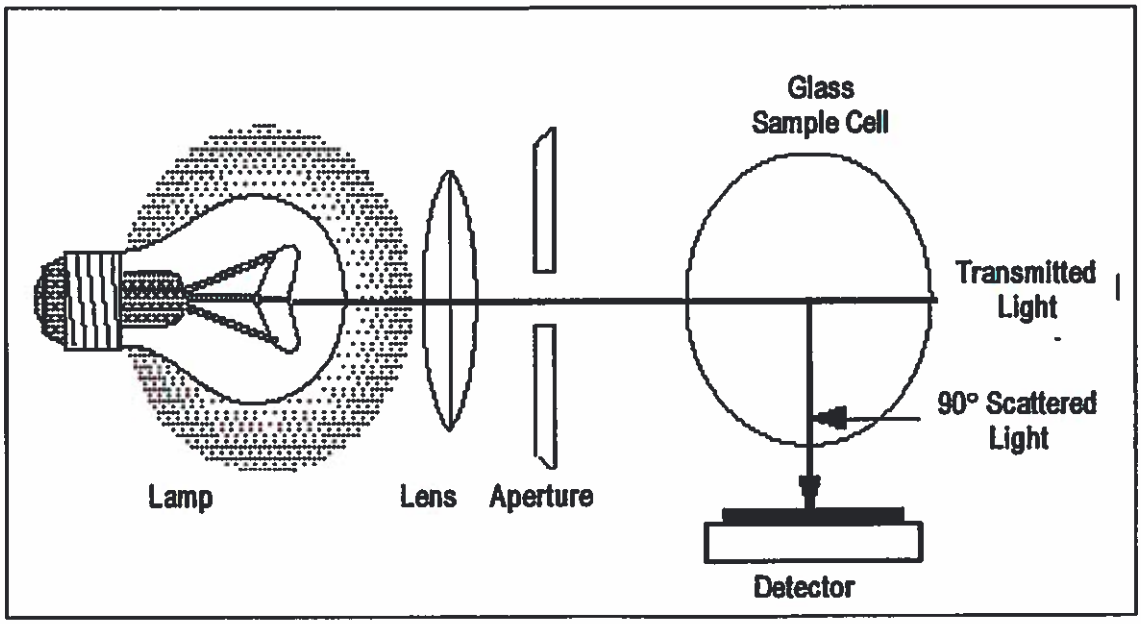
Even though the consistency of formazin improved the accuracy of the Jackson Candle Turbidimeter, it was still limited in its ability to measure extremely high or low turbidity. More precise measurements of very low turbidity were needed to define turbidity in samples containing fine solids. The Jackson Candle Turbidimeter is impractical for this because the lowest turbidity value on this instrument is 25 JTU. The method is also cumbersome and too dependent on human judgement to determine the exact extinction point.

Indirect secondary methods were developed to estimate turbidity. Several visual extinction turbidimeters were developed with improved light sources and comparison techniques, but all were still dependent of human judgement. Photoelectric detectors became popular since they are sensitive to very small changes in light intensity. These methods provided much better precision under certain conditions, but were still limited in ability to measure extremely high or low turbidities.

Finally, turbidity measurement standards changed in the 1970's when the nephelometric turbidimeter, or nephelometer, was developed which determines turbidity by the light scattered at an angle of 90° from the incident beam (Figure 7-3). A 90° detection angle is considered to be the least sensitive to variations in particle size. Nephelometry has been adopted by *Standard Methods* as the preferred means for measuring turbidity because of the method's sensitivity, precision, and applicability over a wide range of particle size and concentration. The nephelometric method is calibrated using suspensions of formazin polymer such that a value of 40 nephelometric units (NTU) is approximately equal to 40 JTU (AWWARF, 1998). The preferred expression of turbidity is NTU.

7.3 Turbidity's Significance to Human Health

Excessive turbidity, or cloudiness, in drinking water is aesthetically unappealing, and may also represent a health concern. Turbidity can provide food and shelter for pathogens. If not removed, turbidity can promote regrowth of pathogens in the distribution system, leading to waterborne disease outbreaks, which have caused significant cases of gastroenteritis throughout the United States and the world. Although turbidity is not a direct indicator of health risk, numerous studies show a strong relationship between removal of turbidity and removal of protozoa.



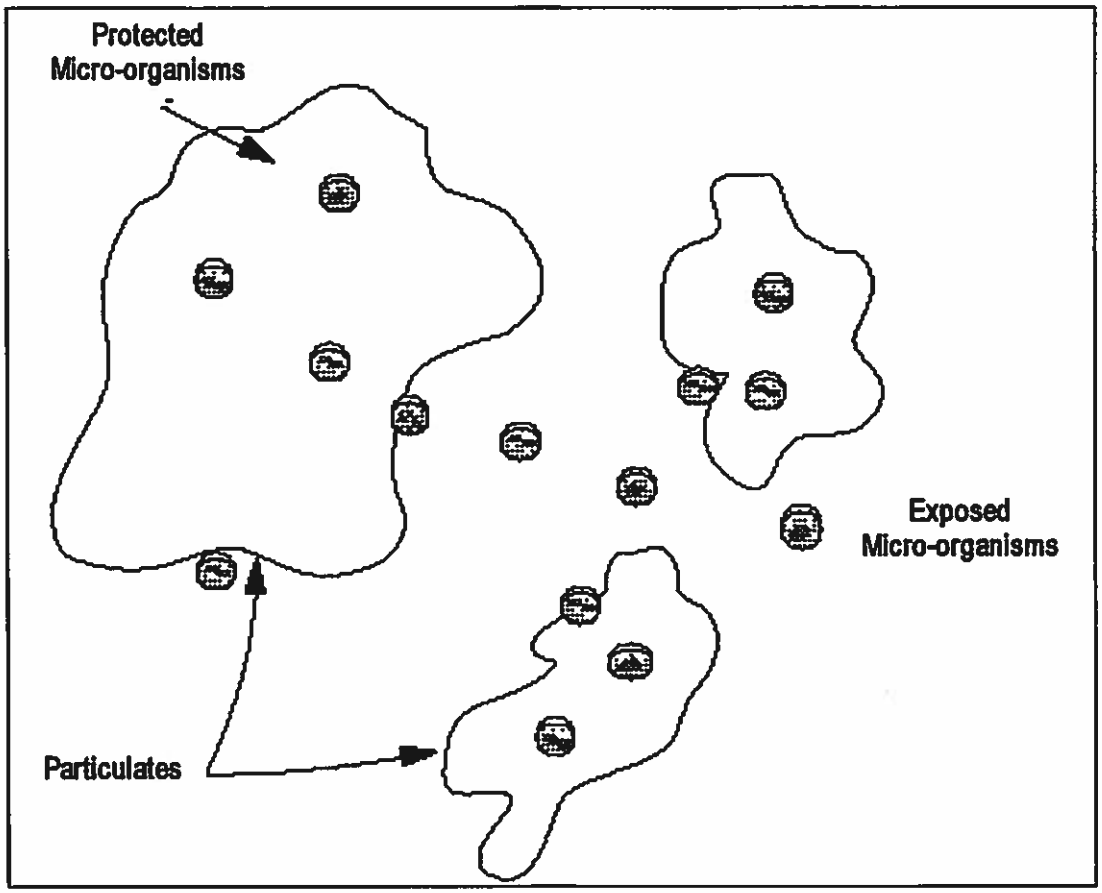
Source: Sadar, 1996; photo revised by SAIC, 1998.

Figure 7-3. Nephelometric Turbidimeter

The particles of turbidity provide "shelter" for microbes by reducing their exposure to attack by disinfectants (Figure 7-4). Microbial attachment to particulate material or inert substances in water systems has been documented by several investigators (Marshall, 1976; Olson et al., 1981; Herson et al., 1984) and has been considered to aid in microbe survival (NAS, 1980). Fortunately, traditional water treatment processes have the ability to effectively remove turbidity when operated properly.

7.3.1 Waterborne Disease Outbreaks

Notwithstanding the advances made in water treatment technology, waterborne pathogens have caused significant disease outbreaks in the United States and continue to pose a significant problem. Even in developed countries, protozoa have been identified as the cause of half of the recognized waterborne outbreaks (Rose et al., 1991). The most frequently reported waterborne disease in the United States is acute gastrointestinal illness, or gastroenteritis (Huben, 1991). The symptoms for this disease include fever, headache, gastrointestinal discomfort, vomiting, and diarrhea. Gastroenteritis is usually self-limiting, with symptoms lasting one to two weeks in most cases. However, if the immune system is suppressed, as with the young, elderly and those suffering from HIV or AIDS, the condition can be very serious and even life threatening. The causes are usually difficult to identify but can be traced to various viruses, bacteria, or protozoa.



Source: LeChevallier and Norton, 1991.

Figure 7-4. Particles of Turbidity May Provide Protection for Microorganisms

Giardia and *Cryptosporidium* are the two most studied organisms known to cause waterborne illnesses. These two protozoa are believed to be ubiquitous in source water, are known to occur in drinking water systems, have been responsible for the majority of waterborne outbreaks, and treatments to remove and/or inactivate them are known to be effective for a wide range of waterborne parasites (LeChevallier and Norton, in Craun, 1993). *Giardia* and *Cryptosporidium* have caused over 400,000 persons in the United States to become ill since 1991, mostly due to a 1993 outbreak in Milwaukee, Wisconsin.

Giardia and viruses are addressed under the 1989 SWTR. Systems using surface water must provide adequate treatment to remove and/or inactivate at least 3-log (99.9%) of the *Giardia lamblia* cysts and at least 4-log (99.99%) of the enteric viruses. However, *Cryptosporidium* was not addressed in the SWTR due to lack of occurrence and health effects data. In the mid-1980's, the United States experienced its first recognized waterborne disease outbreak of cryptosporidiosis (D'Antonio et al., 1985). It was soon discovered that the presence of *Cryptosporidium* in drinking water, even in very low

concentrations, could be a significant health hazard (Gregory, 1994). In 1993, a major outbreak of cryptosporidiosis occurred even though the system was in full compliance with the SWTR. Several outbreaks caused by this pathogen have been reported (Smith et al., 1988; Hayes at al., 1989; Levine and Craun, 1990; Moore et al., 1993; Craun, 1993). The ESWTR's primary focus is to establish treatment requirements to further address public health risks from pathogen occurrence, and in particular, *Cryptosporidium*.

Table 7-1 displays several instances of past outbreaks of cryptosporidiosis in systems using surface water as a source, along with general information about the plant and turbidity monitoring. In three out of four of the cases displayed in the table (Milwaukee, Jackson County, and Carrollton), turbidity over 1.0 NTU was occurring in finished water during the outbreaks.

Table 7-1. Cryptosporidium Outbreaks vs. Finished Water Turbidity

Location of Outbreak	Year	General Plant Information	Turbidity Information
Las Vegas, Nevada (CDC, 1996)	1993-1994	No apparent deficiencies or problems with this community system; SWTR compliant; system performed pre-chlorination, filtration (sand and carbon), and filtration of lake water; outbreak affected mostly persons infected with the human immunodeficiency virus (HIV)	The raw water averaged 0.14 NTU between January 1993 and June 1995, with a high of 0.3 NTU; the maximum turbidity of finished water during this time was 0.17 NTU.
Milwaukee, Wisconsin (CDC, 1996, Logsdon, 1996)	1993	Community system; SWTR compliant; however, deterioration in source (lake) raw-water quality and decreased effectiveness of the coagulation-filtration process	Dramatic temporary increase in finished water turbidity levels; reported values were as high as 2.7 NTU. (Turbidity had never exceeded 0.4 NTU in the previous 10 years.)
Jackson County, Oregon (USEPA, 1997)	1992	Poor plant performance (excessive levels of algae and debris); no pre-chlorination before filtration	Earlier in the year when outbreak occurred, filtered water had averaged 1 NTU or greater.
Carrollton, Georgia (USEPA, 1997, Logsdon, 1996)	1987	Conventional filtration plant; sewage overflowed into water treatment intake, followed by operational irregularities in treatment; filters were placed back into service without being backwashed.	Filtered water turbidity from one filter reached 3 NTU about three hours after it was returned to service without being washed.

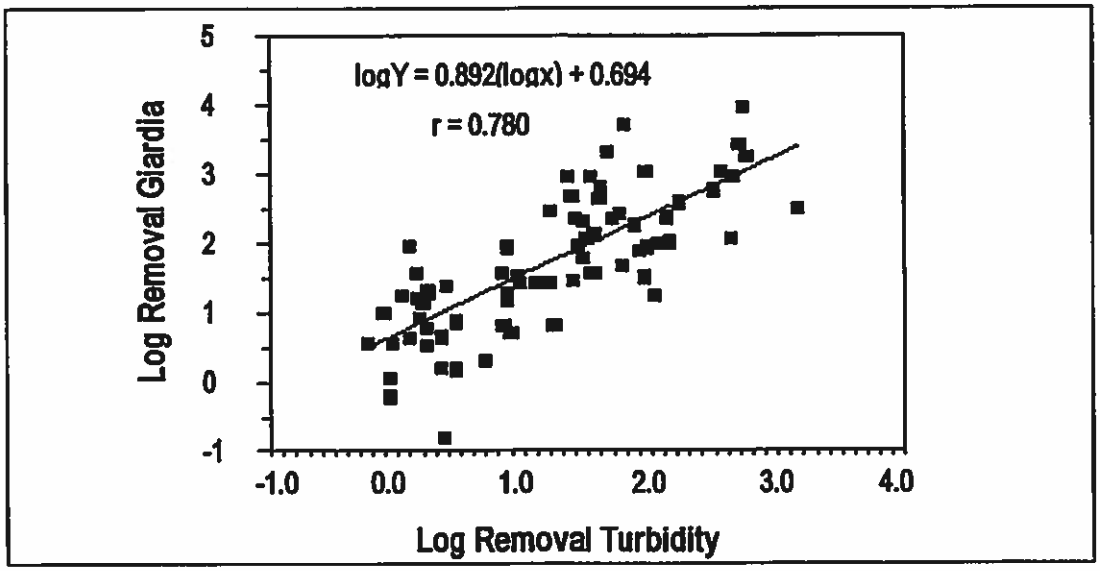
7.3.2 The Relationship Between Turbidity Removal and Pathogen Removal

Low filtered water turbidity can be correlated with low bacterial counts and low incidences of viral disease. Positive correlations between removal (the difference between raw and plant effluent water samples) of pathogens and turbidity have also been observed in several studies. In fact, in every study to date where pathogens and turbidity occur in the source water, pathogen removal coincides with turbidity/particle removal (Fox, 1995).

As an example, data gathered by LeChevallier and Norton (in Craun, 1993) from three drinking water treatment plants using different watersheds indicated that for every log removal of turbidity, 0.89 log removal was achieved for the parasites *Cryptosporidium*

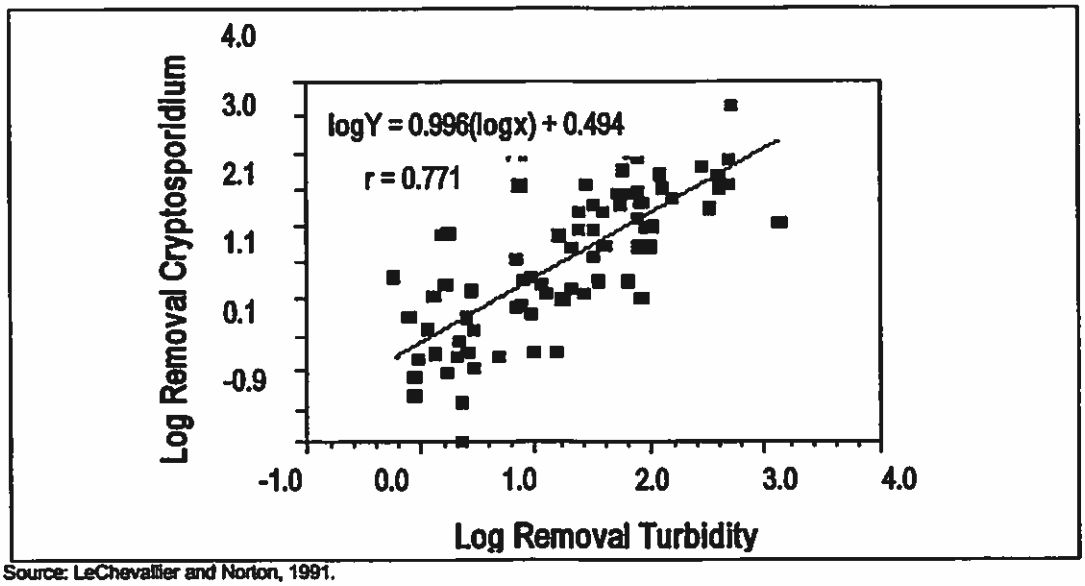
and *Giardia* (Figures 7-5 and 7-6). Of course, this exact relationship does not hold for all treatment plants. Table 7-2 lists several other studies in addition to LeChevallier and Norton's, and their conclusions on the relationship of turbidity to protozoan removal.

All studies in Table 7-2 show turbidity as a useful predictor of parasite removal efficiency. This evidence suggests that although a very low turbidity value does not completely ensure that particles are absent, it is an excellent measure of plant optimization to ensure maximum public health protection.



Source: LeChevallier and Norton, 1991.

Figure 7-5. Relationship Between Removal of *Giardia* and Turbidity



Source: LeChevallier and Norton, 1991.

Figure 7-6. Relationship Between Removal of *Cryptosporidium* and Turbidity

Table 7-2. Studies on the Relationship between Turbidity Removal and Protozoa Removal

Reference/Study	Discovery/Conclusion on Turbidity
Patania et al., 1995*	Four systems using rapid granular filtration, when treatment conditions were optimized for turbidity and particle removal, achieved a median turbidity removal of 1.4 log and median particle removal of 2 log. The median cyst and oocyst removal was 4.2 log. A filter effluent turbidity of less than 0.1 NTU or less resulted in the most effective cyst removal, by up to 1.0 log greater than when filter effluent turbidities were greater than 0.1 NTU (within the 0.1 to 0.3 NTU range).
Nieminski and Ongerth, 1995*	Pilot plant study: Source water turbidity averaged 4 NTU (maximum = 23 NTU), achieving filtered water turbidities of 0.1-0.2 NTU. *Cryptosporidium* removals averaged 3.0 log for conventional treatment and 3.0 log for direct filtration, while *Giardia* removals averaged 3.4 log for conventional treatment and 3.3 log for direct filtration. Full scale plant study: Source water had turbidities typically between 2.5 and 11 NTU (with a peak level of 28 NTU), achieving filtered water turbidities of 0.1-0.2 NTU. *Cryptosporidium* removals averaged 2.25 log for conventional treatment and 2.8 log for direct filtration, while *Giardia* removals averaged 3.3 log for conventional treatment and 3.9 log for direct filtration.
Ongerth and Pecoraro, 1995*	Using very low-turbidity source waters (0.35 to 0.58 NTU), 3 log removal for both cysts were obtained, with optimal coagulation. (With intentionally suboptimal coagulation, the removals were only 1.5 log for *Cryptosporidium* and 1.3 log for *Giardia*.)
LeChavallier and Norton (in Craun, 1993)	Data gathered from three drinking water treatment plants using different watersheds indicated that for every log removal of turbidity, 0.89 log removal was achieved for *Cryptosporidium* and *Giardia*.
Nieminski, 1992	A high correlation (r^2=0.91) exists between overall turbidity removal and both *Giardia* and *Cryptosporidium* removal through conventional water treatment.
Ongerth, 1990	*Giardia* cyst removal by filtration of well-conditioned water results in 90% or better turbidity reduction, which produces effective cyst removal of 2-log (99%) or more.
LeChavallier et al., 1991*	In a study of 66 surface water treatment plants using conventional treatment, most of the utilities achieved between 2 and 2.5 log removals for both *Cryptosporidium* and *Giardia*, and a significant correlation (p=0.01) between removal of turbidity and *Cryptosporidium* existed.
LeChavallier and Norton, 1992*	In source water turbidities ranging from 1 to 120 NTU, removal achieved a median of 2.5 log for *Cryptosporidium* and *Giardia* at varying stages of treatment optimization. The probability of detecting cysts and oocysts in finished water supplies depended on the number of organisms in the raw water; turbidity was a useful predictor of *Giardia* and *Cryptosporidium* removal.
Foundation for Water Research, 1994*	Raw water turbidity ranged from 1 to 30 NTU, and *Cryptosporidium* removal was between 2 and 3 log. Investigators concluded that any measure which reduces filter effluent turbidity should reduce risk from *Cryptosporidium*.
Hall et al., 1994	Any measure which reduces filtrate turbidity will reduce the risk from *Cryptosporidium*; a sudden increase in the clarified water turbidity may indicate the onset of operational problems with a consequent risk from cryptosporidiosis.
Gregory, 1994	Maintaining the overall level of particulate impurities (turbidity) in a treated water as low as possible may be an effective safeguard against the presence of oocysts and pathogens.
Anderson et al., 1996	In a pilot plant study, the removal of particles > 2 m was significantly related to turbidity reduction r=0.97 (p<0.0001); the removal of *Cryptosporidium* oocysts may be related to the removal of *Giardia*, r=0.79 (p<0.14); the reduction of turbidity may be related to the removal of *Giardia* cysts, r=0.67 (p<0.13) and *Cryptosporidium* oocysts (p<0.08)

* as discussed in EPA's Notice of Data Availability (USEPA, 1997)

7.4 References

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ASDWA Survey

1. Does your state require surface water filtration plants to continuously monitor and record their combined filter effluent turbidity?

- Answered: 30
- Skipped: 0

Answer Choices	Responses
Yes	66.67% 20
No	33.33% 10
Total	30

Comments(13)

Yes for membranes. No for all others. For conventional, direct, and DE: required at least every 4 hours; or, once/day for systems serving 500 or fewer persons if approved by the director. For slow sand: every 4 hrs can be reduced to once/day if approved by the director. In lieu of CFE, could monitor IFEs and record average.

1/24/2014 10:22 AM View respondent's answers

Surface water sytems serving 500 or fewer people may grab sample once per day if approved by the State. Slow sand filtration systems may grab sanple once per day if approved by the State.

1/21/2014 11:01 AM View respondent's answers

We only require systems to conduct continuous monitoring of turbidity in the combined filter effluent if they serve fewer than 10,000 people, have only two or fewer filters and choose to monitor turbidity in the combined filter effluent rather than monitor turbidity at individual filters.

1/16/2014 5:51 PM View respondent's answers

Minimum required is 1 reading each 4 hours of operation.

1/10/2014 12:55 PM View respondent's answers

No, we require one grab sample every four hours for combined filter effluent turbidity.

1/9/2014 12:52 PM View respondent's answers

Alabama requires each filter to be monitored and recorded on a continuous basis. Compliance is determined on each individual filter. One filter may cause a violation, even if the combined filter effluent still meets federal standards. Alabama has no CFE limits, all limits are IFE.

1/9/2014 11:37 AM View respondent's answers

Community - The majority of MN Community Surface Water Systems are monitoring CFE continuously; taking grab sample every 4 hours is acceptable. MDH has no plan to require continuous CFE monitoring. NonCommunity - Not for population <500

1/9/2014 7:49 AM View respondent's answers

Systems using conventional or direct filtration must continually monitor individual filter effluent turbidity and record individual filter effluent turbidity every 15 minutes. For conventional and direct filtration systems with only one filter, the combined filter effluent turbidity, by default, must be continuously monitored and recorded every 15 minutes.

1/8/2014 7:48 PM View respondent's answers

At least 15 minute monitoring must be recorded. Systems that serve less than 500 pop can do daily monitoring if requested.

1/8/2014 1:20 PM View respondent's answers

Almost all system have continuous monitoring; however, the Reg.s allow collecting grab samples at 4 hour increments and doing a bench test.

1/8/2014 9:45 AM View respondent's answers

310 CMr 22.20F (6)(a)

1/7/2014 3:00 PM View respondent's answers

Individual filters are continuously monitored.

1/7/2014 1:06 PM View respondent's answers

Our State Regulations require continuous monitoring of CFE but these regs don't explicity state how the reporting should be done (ie do they just report on the four hour mark or report the number of 15 minute intervals in a month) so we have systems that report inconsistently.

1/7/2014 10:58 AM View respondent's answers

2. Does your state require surface water filtration plants using Slow Sand, Diatomaceous Earth, or alternative filtration to continuously monitor and record their individual filter effluent turbidity?

- Answered: 30
- Skipped: 0

Answer Choices–	Responses–
Yes	46.67% 14
No	53.33% 16
Total	30
Comments(14)	

1/10/2014 12:55 PM View respondent's answers

No, we require one grab sample every four hours for individual filter effluent turbidity for systems that use Slow Sand or Diatomaceous Earth. Individual filter turbidity monitoring for systems that use alternative filtration is set on a system-specific basis but cannot be less than one grab sample every four hours.

1/9/2014 12:52 PM View respondent's answers

Alabma only has conventional (high rate) filtration and membrane filtration. Slow sand and others are not allowed on surface water sources.

1/9/2014 11:37 AM View respondent's answers

Community - Minnesota does not have systems using slow sand or diatomaceous earth filters. Alternative filtration systems (using UF) are required to continuously monitor and record effluent turbidity of each UF Train/Skit. Noncommunity - Not for population <500

1/9/2014 7:49 AM View respondent's answers

Systems using membrane filtration must conduct continuous individual filter effluent monitoring at least every 15 minutes on each individual unit, if not conducting continuous direct integrity testing of the membrane units.

1/8/2014 7:48 PM View respondent's answers

We recommend. Bags and Cartridges typically only monitor with grab samples.

1/8/2014 6:19 PM View respondent's answers

Slow sand and alternative filtration may reduce sampling frequency with State approval.

1/8/2014 3:20 PM View respondent's answers

It is a case by case decision but for membranes we require each bank have a monitor via permit condition, not in regulation.

1/8/2014 1:20 PM View respondent's answers

310 CMr 22.20D (4)(b)2

1/7/2014 3:00 PM View respondent's answers

Currently we require IFE turbidity monitoring for membrane filtration plants

1/7/2014 1:42 PM View respondent's answers

We don't have any functing slow sand filters it the state.

1/7/2014 1:39 PM View respondent's answers

Two trains or less not required to do IFE monitoring

1/7/2014 11:03 AM View respondent's answers

We several plants that use membrane filtration.

1/7/2014 10:58 AM View respondent's answers

3. If you answered yes to question 2, do you require these plants to report individual filter trigger level exceedances and conduct any followup actions?

- Answered: 14
- Skipped: 16

Answer Choices–	Responses–
Yes	92.86% 13
No	7.14% 1
Total	14

Comments(5)

All surface water treatment plants are required to report the highest daily turbidity from each filtration unit on their monthly operational report. Membranes have a turbidity limit of 0.15 NTU. Please see ADEM Admin. Code r. 335-7-10-.06(10) for details. Regulations can be downloaded from www.adem.alabama.gov under regulations and then click on Division 7.

1/9/2014 11:37 AM View respondent's answers

Community - for conventional, direct filtration and low-pressure membrane filtration systems Noncommunity - , for conventional/direct filtration.

1/9/2014 7:49 AM View respondent's answers

-na-

1/8/2014 6:19 PM View respondent's answers

Exceedance report similar to conv or direct but via permit so case by case.

1/8/2014 1:20 PM View respondent's answers

NA

1/7/2014 3:00 PM View respondent's answers

4. Does your state require surface water treatment plants to be attended during operation?

- Answered: 30
- Skipped: 0

Answer Choices–	Responses–
Yes	40% 12
No	60% 18

ASDWA Survey

Answer Choices--	Responses--
Total	30
Comments(14)	

Operators must be in contact with the plant via alarms/dialers while the plant is in operation if the operators are not at the plant.

1/23/2014 3:35 PM View respondent's answers

GWUDI plants may be operated remotely if the plant has monitoring equipment and alarms or automatic shutdown capability in place

1/21/2014 11:01 AM View respondent's answers

it is strongly recommended that plants be attended during operation

1/10/2014 3:03 PM View respondent's answers

However, public water supply systems must have the appropriate level of operator certification and the facility must be under their control irrespective of whether or not the facility is physically attended.

1/10/2014 12:55 PM View respondent's answers

We have no specific prohibition against unattended surface water plants and have adopted the Ten States Standards Policy Statement for these types of systems.

1/9/2014 12:52 PM View respondent's answers

But not continuously. They need to be on site at least once per day. However, of the 23 community surface water systems at least 20 of them have personnel on site while the plant is in operation.

1/9/2014 7:49 AM View respondent's answers

Systems using conventional or direct filtration must have a high turbidity alarm with an auto dial or auto plant shutdown, if the plant operates with no operator present.

1/8/2014 7:48 PM View respondent's answers

We have no specified requirements in our State Sanitary Code but we do have a general due care and diligence for the operation of a treatment plant requirement.

1/8/2014 3:20 PM View respondent's answers

But can be remotely attended in certain situations where there is 24-hour manned video and SCADA surveillance of all operations.

1/8/2014 11:25 AM View respondent's answers

However, we acknowledge that some small systems may not have continuous attendance. We also recognize that this problematic.

1/8/2014 9:45 AM View respondent's answers

If remote SCADA is in place, then physical presence is not required during night operation.

1/7/2014 3:00 PM View respondent's answers

401 KAR 8:030 has the following language for surface water treatment plants "...in direct responsible charge of the plant and shall be present at the water treatment plant or performing

system-related duties"; 401 KAR 8:030 further defines "system-related duties" (e) System-related duties shall be for: 1. Class IIA, Class IIIA, and Class IVA water systems, duties related to the operation and maintenance of the water treatment plant; or 2. Class IA-D water systems, duties related to the operation and maintenance of the water treatment plant and distribution system.

1/7/2014 1:42 PM View respondent's answers

Must be attended unless process alarms with auto-dial and/or auto-plant shutdown on pH, turbidity and disinfectant are in place and operational.

1/7/2014 1:06 PM View respondent's answers

Minimum 1/day inspection

1/7/2014 11:03 AM View respondent's answers

5. If you answered yes to question 4, do you allow water systems to apply for an exception?

- Answered: 12
- Skipped: 18

Answer Choices—	Responses—
Yes	58.33% 7
No	41.67% 5
Total	12

Comments(9)

GWUDI systems may be operated remotely. Non-Community surface supplies may apply for exemption from operator in attendance rules.

1/21/2014 11:01 AM View respondent's answers

The exception is for surface systems which serve less than 10,000 persons and which utilize automated operation systems which monitor system operation, record all required readings, notify the operator in the event of a system upset or failure, and allow the operator to remotely control or shut down the system.

1/10/2014 4:03 PM View respondent's answers

-na-

1/8/2014 6:19 PM View respondent's answers

We allow some MF plants treating a high quality raw water source to operate for short periods of time unattended if the proper controls are in place to alarm staff or shut down the plant in the event of a treatment failure.

1/8/2014 2:05 PM View respondent's answers

See above.

1/8/2014 11:25 AM View respondent's answers

However, some large utilities do follow the Recommended Standards Procedure for Automated/Unattended Operation of Surface Water Treatment Plants Policy

1/8/2014 9:45 AM View respondent's answers

SCADA capability--night operation only

1/7/2014 3:00 PM View respondent's answers

401 KAR 8:030 has language regarding "alternate staffing plans" 6. A public water system may propose an alternate staffing plan to the staffing requirement established in this paragraph. a. The proposal shall be submitted to the cabinet and shall thoroughly explain the alternate proposal. b. The proposal shall demonstrate: (i) A necessity for the water system to vary from the requirement in this paragraph; and (ii) An equal level of protection of human health and the environment. c. The cabinet shall not approve an alternate proposal that does not propose that a duly certified operator in direct responsible charge operate a water treatment plant, in accordance with KRS 223.210. Since February 2010, KY DOW has approved alternate staffing plans for 20 operators.

1/7/2014 1:42 PM View respondent's answers

Membrane Filtration systems are the exception - these do not require operator attendance at all times.

1/7/2014 11:21 AM View respondent's answers

6. What state do you represent?

- Answered: 30
- Skipped: 0

Connecticut

1/24/2014 1:24 PM View respondent's answers

Rhode Island

1/24/2014 10:22 AM View respondent's answers

Nebraska

1/23/2014 3:35 PM View respondent's answers

Tennessee

1/21/2014 11:01 AM View respondent's answers

WV

1/20/2014 8:17 AM View respondent's answers

New Mexico

1/16/2014 5:51 PM View respondent's answers

Maine

1/15/2014 1:24 PM View respondent's answers

Louisiana

ASDWA Survey

1/10/2014 4:03 PM View respondent's answers

Idaho

1/10/2014 3:03 PM View respondent's answers

Kansas

1/10/2014 12:55 PM View respondent's answers

Montana

1/9/2014 12:52 PM View respondent's answers

Alabama

1/9/2014 11:37 AM View respondent's answers

Minnesota

1/9/2014 7:49 AM View respondent's answers

Oregon

1/8/2014 7:48 PM View respondent's answers

Alaska

1/8/2014 6:19 PM View respondent's answers

Colorado

1/8/2014 3:46 PM View respondent's answers

New York

1/8/2014 3:20 PM View respondent's answers

Michigan

1/8/2014 2:05 PM View respondent's answers

California

1/8/2014 1:20 PM View respondent's answers

Missouri

1/8/2014 12:06 PM View respondent's answers

Iowa

1/8/2014 11:25 AM View respondent's answers

Vermont

1/8/2014 10:17 AM View respondent's answers

Illinois

1/8/2014 9:45 AM View respondent's answers

Massachusetts

1/7/2014 3:00 PM View respondent's answers

Kentucky

1/7/2014 1:42 PM View respondent's answers

Utah

1/7/2014 1:39 PM View respondent's answers

Arkansas

1/7/2014 1:06 PM View respondent's answers

Virginia

1/7/2014 11:21 AM View respondent's answers

New Hampshire

1/7/2014 11:03 AM View respondent's answers

New Jersey

1/7/2014 10:58 AM View respondent's answers

7. What is your contact information?

- Answered: 30
- Skipped: 0

Tom Chyra Thomas.chyra@ct.gov 860-509-7333

1/24/2014 1:24 PM View respondent's answers

amy.parmenter@health.ri.gov 401-222-7771

1/24/2014 10:22 AM View respondent's answers

Elizabeth Esseks elizabeth.esseks@nebraska.gov 402-471-1010

1/23/2014 3:35 PM View respondent's answers

Bill Hench, PE Tennessee Division of Water Resources Phone (615) 532-0165 Bill.Hench@tn.gov

1/21/2014 11:01 AM View respondent's answers

Charles.h.robinette@wv.gov

1/20/2014 8:17 AM View respondent's answers

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ASDWA Survey

785-296-5516

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Vanessa Wike, 907 269-7636

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1/8/2014 2:05 PM View respondent's answers

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1/8/2014 10:17 AM View respondent's answers

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1/8/2014 9:45 AM View respondent's answers

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ASDWA Survey

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Lance Jones lance.jones@arkansas.gov 501-661-2623

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Karen Fell 609-292-5550

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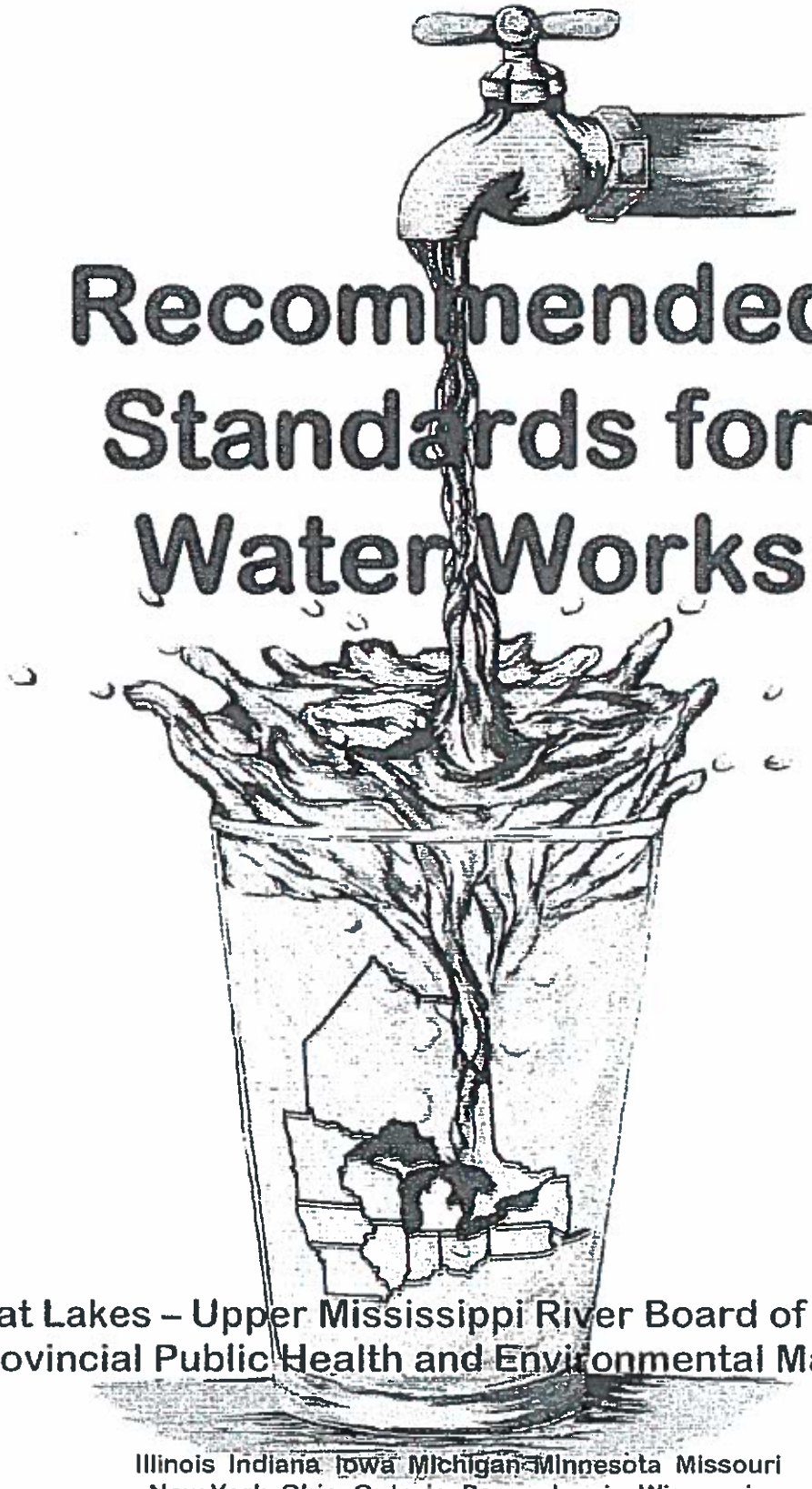

Recommended Standards for Water Works

Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers

Illinois Indiana Iowa Michigan Minnesota Missouri
New York Ohio Ontario Pennsylvania Wisconsin

POLICY STATEMENT ON
AUTOMATED/UNATTENDED OPERATION OF SURFACE WATER TREATMENT PLANTS

Recent advances in computer technology, equipment controls and Supervisory Control and Data Acquisition (SCADA) Systems have brought automated and off-site operation of surface water treatment plants into the realm of feasibility. Coincidentally, this comes at a time when renewed concern for microbiological contamination is driving optimization of surface water treatment plant facilities and operations and finished water treatment goals are being lowered to levels of <0.1 NTU turbidity and <20 total particle counts per milliliter.

Review authorities encourage any measures, including automation, which assist operators in improving plant operations and surveillance functions.

Automation of surface water treatment facilities to allow unattended operation and off-site control presents a number of management and technological challenges which must be overcome before an approval can be considered. Each facet of the plant facilities and operations must be fully evaluated to determine what on-line monitoring is appropriate, what alarm capabilities must be incorporated into the design and what staffing is necessary. Consideration must be given to the consequences and operational response to treatment challenges, equipment failure and loss of communications or power.

An engineering report shall be developed as the first step in the process leading to design of the automation system. The engineering report to be submitted to the reviewing authorities must cover all aspects of the treatment plant and automation system including the following information/criteria:

1. Identify all critical features in the pumping and treatment facilities that will be electronically monitored, have alarms and can be operated automatically or off-site via the control system. Include a description of automatic plant shut-down controls with alarms and conditions which would trigger shut-downs. Dual or secondary alarms may be necessary for certain critical functions.

2. Automated monitoring of all critical functions with major and minor alarm features must be provided. Automated plant shutdown is required on all major alarms. Automated startup of the plant is prohibited after shutdown due to a major alarm. The control system must have response and adjustment capability on all minor alarms. Built-in control system challenge test capability must be provided to verify operational status of major and minor alarms. The computer system must incorporate cyberspace security to protect the confidentiality and integrity of transmitted information and deter identity theft through such means as placing routers and "firewalls" at the entry point of a sub network to block access from outside attackers.

3. The plant control system must have the capability for manual operation of all treatment plant equipment and process functions.

4. A plant flow diagram which shows the location of all critical features, alarms and automated controls to be provided.

5. Description of off-site control station(s) that allow observation of plant operations, receiving alarms and having the ability to adjust and control operation of equipment and the treatment process.

6. A certified operator must be on "standby duty" status at all times with remote operational capability and located within a reasonable response time of the treatment plant.

7. A certified operator must do an on-site check at least once per day to verify proper operation and plant security.

8. Description of operator staffing and training planned or completed in both process control and the automation system.

9. Operations manual which gives operators step by step procedures for understanding and using the automated control system under all water quality conditions. Emergency operations during power or communications failures or other emergencies must be included. A backup battery shall be provided for the control system.

10. A plan for a 6 month or more demonstration period to prove the reliability of procedures, equipment and surveillance system. A certified operator must be on-duty during the demonstration period. The final plan must identify and address any problems and alarms that occurred during the demonstration period. Challenge testing of each critical component of the overall system must be included as part of the demonstration project.

11. Schedule for maintenance of equipment and critical parts replacement.

12. Sufficient finished water storage shall be provided to meet system demands and CT requirements whenever normal treatment production is interrupted as the result of automation system failure or plant shutdown.

13. Sufficient staffing must be provided to carry out daily on-site evaluations, operational functions and needed maintenance and calibration of all critical treatment components and monitoring equipment to ensure reliability of operations.

14. Plant staff must perform, as a minimum, weekly checks on the communication and control system to ensure reliability of operations. Challenge testing of such equipment should be part of normal maintenance routines.

15. Provisions must be made to ensure security of the treatment facilities at all times. Incorporation of appropriate intrusion alarms must be provided which are effectively communicated to the operator in charge.

Adopted April, 1997
Revised April, 2012

The West Virginia Legislative Rule Title 64 Bureau for Public Health Series 4 (64CSR4) specifies adequate operator coverage requirements. The additional exceptions allowable by this policy are for Class II – IV public water systems (PWS) only and are based on proven automation. This policy covers unattended operation with or without remote monitoring and does not allow for remote treatment changes. Systems operating unattended under previous approvals based on the 1993 version of DW-36 must work towards these requirements in cooperation with the Environmental Engineering Division (EED).

To evaluate requests for automated/unattended operations, a proposal must be submitted to the EED central office for review and approval. Equipment used or to be installed to meet the requirements of this procedure must comply with the PWS design standards (64CSR77). Functionality of the automated system must also be demonstrated to EED for final approval.

In considering any proposal, the criteria listed below are to be followed:

1. Identify all critical features in the pumping and treatment facilities that will be electronically monitored and/or have alarms. These critical features will include, but are not limited to:
   a. Water storage facility's high and low levels at the treatment plant and in the distribution system;
   b. Any instrumentation or equipment related to pH (if system is controlled by adding caustic), turbidity, chlorine residual, and required selective ions within specific ranges;
   c. Chlorine gas leaks and tank pressure changes;
   d. Distribution system pressure loss;
   e. Fire;
   f. Intrusion;
   g. Power failures;
   h. Critical pumps, motors and generator failures; and,
   i. Chemical feed tank volumes to prevent any over or underfeed situations.

2. Provide a plant flow diagram which shows the location of all critical features and automated controls.

3. Provide a description of all alarm features. These alarm features will include, but not be limited to:

   a. Alarm set points; and,

b. Automatic actions as a result of an alarm. For example, switch to back-up equipment, notify supervisor via auto-dialer, shutdown of individual equipment, and plant-wide shutdown.

4. Names, titles, and telephone numbers of individuals who will be notified in the event of an alarm/shutdown event.

5. Operation and maintenance manual available that includes description of treatment, control and pumping equipment, necessary maintenance and schedule, and a troubleshooting guide for typical problems.

6. Define the intended period(s) of unattended operations.

7. The plant must retain the capability for on-site operator intervention of all treatment plant equipment and process functions.

For surface and groundwater under the direct influence water treatment plants:

It is recommended that an operator be present at the plant at all times due to the variable nature of most surface water sources in West Virginia. However, if it is desirous to obtain an exception to operate the plant without an operator present at all times, it is mandatory that the following items be installed:

1. Dual turbidimeters and recorders on combined filter effluent. If either analyzer is outside of a specified range, automatic system shutdown shall occur. The systems shall also be equipped with provision to shutdown the plant when turbidity exceeds 70% of the applicable 95th percentile value, as per the chart below (systems may self-impose more stringent shutdown limits):

Filtration Technology	95th Percentile (NTU)	Shutdown Trigger (NTU)
Conventional	0.3	0.20
Direct	0.3	0.20
Diatomaceous Earth	1.0	0.70
Slow Sand	1.0	0.70
Membrane	0.15	0.10
Other Technologies	TBD	TBD

2. Dual chlorine residual analyzers and recorders on the high service pump effluent. The system shall be equipped with provisions to shut down the entire plant if either analyzer indicates the free chlorine demand increases above a predetermined level or if the free chlorine residual drops below the pre-determined set amount needed to maintain adequate disinfection (log removal) in the treatment plant and/or an active total chlorine residual in the extremes of the distribution system of 0.20 mg/L, as required by 64CSR3.

3. An alarm system/auto-dialer to immediately alert the responsible parties in the event of a system shutdown.

It will also be mandatory the system does not operate unattended for more than 8-hours in a given 24-hour period. Unattended startup of the plant is prohibited after shutdown. All laws, rules and regulations of the Department remain in effect.

For groundwater source water treatment plants:

It is mandatory the system is equipped with continuous chlorine analyzers, recorders, and controls as in number 2 above. A system auto-dialer (number 3 above) is also required. Maximum unattended timeframes will be determined by EED on a case-by-case basis.

In addition to the proposal, the following requirements apply to all systems:

1. To be considered for an exception, the system shall have demonstrated automated operation for a minimum of 12-months continuous operation with a properly certified operator present at all times. The system should be able to run without operational problems and without any monitoring or Maximum Contaminant Level (MCL) violations during this time and thereafter. The system must submit documentation of any deviations or occurrences [during the proposed period(s) of unattended operations as defined earlier] requiring operator intervention monthly with the system Monthly Operational Report (MOR). Any reasons for plant shutdown will be submitted to EED with the MOR, and will continue this practice after approval. This documentation will be required for each intended period of unattended operations. Any operation intervention during this period must be noted, regardless of the reason for this intervention. If no interventions or shutdowns are required for any operation period, this will need to be noted on the log that is submitted with the MOR.

2. Exceptions for automated operation will normally be valid until the next scheduled sanitary survey. Any system granted this exemption will continue to submit documentation of any deviation or occurrences that result in a system shutdown or require operation intervention with its MOR. The district office personnel will review and determine that all personnel, equipment, instrumentation and systems perform as originally approved. To be eligible for renewal, the system must be in full compliance with all regulatory requirements from the time of the original or renewed exception approval. At all times, all operators must be properly certified by the EED.

3. If the Chief Operator resigns or otherwise leaves the system, the system must immediately notify the EED. The exception for automated operation becomes null and void if the district office deems it necessary. The system may reapply with a written request to the EED when operations again meet specific criteria of this memorandum necessary for the consideration of an exception issuance.

4. The EED reserves the right to revoke an exception at any time it has been determined the automated system is not fully functional, or meeting operational, monitoring, reporting and/or MCL requirements. If an exception is revoked, reinstatement of exception would require the system to reapply for an exception for

automated operation and the district office staff would have to review operational procedures to insure that the system has rectified any and all problems resulting in revocation.

References	WV 64 CSR 3, Public Water Systems WV 64 CSR 4, Public Water Systems Operators WV 64 CSR 77, Public Water Systems Design Standards
History	Replaces original memo of April 12, 1993.
Attachments	DW-36 Checklist

DW-36 Checklist

This checklist was developed to assist systems with operator exception requests for automated public water systems.

Basic Information:

1. Is this an ☐ initial ☐ renewal or ☐ reinstatement request?

2. Date Proposal Received by EED Central Office: _____
EED Staff Reviewing Checklist: _____

3. Does the PWS understand they must retain the capability for on-site operator intervention of all treatment plant equipment and process functions? ☐ Yes ☐ No

4. PWSID#: WV_____ PWS Classification: ☐ II ☐ III ☐ IV
PWS Source Water: ☐ Purchased ☐ GW ☐ GWUDI ☐ SW
Date of last sanitary survey: _____
Frequency of sanitary surveys for this system: ☐ 3 years ☐ 5 years
District Office:
☐ Beckley ☐ Kearneysville ☐ Philippi ☐ St. Albans ☐ Wheeling
DO Contact Person: _____

Proposal Information:

1. What are the critical features in the pumping and treatment facilities that will be electronically monitored and/or have alarms?

_____
_____
_____
_____

2. Was a plant flow diagram which shows the location of all critical features and automated controls provided? ☐ Yes ☐ No Comments:

_____
_____

3. Were descriptions provided for all alarm features, including set points and automatic actions? ☐ Yes ☐ No Comments:

_____
_____

4. Were the names, titles, and telephone numbers of individuals who will be notified in the event of an alarm/shutdown event provided? ☐ Yes ☐ No

5. Is an operation and maintenance manual available that includes description of treatment, control and pumping equipment, necessary maintenance and schedule, and a troubleshooting guide for typical problems? ☐ Yes ☐ No

6. What are the intended period(s) of unattended operations?

_____

_____

For GWUDI or SW sources only:

1. Are there dual turbidimeters & recorders on combined filter effluent? ☐ Yes ☐ No
   a. Do these have automatic system shutdown if either analyzer is outside of a specified range? ☐ Yes ☐ No

2. Are there dual chlorine residual analyzers and recorders on the high service pump effluent? ☐ Yes ☐ No
   a. Do these have automatic system shutdown if either analyzer is outside of a specified range? ☐ Yes ☐ No

3. Does an alarm system/autodialer immediately alert the responsible parties in the event of a system shutdown? ☐ Yes ☐ No

4. Does the system understand they may not operate unattended for more than 8 hours in a given 24 hour period? ☐ Yes ☐ No

For GW sources only:

1. Are there dual chlorine residual analyzers and recorders on the high service pump effluent? ☐ Yes ☐ No
   a. Do these have automatic system shutdown if either analyzer is outside of a specified range? ☐ Yes ☐ No

2. Does an alarm system/autodialer immediately alert the responsible parties in the event of a system shutdown? ☐ Yes ☐ No

3. What is the maximum unattended timeframe determined by EED? _____

Demonstration Information:

1. Did the PWS demonstrate automated operation for a minimum of 12-months continuous operation with a properly certified operator present at all times? ☐ Yes ☐ No

2. Were there operational problems during this time? ☐ Yes ☐ No

If yes, describe:

3. Were there any monitoring or MCL violations during this time? ☐ Yes ☐ No
If yes, describe:

4. Did the system submit the following required documentation for unattended operations with their MOR:
   a. Any deviations or occurrences requiring operator intervention? ☐ Yes ☐ No
   b. Any reason(s) for plant shutdown? ☐ Yes ☐ No

Note: If no intervention or shutdown occurs during a period of unattended operation, it must still be noted in MOR.

Recommendation Information:
The following EED staff recommend ☐ approval or ☐ denial of the issuance of an operator exception for an automated public water system on the date noted:

DO Name Printed	Signature	Date

EED Name Printed	Signature	Date

Renewal Information:
1. Did the DO Contact Person review and determine all personnel, equipment, instrumentation and systems perform as originally approved? ☐ Yes ☐ No

2. Is the PWS in full compliance with all regulatory requirements from the time of the original exception? ☐ Yes ☐ No Attach any needed comments.

The following EED staff recommend ☐ approval or ☐ denial of the renewal of an operator exception for an automated public water system on the date noted:

DO Name Printed	Signature	Date

EED Name Printed	Signature	Date

Revocation/Reinstatement Information:

1. Does EED staff recommend revocation of an exception based on determination the automated system is not fully functional, or meeting operational, monitoring, reporting and/or MCL requirements? ☐ Yes ☐ No

2. Does EED staff recommend reinstatement of a revoked exception based on the system reapplication for an exception for automated operation and the district office staff review of operational procedures to insure that the system has rectified any and all problems resulting in revocation? ☐ Yes ☐ No

DO Name Printed	Signature	Date
EED Name Printed	Signature	Date

PLEASE COMPLETE FORM THOROUGHLY &
INCLUDE ANY SUPPORTING INFORMATION WITHIN OR ATTACHED

SUBMIT TO:

Office of Environmental Health Services
Environmental Engineering Division
ATTN: Certification & Training Program Manager
350 Capital Street Room 313
Charleston, WV 25301
Phone: (304) 558-2981
Fax: (304) 558-4322

Raco Mfg. & Engineering Co., Inc
1400 62nd St
Emeryville,CA,94608,US
Phone: 510-658-6713
Fax: 510-658-3153
Toll-free: 800-722-6999
Email: sales@racoman.com
Website: http://www.racoman.com

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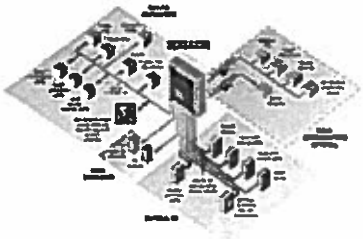

Results 1 - 5 of 5

Model Number	Digital Alarm Inputs	Optional Analog Alarm Inputs	Optional Digital Outputs	Optional PLC Addresses	PLC Protocols	Phone Numbers Dialed	Battery Backup Time	Warranty	List Price
300VSS-4C	4	1 4 8 16	4 8	32 64 96	DF1 & Modbus connection via RS-232 [optional]	16	20 hours	5 years	$2,095.00
301VSS-8C	8	1 4 8 16	4 8	32 64 96	DF1 & Modbus connection via RS-232 [optional]	16	20 hours	5 years	$2,350.00
302VSS-16C	16	1 4 8 16	4 8	32 64 96	DF1 & Modbus connection via RS-232 [optional]	16	20 hours	5 years	$3,250.00
303VSS-24C	24	1 4 8 16	4 8	32 64 96	DF1 & Modbus connection via RS-232 [optional]	16	20 hours	5 years	$3,895.00

304VSS-32C	32	1 4 8 16	4 8	32 64 96	DF1 & Modbus connection via RS-232 [optional]	16	20 hours	5 years	$4,650.00

Results 1 - 5 of 5

ALLIED CONTROL SERVICES, INC.

611 GARFIELD AVE. • P.O. BOX 234 • WEST POINT, PA 19486
Phone: 215-699-2855
Fax: 215-699-9030

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csia control system integrators association

January 20, 2017

Mr. Kevin Anderson
Pennsylvania DEP
400 Market Street
10th Floor RCSOB
Harrisburg, PA 17105

Reference: Surface Water Treatment Plant Effluent Monitor/Alarming and Shut Down System

Dear Kevin,

Per your request, we offer the following proposal for the new SWTP Combined Filter Effluent Monitoring and Alarming System with SWTP shut down. The system includes costs for the monitor/controller and alarm dial-out system. It is assumed that the existing SWTP will have the required chlorine residual analyzer, turbidity analyzer and clear-well level transmitter. An estimated cost for the equipment installation is provided.

The controller/monitor will include adjustable alarm set-points with time delay for a relay output which can be wired to the plant for shut down of the filter system upon the following conditions:

High or Low Clear Well Level
High or Low CFE Chlorine Residual
High or Low CFE Turbidity

The monitor/controller can be configured to send a pre-shut down warning to allow operators the opportunity to go to the plant to try to resolve the problem before reaching the shut-down set-point. If the process value reaches the shut-down set-point, the filter plant shut-down command will occur and a shut-down alarm message will be sent to the plant operator by text message, email or voice message.

If the facility already has an alarm dialer with capacity for three additional alarm inputs, the alarm dialer can be eliminated from the package. A deduct is shown for this on each equipment option.

Option A – Monitor/Alarm System with Standard Dialup Phone Line and Phonetics Alarm Dialer

Item	Qty	Description
1	1	ACS PlantGuard Controller with analog inputs for the following: *CFE Chlorine Residual *CFE Turbidity *Clear Well Level
2	1	Phonetics 8-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.

3	1	System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.
4	-	Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.
5	-	Provide onsite operator training on maintenance and standardization of above equipment.
6	4	O&M Manuals with complete Instruction Manuals for the above system.

Total System Price: $8,860.00
Delivery: 2-3 Weeks ARO

Estimated Installation Cost: $2,000.00
Deduct for use of Owner Furnished Alarm Dialer: ($1,400.00)

Option B – Monitor/Alarm System with Standard Dialup Phone Line and RACO Alarm Dialer

Item	Qty	Description
1	1	ACS PlantGuard Controller with analog inputs for the following: *CFE Chlorine Residual *CFE Turbidity *Clear Well Level
2	1	RACO 8-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.
3	1	System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.
4	-	Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.
5	-	Provide onsite operator training on maintenance and standardization of above equipment.
6	4	O&M Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,980.00
Delivery: 2-3 Weeks ARO

Estimated Installation Cost: $2,000.00
Deduct for use of Owner Furnished Alarm Dialer: ($2,500.00)

Option C – Monitor/Alarm System with Cellular Alarm Dialer

Item	Qty	Description
1	1	ACS PlantGuard Controller with analog inputs for the following: *CFE Chlorine Residual *CFE Turbidity *Clear Well Level
2	1	ACS cellular alarm notification system with 8-channel alarm input with power supply and battery backup. No dial-up telephone line is required. Provides text and email alarm notification.
3	1	System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.
4	-	Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.
5	-	Provide onsite operator training on maintenance and standardization of above equipment.
6	4	O&M Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,700.00
Delivery: 2-3 Weeks ARO

Estimated Installation Cost: $2,000.00

Please give me a call at 1-800-441-4844 if you have any questions.

Sincerely,

Paul C. Mamzic
President

PCM/

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Remove All Items

	Product #	Product Name	Quantity	USD Unit Price	Total Price	Availability ?	
	LXV404.99.51532	SC200 Universal Controller, 100-240 V AC (North America power cord) with one digital sensor input, one analog flow sensor input, MODBUS RS232 & RS485 and two 4-20mA outputs	Update	$2,598.00	$2,598.00	Ships within 1 week	
	LZY807.97.00002	Maintenance Kit for TU5300 sc and TU5400 sc Laser Turbidimeter	Update	$1,100.00	$1,100.00	Call for ship date	
	LZY878	Desiccant Cartridge for TU5300 sc and TU5400 sc Laser Turbidimeter	Update	$16.64	$16.64	Available	
	LXV445.99.23212	TU5400 sc Ultra-High Precision Low Range Laser Turbidimeter with Flow Sensor, RFID, and System Check, EPA Version	Update	$6,142.00	$6,142.00	Available	
	2843100	Chart Recorder Paper -- 7-DAY 0-100 PK/100	Update	$59.85	$59.85	Available	
	2842900	Chart Recorder, 10" Round Dual Pen	Update	$1,657.00	$1,657.00	Call for ship date	
	2843200	Chart Recorder Green Replacement Pens.	Update	$78.45	$78.45	Available	
				Subtotal	$11,649.94		

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	Product #	Product Name	Quantity	USD Unit Price	Total Price	Availability ?	
	2976100	1720E Turbidimeter with sc100 Controller, 1 Channel	Update	$2,881.00	$2,881.00	Call for ship date	
	2660153	StabiCal® Turbidity Standard, 20.0 NTU, Bottle (1 L)	Update	$139.00	$556.00	Ships within 3 days	
	4415300	1720 Series Calibration Cylinder, 1 L	Update	$88.69	$88.69	Available	
	1895000	Lamp Assembly for 1720D and 1720E Low-Range Turbidimeters	Update	$62.00	$62.00	Available	
	2842900	Chart Recorder, 10" Round Dual Pen	Update	$1,657.00	$1,657.00	Call for ship date	
	2843100	Chart Recorder Paper -- 7-DAY 0-100 PK/100	Update	$59.85	$59.85	Available	
	2843300	Chart Recorder Green Replacement Pens.	Update	$78.45	$78.45	Available	
				Subtotal	$5,382.99		

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

December 30, 2016

Lisa D. Daniels, Director
Bureau of Safe Drinking Water
Pennsylvania Department of Environmental Protection
400 Market Street
Harrisburg, Pennsylvania 17101

Dear Ms. Daniels,

The U.S. Environmental Protection Agency (EPA) has evaluated the performance of the Pennsylvania Department of Environmental Protection (PADEP) in meeting the requirements set forth in 40 CFR Part 142, Subpart B – Primary Enforcement Responsibility (i.e., drinking water program primacy). This evaluation included a review of Pennsylvania's performance related to meeting national Government Performance Results Act (GPRA) measures and various drinking water regulatory program requirements. Based on this evaluation, EPA found that while Pennsylvania's drinking water program continues to effectively target its limited resources in addressing priority public health matters, there are a few programmatic requirements that EPA would like to highlight as they are not being met in a complete and timely manner. EPA would like to remind PADEP that the minimum program requirements must be met in order for states to maintain primacy for the Safe Drinking Water Program.

EPA would like to address PADEP's current level of staffing and sanitarian workload. Based on a 2012 survey conducted by the Association of State Drinking Water Administrators (ASDWA), the national average of public water systems (PWS) per sanitarian inspector is 67. In 2015, PADEP realized an average of 149 PWS/sanitarian inspector. This number is more than double the ASDWA national average. EPA cautions PADEP that this kind of excessive workload is not sustainable and program performance will continue to suffer.

Pennsylvania's drinking water program failed to meet the federal requirement for onsite review of water system operations and maintenance capability, also known as a sanitary survey. In addition to the general requirements for sanitary surveys contained in 40 CFR §142.10(b)(2), a state must implement a sanitary survey program that meets the requirements of 40 CFR §142.10(b)(3)(i)-(v). These requirements include conducting sanitary survey inspections no less than once every three years for community water systems and no less than once every five years for non-community water systems. For the last six years, the number of sanitary survey inspections completed by PADEP has significantly declined. PADEP completed 1,847 full inspections in fiscal year 15-16 as compared to 3,177 in fiscal year 09-10. Recent numbers continue to fall short of the GPRA measure and the national average. Not completing sanitary survey inspections in a timely manner can have serious public health implications as major violations could be going unidentified. EPA has also noticed that the number of unaddressed violations in Pennsylvania continues to increase. Over the last five years, the number of

unaddressed violations has nearly doubled from 4,298 to 7,922. This increased risk to public health is of concern to EPA.

In November 2016, EPA conducted a file review of Pennsylvania's Lead and Copper Rule. EPA is currently reviewing the information collected during the file review and a report on our findings is forthcoming. However, it can be noted at this time that a large amount of pertinent information was missing from the files that were reviewed. EPA's report intends to highlight insufficient program personnel in its findings and recommendations. 40 CFR §142.14(d)(8) and (9) outline the reporting requirements of the Lead and Copper Rule.

EPA is encouraged by Pennsylvania's activities to address program challenges and is hopeful that the drinking water program will receive the necessary resources to improve program implementation performance and reduce personnel shortfalls. EPA requests a written action plan from PADEP within 60 days from the date of this letter addressing the aforementioned shortfalls and a plan to provide the resources necessary to meet the minimum program requirements.

If you have any questions, please contact me or have your staff contact Kelly Moran, EPA's Pennsylvania State Program Manager at (215) 814-2331.

Sincerely,

Diane Kelly McNally for

Jon M. Capacasa, Director
Water Protection Division

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

February 24, 2017

Mr. Rick Rogers, Acting Director
Water Protection Division
United States Environmental
Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Rogers:

Thank you for your letter dated December 30, 2016 regarding the U.S. Environmental Protection Agency's (EPA) evaluation of the performance of the Pennsylvania Department of Environmental Protection (DEP) in meeting the requirements set forth in 40 CFR Part 142, Subpart B – Primary Enforcement Responsibility (i.e., drinking water program primacy). DEP shares your concerns and is working diligently to address them.

Pennsylvania is ranked 4th in the nation in terms of the number of public water systems (PWS), with more than 8,500 PWSs across the Commonwealth. DEP is responsible for regulating all PWSs and ensuring that safe and potable drinking water is continuously supplied to the 10.7 million customers they serve. In order to carry out these responsibilities, DEP must ensure adequate funding and resources for the Safe Drinking Water (SDW) Program. It is clear that without this additional investment in the SDW Program, the problems outlined in your letter will continue to be exacerbated.

Since early 2016, DEP has been working on a proposed rulemaking to increase permit fees and establish new annual fees to address the $7.5 million funding gap and improve program performance. The draft proposed rulemaking and other background documents may be found at the following link on DEP's website:
http://www.dep.pa.gov/PublicParticipation/AdvisoryCommittees/WaterAdvisory/TAC/Pages/default.aspx#.VmWPOvMo69J . The proposed fees will account for nearly 50 percent of the program's state funding and will augment funds currently coming from the General Fund (~$7.7 million). The fees will provide much needed revenue for the following:

- Approximately 33 new positions to fill the existing gap in staffing levels to improve program performance, ensure primacy obligations are met, and protect public health. These positions include technical services, operations, regional program management, and program development/administration. The majority of these positions will be new sanitarians.
- Funding to alleviate pressure on the Federal SRF Set-asides Grant. The current rate of timesheet charges coded to the SRF Set-asides is not sustainable. Some of these charges will be shifted to the new annual fees. This will also free up more federal funds for

capability enhancement activities (i.e., water supplier training and technical assistance) and SRF funding for infrastructure projects.

- Funding to cover other costs that can no longer be covered under existing General Fund allocations, including lab costs, supplies, etc.

DEP's action plan and schedule to address the funding and resource shortfall, and improve program performance are included in the below table.

DEP Action Plan to Address Funding and Resource Shortfall and Improve Performance		
Item	**Description**	**Schedule**
1	Present proposed General Update and Fee rulemaking to EQB for approval to move forward	May 2017
2	Publish proposed rulemaking in *PA Bulletin* for public comment	July 2017
3	Present final rulemaking to EQB for approval	November 2017
4	Publish final rulemaking in *PA Bulletin*	February 2018
5	Submit request to increase SDW Program complement	August 2018
6	Begin to hire and train new staff	September 2018

Until such time as the final rulemaking is promulgated and new staff are brought on board and gain adequate experience, DEP will continue to prioritize inspections over other work within the program. DEP will continue to utilize inspections, training, technical assistance and other tools, as needed, to ensure the highest level of public health protection that can feasibly be achieved with the current staffing levels. DEP will also provide EPA with quarterly updates on the progress of this action plan.

It is important to note that these problems did not manifest abruptly. Since 2009, DEP program staffing levels have steadily declined. In 2009, the SDW Program employed 84 sanitarians (i.e., field inspectors). Today, the number of sanitarians is down by more than 25 percent at 61. This workforce includes 43 sanitarians, 11 trainees, and seven vacancies. We continue to prioritize filling these vacancies as resources allow, but it must be recognized that due to the ever increasing complexity of the SDW Program, trainees are not considered adequately trained until they have <u>at least</u> two years of experience. In addition, due to a DEP-wide complement reduction, it is unclear if or when the SDW Program will receive approval to fill the seven vacancies. As such, the actual available workforce is closer to 54 sanitarians. It is also important to note that, of those 54 sanitarians, 26 have only four years or less of SDW Program experience.

The steady decline in staffing levels has led to an ever-increasing workload. The recommended number of PWSs per sanitarian has been determined to be 100 – 125 PWSs/sanitarian in order to ensure that all mandated activities could be completed. Mandated activities include inspections, review of self-monitoring data, compliance and enforcement determinations, maintenance of

DEP's data management systems, review of monitoring and other plans, etc. In 2009, the SDW Program's average workload was within the recommended range at 118 PWSs/sanitarian. Today, the average workload is well over the recommended range at 158 PWSs/sanitarian, when the seven vacancies are taken into consideration. As per a 2012 Association of State Drinking Water Administrators' (ASDWA) survey, the national range and average of PWSs/inspector is 45 – 140 and 67, respectively. DEP's average is more than two times the national average.

We are pursuing the remedy for this problem through our regulatory package to increase program revenue, and we are committed to that end following a very aggressive schedule. We look forward to working with EPA on this important matter. If you have any questions, please feel free to contact me by e-mail at ldaniels@pa.gov or by telephone at 717.787.9633.

Sincerely,

Lisa Daniels
Director
Bureau of Safe Drinking Water

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

APR 12 2017

Lisa D. Daniels, Director
Bureau of Safe Drinking Water
Pennsylvania Department of Environmental Protection
400 Market Street
Harrisburg, Pennsylvania 17101

Dear Ms. Daniels,

Thank you for your letter to the U.S. Environmental Protection Agency (EPA), dated February 24, 2017, regarding how the Pennsylvania Department of Environmental Protection (PADEP) plans to address its funding challenges, personnel shortfalls and declining Public Water System Supervision (PWSS) Program implementation performance.

EPA understands that Pennsylvania is working on draft proposed rulemaking that will establish new annual fees and increase existing permit fees for all drinking water systems in Pennsylvania. PADEP plans to use the revenue generated from these fees to fill existing gaps in staffing levels and to improve program implementation performance. EPA also understands that Pennsylvania plans to pursue an aggressive action plan and schedule throughout this process.

EPA is encouraged by PADEP's plan to increase program revenue through its regulatory fee package providing dedicated funding to PADEP's PWSS Program. EPA remains concerned about Pennsylvania's program performance in the interim until staff are hired in 2018 and trained and productive in the year afterward. EPA recommends PADEP seek a temporary funding source to begin the hiring process earlier. EPA agrees that until the final rulemaking is promulgated and new staff can be hired and trained, Pennsylvania should continue to prioritize drinking water sanitary survey inspections and target its limited resources to ensure the highest level of public health protection. EPA also agrees that PADEP should submit quarterly updates on the progress of the action plan and alert EPA to any new challenges or changes in the proposed timeline.

Thank you for submitting the action plan to increase staffing resources. If you have any questions or would like to further discuss this issue, please feel free to contact me or have your staff contact Kelly Moran, EPA's Pennsylvania State Program Manager at (215) 814-2331.

Sincerely,

Dominique Lueckenhoff, Acting Director
Water Protection Division

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

July 24, 2017

Mr. Dominique Lueckenhoff, Acting Director
Water Protection Division
United States Environmental
Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Lueckenhoff:

Thank you for your letter dated April 12, 2017 regarding the U.S. Environmental Protection Agency's (EPA) continued concerns about Pennsylvania's Safe Drinking Water Program performance during the interim until the General Update and Fee rulemaking is promulgated and new staff are hired and trained.

As per our letter dated February 24, 2017, please consider this response as the Department's first quarterly update on the agency's progress with the action plan. This quarterly update covers the second quarter of 2017 (April – June).

1. **Sanitarian Staffing Levels:** The following table provides an update on the current staffing levels for sanitarians (field inspectors):

	No. Sanitarians	No. Trainees	No. Vacancies	Total No. Positions
Feb. 2017	43	11	7	61
June 2017	43	13	6	62

   - During the April through June timeframe, the total number of sanitarian positions increased from 61 to 62.
   - The Department is in the process of filling the six remaining vacant positions.

2. **Interim Measures to Improve Program Performance:** The Department conducted the following activities during the April through June timeframe:

   Several training events were delivered to ensure that new staff are being properly trained:

   - The Department contracted with EPA and their contractors to deliver the Sanitary Survey Training course to 20 new staff (with < 1 year of service) on April 4 – 7,

2017. This course is intended to teach new staff how to conduct a sanitary survey.

- The Department developed and delivered a New Staff Training course to 38 staff (all with < 5 years of service, and 22 with < 1 year of service) on June 5 – 9, 2017. As a prerequisite, attendees were required to participate in several webinars on basic rule training. The classroom training built on the information provided in the webinars and included hands-on training and small group scenarios. Topics included the Groundwater Rule, the Revised Total Coliform Rule, verification of chlorine residual instrumentation, the nitrate MCL, Lead and Copper Rule compliance, data management, CT calculations, response to loss of positive pressure situations, the Disinfection Byproducts Rule, math lessons on chemical dosage, and a lab tour.

During this reporting period, the Department investigated available options for a temporary funding source to allow the agency to hire new staff sooner. Limited funds may be available in the Safe Drinking Water Fund, a restricted account within the General Fund that includes permit fees and penalties/fines, to support several new staff until the fee package is in place. Thus, we may be able to hire a few additional sanitarians beginning in FY 2017/2018. Additional updates will be provided as available.

Status of the Department's Action Plan:

DEP Action Plan to Address Funding and Resource Shortfall and Improve Performance			
Item	**Description**	**Anticipated Schedule**	**Status**
1	Present proposed General Update and Fee rulemaking to EQB for approval to move forward	May 2017	Completed May 17, 2017
2	Publish proposed rulemaking in *PA Bulletin* for public comment	August 2017	
3	Present final rulemaking to EQB for approval	January 2018	
4	Publish final rulemaking in *PA Bulletin*	May 2018	
5	Submit request to increase SDW Program complement	May 2018	
6	Begin to hire and train new staff	September 2018	

The proposed rulemaking was approved by the EQB on May 17, 2017. The Department is currently addressing several questions that were received from the Office of Attorney

General. The Department anticipates that the proposed rulemaking will be published in the *PA Bulletin* for public comment in August.

If you have any questions about this quarterly report, please feel free to contact me by e-mail at ldaniels@pa.gov or by telephone at 717.787.9633. Our next quarterly report will be submitted by the end of September 2017.

Sincerely,

Lisa Daniels
Director
Bureau of Safe Drinking Water

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

January 18, 2018

Ms. Catherine McManus, Acting Director
Water Protection Division
United States Environmental
Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Update on Performance of Pennsylvania's Safe Drinking Water Program

Dear Ms. McManus:

This letter is intended to provide you with an update on the performance of Pennsylvania's Safe Drinking Water Program during the interim period until the General Update and Fee rulemaking is promulgated and new staff are hired and trained. This update covers July – September and October – December of 2017.

1. **Sanitarian Staffing Levels:** The following table provides an update on the current staffing levels for sanitarians (field inspectors):

	No. Sanitarians	No. Trainees	No. Vacancies	Total No. Positions
Feb 2017	43	11	7	61
June 2017	43	12	7	62
Nov 2017	41	14	7	62

Note: Due to the turnover of entry level positions, it is a continual process to post and fill new sanitarian/trainee vacancies.

2. **Sanitary Surveys:** The following table provides a summary of the number of sanitary surveys (full inspections) conducted and whether violations were identified.

	Sanitary Surveys			Total No. Violations Identified
	Total No. San Surveys	No. With Violations	No. Without Violations	
Apr – June 2017	527	243 (46%)	284 (54%)	282
Jul – Sept 2017	443	202 (46%)	241 (54%)	209
Oct – Dec 2017	377	218 (58%)	159 (42%)	195

Note: Due to the size of the reports, the inspection details for April – June were conveyed to EPA via email on August 30, 2017. The inspection details for July – September and October – December are attached to the electronic transmission of this letter.

3. **Interim Measures to Improve Program Performance:** The Department conducted the following activities during the July through December 2017 timeframe:

   - The Department continued to oversee the training plans for new staff, track progress, and ensure completion of on-the-job training.
   - The Department held statewide meetings/conference calls with Sanitarian Supervisors, Operations Chiefs and Program Managers on July 19, September 6 – 7, November 1 – 2 and 15, 2017 to discuss implementation issues and ensure statewide consistency.

In November, the Department received approval from the Governor's Budget Office to use unspent state monies as a temporary funding source to fund additional positions for Safe Drinking Water until the new fees are promulgated. The new positions will include 17 new sanitarians/trainees. The new positions will reduce the workload for each of the DEP regions to levels that are within the recommended range of 100 – 125 public water systems (PWS)/sanitarian (based on a workload analysis).

	DEP Region					
	1-SERO	2-NERO	3-SCRO	4-NCRO	5-SWRO	6-NWRO
Sanitarian Workload with New Positions (No. PWSs/San)	112	108	112	112	95	107

The Department is in the process of completing the necessary steps to create and post the new positions. It is anticipated that the new sanitarian positions will be filled by March of 2018.

4. Status of the Department's Action Plan:

DEP Action Plan to Address Funding and Resource Shortfall and Improve Performance			
Item	**Description**	**Anticipated Schedule**	**Status**
1	Present proposed General Update and Fee rulemaking to EQB for approval to move forward	May 2017	Completed May 17, 2017
2	Publish proposed rulemaking in *PA Bulletin* for public comment	July 2017	Completed Aug 26, 2017
3	Investigate and secure temporary funding to hire new staff until fees are in place	By end of 2017	Completed Nov 2017
4	Complete steps to create, post and hire 17 new sanitarians/trainees	March 2018	
5	Present final General Update and Fee rulemaking to EQB for approval	April 2018	
6	Train new staff	Apr – Dec 2018	
7	Publish final General Update and Fee rulemaking in *PA Bulletin*	July 2018	

If you have any questions about this update, please feel free to contact me by e-mail at ldaniels@pa.gov or by telephone at 717.787.9633.

Sincerely,

Lisa Daniels
Director

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

December 22, 2017

Ms. Lisa Daniels, Director
Bureau of Safe Drinking Water
P.O. Box 8467
Harrisburg, PA 17105-8467

Re: Comments on the Final-Form General Update and Fees Revisions to Chapter 109

Dear Ms. Daniels:

The Small Systems Technical Assistance Center (TAC) Advisory Board met on December 7, 2017 to review and discuss the Department's draft Final-Form revisions to the safe drinking water regulations, specific to the General Update and Fees. The following comments were approved by the TAC Board:

1. TAC would like to express appreciation to DEP for taking their comments regarding the turbidity provisions into consideration. The motion passed by a unanimous vote.

2. Section 109.416 – CCR requirements: Subparagraph (4)(ii) should be revised to include an additional sentence, "When e-reporting is available, electronic submission shall suffice in lieu of mailing a paper copy." This is environmentally prudent and resource conservative. The motion passed by a unanimous vote.

3. Section 109.602(f) & (g): Language similar to what is included in the Disinfection Requirements Rule for an alternative compliance schedule should be added to the alarm and shut-down provisions (i.e. "The department may approve in writing an alternate compliance schedule if the water supplier submits a written request with supporting documentation before the effective compliance date."). The motion passed by a unanimous vote.

4. Section 109.602(i)(2): Subparagraph (iii) should be revised to replace the term "clearwell water levels" with "water levels to maintain adequate CT for Giardia inactivation" because not all water systems use the clearwell as a disinfection segment for CT. The motion passed by a unanimous vote.

5. Section 109.606: The changes to this Section should be deferred (except for subparagraph (e)(3)(v)) until further information is available from NSF or another certification organization because the requirement that all equipment be certified as compliant with NSF standard 61 is not possible. The motion passed by a vote of 9 to 4.

   5(a). If DEP is unable to defer the changes to § 109.606, then the phrase "which may come into contact with or affect the quality of the water" in Subsections (c) & (d) should be revised so that they state, "which directly comes into contact with or directly affects the quality of the water…". The motion passed by a vote of 11 to 2.

   5(b). TAC agrees with the Independent Regulatory Review Commission's comment regarding this Section. "Philadelphia Water Department (PWD) comments that the term *equipment* and the expanded certification requirements in this provision are unclear. PWD states that potentially

requiring every pump or piece of equipment in a treatment facility to be certified will be very costly, and it is uncertain what public health risk this proposed change is designed to address. NAWC comments similarly that the current wording in the regulation is overly broad. The Board should define *equipment*, clarify its intent regarding certification, and explain the reasonableness of the expanded certification, including addressing economic impacts." The motion passed by a vote of 12 to 1.

6. Section 109.612(b): The phrase "or the components of a POE device" should be added to this language so that it states, "POE devices <u>or the components of a POE device</u> used by a public water supplier shall be tested and certified by the NSF or other certification organization acceptable to the Department…". The motion passed by a vote of 11 to 1 with 1 abstention.

7. Section 109.1402(c)(3): The $10,000 cap should be eliminated and the option to submit the annual fee over 4 quarters should be allowed for all water systems. The motion passed by a vote of 11 to 1 with 1 abstention.

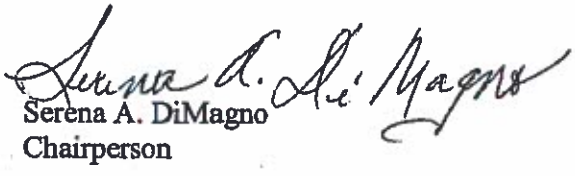
8. Section 109.1402: Fees should be reevaluated to bear a reasonable relationship to the cost of the service. The motion passed by a vote of 8 to 4.

9. Subchapter N: Subchapter N should be eliminated and DEP should request adequate funding from the legislature. The motion passed by a vote of 7 to 5.

10. Section 109.1402(c): Paragraph (1) should be revised so that the payment schedule begins on January 1 of the calendar year following the publication date of the final regulation (the language should be revised to what was presented to TAC on 11/14/2016 for the proposed rule). This is an annual fee that should be based on the calendar year beginning January 1 because of budget cycles set by water systems. Most water systems have already finalized their 2018 budgets. The motion passed by vote of 11 to 1.

Thank you for the opportunity to comment.

Sincerely,



Serena A. DiMagno
Chairperson

CDL-1

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Copy below is hereby approved as to form and legality. Attorney General

By: (Deputy Attorney General)

DATE OF APPROVAL

☐ Check if applicable
Copy not approved. Objections attached.

Copy below is hereby certified to be true and correct copy of a document issued, prescribed or promulgated by:

DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL QUALITY BOARD

(AGENCY)

DOCUMENT/FISCAL NOTE NO. 7-521

DATE OF ADOPTION APRIL 17, 2018

BY

TITLE PATRICK MCDONNELL
CHAIRMAN

EXECUTIVE OFFICER CHAIRMAN OR SECRETARY

Copy below is hereby approved as to form and legality Executive or Independent Agencies

BY Marisa H. Z. Lehr

MAY 03 2018
DATE OF APPROVAL

(Deputy General Counsel)
(~~Chief Counsel - Independent Agency~~)
(Strike inapplicable title)

☐ Check if applicable. No Attorney General Approval or objection within 30 days after submission.

NOTICE OF FINAL RULEMAKING

DEPARTMENT OF ENVIRONMENTAL PROTECTION
ENVIRONMENTAL QUALITY BOARD

Safe Drinking Water – General Update and Fees

25 Pa. Code Chapter 109

NOTICE OF FINAL RULEMAKING
ENVIRONMENTAL
QUALITY BOARD

[25 PA. CODE CH. 109]
Safe Drinking Water (General Update and Fees)

The Environmental Quality Board (Board) by this order amends Chapter 109 (relating to safe drinking water) to read as set forth in Annex A. The amendments include three parts:

1. Incorporate the remaining general update provisions that were separated from the proposed Revised Total Coliform Rule (RTCR) as directed by the Board on April 21, 2015, including revisions to treatment technique requirements for pathogens, clarifications to permitting requirements, and new requirements for alarms, shutdown capabilities, and system service.
2. Amend existing permit fees and add new annual fees to supplement Commonwealth costs and fill the funding gap ($7.5 million).
3. Add new amendments to establish the regulatory basis for issuing general permits, clarify that noncommunity water systems (NCWS) require a permit or approval from the Department prior to construction and operation, and address concerns related to gaps in the monitoring, reporting and tracking of back-up sources of supply.

Collectively, these amendments will provide for the increased protection of public health by every public water system (PWS) within the Commonwealth, and ensure that the Department of Environmental Protection (DEP or Department) has adequate funding to enforce the applicable drinking water laws, meet state and federal minimum program elements, and retain primacy (primary enforcement authority).

Safe drinking water is vital to maintaining healthy and sustainable communities. Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidents of illness, and reduce health care costs. Proper investment in public water system infrastructure and operations helps ensure a continuous supply of safe drinking water, enables communities to plan and build future capacity for economic growth, and ensures their long-term sustainability.

One or more of these amendments will apply to all 8,521 PWSs in Pennsylvania.

This final-form rulemaking was adopted by the Board at its meeting of April 17, 2018.

A. *Effective Date*

This final-form rulemaking is effective upon publication in the *Pennsylvania Bulletin*. Based on advisory committee and public comments, this final-form rulemaking includes the following deferred implementation dates:

- The amended turbidity treatment technique requirements for membrane filtration are required one year after the effective date to allow additional time to achieve compliance.
- The amended turbidity monitoring requirements are required one year after the effective date.
- The amended monitoring requirements for reserve sources and entry points are required one year after the effective date.
- The new comprehensive monitoring plan requirements are required one year after the effective date.
- The new alarm and shutdown capability requirements are required one year after the effective date unless an alternate compliance schedule is approved in writing by the Department.
- The new system service requirements are required from one to three years after the effective date, based on system population.
- The new annual fees are required beginning January 1, 2019 to allow additional time for public water systems, boards and authorities to include the new fees in their 2019 budget. Budgets for 2018 are already completed.

B. *Contact Persons*

For further information, contact Lisa D. Daniels, Director, Bureau of Safe Drinking Water, P. O. Box 8467, Rachel Carson State Office Building, Harrisburg, PA 17105-8467, (717) 787-9633; or William Cumings, Assistant Counsel, Bureau of Regulatory Counsel, P. O. Box 8464, Rachel Carson State Office Building, Harrisburg, PA 17105-8464, (717) 787-7060. Persons with a disability may use the Pennsylvania AT&T Relay Service at (800) 654-5984 (TDD users) or (800) 654-5988 (voice users).

C. *Statutory Authority*

This final-form rulemaking is being made under the authority of section 4(a) of the Pennsylvania Safe Drinking Water Act (SDWA) (35 P.S. § 721.4(a)), which authorizes the Board " . . . to adopt such rules and regulations of the department governing the provision of drinking water to the public, as it deems necessary for the implementation of the provisions of this act." With respect to the fees set forth in Sections 109.1401 – 1409, Section 4(c) of the SDWA (35 P.S. § 721.4(c)) authorizes and directs the Board to "establish fees for permit applications, laboratory certification and other services." The rulemaking is also being made under the authority of section 1920-A of The Administrative Code of 1929 (71 P.S. § 510-20(b)), which authorizes the Board to promulgate rules and regulations necessary for the performance of the work of the Department.

D. *Background and Purpose*

The General Assembly found in section 2 of the Pennsylvania SDWA that it is "in the public interest for the Commonwealth to assume primary enforcement responsibility under the Federal Safe Drinking Water Act." 35 P.S. § 721.2. When the SDWA was passed, the purpose was to create a drinking water program to allow the Commonwealth to obtain legal primacy over the Federal program in Pennsylvania.

The Department is the agency that was delegated authority to implement the safe drinking water program, including the program elements necessary for Pennsylvania to assume and maintain primary (in other words, lead) administration and enforcement authority under the Federal Safe Drinking Water Act. 35 P.S. § 721.5(a). The Department, through its Bureau of Safe Drinking Water, provides services to over 8,500 public water systems serving 11.3 million citizens to ensure compliance with both the Federal and State Safe Drinking Water acts. The Board adopted this final-form rulemaking to ensure the continued implementation of critical program activities under applicable Federal and State law requirements.

Part I: General Update Provisions

The amendments incorporate the remaining general update provisions that the Board previously determined should be proposed in a separate rulemaking. These general updates:

- Clarify the source water assessment, source water protection area, and source water protection program elements and requirements.
- Revise the treatment technique requirements for pathogenic bacteria, viruses and protozoan cysts by adding specific turbidity performance requirements for membrane filtration.
- Revise the disinfection profiling and benchmarking requirements to clarify that all PWSs using filtered surface water or groundwater under the direct influence of surface water (GUDI) must consult with the Department prior to making significant changes to disinfection practices to ensure adequate Giardia inactivation is maintained.
- Revise and clarify the monitoring, calibration, recording and reporting requirements for the measurement of turbidity.
- Revise the permit requirements to clarify the components that must be included in a permit application for a new source, including a source water assessment, a pre-drilling plan, an evaluation of water quantity and quality, and a hydrogeologic report.
- Revise the design and construction standards to require PWSs using surface water or GUDI sources to be equipped with alarm and shutdown capabilities. These provisions are required for plants that are not staffed continuously while the plant is in operation.
- Clarify that treatment technologies must be certified for efficacy through an approved third party.

- Update the system management requirements for community water systems (CWSs) to strengthen system service and resiliency by requiring completion of an uninterrupted system service plan (USSP) which focuses on utilizing auxiliary power or a combination of alternate provisions such as finished water storage and interconnections.
- Clarify system management responsibilities relating to source water assessments and sanitary surveys.
- Revise the corrective action timeframes in response to a significant deficiency for PWSs using groundwater and surface water sources to be consistent.
- Delete the provision that allows a PWS to avoid the requirement for a corrective action by collecting five additional source water samples after an *E. coli*-positive triggered source water sample.

Amendments to Source Water Assessment and Protection Program:

The source water assessment and protection amendments will not only protect public health, but should also help to maintain, reduce or avoid drinking water treatment costs. Source water protection represents the first barrier to drinking water contamination. A vulnerable drinking water source puts a water utility and the community it serves at risk and at a disadvantage in planning and building future capacity for economic growth. Contamination of a CWS source is costly for the water supplier and the public. For example, it is estimated that the total cost of the May 2000 Walkerton, Ontario *E. coli* contamination incident was $64.5 million (*The Economic Costs of the Walkerton Water Crisis* by John Livernois, 2001). In addition to increased monitoring and treatment costs for the water system, a contaminated source may result in costs associated with containment or remediation, legal proceedings, adverse public health and environmental effects, reduced consumer confidence, diminished property values, and costs to replace the contaminated source.

A case study in Texas showed that water suppliers in source water areas with chemical contaminants paid $25 more per million gallons to treat drinking water than suppliers in areas with no chemical contaminant detections. Dearmont, D., et al. (1998), "Costs of Water Treatment Due to Diminished Water Quality: A Case Study in Texas," *Water Resources Research*, 34(4), 849—853. A study by The Trust for Public Land showed that for every four percent increase in source water turbidity (an indicator of water quality degradation from sediment, algae and microbial pathogens), treatment costs increase by one percent. The Trust for Public Land, (2002), "The Cost of Not Protecting Source Waters." A study by the Pennsylvania Legislative Budget and Finance Committee stated that "reducing pollution inputs from pipes and land-based sources can reduce locality costs to treat drinking water sources to safe standards." Legislative Budget and Finance Committee (2013), "A Cost Effective Alternative Approach to Meeting Pennsylvania's Chesapeake Bay Nutrient Reduction Targets." According to the Legislative Budget and Finance study, a study by the Brookings Institute suggested that a one percent decrease in sediment loading will lead to a 0.05 percent reduction in water treatment costs. Source water assessments can support and enhance emergency response, improve land use planning and municipal decisions, complement sustainable infrastructure initiatives, and help

prioritize and coordinate actions by Federal and Commonwealth agencies to better protect public health and safety.

Amendments to Surface Water Treatment Requirements:

The United States Environmental Protection Agency (EPA) describes turbidity as "a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (such as whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches." *National Primary Drinking Water Regulations,* EPA 816-F-09-004 (May 2009). These amendments will ensure that PWSs consistently produce water that meets turbidity standards to help ensure the delivery of safe and potable water to all users.

The proposed amendments were intended to reduce the public health risks related to waterborne pathogens and waterborne disease outbreaks. Costs related to waterborne disease outbreaks are extremely high. For example, as stated in the below-referenced article, the total medical costs and productivity losses associated with the 1993 waterborne outbreak of cryptosporidiosis in Milwaukee, Wisconsin was $96.2 million: $31.7 million in medical costs and $64.6 million in productivity losses. The average total cost per person with mild, moderate, and severe illness was $116, $475, and $7,808. *Cost of Illness in the 1993 Waterborne Cryptosporidium Outbreak, Milwaukee, Wisconsin.* Corso, et al. Emerging Infectious Diseases, Volume 9, No. 4 (April 2003). Available at http://wwwnc.cdc.gov/eid/article/9/4/02-0417.

When problems such as rapid changes in source water quality, treatment upsets requiring a filter backwash, or other unforeseen circumstances occur at filter plants, an immediate response from water plant operators is needed. The amendments were intended to ensure that operators are promptly alerted to major treatment problems, or if an operator is unable to respond, that the plant will automatically shut down when producing inadequately treated water. Thus, these amendments would prevent situations that pose an imminent threat to consumers, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence.

While the Department favors establishing more stringent individual filter effluent (IFE) and combined filter effluent (CFE) turbidity compliance and trigger levels of 0.30 NTU and 1.0 NTU for surface water filtration plants, in response to numerous comments from the Small Water Systems Technical Assistance Center Advisory Board (TAC) and public commentators, the Department is deferring such amendments until the EPA completes its six-year review of the Federal turbidity requirements established under the Surface Water Treatment Rules. This will allow the Department to consider EPA's proposed changes before moving forward with proposed modifications to applicable state regulatory requirements. Until that time, the Department encourages filter plant operators to voluntarily meet optimal water quality levels and respond to trends of increasing turbidity as quickly as possible. This can be accomplished through the use of the Department's existing programs, including the Area-Wide Optimization and Filter Plant Performance Evaluation and Partnership for Safe Water programs. Through

these programs, the SDW program has always dedicated significant resources towards compliance assistance/violation prevention at surface water filtration plants.

Revisions to System Service and Auxiliary Power Requirements:

The revisions to system service and auxiliary power requirements will strengthen system resiliency and ensure that safe and potable water is continuously supplied to consumers and businesses. A continuous and adequate supply of safe drinking water is vital to maintaining healthy and sustainable communities.

This Commonwealth's PWS sources and treatment facilities are susceptible to emergency situations resulting from both natural and man-made disasters. Examples of emergencies from recent years include tropical storms, flooding, high winds, ice, snow, industrial chemical plant runoff, pipeline ruptures, and transportation corridor spills. These emergencies have resulted in significant impacts to consumers and businesses due to inadequate water quantity or quality, and required water supply warnings and advisories. For example, in 2011, Hurricane Irene and Tropical Storm Lee caused flooding, water line ruptures, and power outages resulting in mandatory water restrictions and boil water advisories (BWA) at 32 PWSs in Pennsylvania. In 2012, Hurricane Sandy caused similar problems at 85 CWSs. Most of the impacted systems were small systems where redundancy and back-up systems were lacking. In comparison, systems with redundancy and adequate planning maintained operations until the power was restored, with little negative impact to their customers. Countless incidents at individual CWSs have occurred due to localized emergencies, with interruptions in potable drinking water service that could have been prevented if adequate preparation and equipment were available.

In addition, numerous wastewater treatment plants were forced to send untreated sewage to Pennsylvania waterways during these major weather events. PWSs that use these waterways as a source of supply for drinking water were at an increased risk due to extremely elevated turbidity levels and pathogen loading. Effectively treating drinking water during and after emergencies requires increased vigilance and operational control.

Water outages caused by power failures or other emergencies can cause additional adverse effects including:

- Lack of water for basic sanitary purposes, such as hand-washing and flushing toilets.
- Increased risk to public health when water systems experience a sharp reduction in supply, which can result in low or no pressure situations within the distribution system. Low pressure can allow intrusion of contaminants into distribution system piping from leaks, and backflow from cross connections.
- Dewatering of the distribution system can result in physical damage to pipes when the system is re-pressurized. This situation is exacerbated due to the nationwide problem with aging infrastructure.

These amendments improve the reliability of service provided to all consumers by requiring the development of a feasible plan to consistently supply an adequate quantity of safe and

potable water during emergency situations. More specifically, water suppliers will need to provide on-site auxiliary power sources (specifically, generators), or connection to at least two independent power feeds from separate substations; or develop a plan for alternate provisions, such as interconnections with neighboring water systems or finished water storage capacity. Ideally, water systems will implement a combination of options to improve their redundancy and resiliency.

After significant consideration of the comments, the Department has made several modifications to the proposed regulatory language. First, the Department has expanded the alternate provision options even further to include "a combination of alternate provisions", "access to portable generators", and a category of "other" alternate provisions; within this category, system specific alternate provisions may be proposed to insure uninterrupted system service. Additionally, due to the variety of system specific challenges, the Department has included the option to submit a schedule for necessary improvements which have not been completed by the compliance deadlines specified in § 109.708(a) (relating to system service and auxiliary power) for submittal of the USSP. This new approach requires certification of completion of the USSP form created by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist which prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the CWS has not fully addressed those deficiencies by the deadline for USSP submittal, a schedule will need to be submitted within six months which includes detailed corrective actions and corresponding completion dates. These significant regulatory modifications will help enable the cost for compliance with these provisions to be spread out over a longer period of time. Additionally, these revisions will provide water suppliers with more flexibility in choosing the approach that best suits their particular water system, and adequate time to implement that plan in the most effective manner.

Part II: New Annual Fees and Amended Permit Fees

Funding Necessary to Provide Services

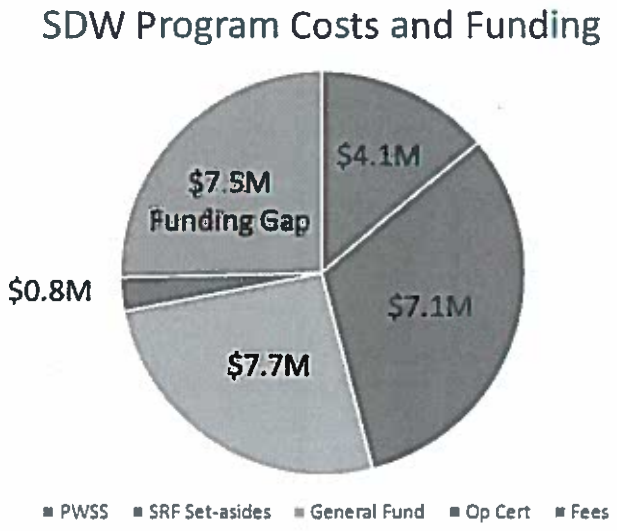
The Department is required to adopt and implement a public water supply program under Section 5(a) of the SDWA that includes, but is not limited to, maximum contaminant levels or treatment technique requirements establishing drinking water quality standards, monitoring, reporting, recordkeeping and analytical requirements, requirements for public notification, standards for construction, operation and modification to public water systems, emergency procedures, standards for laboratory certification, and compliance and enforcement procedures. 35 P.S. § 721.5(a). All of these functions and services are required in order to have an approvable program and maintain primacy from EPA. Services provided by the Department to maintain compliance with Section 5(b) of the SDWA, as well as regulations in Chapter 109 and permits issued, include monitoring and inspections; maintaining an inventory of PWSs in this Commonwealth; conducting systematic sanitary surveys of PWSs; assuring the availability of laboratories certified to analyze drinking water for all contaminants specified in the drinking water standards; reviewing and approving plans and specifications for the design and construction of new or substantially modified PWSs to deliver water that complies with drinking water standards with sufficient volume and pressure to users of the systems; and issuing orders

and taking other actions necessary and appropriate for enforcement of drinking water standards. 35 P.S. §721.5(b)

The fees in this final-form rulemaking are necessary to ensure adequate funding for the Department to carry out its responsibilities under the Federal and State Safe Drinking Water acts. Pennsylvania is ranked third in the nation in terms of the number of PWSs, with 8,521 PWSs across this Commonwealth. The Department is responsible for regulating all PWSs in this Commonwealth and ensuring that safe and potable drinking water is continuously supplied to the 11.3 million customers the PWSs serve.

The Department's appropriations from the General Fund for the Safe Drinking Water Program have steadily decreased in recent years while the cost of staff salaries and benefits, as well as other operation costs, have increased. The result has been an overall decrease in staffing for the Safe Drinking Water Program of 25% since 2009. As discussed in more detail in the preamble to the proposed rule (47 Pa.B. 4986 (August 26, 2017)), these staff reductions have led to a steady decline in the Department's performance of services necessary to ensure compliance with SDWA requirements.

The current funding available to administer the Safe Drinking Water Program from State and Federal sources is $ 19.7 million (see chart below). The fees are expected to generate approximately $7.5 million, which will allow the Safe Drinking Water Program to restore staffing levels and reverse the decline in services that has occurred since 2009. The fees will provide nearly 50% of the Commonwealth's share of funding for the Safe Drinking Water Program. The remaining portion of the Commonwealth's share ($7.7 million) is expected to be provided through annual General Fund appropriations. If appropriations from the General Fund do not keep pace with program costs, a funding gap could remain even with this final-form rulemaking.



Federal sources currently provide approximately $11.2 million to fund the Pennsylvania Safe Drinking Water Program, including:

- Public Water System Supervision (PWSS) grant ($4.1 million) – used for personnel costs; lab costs; staff training
- State Revolving Fund (SRF) Set-asides grant ($7.1 million) – used for personnel costs; capability enhancement programs (training, technical assistance, optimization programs); source water assessment and protection; PADWIS; assistance grants/contracts

The Commonwealth currently provides approximately $8.5 million to fund the program through the following sources:

- General Fund appropriations (~$7.7 million) – used for personnel costs
- Operator Certification fees ($0.8 million) – used for Operator Certification Program implementation costs

With the addition of the $7.5 million expected to be generated from this final-form rulemaking, the funds available for the Safe Drinking Water Program should total $27.2 million.

The minimum critical services that the Safe Drinking Water Program must provide to administer the SDWA and its regulations include:

- Conducting surveillance activities, such as sanitary surveys and other inspections;
- Collecting and analyzing drinking water samples;
- Determining compliance with the regulations, a permit or order;
- Taking appropriate enforcement actions to compel compliance;
- Reviewing applications, plans, reports, feasibility studies and special studies;
- Issuing permits;
- Conducting evaluations, such as filter plant performance evaluations and other site surveys;
- Tracking, updating and maintaining water supply inventory, sample file, and enforcement data in various data management systems;
- Meeting and assuring compliance with all Commonwealth and Federal recordkeeping and reporting requirements;
- Conducting training;
- Providing technical assistance; and
- Responding to water supply emergencies.

Failure to provide these fundamental services may result in an increased risk to public health, as well as the loss of approval from EPA for the Department to serve as the primary enforcement agency for the administration of the Safe Drinking Water Program in this Commonwealth under Federal law.

The Board has the authority and is directed under section 4(c) of the SDWA (35 P.S. § 721.4(c)) to establish fees for services that bear a reasonable relationship to the actual cost of providing the services. The Board must also consider the impacts of the proposed fees on small businesses as part of the regulatory analysis required by section 5 of the Regulatory Review Act (71 P.S. § 745.5). Sixty-eight percent of the PWSs in the Commonwealth are considered small businesses.

The fees in this final-form rulemaking will provide the Department with funding necessary to properly administer the SDWA while bearing a reasonable relationship to the actual cost of services provided and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost.

The fees will allow the Department to restore sanitarian (field inspector) positions and lower the workload of PWSs/sanitarian to an acceptable level (~100-125 as per a workload analysis) as follows:

Region	No. PWSs			No. Sanitarians			Sanitarian Workload (No. PWSs/San)		
	2009	2015	2017	2009	2015	With New Fees	2009	2015	With New Fees
1 SERO	1,062	911	895	9	6	8	118	152	112
2 NERO	2,973	2,559	2,481	23	19	23	129	135	108
3 SCRO	2,596	2,408	2,353	21	13	21	124	185	112
4 NCRO	1,115	941	894	10	6	8	112	157	112
5 SWRO	879	694	667	10	6	7	88	105	95
6 NWRO	1,302	1,205	1,281	11	7	12	118	158	107
Totals	9,927	8,718	8,521	84	57	79	118 Avg.	153 Avg.	108 Avg.

New Annual Fee and Permit Fee Increases

The amended fees apply to all 8,521 PWSs, which include 1,952 CWSs, 6,397 noncommunity water systems (NCWSs) and 172 bottled and vended water systems, retail water facilities and bulk water hauling systems (BVRBs). The new annual fees range from $250 - $40,000 for CWSs, $50 - $1,000 for NCWSs, and $1,000 - $2,500 for BVRBs. If passed on to their customers, these annual fees would result in an increase in cost ranging from $0.35 to $10 per person per year, depending on the water system size. Further explanation of the annual fees is provided in Section E under the discussion of § 109.1402 (relating to annual fees). The increased permit fees range from $100 to $10,000 depending on the population served and whether the permit is for major or minor construction. The prior permit fees ranged from $125 to $1,750. This final-form rulemaking provides for a review of the fee structure every three years to ensure that the fees continue to adequately supplement the cost of maintaining the program.

As provided in section 14 of the SDWA, all fees will be paid into the State Treasury into a special restricted revenue account in the General Fund known as the Safe Drinking Water

Account administered by the Department. 35 P.S. § 721.14. The funds may only be used for such purposes as are authorized under the SDWA.

Comparison to Other States Annual Fees

As described in the preamble to the proposed rule, at least 26 states charge annual fees to augment the cost of their Drinking Water Programs. Some of these states charge a flat fee based on the PWS type and size. Other states charge a fee based on population served or the number of service connections. Annual fees for these 26 states range from $25 to $160,000 and were summarized in the preamble to the proposed rulemaking at 47 Pa.B. 4992 – 4994.

Part III: New Amendments

The remaining component of this final-form rulemaking consists of amendments to other parts of Chapter 109 to:

- Establish in § 109.511 (relating to general permits) the regulatory basis for the issuance of general permits for high volume, low risk modifications or activities to streamline the permitting process.
- Clarify in § 109.505(a)(2)(ii) (relating to requirements for noncommunity water systems) that NCWSs that are not required to obtain a permit must still obtain Department approval of the facilities prior to construction and operation.
- Address in §§ 109.301(15) (relating to general monitoring requirements) and 109.717 (relating to comprehensive monitoring plan) concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As per Federal and Commonwealth regulations, 40 CFR 141.23(a), 141.24(f) and (h) and 141.26(a) and 25 Pa. Code §§ 109.301 and 109.303, respectively, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means verifiable controls are not in place to ensure that all sources and entry points meet safe drinking water standards. Some of these sources have not been used in at least five years, and, therefore, the Department does not know the water quality for these sources. In addition, the treatment facilities and other appurtenances associated with these sources may have gone unused as well, and may no longer be in good working order. These amendments will ensure that all sources and entry points are monitored at least annually, or when in use. PWSs will also be required to document in a comprehensive monitoring plan how routine compliance monitoring will include all sources and entry points.

Advisory Committee Review

This final-form rulemaking was presented to TAC on December 7, 2017. Final written comments were received on December 22, 2017. The TAC Board made ten recommendations:

- Five of the recommendations were incorporated into this final-form rulemaking.
- TAC recommended that electronic submission of Consumer Confidence Reports (CCR) to DEP be allowed as an environmentally prudent option. The Department continues to investigate options for water suppliers to submit reports electronically, and intends to move forward with promulgating a regulation to implement this recommendation as soon as a system is available to accept electronic submissions.
- TAC made three recommendations regarding NSF International (NSF) certification requirements under § 109.606 (relating to chemicals, materials and equipment) . These recommendations were not incorporated because NSF certification is an existing requirement. NSF certification has been a long-standing requirement to ensure the safety and efficacy of materials and equipment. NSF certification ensures that harmful metals such as cadmium, chromium and lead do not leech from materials and equipment. NSF certification also ensures that water treatment devices can meet manufacturers' claims and effectively treat the water. However, the Department clarified in this final-form rulemaking that NSF certification requirements apply to materials and equipment that come in contact with the water. In other words, these requirements apply to the wetted parts of materials and equipment, and exclude motors, casings and the like which do not come into contact with the water. Finally, § 109.606 allows the use of other standards to meet these criteria. For example, the use of materials, such as concrete and stainless steel, which meet American Water Works Association (AWWA) standards, would be acceptable to the Department.
- TAC made recommendations regarding the elimination of the fees and whether the fees bear a reasonable relationship to the cost of services. These recommendations are addressed in Section E, particularly in the discussion relating to § 109.1402.
- Section E includes more information about the TAC Board's recommendations.

Summary of Major Comments and Responses

The Independent Regulatory Review Commission (IRRC) submitted several comments. A summary of the IRRC's major comments and the Board's responses to those comments is included below. For more information about the comments received and the Department's responses, please refer to the Comment and Response Document for this final-form rulemaking.

1. The current state of the Program, which is the cumulative result of numerous decisions made over many years, is cause for serious concern regarding protection of the public health, safety and welfare. The SDWA not only envisions, but directs the Board to establish fees to cover services. We question the Department's decision to cut services rather than gradually increase fees as appropriations from the General Fund decreased in recent years. We ask the Board to explain why the statutory directive to establish fees to cover services was not used to sustain the Program. We also ask the Board to explain how the Program's budget will be monitored in the future to ensure that revenues are in place to meet SDWA requirements before a budget shortfall exposes the public to the risk of unsafe drinking water.

Response: The Department attempted to increase permit fees and establish new annual fees in 2010 when program resources and performance first began to decline. The draft proposed rulemaking (Safe Drinking Water Program Fees) was presented to TAC on March 9, 2010, with further discussion on June 18, 2010. The proposed rulemaking was presented to the Board at its November 16, 2010 meeting, where it was approved to move forward as proposed rulemaking. However, due to circumstances beyond the control of the Department at that time, the rulemaking was prohibited from moving forward beyond that point in the regulatory review process.

Regarding the Department's protocols that will ensure the proper monitoring of the SDW Program's performance and budget in the future, the three-year review of fees specified under § 109.1413 (relating to evaluation of fees) of this final-form rulemaking will ensure ongoing monitoring and tracking. There are several additional levels of accountability within the SDW Program. At the Federal level, the Department is accountable to EPA to ensure that the SDW Program meets all primacy and grant conditions and is at least as stringent as the federal program. The Department provides several updates to EPA throughout the year including quarterly enforcement updates, semi-annual updates on grant commitments and program performance, and annual and triennial reports on program implementation. The Department's performance is also tracked by the Governor's Office and the Legislature through the annual budget process and through the reporting and tracking of annual performance measures. The Department is accountable to the citizens of this Commonwealth through advisory committees, public meetings, and publicly-accessible web applications. Currently, the Department provides on its website all compliance monitoring results, violations and enforcement actions, and inspection results for all 8,500 PWSs. Here is the link to the Department's Drinking Water Reporting System: http://www.drinkingwater.state.pa.us/dwrs/HTM/Welcome.html. The fees in this final-form rulemaking will provide the Department with funding necessary to properly administer the SDWA while bearing a reasonable relationship to the actual cost of services provided by the Department and while achieving a reasonable cost to the customers served.

2. Public comments opposing the proposed fees, and even those supporting them, challenge the Board's methodology for assessing the fees. The commenters question whether fees based on parameters including population served, public water system identification number and system construction, bear a reasonable relationship to the actual cost of the services provided by the Department. We recommend that the Board reevaluate the basis of the fees in the final-form regulation, including consideration of the recommendation from the TAC. We ask the Board to explain in the Preamble of the final regulation how the chosen method of assessment of fees bears a reasonable relationship to the actual cost of providing each service, and to explain why the TAC recommendation is not in the public interest if it is not adopted.

   Response: The Department retained the assessment of fees by population served. Nearly all aspects of the State and Federal drinking water program are governed by system size (population). System population is used to determine monitoring requirements (both the number of samples and the frequency of monitoring), implementation due dates (many rules phase-in effective dates by system size), and treatment techniques (some treatment

techniques only apply to certain system sizes), among other things. System population is used as a surrogate for system complexity—medium and large systems are generally more complex than small systems, with more overall facilities (namely, sources, entry points, interconnections, and storage tanks, among others) and types of treatment technologies. Medium and large systems often face additional challenges with maintaining simultaneous compliance, which factor heavily into Department services. For these reasons, it is appropriate to use system population to determine the various fee categories and Department costs. Refer to the discussion regarding Section 109.1402 in Section E, below, for more information about the appropriateness of the fees.

3. The Board notes that several areas of the proposed regulation are more stringent than federal requirements, and commenters take issue with the increased regulation relative to lack of staff and increased fees. We ask the Board to explain the reasonableness of expanding regulatory requirements which would result in increased demands on the Department's staff and funding during a time when both staff and funding are decreasing.

   Response: The Department amended several provisions in response to TAC and public comments. Several provisions that are more stringent were either modified or deleted, including the turbidity requirements under §§ 109.202 (relating to state MCLs, MRDLs and treatment technique requirements) and 109.701 (relating to reporting and recordkeeping), the monitoring and reporting requirements for "back-up" sources and entry points under §§ 109.301, 109.303 (relating to sampling requirements), 109.703 (relating to facilities operation) and 109.717, and the system service and auxiliary power requirements under § 109.708. The remaining more stringent provisions are designed to help reduce the occurrence of violations, treatment breakdowns and water supply emergencies, thereby improving system resiliency and reliability and reducing the need for Department staff resources to respond to these emergency situations. Refer to Section E for more information on the amendments to these sections of the final-form rulemaking.

4. We ask the Board to ensure that the final-form RAF and regulation make clear who is required to comply with the regulation and how the final-form regulation affects the various segments of the regulated community. We ask the Board to consider regulatory methods to minimize adverse impacts on small businesses or explain the reasonableness of not considering alternatives.

   Response: The various definitions and types of PWSs that must comply with the SDWA and regulations are not being amended by this final-form rulemaking. The existing State and Federal regulatory definitions and guidance provide more information about the types of water systems. In general, nontransient noncommunity water systems include facilities that serve 25 or more of the same people, but are not residential facilities. This includes schools and places of business with 25 or more employees. Transient noncommunity water systems generally serve a transient population and include restaurants and campgrounds. Finally, the fees for small water systems and businesses were established to bear a reasonable relationship to the actual cost of services provided and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost. Refer to Section F of this preamble and to the responses to Questions 17, 24, 26 and 27 in the Regulatory Analysis

Form (RAF) for this final-form rulemaking for more information about who is required to comply with the regulation, how the final-form regulation affects the various segments of the regulated community, the costs for the various segments of the regulated community, including small businesses, and for the consideration of alternative regulatory approaches.

5. We strongly encourage the Department to organize additional stakeholder meetings with representatives from all segments of the regulated community in order to develop final-form regulations that are clear, reasonable and have the least adverse economic impact while protecting the public health, safety and welfare. We ask the Board to address the reasonableness, economic impact and implementation of changes made to these sections of the final-form regulation in the revised Preamble.

   Response: The fees and other proposed amendments were thoroughly discussed with TAC and other stakeholders through several advisory committee meetings and a public webinar. Advisory committee meetings were announced publicly and are open to the public. As mentioned above, several general update provisions were either modified or deleted in response to TAC and public comments. In addition, several options were evaluated using all available data to determine the best method of assessing fees to ensure the fees bear a reasonable relationship to the actual cost of services provided by the Department and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost. Refer to Sections E and F for more information about the reasonableness, economic impact and implementation of changes made to this final-form rulemaking.

6. The Board proposes to reduce acceptable turbidity levels, making the maximum level more stringent than federal standards. We ask the Board to explain the reasonableness and economic impact of making this requirement more stringent than federal standards.

   Response: The Department has deleted these provisions from this final-form rulemaking. Refer to the discussion of the amendments to §§ 109.202 and 109.701 in Section E for more information.

7. The proposed rulemaking, in § 109.301(11)(ii), adds the requirement that "at a minimum, all entry points shall provide water to the public on an annual basis to ensure all sources and entry points are included in routine compliance monitoring." We ask the Board to address in the final Preamble the economic impact and feasibility of requiring all entry points to provide water to the public, as well as the implementation schedule. We ask the Board to define the term "entry points" in the final regulation. We ask the Board to clarify the term "back-up sources" and to define it in § 109.1 (relating to definitions), and to clarify how interconnections will be affected in the final regulation.

   Response: The Department has revised these provisions in § 109.301(11)(ii) in this final-form rulemaking in response to TAC and public comments. Changes were made to include the designation "reserve" in §§ 109.301(15) and 109.717, rather than define the term "back-up sources" in § 109.1, to allow select sources and entry points to remain off-line until needed. The term "entry point" is established in existing § 109.1. The term "back-up" source is not used in the regulations, so no definition is needed. Refer to the discussion of §§

109.301, 109.303, 109.703 and 109.717 in Section E for more information, including an explanation of how interconnections will be affected.

8. We ask the Board to clarify the pre-drilling plan and source water assessment requirements of § 109.503(a)(1) in the final regulation. We ask the Board to explain the reasonableness of this requirement.

   Response: Predrilling plans and source approvals are coordinated with other agencies such as the Susquehanna River Basin Commission (SRBC), Delaware River Basin Commission (DRBC), etc. The individual components of a pre-drilling plan and subsequent approvals of potential production well site locations have been required as part of the permitting process since at least 1997. The individual components are currently listed in § 109.503(a)(1)(iii) (relating to PWS construction permits) of the existing regulations and are required to be submitted to the Department as part of a construction permit application. However, with these revisions, the predrilling plan will now be required to be submitted to the Department for review and approval prior to drilling the well. No change to this subsection has been made in the final-form rulemaking.

   Test wells and exploratory activities would be undertaken first to determine potential production well site locations; the Department does encourage these valuable data gathering activities. Potential production well sites would then be addressed by the pre-drilling plan.

   The clarifications to existing requirements for preliminary source water assessments in § 109.503(a)(1)(iii)(A) do not involve water quality monitoring and are primarily to determine potential sources of contamination and the susceptibility of the production water source to contamination, not to assess existing water quality in the well. In addition, the Groundwater Monitoring Guidance Manual is used by DEP and multiple agencies to address groundwater sampling/monitoring issues. Refer to Section F of this preamble, *Benefits, Costs and Compliance*, under the *Benefits* heading, for more information.

9. Regarding the proposed revisions to section 109.606, the Board should define equipment, clarify its intent regarding certification, and explain the reasonableness of the expanded certification, including addressing economic impacts.

   Response: The Board has revised § 109.606 of the final-form rulemaking to clarify that chemicals, materials and equipment that come in contact with the water or may affect the quality of the water must be acceptable to the Department. In other words, this section applies to the wetted parts of materials and equipment, and excludes motors, casings and the like that do not come in contact with the water. The Department believes that this clarification should alleviate the need for a definition for "equipment."

   According to NSF, a 2016 survey of members of the Association of State Drinking Water Administrators (ASDWA) found that 48 states have legislation, regulations or policies requiring compliance with NSF standards. NSF International (2016), "Survey of ASDWA Members on the Use of NSF/ANSI Standards," available at http://www.nsf.org/newsroom_pdf/water_asdwa_survey.pdf. In this Commonwealth, NSF

certification requirements under § 109.606 are long-standing and are intended to ensure the safety and efficacy of chemicals, materials and equipment that come into contact with water. NSF certification ensures that harmful metals such as cadmium, chromium and lead do not leech from materials and equipment. NSF certification also ensures that water treatment devices can meet manufacturer's claims and effectively treat the water. The intent of the revisions in § 109.606 is to clarify that "equipment" has always been included, as evidenced by the fact that "equipment" has always been part of the title of § 109.606. Under existing Department protocols, water systems must take all steps necessary to identify and propose the use of NSF-approved equipment. If NSF-certified equipment is not available, the Department, on a case-by-case basis, will allow the use of other equipment, provided the equipment does not pose an increased risk to public health. The Department is not expanding the scope of equipment for which NSF certification requirements apply; therefore, no additional costs are expected to be incurred.

10. Regarding the proposed revisions to section 109.1303 (relating to triggered monitoring requirements for groundwater sources) related to the deletion of the existing opportunity to collect five additional *E. coli* source water samples to confirm if there is a problem, we ask the Board to address the reasonableness and economic impacts of eliminating the opportunity for further testing to prevent false positives, if the deletion is maintained in the final-form regulation.

    Response: EPA approves analytical methods based on the reliability of a method to have a low risk of samples being false positive or false negative. In the preamble to the proposed Federal Ground Water Rule, EPA states, "that, in the interest of public health, a positive sample by any of the methods listed in Table III-4 should be regarded as a fecal indicator-positive source water sample." 65 FR 30230 (May 10, 2000). The proposed and final Federal rules along with the Department's revisions to Chapter 109 provide a means for the laboratory or state to invalidate samples. Although EPA allowed the five additional samples as a concession relating to the rare event that a sample is false positive, EPA's commentary in the preamble to this final rule states "that in most cases these five additional samples should capture the fecal contamination event since the samples are taken within 24 hours." 71 FR 65594 (November 8, 2006). This statement acknowledges that a risk to public health exists because the five additional samples may miss detecting the fecal contamination. In other words, the fecal contamination that was detected in the original sample was a true positive; however, because contamination is neither constant nor immobile, the five additional samples may miss detecting the contamination event. This risk of missing the event is the main rationale for the Department's decision to delete the five additional samples.

    Regarding economic impact, water systems will no longer be required to collect the five additional *E. coli* samples, which will result in a potential cost savings. Further, all bottled water systems are already required to provide continuous disinfection. So, if 4-log treatment is triggered, no additional capital costs will be incurred—treatment already exists. However, some bottled water systems will need to modify operational practices using existing treatment, and improve associated monitoring and reporting practices, as specified in revised operations permits, to insure adequate 4-log treatment is maintained.

E. *Summary of Changes to the Proposed Rulemaking*

§ 109.202. State MCLs, MRDLs, and treatment technique requirements.

Proposed § 109.202(c)(1)(i)(A)(V) was deleted in response to TAC and public comments and will be considered in a future rulemaking. The Department has decided to defer these proposed amendments until after EPA completes its six-year review of the federal turbidity requirements established under the Surface Water Treatment Rules. This will allow the Department to consider EPA's proposed changes before moving forward with proposed modifications to applicable state regulatory requirements. During the interim, the Department through its existing programs, including the Area-Wide Optimization, Filter Plant Performance Evaluation and Partnership for Safe Water programs, will continue to recommend and encourage filter plant operators to voluntarily meet optimal water quality levels and respond to trends of increasing turbidity as quickly as possible. Through these programs, the SDW program has always dedicated significant resources towards compliance assistance/violation prevention at surface water filtration plants.

Additionally, the proposed alarm and shutdown capability amendments under § 109.602 remain in this final-form rulemaking, which are also targeted at surface water filtration plants. The automated plant shut down requirements are intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence. Therefore, the improved alarm and shutdown capabilities that will occur as a result of systems complying with this final-form rulemaking are a very important interim public health protection measure which will be in place while the Department awaits EPA's future actions on potentially more stringent turbidity provisions.

Proposed modifications in § 109.202(c)(1)(i)(C) remain unchanged and include specific treatment technique requirements for membrane filtration. These standards are consistent with the results of pilot testing conducted throughout the Commonwealth, recommendations by EPA in the Membrane Filtration Guidance Manual (EPA 815-R-06-009, November 2005), as well as recommendations made by equipment manufacturers. These standards were previously applied through special permit conditions. Certified operators have consistently maintained the proposed levels of performance at membrane filter plants throughout the Commonwealth; and when deviations from this performance have occurred, follow-up investigations revealed the need for repairs to this treatment barrier. The Membrane Filtration Guidance Manual may be found by typing the title of the document into the search box at https://nepis.pa.gov or at the following direct link: https://goo.gl/horVd4

§ 109.301. General monitoring requirements.

Subsection 109.301(11) was amended in this final-form rulemaking in response to TAC and public comments. These amendments were modified accordingly and moved to a new § 109.301(15) and to the comprehensive monitoring plan requirements under § 109.717.

These amendments are intended to clarify the monitoring requirements for entry points that do not provide water continuously, and address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As per Federal and Commonwealth regulations, 40 CFR 141.23(a), 141.24(f) and (h) and 141.26(a) and 25 Pa. Code §§ 109.301 and 109.303, respectively, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Currently, sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means no verifiable controls are in place to ensure that all sources and entry points meet safe drinking water standards.

These concerns were most recently highlighted in a 2010 report from EPA's Office of Inspector General entitled *"EPA Lacks Internal Controls to Prevent Misuse of Emergency Drinking Water Facilities"* (Report No. 11-P-0001). Note: The term "emergency" is often used to describe sources other than permanent sources. In this Commonwealth, some of these back-up sources have not been used in at least five years and, therefore, the Department does not know the water quality for these sources.

In order to better understand the scope of the problem in this Commonwealth, the following data was retrieved from the Pennsylvania Drinking Water Information System (PADWIS).

Entry Points (EP)				
PWS Type	**Total No. EPs**	**No. Permanent EPs**	**No. Non-Permanent EPs**	**% Non-Permanent EPs**
CWSs	3,330	3,003	327	10%
Others	7,880	7,760	120	2%
Total	11,210	10,763	447	4%

An entry point is the place at which finished water representative of each source enters the distribution system. Routine compliance monitoring is not tracked at non-permanent entry points. Non-permanent entry points include the existing categories of seasonal, interim, reserve, and emergency entry points.

Based on the data, CWSs provide finished water to consumers through a total of 3,330 entry points, 327 (or 10%) of which are non-permanent. Therefore, as many as 10% of all entry points may not be included in all required monitoring prior to serving water to consumers.

The numbers are even higher at the individual source level.

Water Supply Sources (wells, springs, surface water intakes, etc.)				
PWS Type	**Total No. Sources**	**No. Permanent Sources**	**No. Non-Permanent Sources**	**% Non-Permanent Sources**
CWSs	5,252	4,634	618	12%
Others	8,604	8,297	307	4%
Total	13,856	12,931	925	7%

For CWSs, as many as 12% of all sources may not be included in routine compliance monitoring, yet these sources can be used at any time.

The Department also reviewed the monitoring history of the 447 non-permanent entry points mentioned above.

Non-Permanent Entry Points (EP)			
PWS Type	**No. EPs**	**No. & % of EPs with No Monitoring Data (Since 1992)**	**No. of EPs with Some Monitoring Data**
CWSs	327	143 (44%)	184 (of these EPs, 47 were sampled in 2016, 37 were sampled during the 2012-2015 monitoring period, and the remaining 101 were sampled prior to 2012.
Others	120	7 (6%)	113 (55 EPs have recent data (2016)).
Total	447	150 (34%)	

For CWSs, 143 (or 44%) of all non-permanent entry points have no monitoring data since 1992. Of the 184 entry points with some data, most of the data are 5 to 10 years old.

The use of unmonitored sources and entry points could adversely impact basic water quality, including pH, alkalinity, turbidity, corrosivity and lead solubility, dissolved inorganic carbon, and natural organic matter. Water suppliers may have limited information about how these sources or entry points will impact treatment efficacy and distribution system water quality. In addition, back-up or emergency sources may have poor water quality or MCL exceedances. The use of these sources without proper monitoring and verifiable controls could lead to an increased risk to public health.

Finally, treatment facilities and other appurtenances associated with these sources may no longer be in good working order. Back-up sources and entry points with unknown water quality or that have not been used or are no longer in good working order provide a false sense of security in terms of system resiliency and emergency response. While the Department understands that many facilities are not used on a "24/7" basis, these amendments will ensure that all permitted sources and entry points are monitored at least annually, or when in use.

The Department anticipates that select purchased interconnections will be able to retain the "emergency" designation if the following criteria are met. The Department anticipates proposing technical guidance in the near future that addresses these criteria. As noted previously, the term "emergency" is often used to describe sources other than permanent sources.

- Using the last three years of historical water use data, the water supplier can demonstrate that the purchased interconnection has only been used for emergency purposes.
- Emergency use has not occurred more than 14 days per year, excluding use under Commonwealth or Federal emergency declarations.

- The Department has conducted an annual compliance check using reported water use data.

On a case-by-case basis, the Department may allow the use of the "reserve" designation for select sources and entry points, without conducting routine annual compliance monitoring, if documentation is provided to the Department that supports the use of this designation. Select sources and entry points that meet these criteria will be covered by a special condition in the permit that requires Department notification and completion of compliance monitoring prior to use.

Subsection 109.301(15) was added to clarify the monitoring requirements for reserve sources and reserve entry points to ensure these facilities are properly monitored prior to and during each use.

§ 109.303. Sampling requirements.

Subsection 109.303(a)(4) was amended in this final-form rulemaking in response to TAC and public comments. The proposed amendments to clarify the monitoring requirements when sources are blended or alternated prior to the entry point were modified and moved to § 109.717.

Subsection 109.303(i) was amended to remove unnecessary language.

§ 109.503. Public water system construction permits.

Subsection 109.503(b)(2) was amended in this final-form rulemaking to clarify that a change to a source designation may be considered a minor amendment.

§ 109.602. Acceptable design.

Subsections 109.602(f) and (g) were amended in this final-form rulemaking in response to TAC and public comments to allow the Department to approve an alternate compliance schedule if the water supplier submits a written request with supporting documentation.

Subsection (i)(2)(iii) was amended in response to TAC and public comments to change "clearwell water levels" to "water levels to maintain adequate CT for Giardia inactivation". This change was necessary because not all water systems use the clearwell as a disinfection segment for Giardia Inactivation Contact Time (CT). After consideration of comments, the Department also removed the requirement under § 109.602(i)(2)(iv) to establish alarm and shutdown capabilities for "any other operational parameter determined by the Department as necessary for the system to maintain compliance." Commentators were concerned that this language may be overly broad and lead to inconsistent implementation. With this deletion, the universe of required alarms is reduced; thereby, allowing potential for additional cost savings. The basis for this deletion was the concern that this particular requirement may be too far reaching and cost prohibitive. Rather than include this language, the Department will rely on appropriate water system personnel (for example, properly certified operators and consulting engineers) to carefully evaluate what additional operational parameters may require alarms in order for their

particular filter plant to consistently comply with regulatory requirements. Additionally, if lack of an alarm is linked to risk of treatment breakdown, the Department will address these issues through a system-specific permit or order on a case-by-case basis.

These new requirements are being added to define new requirements for alarm and shutdown capabilities. Alarm and shutdown capabilities are intended to prevent unsafe water from reaching customers.

TAC recommended that DEP should provide accurate cost estimates for compliance with these provisions and evaluate whether 12 months is adequate time for systems to comply given the costs associated overall with the regulatory package and the addition of fees. TAC expressed concerns that the proposed provision in § 109.602(i)(2)(iv), concerning other operational parameters that the Department may determine necessary for compliance, may be too far reaching and cost prohibitive.

To address TAC's concerns about costs, the Department conducted additional cost estimate research. The Department estimates that 10% of the 353 filter plants in Pennsylvania will need to install an auto-dialer. The Department estimates that the cost to achieve the automatic alarm and shutdown capabilities ranges from $8,860 to $11,980 per treatment plant, depending on the options chosen, with annual maintenance costs of $600. A detailed discussion of these estimated costs is included in Section F.

Overall, the Department notes that the alarm and shutdown amendments will be cost-effective in comparison to staffing costs incurred by systems that maintain physical staffing of the facility. Several states have regulations that do not allow unattended operation of surface water filtration plants. These revisions provide a reasonable alternative to mandating the presence of a certified operator at all times in all water systems in Pennsylvania.

§ 109.606. Chemicals, materials and equipment.

In response to public comments, § 109.606(a)—(d) was amended in this final-form rulemaking to clarify that chemicals, materials and equipment that come in contact with the water or may affect the quality of the water must be acceptable to the Department. In other words, these requirements apply to the wetted parts of materials and equipment, and exclude motors, casings and the like that do not come in contact with the water.

According to NSF, a 2016 survey of ASDWA members found that 48 states have legislation, regulations or policies requiring compliance with NSF standards. (NSF International (2016), "Survey of ASDWA Members on the Use of NSF/ANSI Standards," available at http://www.nsf.org/newsroom_pdf/water_asdwa_survey.pdf) In Pennsylvania, NSF certification requirements in § 109.606 have been long-standing and are intended to ensure the safety and efficacy of chemicals, materials and equipment that come into contact with water. NSF certification ensures that harmful metals such as cadmium, chromium and lead do not leech from materials and equipment. NSF certification also ensures that water treatment devices can meet manufacturers' claims and effectively treat the water. The intent of the revisions in § 109.606 is to clarify that "equipment" has always been included, as evidenced by the fact that "equipment"

has always been part of the title of §109.606. Under existing Department protocols, water systems must take all steps necessary to identify and propose the use of NSF-approved equipment. If NSF-certified equipment is not available, the Department, on a case-by-case basis, will allow the use of other equipment, provided the equipment does not pose an increased risk to public health. The Department is not expanding the scope of equipment for which NSF certification requirements apply; therefore, no additional costs are expected to be incurred.

Finally, § 109.606 allows the use of other standards to meet these criteria. For example, the use of materials, such as concrete and stainless steel, which meet American Water Works Association (AWWA) standards would be acceptable to the Department.

§ 109.612. POE devices.

Subsection 109.612(b) was amended in this final-form rulemaking in response to TAC's recommendation that the Department change "and" to "or".

§ 109.701. Reporting and recordkeeping.

In response to comments from TAC and other commentators, §§ 109.701(a)(2)(i)(A)(VIII) and (IX) have been modified in this final-form rulemaking to remove more stringent turbidity performance standards for conventional, direct, slow sand and diatomaceous earth filtration technologies.

Subsection 109.701(e)(2) was proposed to be amended to add a citation to clarify which systems are required to report individual filter turbidity monitoring. The trigger levels specified in § 109.701(e)(2)(i) – (iv) were proposed to be replaced by lower trigger levels for IFE reporting requirements for all filtration technologies as specified in proposed new subparagraphs (v) – (viii). These proposed turbidity reporting requirements have been deleted in this final-form rulemaking. Therefore, existing requirements in § 109.701(e)(2)(i) – (iv) remain unchanged.

Through the rulemaking process, TAC commented that the "ramifications of these turbidity reductions include additional reporting, self-assessments and comprehensive performance evaluations, as well as possible public notifications". TAC recommended that "DEP should provide rationale, science and methodology, cost vs. benefits, public health benefit, etc. and data to support the proposed changes". These comments mirror previous comments regarding significant figures and reducing IFE turbidity standards significantly.

In response to TAC's comments, the Department explains the following. Individual Filter Effluent is a primary compliance monitoring location. As with CFE, IFE turbidity is the surrogate measurement for pathogen breakthrough, primarily the acute pathogen Cryptosporidium. Turbidity breakthrough on individual filters often provides an indication of water quality problems before CFE turbidity is significantly impacted. As IFE turbidity increases, risk of particle breakthrough on that particular filter increases; this science is supported by existing regulations and industry experts. Most filter plants in Pennsylvania typically produce IFE water quality <0.10 NTU. Therefore, exceedances of the proposed lower turbidity levels will occur only when water systems are experiencing significant increases in

turbidity from an individual filter. Multiple peer reviewed research papers indicate that as turbidity significantly increases from the baseline levels, the risk of pathogen breakthrough increases. Huck, P.M., et al. (2002), "Effects of Filter Operation on *Cryptosporidium* Removal," *Journal—American Water Works Association*, 94(6), 97—111. Emelko, M.B., et al. (2003), "*Cryptosporidium* and Microsphere Removal During Late In-Cycle Filtration," *Journal—American Water Works Association*, 95(5), 173—182.

The real-world impact to operational practices at this Commonwealth's filter plants under the proposed revisions would have been that water suppliers would take important corrective actions (such as removing the filter from service, consulting with Department, notifying customers) sooner. This was intended to enable suppliers to identify physical integrity issues within an individual filter before CFE water quality is impacted, or before problems within one filter occur in other filters. The Department has documented breakdowns in treatment and the presence of pathogens (such as Giardia or *Cryptosporidium*) in the individual filter effluent of water treatment plants in Pennsylvania that complied with the current IFE turbidity standards. This has been documented both with continuous turbidity monitoring and Microscopic Particulate Analysis (MPA) cartridges. Therefore, strengthening the current IFE turbidity standards was proposed to provide an additional level of protection.

As previously noted, the Department favors establishing more stringent IFE and CFE turbidity compliance and trigger levels for surface water filtration plants. However, in responding to numerous TAC and public comments, the Department is deferring such amendments until the EPA completes its six-year review of the Federal turbidity requirements established under the Surface Water Treatment Rules. This will allow the Department to consider EPA's proposed changes before moving forward with proposed modifications to applicable state regulatory requirements. Until that time, the Department encourages filter plant operators to voluntarily meet optimal water quality levels and respond to trends of increasing turbidity as quickly as possible. This can be accomplished through the use of the Department's existing programs, including the Area-Wide Optimization and Filter Plant Performance Evaluation and Partnership for Safe Water programs. Through these programs, the SDW program has always dedicated significant resources towards compliance assistance / violation prevention at surface water filtration plants.

Subsection 109.701(n) was added in this final-form rulemaking to set forth additional reporting requirements for systems using reserve sources, reserve treatment plants or reserve entry points. These requirements are needed to ensure proper tracking and oversight of these facilities. While these facilities are in use, additional monitoring is required. Timely notification that the facility is no longer in use will allow the Department to modify the monitoring requirements in PADWIS accordingly.

§ 109.703. Facilities operation.

Subsection 109.703(d) was added in this final-form rulemaking in response to TAC and public comments to specify the requirements for requesting Department approval to use a reserve source, reserve treatment plant or reserve entry point. These amendments are necessary to ensure that the use of reserve facilities is properly tracked and monitored prior to each use.

§ 109.706. System map.

In response to public comments, § 109.706(a) was amended in this final-form rulemaking to clarify that the requirement for a system distribution map does not apply to BVRBs.

§ 109.708. System service and auxiliary power.

This Commonwealth is susceptible to natural disasters, such as ice storms, tropical storms and hurricanes, which can lead to massive and extended flooding and/or power outages. As noted previously, all of this Commonwealth's drinking water sources and treatment facilities are susceptible to emergency situations resulting from both natural and man-made disasters. Therefore, all CWSs must have effective options to provide consistent system service during such emergencies. Despite long-standing efforts to encourage water systems to develop feasible plans for the continuous provision of adequate and safe water quantity and quality during emergency circumstances, many water suppliers are still inadequately prepared. The Department estimates that more than 400 CWSs do not have an up-to-date emergency response plan. This has resulted in significant impacts to consumers in the form of inadequate water quantity and/or quality and the resulting consumption advisories.

Flooding events caused by localized heavy rains, hurricanes, and tropical storms result in elevated public health risks. Source water turbidity and pathogen loading can increase dramatically during these events. Additionally, when power outages cause interruptions in water system operations, water systems can experience a sharp reduction in supply, which results in low or no pressure within the distribution system. This results in increased risk to public health, because low pressure can allow intrusion of contaminants into distribution system piping from backflow and cross connections. Some customers may also experience inadequate supply of water for basic sanitary purposes, flushing toilets, and potable uses.

Several other mid-Atlantic and Northeastern states are considering promulgating, or have already promulgated, regulations for auxiliary power. Both New Jersey and New York have existing design standards for auxiliary power. New York requires standby power through incorporation of standards recommended by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (known as the 10 States Standards). New Jersey's requirements can be found at N.J.S.A. 58:12A-4(c) and N.J.A.C. 7:10-11.6(i). New Jersey recently evaluated its regulations and issued additional guidance and best management practices regarding auxiliary power, which is available on its website at http://www.nj.gov/dep/watersupply/pdf/guidance-ap.pdf. Connecticut is in the process of updating its regulations to incorporate generator and emergency contingency and response plan requirements. Connecticut's proposed regulations can be found on its website at http://www.ct.gov/dph/lib/dph/public_health_code/pending_regulations/proposed_regulation--generators.pdf.

TAC commented that the Department should not be prescribing the methods by which a public water supplier obtains auxiliary power. TAC further claimed that the Department has not sufficiently evaluated the cost of providing auxiliary power; that secondary power feeds may not

be attainable in rural areas or may be extremely cost prohibitive; and that the Department has not properly evaluated the total cost for implementing generator power. Also, TAC stated that systems may avail themselves of the resources from PaWARN to meet auxiliary power demands. TAC recommended that this provision be addressed in the Emergency Response Plans and not in regulation.

This final-form rulemaking does not prescribe a specific method by which a system must comply. Rather, it requires that a feasible plan be in place to ensure safe and potable water is continuously supplied to users. The water supplier will determine which option or combination of options it will use to comply. Ideally, suppliers will implement a combination of options to improve their redundancy and resiliency.

This information should be incorporated into Emergency Response Plans, as TAC suggests. However, despite long-standing efforts to encourage water systems to develop feasible plans for the continuous provision of adequate and safe water quantity and quality during emergency circumstances, many water suppliers are still inadequately prepared. The Department estimates that more than 400 CWSs in this Commonwealth do not have an up-to-date emergency response plan.

Therefore, the Department believes that these revisions are necessary. Wastewater treatment plants have been required to have back-up power supplies for many years now. These amendments provide consistency within the drinking water and wastewater industry. It is not feasible to develop these plans under an emergency. Rather, plans must be in place before an emergency occurs. It is only a matter of time before another natural or man-made disaster significantly impacts water systems in this Commonwealth. If these revisions were not adopted, a large number of CWSs would likely not be able to provide a consistent supply of safe and potable water.

In response to TAC's comment that systems can use the services of PaWARN to comply, the Department fully recognizes the importance of PaWARN and encourages membership in this valuable mutual aid network. For this reason, PaWARN is listed as one critical component of a complete plan to provide uninterrupted system service. In the draft certification form (USSP) which must be completed to comply with the amendments to § 109.708, PaWARN is listed as one "alternate provision" option (along with finished water storage capacity, interconnections with neighboring water systems, and rental agreements for generators). As of December 2017, PaWARN had approximately 104 members, approximately 92 of those members manage CWSs throughout this Commonwealth. This is a very small subset of the 1,952 CWSs in this Commonwealth. PaWARN membership should prove valuable during small scale events.

After significant consideration of comments, the Department made several modifications to the proposed regulatory language. First, the Department expanded the alternate provision options further to include "a combination of alternate provisions", "portable generators", and a category of "other alternate provisions"; within this category, system specific alternate provisions may be proposed to insure uninterrupted system service. Additionally, due to the variety of system specific challenges, the Department has included in a new § 109.708(c) the option to submit a corrective action schedule for necessary improvements that have not been

completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP. More specifically, this new approach requires certification of completion of the USSP form created by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist that prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the community water supplier has not addressed those deficiencies by the deadline for USSP submittal, a schedule must be submitted within six months which includes detailed corrective actions and corresponding completion dates. These significant regulatory modifications will help enable the cost for compliance with these provisions to be spread out over a longer period of time. Additionally, these revisions provide water suppliers with more flexibility in choosing the approach that best suits their particular water system, and adequate time to implement that plan in the most effective manner.

§ 109.717. Comprehensive monitoring plan.

This section was amended in this final-form rulemaking in response to TAC and public comments to defer the compliance date of the new comprehensive monitoring plan requirements until one year after the effective date of this final-form rulemaking.

This section was also amended to incorporate recommended changes that allow the use of the designation "reserve" for select sources and entry points if certain conditions are met. Reserve sources and reserve entry points will be identified as such in the water system's permit, and will require notification to the Department and monitoring prior to use.

These requirements will ensure that all sources and entry points are included in routine compliance monitoring at the entry point and within the distribution system, or are properly monitored prior to use. The plan must be specific to the system and include details about the various sources and entry points, and how the facilities are operated. The operation of each source and entry point will dictate how compliance monitoring is conducted to ensure that all sources and entry points are included in routine compliance monitoring.

§ 109.1202. Monitoring requirements.

Subsection 109.1202(i) was amended in this final-form rulemaking to correct a cross-reference.

§ 109.1402. Annual fees.

This section was amended in response to TAC and public comments to defer the effective date of the fees until January 1, 2019 to provide more time for budgeting. Water system boards and authorities have already completed and authorized their budgets for 2018.

Paragraphs (1), (2) and (3) of subsection (a) were also amended to change the number of people in the population served for the smallest category of PWSs in these paragraphs. The proposed rule outlined the annual fees for PWSs serving populations of 25 to 100 people. The population numbers were changed in the final-form rulemaking to apply to PWSs serving a population of 100 people or less. These amendments were made because a PWS is defined in

§ 109.1 as "[a] system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of 25 individuals daily at least 60 days out of the year." In this Commonwealth, there are some PWSs that serve at least 15 service connections, but still serve a population of less than 25 people. Therefore, the population number was amended to account for those PWSs.

This section was also amended to change the fee schedule due dates as follows:

Population Served	Submit annual fee by:	Expected Quarterly Revenue*
3,301 or more	Mar 31	$1,314,875
501 – 3,300	June 30	$2,527,275
101 – 500	Sept 30	$1,830,425
100 or less	Dec 31	$1,978,175
	Total	**$7,650,750**

*The expected quarterly revenue assumes that most systems paying $6,500 or more will request the quarterly payment option.

The larger systems will be billed during the first quarter, with the smaller systems receiving invoices later in the year. This amendment will ensure:

- Receipt of all annual fees (including quarterly payments for larger systems) within the same calendar year.
- A more even distribution of revenue throughout the year.
- Additional time for small systems to budget for the fees.

Finally, this section was amended in response to TAC and public comments to allow a lower threshold for systems that may request quarterly payments. The threshold was lowered from $10,000 to $6,500.

The preamble to the proposed rule included an extensive explanation regarding the appropriateness of the fees, and how the fees bear a reasonable relationship to the actual cost of services provided. Please see the preamble to the proposed rulemaking at 47 Pa.B. 5005 – 5010 for the full explanation.

The following table summarizes the annual fees for CWSs, which are based on population and range from $250 to $40,000. The per-person costs range from $0.35 to $10/person/year.

CWS Annual Fees (Based on Population)		
Population Served	**Annual Fee**	**Cost/Person/Year**
100 or less	$250	$2.50 - $10.00
101 – 500	$500	$1.00 - $4.95
501 – 1,000	$1,000	$1.00 - $2.00
1,001 – 2,000	$2,000	$1.00 - $2.00
2,001 – 3,300	$4,000	$1.21 - $2.00

CWS Annual Fees (Based on Population)		
Population Served	**Annual Fee**	**Cost/Person/Year**
3,301 – 5,000	$6,500	$1.30 - $1.97
5,001 – 10,000	$10,000	$1.00 - $2.00
10,001 – 25,000	$20,000	$0.80 - $2.00
25,001 – 50,000	$25,000	$0.50 - $1.00
50,001 – 75,000	$30,000	$0.40 - $0.60
75,001 – 100,000	$35,000	$0.35 - $0.47
100,001 or more	$40,000	≤ $0.40

The Department analyzed the cost of providing services to administer the SDWA and its regulations. The cost of some services can be estimated, while the cost of other services depends on the specific circumstances and will vary widely. The table below summarizes the Department's costs of providing those services that can be estimated for CWSs serving various populations. The hourly rate was provided by the Department's fiscal office and includes salary, benefits, and in-direct costs (such as supplies, and the like).

DEP Cost of Services That Can Be Estimated				
Activity	**Hours/Activity/Year for CWSs Serving the Following Population**			
	<750	**750-5,000**	**5,000-50,000**	**>50,000**
Conduct sanitary surveys	7.5	10	25	37.5
Conduct other inspections	2.5	3.3	5	10
Determine compliance	12	12	15	15
Maintain PADWIS/eFACTS	7.5	7.5	10	10
Review plans/reports	7.5	10	15	15
Provide technical assistance/ training	7.5	7.5	10	10
Total Hours	**44.5**	**50.3**	**80**	**97.5**
@ $49/hr =	**$2,180**	**$2,465**	**$3,920**	**$4,778**

Examples of other services and costs that involve variable circumstances <u>and preclude a single estimate for the services</u> include the following:

1. Sanitary surveys that take longer to conduct due to the complexity or size of the water system. Examples of actual hours expended and costs to complete more complicated sanitary surveys at large water systems (namely those serving populations > 50,000) are as follows:
    a. System A (population = 57,000): 40.5 hours at a cost of $1,984
    b. System B (population = 66,500): 40 hours at a cost of $1,960
    c. System C (population = 87,000): 49 hours at a cost of $2,401
    d. System D (population = 105,000): 60 hours at a cost of $2,940
    e. System E (population = 120,000): 60 hours at a cost of $2,940
    f. System F (population = 747,500): 103 hours at a cost of $5,047
    g. System G (population = 1.6 million): 124 hours at a cost of $6,076

2. Additional follow-up actions taken by the Department in response to a violation. When a drinking water standard is exceeded, Department staff are responsible for consulting with and providing direction to the water system; ensuring that public notice is complete, timely and repeated as needed; tracking, reviewing and approving follow-up and corrective actions (such as collecting confirmation or additional samples, repairing/replacing/installing water treatment, or taking contaminated sources off line); and determining when the system has returned to compliance.

   For example, in 2016, monitoring results for a large Pennsylvania water system indicated the 90th percentile lead value exceeded the action level established in the Lead and Copper Rule. This triggered lead service line replacement actions. Department staff spent at least 116.5 hours working to address this important issue. Services provided by the Department to achieve compliance included meetings, file reviews, drafting compliance documents, follow up action reviews and letters. The approximate cost for these services was $5,708.

3. Additional follow-up, corrective and emergency actions taken by the Department in response to a water supply emergency. Water supply emergencies occur each year and require substantial resources from the Department. The following are examples of emergencies and associated costs for services provided by the Department:

   a. In the Spring of 2011, unexpected damage to a very large water main resulted in a major leak, loss of significant water quantity and pressure. The result was closure of multiple businesses and government agencies in a large city within the Commonwealth for three days due to lack of a potable water supply. This emergency spanned approximately five consecutive days with approximately 66,500 customers impacted. The Department provided a variety of onsite support services at the site of the break, and at the drinking water filtration plant. Department cost for services provided during this event equates to approximately160 hours of staff time and a cost of $7,840.

   b. During the Summer of 2012, significant construction delays in completing critical renovations and upgrades to a water filter plant threatened the ability to provide an adequate quantity of drinking water to approximately 210,000 customers. Department staff provided a variety of specialized engineering and operational support services over the course of several weeks. Total cost estimate of Department services provided during this event includes 600 hours of staff time costing approximately $29,400.

   c. In the Summer of 2015, runoff from a large fire at an industrial facility severely contaminated the intakes for two public water systems thereby rendering their normal source of surface water untreatable for almost three months. Together, the two public water suppliers impacted provided drinking water to approximately 43,000 customers. Several Department staff were involved in providing a wide variety of emergency support services, over the course of several months, to the water suppliers affected. Department cost estimates for this event include 515 staff hours ($25,235) and emergency sampling costs ($17,818). The total cost of Department services provided was approximately $43,053.

d. In the winter of 2016, an equipment failure resulted in flooding at a surface water filtration plant which provides water to approximately 20,000 customers. This immobilized treatment and pumping capabilities for six consecutive days. The filter plant did not resume normal operations for approximately two weeks. Without combined efforts by the water system, the Department and neighboring water systems, 20,000 customers could have endured consecutive days without an adequate supply of water. Department services included coordination with neighboring water systems to identify alternate sources of water, emergency permit considerations, site assessments, engineering and operational support. Additionally, the Department loaned the public water system critical water quality monitoring equipment (valued at approximately $24,000) for approximately 10 weeks to help verify that safe water was consistently provided. The total cost estimate of Department services provided during this event also includes 300 hours of staff time, which cost approximately $14,700.

4. The cost of samples collected by the Department during inspections and filter plant performance evaluations, in response to complaint investigations, and to assess water quality and protect public health during water supply emergencies. These sampling costs range from $30 for inorganic analyses to $400 for pesticides to $1,200 for analysis of Cryptosporidium and Giardia to $2,968 for a complete emergency sampling suite. Total Department lab costs average approximately $680,000 per year.

5. The costs associated with additional training when new regulations are promulgated. One example is the numerous training sessions that were developed and delivered in 2015 - 2016 to roll-out implementation of the Revised Total Coliform Rule (RTCR) adopted to conform to Federal requirements. This training included eight different training courses, workshops and webinars; that were presented 160 times across the Commonwealth; for a total of 482 hours of training. The cost to deliver 482 hours of training was $23,618.

6. The costs associated with specific follow-up actions established in new regulations. The federal RTCR became effective on April 1, 2016, and the Department and EPA shared enforcement of the federal rule until Pennsylvania's regulations were published as final on September 24, 2016. As part of the Department's enforcement responsibilities during this interim period, staff conducted Level 2 assessments at public water systems. A Level 2 assessment is triggered when a public water supply has an *E. coli* MCL violation or when two total coliform triggers occur during a 12-month period. During this interim period, Department staff completed 94 Level 2 Assessments at more than 85 regulated public water systems. These assessments identified over 400 defects that have already been, or are being, corrected thereby improving public health protection. Estimated costs for services provided by the Department were approximately $3,000 per assessment for a total cost of $282,000.

The additional costs described in items 1 – 4 above are more evident in medium and large water systems due to their size, age, complexity, and number of customers at risk. Because these additional costs are variable, it is not possible to establish an average cost for these services. However, these additional costs were considered when determining the annual fees for the medium and large water systems.

The annual fees could have been based solely on the costs for the services that could be estimated above. However, that approach would have resulted in a disproportionate impact on the smallest CWSs and would have failed to account for the additional costs incurred by the Department to provide services that cannot be readily estimated, such as those described above, which result in substantially higher costs for medium and large water systems. Thus, the annual fees were developed to bear a reasonable relationship to the actual costs of the services provided while achieving a reasonable cost to the 11.3 million customers served.

As discussed in the preamble to the proposed rule, the Department considered alternatives to assessing fees. However, the other options would have resulted in further disparity between the fees and Department costs for services for the very small and very large water systems. The Department retained the fee structure based on population served because it was the best option to comply with the statutory language in the SDWA that directs the Board to establish fees for services that bear a reasonable relationship to the actual costs of the services provided. 35 P.S. § 721.4(c). The Board emphasizes that the SDWA requires that the fees assessed by the Department "bear a reasonable relationship" to the actual costs of the services provided, not that the fees be the "exact" costs for the services provided.

The Department has requested and will continue to request additional funding from the General Fund during the annual budget process to support the Safe Drinking Water Program. The decrease in such funding has caused the need for the new annual fees. If such funding becomes available, the Department will evaluate the continuing need for the annual fees. As for the cost to customers of small versus medium and large water systems and businesses, the annual fees provide a reasonable relationship to the actual costs of the services provided by the Department when considering both the minimum costs that can be estimated in advance and the cost of services that arise on a case-by-case basis as discussed above.

The Department has streamlined its operations in nearly all areas. In response to many years of staffing and resource shortfalls, the program has been reduced to only those activities that are mandated by Commonwealth and Federal laws, regulations and primacy requirements. If other efficiencies are developed in the future, the ongoing three-year review of fees will be updated accordingly.

Regarding the other annual fees in subsection (a), fees for nontransient noncommunity water systems (NTNCWS) range from $100 to $1,000; annual fees for transient noncommunity water systems (TNCWS) range from $50 to $500; annual fees for bottled water systems are $2,500; and annual fees for vended, retail and bulk water systems are $1,000.

These fees were determined using the same criteria as discussed above and are illustrated in the table below. The total hours for services that can be estimated were as follows:

- For NTNCWSs, the total hours ranged from 16 to 22 hours.
- For TNCWSs, the total hours ranged from 8 to 13 hours.
- For BVRBs, the total hours ranged from 21 to 26 hours.

Annual Fees vs. Cost Per Person Per Year				
Population Served	**Annual Fee**	**Cost Per Person Per Year**	**Estimated Cost of Services**	**Cost Per Person Per Year**
NTNCWSs:				
100 or less	$100	$1.00 - $4.00	$784	$7.84 - $31.36
101 – 500	$250	$0.50 - $2.48	$784	$1.57 - $7.76
501 – 1,000	$500	$0.50 - $1.00	$784	$0.78 - $1.56
1,001 – 3,300	$750	$0.23 - $0.75	$1,078	$0.33 - $1.08
3,301 or more	$1,000	$0.30 or less	$1,078	$0.33 or less
TNCWSs:				
100 or less	$50	$0.50 - $2.00	$392	$3.92 - $15.68
101 – 500	$100	$0.20 - $0.99	$392	$0.78 - $3.88
501 – 1,000	$200	$0.20 - $0.40	$392	$0.39 - $0.78
1,001 or more	$500	$0.50 or less	$392	$0.39 or less
BVRBs:				
Bottled	$2,500	N/A	$1,274	N/A
Vended	$1,000	N/A	$1,029	N/A
Retail	$1,000	N/A	$1,029	N/A
Bulk	$1,000	N/A	$1,029	N/A

Section 109.1404 (relating to community and noncommunity water system permitting fees).

A minor amendment was made in this final-form rulemaking to replace the acronym "BVRB" with the words "bottled water or vended water system, retail water facility or bulk water hauling system facility," because BVRB is not a defined term.

In addition, subsections (a) and (b) were amended to change the number of people in the population served for the smallest category of PWSs. The proposed rule outlined the permit fees for CWSs and NCWSs serving populations of 25 to 100 people. The population numbers were changed in the final-form rulemaking to apply to CWSs and NCWSs serving a population of 100 people or less. These amendments were made because a PWS, which includes a CWS and a NCWS, is defined in § 109.1 as "[a] system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of 25 individuals at least 60 days out of the year." In this Commonwealth, there are some PWSs that serve at least 15 service connections, but still serve a population of less than 25 people. Therefore, the population number was amended to account for those PWSs.

Section 109.1406 (relating to permitting fees for bottled water and vended water systems, retail water facilities and bulk water hauling facilities)

Subsections (a) and (b) were amended to change the number of people in the population served for the smallest category of PWSs in the same manner as discussed in the changes to §109.1404 above.

Section 109.1407 (relating to feasibility study)

This section was amended to change the number of people in the population served for the smallest category of PWSs in the same manner as discussed in the changes to §109.1404, above.

F. *Benefits, Costs and Compliance*

Benefits

One or more of these amendments will affect all 8,521 PWSs serving approximately 11.3 million people in this Commonwealth. The residents of this Commonwealth will benefit from: (1) the avoidance of a full range of adverse health effects from the consumption of contaminated drinking water such as acute and chronic illness, endemic and epidemic disease, waterborne disease outbreaks, and death; (2) the continuity of a safe and adequate supply of potable water; and (3) the protection of public drinking water sources, which will result in maintaining the highest source water quality available, thereby minimizing drinking water treatment costs.

This rulemaking will protect public health by providing increased protection from microbial pathogens and chemical contaminants in PWSs, and strengthen system resiliency. Safe drinking water is vital to maintaining healthy and sustainable communities. Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidents of illness and reduce health care costs. Proper investment in PWS infrastructure and operations helps ensure a continuous supply of safe drinking water, enables communities to plan and build future capacity for economic growth, and ensures their long-term sustainability for years to come.

Source Water Assessment, Protection and Permitting Requirements: The benefits of the source water assessment and protection program amendments are discussed in Section D (Background and Purpose) of this preamble under "Amendments to Source Water Assessment and Protection Programs".

In addition to those benefits, the amendments relating to new sources of supply in § 109.503 of this final rulemaking more clearly define the requirements regarding the proper order of the permitting process for developing a new PWS source. These clarifications are needed to help insure that the proper level of treatment is designed and installed in a timely manner, thereby resulting in less delay for permitting a new source that may be needed to meet public health protection requirements, or provide redundancy in the event of contamination of existing sources. These amendments should result in cost savings due to the avoidance of expensive permitting mistakes.

Two other states in EPA Region III, West Virginia and Virginia, also require source water assessments for new sources. In Virginia, the goal is to have a source water assessment completed by Virginia drinking water program staff before the operations permit is issued. Under West Virginia's new statute on source water protection, an assessment is included as part of a local source water protection plan and must be completed by the water supplier prior to operation for a surface water source.

Regarding the development of local source water protection programs, Delaware and more recently, West Virginia, have requirements for source water protection by statute. Under these amendments, the development of a local source water protection program will remain voluntary in Pennsylvania.

Turbidity and Filtration Requirements: Some of the amendments to the monitoring, calibration, recording and reporting requirements for the measurement of turbidity are more stringent than Federal requirements. These amendments will benefit more than 8 million Pennsylvanians that are supplied water by PWSs using filtration technologies. These amendments are based on Department inspections and the evaluation of more than 1,250 filters through the Department's Filter Plant Performance Evaluation (FPPE) program. These evaluations have documented that existing requirements are not sufficient to prevent turbidity spikes or the shedding of particles and microbial pathogens into the finished water, which puts consumers at risk of exposure to microbial pathogens. Costs related to waterborne disease outbreaks are discussed in Section D of this preamble under "Amendments to Surface Water Treatment Requirements".

Existing regulations at § 109.301(i) require turbidity monitoring of the CFE once every four hours. This period of intermittent sample review allows the production of significant volumes of water that are not monitored for compliance with the maximum allowable turbidity limit. The amendments for CFE turbidity monitoring will require continuous monitoring and recording of the results every 15 minutes. This will also enable operators to identify problematic water quality trends and respond more quickly with necessary process control adjustments.

Health effects associated with microbial contaminants tend to be due to short-term, single dose exposure rather than long-term exposure. Therefore, if a short duration single turbidity exceedance of the existing maximum allowable turbidity limit occurs and goes unnoticed, consumers are at risk of exposure to microbial pathogens. By requiring continuous monitoring and recording of the results at least every 15 minutes for CFE at all filter plants, water suppliers will be better able to identify problems before an exceedance occurs and determine compliance with the maximum allowable turbidity limit at all times.

An additional revision will require all surface water filtration plants to implement a filter bed evaluation program that assesses the overall integrity of each filter to identify and correct problems before a turbidity exceedance or catastrophic filter failure occurs. Filters are the final barrier for removal of acute pathogens, and are therefore critical to public health protection. For many systems in this Commonwealth and across the country, this infrastructure is aging, and the revision to require a physical inspection once per year is a necessary minimum preventative action item.

All of these filter plant performance provisions are part of a multi-barrier approach to ensure treatment is adequate to provide safe and potable water to all users.

Thirty states responded to a survey conducted by the Association of State Drinking Water Administrators (ASDWA) on behalf of this Commonwealth. Twenty states require continuous turbidity monitoring and recording of CFE and fourteen states require continuous IFE monitoring and recording for all filtration types.

Automatic Alarms and Shutdown Capabilities: Filter plants are complex and dynamic. In response to many circumstances, the water plant operator must take an immediate action to protect public health, such as when source water quality changes, chemical feed pumps malfunction, filters require backwashing, or other unforeseen circumstances occur. Water plant operators are often required to perform other duties, which leave water plants unattended, and which limit operators' ability to respond immediately to treatment needs.

Automated alarms and shutdown capabilities play an important role in modern water treatment and public health protection. Many water suppliers have already taken advantage of readily available technology to reduce personnel costs while still providing safe water to their customers. The amendments will ensure that all surface water filtration plants have the minimum controls in place to ensure that operators are immediately alerted to major treatment problems. The amendments will also ensure that unmanned filter plants are automatically shut down when the plant is producing water that is not safe to drink, which prevents contaminated water from being provided to customers for extended periods of time. These alarms and shutdown capabilities will allow operators at both attended and unattended filtration plants to promptly respond to the water quality problems and treatment needs of the plant. The automated plant shut down is intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence.

Based on an ASDWA survey, twelve states responded that they require filter plants to be attended at all times while in operation. Of the twelve states that require attended operation, seven have regulations that establish standards for plant automation, alarms and shutdowns. The Commonwealth's amendments are less stringent than twelve other states since attended operation is not being required. In addition, the amendments related to plant automation, alarms, and shutdown capabilities are less stringent than the standards from the Great Lakes—Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (10 States Standards). See Recommended Standards for Water Works (*2012* Edition*)* Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.

Filter-To-Waste Requirements: The Department's FPPE program has evaluated approximately 1,250 filters since 1999. The results of these evaluations show that filters are most likely to shed turbidity, particles, and microbial organisms at the beginning of a filter run when the filter is first placed into service following filter backwash and/or maintenance. The amendments will require all filter plants that have the ability to filter-to-waste to do so following filter backwash and/or maintenance and before placing the filter into service. Filtering to waste will reduce the likelihood of pathogens passing through filters and into the finished drinking water.

All thirty states responding to an ASDWA survey require some of their filter plants to filter-to-waste. This regulation is not expected to negatively affect this Commonwealth because implementation is not expected to require any capital improvements.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions: The revisions to system service and auxiliary power requirements will strengthen system resiliency and ensure that safe and potable water is continuously supplied to consumers and businesses. A continuous and adequate supply of safe drinking water is vital to maintaining healthy and sustainable communities.

This Commonwealth's PWS sources and treatment facilities are susceptible to emergency situations resulting from both natural and man-made disasters. Examples of emergencies from recent years include tropical storms, flooding, high winds, ice, snow, industrial chemical plant runoff, pipeline ruptures, and transportation corridor spills. These emergencies have resulted in significant impacts to consumers and businesses due to inadequate water quantity or quality, and in water supply warnings and advisories. Examples of emergencies that have occurred in Pennsylvania and demonstrate the benefit of these amendments are provided in Section D of this preamble under "Revisions to System Services and Auxiliary Power Requirements".

New Annual Fees and Amended Permit Fees: To improve program performance, this final-form rulemaking will supplement Commonwealth costs for administering the Safe Drinking Water Program by filling the funding gap. The fees will total approximately $7.5 million annually and will account for nearly 50% of the Program's Commonwealth funding. The fees will augment the Program funding currently coming from the General Fund ($7.7 million).

The annual fees range from $250 - $40,000 for CWSs, $50 - $1,000 for NCWSs, and $1,000 - $2,500 for bottled and vended water systems, retail water facilities, and bulk water hauling systems (BVRB). The fees will most likely be passed on to the 11.3 million customers of these PWSs as a user fee. Per person costs are expected to range from $0.35 to $10 per year, depending on the water system size.

Please refer to Sections D and E for more information about the benefits and costs associated with the fees.

General Permits: These amendments will establish the regulatory basis for the issuance of general permits for high volume, low risk modifications or activities to streamline the permitting process. General permits provide a cost-effective method for a PWS to obtain a permit and for DEP to regulate such activities.

Requirements for NCWSs: These amendments will clarify that NCWSs that are not required to obtain a permit must still obtain Department approval of the facilities prior to construction and operation. The Department's public water supply well construction standards are measures that can prevent pollution from surface runoff and shallow aquifer zones that are above the source aquifer used for public water supply. Obtaining approval prior to constructing a source and associated water system facilities (such as treatment and storage) ensures the facility is planning and constructing a source and water system facilities that meet Pennsylvania's construction standards. This will avoid the costs for rehabilitating an improperly constructed source and avoid delays in obtaining approvals to operate the water system.

Address Gaps in Monitoring, Reporting and Tracking Back-up Sources: These amendments will address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As per Federal and Commonwealth regulations, 40 CFR 141.23(a), 141.24(f) and (h) and 141.26(a) and 25 Pa. Code §§ 109.301 and 109.303, respectively, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means that verifiable controls are not in place to ensure that all sources and entry points meet safe drinking water standards. Some of these sources have not been used in 5 to 10 years, and, therefore, the Department does not know the water quality for these sources. These concerns were most recently highlighted in a 2010 report from EPA's Office of Inspector General entitled *"EPA Lacks Internal Controls to Prevent Misuse of Emergency Drinking Water Facilities"* (Report No. 11-P-0001). These amendments will ensure that all sources and entry points are monitored at least annually. PWSs will also be required to document in a comprehensive monitoring plan how routine compliance monitoring will include all sources and entry points.

The use of unmonitored sources and entry points could adversely impact basic water quality, including pH, alkalinity, turbidity, corrosivity and lead solubility, dissolved inorganic carbon, and natural organic matter. Water suppliers may have limited information about how these sources or entry points will impact treatment efficacy and distribution system water quality. In addition, many sources may be off-line due to poor water quality or MCL exceedances. The use of these back-up or emergency sources, without proper monitoring and verifiable controls, could lead to an increased risk to public health.

Finally, treatment facilities and other appurtenances associated with these sources may also have gone unused, and may no longer be in good working order. Back-up sources and entry points with unknown water quality or that are no longer in good working order provide a false sense of security in terms of system resiliency and emergency response. While the Department understands that many facilities are not used on a 24/7 basis, these amendments will ensure that all permitted sources and entry points are monitored at least annually, or when in use.

Compliance Costs

The general update provisions will increase public health protection and system resiliency. Safe drinking water is vital to maintaining healthy and sustainable communities. Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidents of illness and reduce health care costs. For example, it is estimated that the total cost of the May 2000 *E. coli* contamination incident in Walkerton, Ontario was $64.5 million. Costs related to the 1993 waterborne outbreak of cryptosporidiosis in Milwaukee, Wisconsin were $96.2 million. Waterborne disease outbreaks result in significant economic and health impacts and can have long-term impacts due to the loss of trust in public water systems.

Proper investment in PWS infrastructure and operations helps ensure a continuous supply of safe drinking water, enables communities to plan and build future capacity for economic growth, and ensures their long-term sustainability for years to come.

The fees are necessary to improve program performance and will supplement Commonwealth costs for administering the Safe Drinking Water Program. Program costs are directly tied to the resources needed to meet Federal and Commonwealth mandates for minimum program elements and for the administration of an effective Safe Drinking Water Program. Failure to meet minimum program elements may result in an increased risk to public health and the loss of primacy for the Safe Drinking Water Program and associated Federal funding.

Source water protection and permitting requirements: Per the Department's records, approximately 30 new CWS sources are permitted each year. DEP estimates that an additional 8 hours of work completed for the CWS by a professional geologist will be needed to comply with the new source permitting amendments. This extra time will amount to approximately $1,176 per source permitted, based on current hourly rates charged by consulting firms.

Revisions to turbidity monitoring, recording and reporting requirements: Filter plants that need to install continuous monitoring and recording devices will need to spend about $3,000 - $4,000 per monitoring site (includes turbidimeter, controller and installation), with estimated annual costs for maintenance and calibration of $500 per plant. It is estimated that 21 filter plants will need to install this equipment on individual filters and 52 filter plants will need to install this equipment at their combined filter effluent monitoring site.

- *IFE and CFE Monitoring Costs*: Costs have been derived from vendors of HACH brand turbidimeters; the most commonly used turbidimeter in this Commonwealth. If the water supplier prefers a different brand of equipment, the cost may change. Some per instrument cost savings may occur when multiple instruments are purchased. The following table, provided for illustrative purposes, shows costs related to installing and maintaining one HACH continuous monitoring and recording device:

White Light Turbidimeter (analog) and Chart Recorder (analog)

Items	Initial Cost for First Turbidimeter and Recorder	Estimated Annual Calibration and Maintenance Cost	Additional Turbidimeter and Recorder
HACH 1720E and SC200 (analog signal)	$2,881		$2,881
Calibration Cylinder	$ 89		
20 NTU StablCal x (4) Calibrations		$ 556	
Lamp Assembly Replacement		$ 62	
Chart Recorder- Duel Pen	$1,657		$1,657
Chart Recorder Paper		$ 60	
Chart Recorder Replacement Pens		$ 79	
Installation	$1,000		

Items	Initial Cost for First Turbidimeter and Recorder	Estimated Annual Calibration and Maintenance Cost	Additional Turbidimeter and Recorder
Total (not including tax and shipping)	$5,627	$ 757	$4,538

Laser Turbidimeter (digital) and Chart Recorder (analog)

Items	Initial Cost for First Laser Turbidimeter and Recorder	Estimated Annual Calibration and Maintenance Cost	Additional Turbidimeter and Recorder
HACH TU5400 Laser Turbidimeter (includes flow sensor RFID, and System Check)	$6,142		$6,142
HACH SC200 (includes flow sensor input, RFID, and Modbus))	$2,596		$2,596
Maintenance/Calibration Kit (includes primary standards)		$1,100 ($349 to replace the primary standards that are included in the kit)	
Replacement Desiccant Cartridge		$ 17	
Chart Recorder- Duel Pen	$1,657		$1,657
Chart Recorder Paper		$ 60	
Chart Recorder Replacement Pens		$ 79	
Installation	$1,000		
Total (not including tax and shipping)	$11,395	$ 1,256 (1st year) $ 505 (subsequent year)	$10,395

- *IFE Monitoring:* This Commonwealth has 353 filter plants, of which 263 are currently required to continuously monitor and record their IFE and already have instrumentation installed. The amendments will require the remaining 90 filter plants to comply with the IFE monitoring requirements of which 69 already have the needed instrumentation. Therefore, 21 filter plants will need to install one or more monitoring and recording devices. The majority of these 21 filter plants only have two filters. The estimated cost for a water supplier having two filters to install IFE monitoring and recording equipment is expected to be $10,165 for white light turbidimeters or $21,790 for laser turbidimeters. The annual maintenance cost for the monitoring and recording equipment on two filters is estimated to be $757 for the white light turbidimeters or $505 for laser turbidimeters. The cumulative cost for the installation of the IFE monitoring and recording equipment at all 21 filter plants is estimated to be $213,465 for white light turbidimeters or

$457,590 for laser turbidimeters. The cumulative cost for maintaining the monitoring and recording equipment at all 21 filter plants is estimated to be $15,897 per year for white light turbidimeters and $10,605 per year for laser turbidimeters.

- *CFE Monitoring:* The majority of filter plants in this Commonwealth already continuously monitor and record their CFE. The exact number of filtration plants without this capability is not known, but based on a review of 90 filtration plants, it is estimated to be 15% of the 353 filter plants in this Commonwealth. The estimated cost to install CFE monitoring and recording equipment is $5,627 per plant for white light turbidimeters and recorders or $11,395 per plant for laser turbidimeters and recorders. The annual maintenance cost for the monitoring and recording equipment is estimated to be $757 for the white light turbidimeters or $505 for laser turbidimeters. The cumulative cost for an estimated 52 filter plants to install continuous monitoring and recording equipment is estimated to be $292,604 for white light or $592,540 for laser turbidimeters. The cumulative cost for maintaining the monitoring and recording equipment at all 52 filter plants is estimated to be $39,364 per year for white light turbidimeters or $26,260 per year for laser turbidimeters.

Annual Filter Inspection Program: No additional costs are expected to be associated with implementation of a filter inspection program.

Filter-To-Waste Requirements: No expected costs are associated with the filtering to waste amendments.

Automatic Alarms and Shutdown Capabilities: Depending on options chosen, systems may incur $8,860 to $11,980 per treatment plant with annual maintenance costs of $600. Note: it is estimated that 317 of the 353 filter plants already meet these provisions and therefore will not incur any additional costs.

The following information is provided as example cost estimates related to adding automated alarm and shutdown capabilities at a small surface/GUDI water filtration plant. The costs include the monitor, controller and alarm dial-out system. It is assumed that the existing filtration plant will already have the chlorine residual analyzer, turbidity analyzer and clear-well level or other disinfection segment water level transmitter. These instruments are required to maintain compliance with existing regulations. An estimated cost for the equipment installation is provided. However, systems could save costs if they install the equipment using in-house staff or a local contract electrician.

The controller and monitor will include adjustable alarm set-points with time delay for a relay output which can be wired to the plant for shut down of the filter system upon the following conditions:

- Water levels needed to maintain adequate Giardia CT
- High or low entry point (EP) chlorine residual
- High CFE turbidity

The monitor and controller can be configured to send a pre-shut down warning to allow operators the opportunity to go to the plant to try to resolve the problem before reaching the shut-down set-point. If the process value reaches the shut-down set-point, the filter plant shut-down command will occur and a shut-down alarm message will be sent to the plant operator by text message, email or voice message.

If the facility already has an alarm dialer with capacity for three additional alarm inputs, the alarm dialer can be eliminated from the package. A deduction is shown for this on each equipment option. If the system is staffed continuously, then only alarm capabilities are necessary. This can be accomplished for a lower cost, or possibly no additional cost, depending on the capability of existing filter plant supervisory control and data acquisition (SCADA) equipment. The Department describes these type of monitor and alarm systems below, with associated cost estimates.

Option A – Monitor/Alarm System with Standard Dial-up Phone Line and Phonetics Alarm Dialer

1) One alarm control device with analog inputs for the following:
- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One Phonetics eight-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owners site. Exact terminal numbers will be provided based on Owners equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.

6) Four Operation and Maintenance Manuals with complete Instruction Manuals for the above system.

Total System Price: $8,860
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000
Deduct for use of Owner Furnished Alarm Dialer: ($1,400)

Option B – Monitor/Alarm System with Standard Dial-up Phone Line and Alarm Dialer

1) One alarm control device with analog inputs for the following:

- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One eight-channel alarm auto-dialer with power supply and battery backup. Requires standard dial-up telephone line connected to alarm dialer. Provides voice message alarm only.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owner's site. Exact terminal numbers will be provided based on Owner's equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.

6) Four Operation and Maintenance Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,980
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000
Deduct for use of Owner Furnished Alarm Dialer: ($2,500)

Option C – Monitor/Alarm System with Cellular Alarm Dialer

1) One alarm control device with analog inputs for the following:

- EP Chlorine Residual
- CFE and IFE Turbidity
- Water Levels Needed to Maintain Adequate Giardia CT

2) One cellular alarm notification system with 8-channel alarm input with power supply and battery backup. No dial-up telephone line is required. Provides text and email alarm notification.

3) One System Wiring Diagram – custom wiring diagram for specific analyzer types in use at Owner's site. Exact terminal numbers will be provided based on Owner's equipment to allow installation by local electrical contractor.

4) Furnish onsite calibration, programming and alarm configuration for all equipment and provide full onsite testing for all equipment including alarm testing and dial-out for plant designated phone numbers and/or pager numbers.

5) Provide onsite operator training on maintenance and standardization of above equipment.

6) Four Operation and Maintenance Manuals with complete Instruction Manuals for the above system.

Total System Price: $9,700
Delivery: 2-3 Weeks (standard delivery)
Estimated Installation Cost: $2,000

The Department estimates that 10% of the 353 filter plants in this Commonwealth will need to install a controller. The cumulative installation cost for an estimated 35 filter plants to comply with automated alarms and shutdown capability is estimated to be between $380,100 and $419,300.

Strengthened System Resiliency Through Auxiliary Power or Alternate Provisions: All CWSs will be required to review their existing emergency response plan and equipment to complete an uninterrupted system service plan, using the form provided by the Department, to provide a consistent supply of adequate quantity and quality of water during emergency situations. The Department estimates that 400 CWSs do not even have an updated emergency response plan. CWSs that do not have a functional generator or do not have existing capability to meet this requirement via the alternate provision options may need to purchase a generator. The generator should be adequately sized such that it can supply power to critical treatment components necessary to supply safe and potable water. Therefore, the cost of the generator will be proportional to the size of the system (in other words, less expensive for small systems). It is difficult to predict system specific costs because of the various options to comply with the revisions. Estimates for small systems are $3,000 - $4,000 for the installation of a transfer switch, generator and concrete pad. Small systems may also explore the lower cost option to rent a portable generator for the following costs: Compact portable generator = $70/day (daily rental cost) or $35/day (weekly rental cost); Mobile towable generator = $320/day (daily rental cost) or $140/day (weekly rental cost). Costs for medium and large systems could range from $50,000 - $200,000 per treatment plant. Not all systems will require auxiliary power. Some systems may already meet reliability criteria through storage or interconnections. Several mid-Atlantic states have already moved forward with mandatory requirements for auxiliary power supply including New Jersey, New York and Connecticut.

In order to accommodate the variety of system specific differences that must be addressed in this provision, the Department has included the option to submit a schedule for necessary improvements which have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP. More specifically, this new approach requires certification of completion of the USSP form provided by the Department by the deadlines specified in § 109.708(a). However, if the USSP identifies that deficiencies exist which prevent a continuous supply of safe and potable water as specified in § 109.708(a), and the community water supplier has not addressed those deficiencies by the deadline for USSP submittal, a schedule will need to be submitted within six months which includes detailed corrective actions and corresponding completion dates. These significant regulatory modifications will help enable

the cost for compliance with these provisions to be spread out over a longer period of time. Additionally, these revisions will provide water suppliers with even more flexibility in choosing the approach that best suits their particular water system, and adequate time to implement that plan in the most effective manner.

An estimated 30% of small systems (<3,300) or 485 systems may need to use rental services for a portable generator, or install a back-up power supply. Assuming that 50% of the small systems will rent a generator and 50% will install their own equipment, the cumulative cost is estimated to be $1,115,620. The estimate for medium and large systems is that 20% or 65 systems may need to install a back-up power supply at a cumulative cost of $8,125,000. Between proposed and final rulemaking, the Department expanded the combination of alternate provisions systems may use, and included more flexibility to potentially spread the cost of compliance over a longer time period. As such, the cost estimates have been spread out over an anticipated 5-year period. Please refer to the Regulatory Analysis Form for this final-form rulemaking for more information about estimated costs and savings.

Cost savings of avoiding interruption of continuous supply of safe and potable water were evaluated using the Water Health and Economic Analysis Tool (WHEAT) software developed by EPA. The Department ran the model for a scenario of a water system serving 2,500 customers and experiencing a water outage for two days. The model outcomes regarding economic consequences are summarized as follows:

- The value of water sales that would have occurred if there was no disruption in water service is estimated to be $2,891.
- The value of additional operating costs incurred during the event, which may include bottled/replacement water, equipment, other remediation, or miscellaneous costs is estimated at $24,775.
- Total economic impact on the water utility due to the two-day outage (sum of the above losses) is estimated at $27,666.
- Regional economic consequences for this same event are estimated at $926,486. This is the total value of economic activity lost among businesses directly affected by the water service disruption, due to the contraction in business activity during the two-day event.

If the water utility complies with the revisions, the potential cost savings for this two-day outage, offsetting the costs to install additional auxiliary power, emergency interconnections with neighboring water systems, and/or finished water storage, are summarized above. These costs would increase with each additional day that the water outage continues.

Additional costs savings to water systems and customers will be the prevention of dewatering of the distribution system piping and protection from damage to collapsed water lines (due to lack of ability to provide adequate quantity water to maintain positive pressure).

An estimated 250 boil water advisories (BWA) occur each year and 25% or 63 BWAs are caused by water supply disruptions. The total annual cost savings to the regulated water systems is estimated at $1,742,958. However, the regional economic cost savings to businesses is

estimated at more than $58 million. These cost savings will offset the costs of improving system resiliency.

Compliance Assistance Plan

The Safe Drinking Water Program uses the Commonwealth's PENNVEST Program to offer financial assistance to eligible PWSs. This assistance is in the form of a low-interest loan, with some augmenting grant funds for hardship cases. Eligibility is based upon factors such as public health impact, compliance necessity, project affordability and operational affordability.

The Safe Drinking Water Program has established a network of regional and central office training staff that is responsive to identifiable training needs. The target audience in need of training may be either program staff or the regulated community.

In addition to this network of training staff, the Bureau of Safe Drinking Water has staff dedicated to providing both training and outreach support services to PWS operators. The DEP website also provides timely and useful information for treatment plant operators.

Paperwork Requirements

Paperwork requirements include:

- Updating a source water assessment report when a community water system's annual evaluation identifies changes to actual or potential sources of contamination.
- Reporting a failure of alarm or shutdown equipment.
- Developing and maintaining a distribution map for noncommunity water systems.
- Developing and maintaining a comprehensive monitoring plan.
- For CWSs, completing the USSP form provided by the Department, which provides a form field template for a plan, and incorporating this completed plan into their existing emergency response plans. Water suppliers will also need to submit the accompanying USSP Certification Form to verify they have completed a USSP, and that it is available upon Department request.
- For CWSs which have identified deficiencies in their ability to provide uninterrupted system service, but have not corrected these deficiencies by the deadlines specified in § 109.708(a) submitting a detailed corrective action plan and corresponding schedule.

G. *Sunset Review*

The Board is not establishing a sunset date for these regulations since they are needed for the Department to carry out its statutory authority. The Department will continue to closely monitor these regulations for their effectiveness and recommend updates to the Board as necessary. Under this final-form rulemaking, the Department will evaluate the fees every three years and recommend regulatory changes to address any disparity between the program income generated by the fees and the Department's cost of administering the program.

H. *Regulatory Review*

Under section 5(a) of the Regulatory Review Act (71 P. S. § 745.5(a)), on August 9, 2017, the Department submitted a copy of the notice of proposed rulemaking, published at 47 Pa.B. 4986, to IRRC and the Chairpersons of the House and Senate Environmental Resources and Energy Committees for review and comment.

Under section 5(c) of the Regulatory Review Act, IRRC and the House and Senate Committees were provided with copies of the comments received during the public comment period, as well as other documents when requested. In preparing this final-form rulemaking, the Department has considered all comments from IRRC and the public.

Under section 5.1(j.2) of the Regulatory Review Act (71 P. S. § 745.5a(j.2)), on _____, 2018, this final-form rulemaking was deemed approved by the House and Senate Committees. Under section 5.1(e) of the Regulatory Review Act, IRRC met on_____, 2018, and approved this final-form rulemaking.

I. *Findings of the Board*

The Board finds that:

(1) Public notice of proposed rulemaking was given under sections 201 and 202 of the act of July 31, 1968 (P.L. 769, No. 240) (45 P.S. §§ 1201 and 1202) and regulations promulgated thereunder at 1 Pa. Code §§ 7.1 and 7.2.

(2) A public comment period was provided as required by law, and all comments were considered.

(3) These regulations do not enlarge the purpose of the proposal published 47 Pa.B. 4986 (August 26, 2017).

(4) These regulations are necessary and appropriate for administration and enforcement of the authorizing acts identified in Section C of this order.

J. *Order of the Board*

The Board, acting under the authorizing statutes, orders that:

(a) The regulations of the Department of Environmental Protection, 25 Pa. Code Chapter 109, are amended by amending §§ 109.1, 109.5, 109.202, 109.204, 109.301 - 109.304, 109.416, 109.503, 109.505, 109.602, 109.606, 109.612, 109.701 - 109.706, 109.708, 109.713, 109.810, 109.1003, 109.1005, 109.1105, 109.1107, 109.1108, 109.1202 – 109.1204, 109.1206, 109.1302, 109.1303 and 109.1305 – 109.1307, and adding §§ 109.511, 109.716, 109.717, 109.1401 – 109.1413 to read as set forth in Annex A, and reserving § 109.305.

(b) The Chairperson of the Board shall submit this order and Annex A to the Office of General Counsel and the Office of Attorney General for review and approval as to legality and form, as required by law.

(c) The Chairperson of the Board shall submit this order and Annex A to the IRRC and the Senate and Hose Environmental Resources and Energy Committees as required by the Regulatory Review Act.

(d) The Chairperson of the Board shall certify this order and Annex A, as approved for legality and form, and deposit them with the Legislative Reference Bureau, as required by law.

(e) This order shall take effect immediately upon publication in the *Pennsylvania Bulletin*.

PATRICK McDONNELL,
Chairperson

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Safe Drinking Water General Update and Fees Rule

25 Pa. Code Chapter 109
47 Pa.B. 4986 (August 26, 2017)
Environmental Quality Board Regulation #7-521
(Independent Regulatory Review Commission #3177)

Comment and Response Document

List of Commentators

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INTRODUCTION

The Environmental Quality Board (Board) adopted the proposed safe drinking water general update and fees rule at its May 17, 2017 meeting. On August 9, 2017, the Department of Environmental Protection (DEP) submitted a copy of the proposed rulemaking to the Independent Regulatory Review Commission (IRRC) and to the Chairpersons of the Senate and House Environmental Resources and Energy Committees for review and comment in accordance with Section 5(a) of the Regulatory Review Act (71 P.S. § 745.5(a)). The proposed rulemaking was published in the *Pennsylvania Bulletin* on August 26, 2017 (47 Pa.B. 4986) with provision for a 30-day public comment period that closed on September 25, 2017. Comments were received from 40 commentators, including IRRC. All comments can be viewed in their entirety on the Department of Environmental Protection's (Department or DEP) eComment page for this rulemaking:
http://www.ahs.dep.pa.gov/eComment/ViewComments.aspx?enc=8YWIeHIdijzUAfiG53EkjZsi%2bU7zETpGUQj8Jkj%2bS%2f0%3d

COMMENTS AND RESPONSES

GENERAL COMMENTS:

1. **Comment:** Do all you can to ensure safe drinking water - BUT meanwhile fracking goes on. We need a moratorium now and a ban when the legislature is finally convinced by health providers and ecologists that fracking will ruin PA. The proposed Atlantic Sunrise Pipeline will run directly above my well. Can you assure me that my water will be safe? Thank you for taking your job seriously!!! (1)

   Response: This rulemaking is specific to the Safe Drinking Water (SDW) Program, which provides regulatory oversight for Pennsylvania's public water systems (PWS). Private wells are not regulated by the Commonwealth of Pennsylvania. As such, each homeowner is responsible for the proper construction, maintenance, and monitoring of private wells. For more information about general steps you can take to protect your water supply, please refer to the Department's website for private well owners: http://www.dep.pa.gov/citizens/my-water/privatewells/pages/default.aspx .

2. **Comment:** I wholeheartedly agree with the PA Dept. of Environmental Protection's plans to hire more inspectors to shore up the drinking water system inspection program. We are far short of the national average. Safe water is priority. Please follow through! Lives depend on it. (2)

   Response: The Department acknowledges the comment.

3. **Comment:** Safe drinking water is a high priority. We support additional staff and the fees to pay for it. (3)

   Response: The Department acknowledges the comment.

4. **Comment:** Protection of water resources is vital. Protection of watersheds and aquifers and transport systems and reservoirs is vital. DEP needs help. It needs inspectors. Now you are asking

for all of us to help by raising fees. I guess there is no choice, but really, isn't this what I pay taxes for? Aren't those taxes for protection of our lives and the Natural world that is Pennsylvania? I guess these fees have to happen because underfunding isn't going to stop. So, raise the fees, but make it part of this law that those fees are 100% guaranteed to be funneled into the DEP and its work, and not allowed to get siphoned off into the General Fund to be used for other purposes. (4)

Response: Under Section 14 of the Pennsylvania Safe Drinking Water Act (SDWA), 35 P.S. § 721.14, and § 109.1411 (relating to disposition of funds) of this final-form rulemaking, the fees will be deposited into a special restricted revenue account in the General Fund known as the Safe Drinking Water Account administered by the Department for use in protecting the public from the hazards of unsafe drinking water. The funds may only be used by the Department and for the purposes as are authorized in the SDWA. Under § 109.1413 (relating to evaluation of fees) of this final-form rulemaking, every three years, the Department will evaluate the fees and recommend regulatory changes to the Board to address any disparity between program income and the Department's costs. The evaluation will include an assessment of program income, expenses, program complement and workload. This ongoing assessment will ensure proper accountability for the fees. Please also see the response provided to Comment #14.

5. **Comment:** Providing clean drinking water is a primary responsibility of any government since it has a direct effect on the health and well-being of all residents. If the Commonwealth cannot inspect all sources of drinking water for residents, it is not fulfilling its responsibilities. Having sufficient numbers of trained inspectors is necessary and this lack should be addressed as quickly as possible, and funding for this department should never fall below the amount needed to provide this service. (5)

   Response: The Department acknowledges the comment.

6. **Comment:** I read your article on a charge for public water users. It is important to have funds for projects – it's time for the public to pay for the cost of water production by the private individual. It's time for a 1 cent to 20 cents per gallon assessment on all public water systems so money is available for projects – this water is sold not given away. It's time for public water systems to bear the cost of clean water. We need sources of money to do these improvements – government should not have to carry it – those who get the benefit should pay for it. (6)

   Response: The Department acknowledges the comment.

7. **Comment:** Thank you for the opportunity to submit public comments on the proposed amendments to 25 Pa. Code Chapter 109 (relating to Safe Drinking Water: General Update and Fees). I fully support all of the proposed amendments including the fee increase to support the cost of employing additional water safety inspectors for the Commonwealth. I have written on multiple occasions to my state representative and senator asking them to increase the state budget for the DEP including its water quality inspection and enforcement services, but in light of the lack of funding from the legislature, I fully support the proposed regulation. I support all sections of the proposed regulation. Thank you for your work to protect the quality of our drinking water on behalf of all Pennsylvania citizens. (7)

Response: The Department acknowledges the comment.

8. **Comment:** I support the proposed regulations at 47 Pa.B 4986 regarding the Safe Drinking Water; General Update and Fees regulations. I support increasing the fee to support an increase in the number of water quality inspectors. The safety of Pennsylvania's environment, particularly our air, soil and water is of utmost importance and cannot be deregulated, ignored or abandoned. Please assure that the DEP's regulatory inspection, investigation and enforcement services are restored to at least the funding and staffing levels in FY 2008-09, plus an inflation factor. The water quality safety inspector ratios must be funded to at least a staffing to public water system ratio of 1:60. Please assure an increase in regulatory enforcement staff as well. I support all of the proposed regulations. Thank you for protecting the health and safety of all Pennsylvanians. (8)

   Response: The Department acknowledges the comment.

9. **Comment:** I applaud the DEP for the proposed rulemaking in support of increasing the number of water quality inspectors in PA. The quality and safety of our drinking supply is paramount. I support the proposal to increase fees to pay for the inspectors. The fees should cover the cost to not only inspect Pennsylvania's water facilities, but also to aggressively enforce the DEP regulations. (12)

   Response: The Department acknowledges the comment.

10. **Comment:** I am writing in support of the proposed rulemaking titled Safe Drinking Water General Update and Fees. I support all of the proposed regulations, and in particular the increase in fees to fund additional water safety inspectors in PA. Pennsylvania's ratio of water safety inspectors to water facilities falls well below the ratios of our neighboring states. Protecting our water sources through rigorous and frequent regulatory inspections is fundamental to promote the health and safety of all citizens. Thank you for proposing this fee increase to support the protection of all Pennsylvanians. (13)

    Response: The Department acknowledges the comment.

SAFE DRINKING WATER FEES:

11. **Comment: Cut expenses and improve efficiencies:** The protection of our drinking water is one of the most important responsibilities of our government, but so is proper budgeting. Balancing the budget, cutting expenses, and spending wisely would allow DEP to afford competent individuals to assure safety without causing additional financial hardship to water suppliers. The Department should continue efforts to improve efficiencies in regulatory program delivery including better tools for electronic permit submissions and reporting, improved training, and streamlining processes to focus on those issues most important to protecting public health. (9, 11, 23, 28, 29, 34)

    Response: The Department has streamlined its operations in nearly all areas. In response to many years of staffing and resource shortfalls, the program has been reduced to only those activities that

are mandated by State and Federal laws, regulations and primacy requirements. Despite these efforts, the Department's appropriations for the Safe Drinking Water Program from the General Fund have decreased in recent years, resulting in an overall decrease in staffing of 25% since 2009. Under § 109.1413 of the final-form rulemaking, at least every three years, the Department will evaluate the adequacy of fees and recommend regulatory changes to address any disparity between program income and the Department's costs. The three-year review will include an assessment of program income, expenses, program complement and workload. Any future increases in funding, improved efficiencies or other cost saving measures will be evaluated as part of the three-year review.

12. **Comment: Unfair burden on small systems:** This proposed revision is not fair to water suppliers who service smaller communities and struggle to keep water rates as reasonable as possible for ratepayers while trying to maintain and improve water quality. The proposed fees will disproportionately affect lower income citizens and communities. The new fees are an enormous cost to bear, especially for small businesses. (9, 10, 11, 18, 25, 28, 33, 37)

    Response: The Department acknowledges the concern for small water systems and businesses, and lower income communities. The Department offers many technical assistance programs that are targeted towards small systems and disadvantaged communities. The Department's Capability Enhancement (CE) program helps small drinking water systems operate more effectively and efficiently by improving the technical, managerial, and financial capability of the water system. The CE program provides a mechanism to address the needs of small drinking water systems by evaluating a system's current needs, and then developing an assistance plan to meet those needs. The CE program provides facilitation among all of the parties needed to implement the assistance plan. CE program staff deliver this free on-site assistance through facilitators in conjunction with wage payroll peer water operators employed by the Department. These assistance providers are practicing operators and administrators in local water systems. This program is designed to:

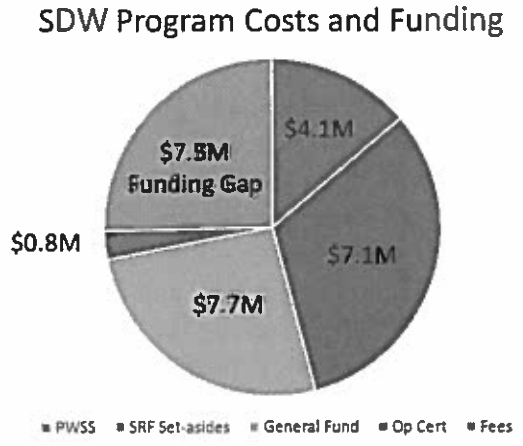
    - Enhance the capabilities of system operators to operate their systems in the most professional, effective and efficient manner.
    - Enhance the financial and managerial expertise of system owners and operators.
    - Empower PWS personnel by providing them with knowledge or access to information that allows them to address any factor that limits the PWS's capability to produce quality and quantity of water in a reliable and efficient manner.
    - Ensure that this Commonwealth's water systems are sustainable and are able to meet current and future drinking water demand while protecting public health and the environment and ensuring continued economic growth and development.

    For more information about the Department's CE program, please visit DEP's website at: http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/default.aspx

Staff reductions have led to a steady decline in the Department's ability to provide services necessary to ensure compliance with SDWA requirements. Failure to provide these services may result in an increased risk to public health. Under the SDWA, the Board has the authority and is directed to establish fees for services that bear a reasonable relationship to the actual cost of providing services. The Board must also consider the impacts of the proposed fees on small businesses as part of the regulatory analysis required under the Regulatory Review Act (RRA). The Department considered several alternatives for assessing fees. In the end, the proposed fees were retained in the final-form rulemaking because the Department believes the fees will provide the funding necessary to properly administer the SDWA and provide the wide variety of necessary services in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost. The fees for small community water systems (serving 3,300 or fewer people) will range from $250 to $4,000, and will result in per person costs of $1.00 to $10.00 per year. The fees for small noncommunity water systems will range from $50 to $750, and will result in per person costs of $0.33 to $31.36 per year. These fees bear a reasonable relationship to the cost of services provided by the Department.

13. **Comment: Alternate sources of funding:** The water industry understands the effort to ensure clean drinking water, and acknowledges the need for a certain funding level to do the job. However, alternate means should be explored and perhaps implemented before creating a new fee for water systems and their customers. Core functions of the Department, like those involving the SDW Program, should be covered by the General Fund. The Department should request the additional funding from the legislature. (10, 11, 14, 16, 17, 19, 21, 22, 23, 24, 25, 28, 29, 32, 33, 34, 37, 38)

    Response: The current funding available to administer the SDW Program from State and Federal sources is $19.7 million. The fees are expected to generate approximately $7.5 million, which will allow the SDW Program to restore staffing levels and reverse the decline in services that has occurred since 2009. The fees will provide nearly 50% of the Commonwealth's share of funding for the SDW Program. The remaining portion of the Commonwealth's share ($7.7 million) is expected to be provided through annual General Fund appropriations.



Federal sources currently provide approximately $11.2 million to fund the Pennsylvania SDW Program, including:

- Public Water System Supervision (PWSS) grant ($4.1 million) – used for personnel costs; lab costs; staff training
- State Revolving Fund (SRF) Set-asides ($7.1 million) grant – used for personnel costs; capability enhancement programs (training, technical assistance, optimization programs); source water assessment and protection; PADWIS; assistance grants/contracts

The Commonwealth currently provides approximately $8.5 million to fund the program through the following sources:

- General Fund appropriations (~$7.7 million) – used for personnel costs
- Operator Certification fees ($0.8 million) – used for Operator Certification Program implementation costs

With the addition of the $7.5 million expected to be generated from this rulemaking, the funds available for the SDW Program should total $27.2 million.

The Department has requested and will continue to request additional funding from the General Fund during the annual budget process to support the SDW Program. The decrease in funding has caused the need for the annual fees. If additional funding becomes available in the future, the Department will evaluate the continuing need for and/or level of annual fees.

14. **Comment: Oversight of funds:** Currently, the Governor and the state legislative branch have oversight of allocated funds. Additionally, elected officials through the budget process can institute the will of the people. A separate funding source at the direction of a program within a department would separate the activities of that program from the elected officials put in those positions by Pennsylvania's citizens to manage them. The proposed fees are excessive and appear to be a means for the DEP to bring in funds in order to assist in the operation of the entire Department, not just for the specific task involved. (11, 17)

    Response: Please see the response provided to Comment #4. In addition to the ongoing three-year review of fees, there are several additional levels of accountability within the SDW Program. At the Federal level, the Department is accountable to EPA to ensure that the SDW Program meets all primacy and grant conditions and is at least as stringent as the Federal program. The Department provides several updates to EPA throughout the year, including quarterly enforcement updates, semi-annual updates on grant commitments and program performance, and annual and triennial reports on program implementation. The Department's performance is also tracked by the Governor's Office and the Legislature through the annual budget process and through the reporting and tracking of annual performance measures. The Department is also accountable to the citizens of this Commonwealth through advisory committees, public meetings and publicly-accessible web applications. Currently, the Department provides on its website all compliance monitoring results, violations and enforcement actions, and inspection results for all 8,521 PWSs in the Commonwealth.

Here is the link to the Department's Drinking Water Reporting System: http://www.drinkingwater.state.pa.us/dwrs/HTM/Welcome.html If the public has any questions or concerns about their water supply, there are various means of contacting the Department. Here is the link with additional contact information: http://www.dep.pa.gov/About/ReportanIncident/Pages/default.aspx. The fees in this final-form rulemaking will provide the Department with funding necessary to properly administer the SDWA while bearing a reasonable relationship to the actual cost of services provided by the Department and while achieving a reasonable cost to the customers served.

15. **Comment: Fees may impact infrastructure projects**: Increased system costs (fees) are not and cannot always be passed onto the customer. Some systems may pay the regulatory fees through existing rate structures, which will strain existing resources. Systems may need to reevaluate which infrastructure maintenance, replacement and upgrade projects can be completed. The proposed fees may lead to deferred maintenance. (14, 19, 33, 39)

    Response: The Department encourages all systems to consider full-cost pricing and the development of asset management plans to ensure resiliency and the continuous provision of safe drinking water. Safe drinking water is vital to maintaining healthy and sustainable communities. Proper investment in PWS infrastructure and operations helps ensure a continuous supply of safe drinking water, enables communities to plan and build future capacity for economic growth, and ensures their long-term sustainability. There are various tools available for all system types and sizes including templates and training materials from the Pennsylvania Rural Water Association (PRWA), American Water Works Association (AWWA) and EPA. Here are several links to various EPA resources.

    - Link to EPA's webpage on Building the Capacity of Drinking Water Systems: https://www.epa.gov/dwcapacity
    - Link to EPA's webpage on Sustainable Water Infrastructure: https://www.epa.gov/sustainable-water-infrastructure

    The Department also provides technical assistance and training to systems that are interested in improving their technical, managerial and financial capabilities. More information is available on the Department's Capability Enhancement webpage: http://www.dep.pa.gov/Business/Water/BureauSafeDrinkingWater/CapabilityEnhancement/Pages/default.aspx

16. **Comment: Fees should bear a reasonable relationship to the cost of services:** The SDWA requires fees to bear a reasonable relationship to the actual cost of services provided. The Department should provide additional explanation or analysis to account for this, otherwise the fees being proposed are arbitrary, capricious, and not commensurate with the services provided, violating federal law. The IRRC recommended that the Board reevaluate the basis of the fees in the final-form rulemaking. (15, 16, 17, 21, 22, 23, 24, 27, 29, 32, 40)

Response: Section E. of the preamble of the proposed rulemaking, 47 Pa.B. pages 5005-5011, contained extensive information and data regarding how the Department analyzed the cost of providing services to administer the SDWA and its regulations. The cost of some services can be estimated, while the cost of other services depends on the specific circumstances and will vary widely.

The table below summarizes the Department's costs of providing those services that can be estimated for CWSs serving various populations. The hourly rate was provided by the Department's fiscal office and includes salary, benefits, and in-direct costs (supplies, etc.).

DEP Cost of Services That Can Be Estimated				
Activity	**Hours/Activity/Year for CWSs Serving the Following Population**			
	<750	**750-5,000**	**5,000-50,000**	**>50,000**
Conduct sanitary surveys	7.5	10	25	37.5
Conduct other inspections	2.5	3.3	5	10
Determine compliance	12	12	15	15
Maintain PADWIS/eFACTS	7.5	7.5	10	10
Review plans/reports	7.5	10	15	15
Provide technical assistance/ training	7.5	7.5	10	10
Total Hours	**44.5**	**50.3**	**80**	**97.5**
@ $49/hr =	**$2,180**	**$2,465**	**$3,920**	**$4,778**

Examples of other services and costs that involve variable circumstances and preclude a single estimate for the services include the following:

1. **Sanitary surveys that take longer to conduct due to the complexity or size of the water system.** Examples of actual hours expended and costs to complete more complicated sanitary surveys at large water systems (i.e., those serving populations > 50,000) are as follows:
    a. System A (population = 57,000): 40.5 hours at a cost of $1,984
    b. System B (population = 66,500): 40 hours at a cost of $1,960
    c. System C (population = 87,000): 49 hours at a cost of $2,401
    d. System D (population = 105,000): 60 hours at a cost of $2,940
    e. System E (population = 120,000): 60 hours at a cost of $2,940
    f. System F (population = 747,500): 103 hours at a cost of $5,047
    g. System G (population = 1.6 million): 124 hours at a cost of $6,076

2. **Additional follow-up actions taken by the Department in response to a violation.** When a drinking water standard is exceeded, Department staff are responsible for consulting with and providing direction to the water system; ensuring that public notice is complete, timely and repeated as needed; tracking, reviewing and approving follow-up and corrective actions (such as collecting confirmation or additional samples, repairing/replacing/installing water treatment, or taking contaminated sources off line); and determining when the system has returned to compliance.

   For example, in 2016, monitoring results for a large Pennsylvania water system indicated the 90th percentile lead value exceeded the action level established in the Lead and Copper Rule. This triggered lead service line replacement actions. Department staff spent at least 116.5 hours working to address this important issue. Services provided by the Department to achieve compliance included meetings, file reviews, drafting compliance documents, follow-up action reviews and letters. The approximate cost for these services was $5,708.

3. **Additional follow-up, corrective and emergency actions taken by the Department in response to a water supply emergency.** Water supply emergencies occur each year and require substantial resources from the Department. The following are examples of emergencies and associated costs for services provided by the Department:

   a. In the Spring of 2011, unexpected damage to a very large water main resulted in a major leak, loss of significant water quantity and pressure. The result was closure of multiple businesses and government agencies in a large city within the Commonwealth for three days due to lack of a potable water supply. This emergency spanned approximately five consecutive days with approximately 66,500 customers impacted. The Department provided a variety of onsite support services at the site of the break, and at the drinking water filtration plant. Department costs for services provided during this event equates to approximately 160 hours of staff time and a cost of $7,840.

   b. During the Summer of 2012, significant construction delays in completing critical renovations and upgrades to a water filter plant threatened the ability to provide an adequate quantity of drinking water to approximately 210,000 customers. Department staff provided a variety of specialized engineering and operational support services over the course of several weeks. Total cost estimate of Department services provided during this event includes 600 hours of staff time costing approximately $29,400.

   c. In the Summer of 2015, runoff from a large fire at an industrial facility severely contaminated the intakes for two public water systems thereby rendering their normal source of surface water untreatable for almost three months. Together, the two public water suppliers impacted provided drinking water to approximately 43,000 customers. Several Department staff were involved in providing a wide variety of emergency support services, over the course of several months, to the water suppliers affected. Department cost estimates for this event include 515 staff hours ($25,235) and emergency sampling costs ($17,818). The total cost of Department services provided was approximately $43,053.

   d. In the winter of 2016, an equipment failure resulted in flooding at a surface water filtration plant which provides water to approximately 20,000 customers. This

immobilized treatment and pumping capabilities for six consecutive days. The filter plant did not resume normal operations for approximately two weeks. Without combined efforts by the water system, the Department and neighboring water systems, 20,000 customers could have endured consecutive days without an adequate supply of water. Department services included coordination with neighboring water systems to identify alternate sources of water, emergency permit considerations, site assessments, engineering and operational support. Additionally, the Department loaned the public water system critical water quality monitoring equipment (valued at approximately $24,000) for approximately 10 weeks to help verify that safe water was consistently provided. The total cost estimate of Department services provided during this event also includes 300 hours of staff time, which cost approximately $14,700.

4. **The cost of samples collected by the Department during inspections and filter plant performance evaluations, in response to complaint investigations, and to assess water quality and protect public health during water supply emergencies.** These sampling costs range from $30 for inorganic analyses to $400 for pesticides to $1,200 for analysis of Cryptosporidium and Giardia to $2,968 for a complete emergency sampling suite. Total Department lab costs average approximately $680,000 per year.

5. **The costs associated with additional training when new regulations are promulgated.** One example is the numerous training sessions that were developed and delivered in 2015 - 2016 to roll-out implementation of the Revised Total Coliform Rule (RTCR) adopted to conform to Federal requirements. This training included eight different training courses, workshops and webinars that were presented 160 times across the Commonwealth, for a total of 482 hours of training. The cost to deliver 482 hours of training was $23,618.

6. **The costs associated with specific follow-up actions established in new regulations.** The federal RTCR became effective on April 1, 2016, and the Department and EPA shared enforcement of the federal rule until Pennsylvania's regulations were published as final (which occurred on Sept. 24, 2016). As part of the Department's enforcement responsibilities during this interim period, staff conducted Level 2 assessments at public water systems. A Level 2 assessment is triggered when a public water supply has an *E. coli* MCL violation or when two total coliform triggers occur during a 12-month period. During this interim period, Department staff completed 94 Level 2 Assessments at more than 85 regulated public water systems. These assessments identified over 400 defects that have already been, or are being, corrected thereby improving public health protection. Estimated costs for services provided by the Department were approximately $3,000 per assessment for a total cost of $282,000.

The additional costs described in items 1 – 4 above are more evident in medium and large water systems due to their size, age, complexity, and number of customers at risk. Because these additional costs are variable, it is not possible to establish an average cost for these services. However, these additional costs were considered when determining the annual fees for the medium and large water systems. Thus, the Department developed the annual fees, to bear a reasonable relationship to the actual costs of all the services provided by the Department while achieving a reasonable cost to the 11.3 million customers served.

17. **Comment: Unfair burden on companies that own multiple PWSs:** The proposed fees create an unfair and unequal burden on water suppliers owning and operating multiple water systems. For example, the City of Philadelphia (PWD) operates one system serving 1.4 million people and would be charged approximately $40,000 under the proposed fee structure while Aqua PA serving the same number of customers would be required to pay $400,000 or ten times the amount for a similar amount of customers. Pennsylvania American Water has 66 Public Water Supply ID numbers and estimates that they would pay an increase in annual fees of approximately $830,000. Likewise, Suez has 15 PWS ID numbers, with a population of 150,000, and would experience an increase of $124,000 or an increase in magnitude of 26 times the current rate. Furthermore, this rate would be over three times the rate imposed on a city serving a population of 1.5 million. Therefore, the Department should consider a cap on the fees for companies that own and operate more than 10 PWSs in PA to no more than $150,000 annually. (15, 16, 22)

Response: Based on the examples provided in the comments, the workload or level of services for each "company" is as follows:

PWD – PWD owns/operates 1 PWS, serves a total population of ~ 1.4 million people, and would be required to pay an annual fee of $40,000. Per person costs would be ~ $0.03 per year.

Aqua PA – Aqua owns/operates 110 PWSs, serves a total population of ~ 1.4 million people, and would be required to pay total annual fees of $400,000. Per person costs would be ~ $2.80 per year.

PA American – PA American owns/operates 66 PWSs, serves a total population of more than 700,000, and would be required to pay total annual fees of $830,000. Per person costs would be ~ $1.18 per year.

Suez – Suez owns/operates 15 PWSs, serves a total population of 150,000, and would be required to pay total annual fees of $124,000. Per person costs would be ~ $0.83 per year.

Comparison of Workload or Level of Services				
	PWD	**Aqua PA**	**PA American**	**Suez**
# PWSs	1	110	66	15
# required sanitary surveys	1	110	66	15
# surface water filtration plants (requiring routine data review and filter plant performance evaluations)	3	12	37	5
# EPs (requiring review of monitoring results on a routine basis)	3	296	198	44
# sets of distribution system monitoring results to review for LCR, RTCR, DBPR	1	110	66	15
# inventories and compliance/enforcement records to maintain in PADWIS & eFACTS	1	110	66	15
# plans to review (ERP, O&M, etc.)	1	110	66	15

# regional sanitarians and engineers assigned to these systems	1 each	Multiple staff in 5/6 regions	Multiple staff in all 6 regions	Multiple staff in 4/6 regions

Even though these companies consider themselves as one company, they in fact represent multiple individual water systems, each with its own workload. And when the cumulative workload is considered, the Department believes that the fees for these companies bear a reasonable relationship to the level of services provided to the PWSs owned by the companies. The resulting average per person costs are in-line with those of other water systems. Finally, if the Department were to consider a cap on fees for companies that own multiple water systems, it would result in the companies underpaying their fair share of costs for Department services.

18. **Comment: Financial burden on PUC-regulated systems:** The fees create a financial burden on PUC-regulated facilities. These systems will need to seek costly rate increases, and will need to absorb the costs until the PUC approves the recovery of these costs. (15, 16, 22)

    Response: While it is true that the new annual fees will require an initial rate increase in order to recover the costs, the frequency of future potential rate increases (due to fees) is not expected to be more than once every five years. This anticipated frequency takes into consideration the three-year review cycle, and the two-year regulatory process. A potential rate increase cycle of not more than once every five years is in-line with typical PUC rate cases.

19. **Comment: Permit fees:** Permit fees should be based on the scope of work (type of project, scope of project, project size and complexity) and not on the population served. Permit fees should be independent of system size. (16, 21, 22, 23, 29, 32)

    Response: The Department disagrees that permit fees should be independent of system size. Nearly all aspects of the Commonwealth and Federal drinking water program are governed by system size (population). System population is used to determine monitoring requirements (both the number of samples and the frequency of monitoring), implementation due dates (many rules phase-in effective dates by system size), and treatment technique requirements (some treatment techniques only apply to certain system sizes), among other things. System population is used as a surrogate for system complexity – medium and large systems are generally more complex than small systems, with more overall facilities (sources, EPs, interconnections, and storage tanks, among others) and types of treatment technologies. Medium and large systems often face additional challenges with maintaining simultaneous compliance, which factor heavily into permit reviews. For these reasons, it is appropriate to use system population to determine the various permit fee categories and Department costs.

20. **Comment: Minor permit amendments:** Minor permits should not require extensive DEP review so the fees should be substantially less. (16, 21, 22)

    Response: The Department agrees that review times for minor amendments are less than the review times for new permits or major amendments. In recognizing this, the Department set the fees for minor amendments at one-third to one-half the fees of major amendments.

21. **Comment: General permits:** The water industry supports the use of general permits and a fee not to exceed $500. (16)

    Response: The Department acknowledges the comment.

22. **Comment: BVRB fees:** Bottled, vended, retail and bulk water hauler (BVRB) fees do not seem equitable in relationship to the cost of the product. BVRB fees should be based on gallons produced. The IRRC recommended that the Board include consideration of the recommendation from TAC regarding the suggestion to use gallons produced as the basis for determining annual fees. (16, 22, 23, 29, 32, 40)

    Response: The Department disagrees. BVRB fees were assessed using the same criteria as the more traditional PWSs. The fees are based on a workload analysis and an estimate of costs associated with Department services. In addition, as stated in the preamble to the proposed rulemaking at 47 Pa.B. page 5009, the Department does not currently have complete data on gallons produced. Moving forward, the Department will consider revisions to reporting forms so that this data may be available in the future. However, even if this data were available, the Department believes that establishing fees based solely on gallons produced would present additional challenges. Not all water systems are metered or have meters installed in the correct locations to track gallons produced. Some water systems produce and sell raw water for non-potable purposes, such as in the oil and gas industry, and it is unclear whether those volumes would be included. Other water systems have high levels of unaccounted for water due to unmetered connections, fire protection, and waterline leaks and breaks. Finally, gallons produced may not be commensurate with the complexity of water system facilities and types of treatment provided. For these reasons, the use of gallons produced to assess fees would not bear a reasonable relationship to the cost of services provided by the Department.

23. **Comment: Effective date of fees:** Fees should be deferred and phased-in in 2019 to allow water systems to include the new fees in budgeting. (22)

    Response: The Department agrees that water system boards and authorities should be given sufficient time to include the new annual fees in the budgeting process. The Department has clarified in the final-form rulemaking that the payment schedule will begin with the first full quarter of calendar year 2019 (Jan – Mar).

24. **Comment:** The proposed fees require more discussion, and complete analysis of all factors has not been communicated to all stakeholders. (27)

    Response: The Department disagrees that more analysis and discussion are needed. Extensive analysis has been completed, using all available data and resources. The fees were thoroughly discussed with the Department's Small Water Systems Technical Assistance Center Advisory Board (TAC) and other stakeholders through several advisory committee meetings and a public webinar. Advisory committee meetings are announced publicly and are open to the public. Due to the webinar and a series of letters from EPA and the resulting news articles regarding the Department's

limited resources and resulting poor performance, information about the proposed rulemaking was broadcast statewide. The additional focus from the news media resulted in several comments being submitted from the general public, which rarely happens with proposed drinking water regulations. Please also see the response provided to Comment #16 for more information about the factors and data that were used to establish the fees.

25. **Comment:** The current state of the Program, which is the cumulative result of numerous decisions made over many years, is cause for serious concern regarding protection of the public health, safety and welfare. The Department finds itself experiencing difficulty in meeting the directives of the SDWA to the point that it needs $7.5 million in additional revenues from water systems and suppliers to ensure compliance. The SDWA not only envisions, but directs the Board to establish fees to cover services. However, the Board states in the Preamble that permit fees have not been increased since originally adopted in 1984. As to the cost of other services, the Board does not explain whether any consideration was given to implementing or increasing fees over the years in order to avoid reaching this current state. Given that the statutory directive to establish fees for services has been in place since 1984, we question the Department's decision to cut services rather than gradually increase fees as appropriations from the General Fund decreased in recent years. We ask the Board to explain why the statutory directive to establish fees to cover services was not used to sustain the Program. We also ask the Board to explain how the Program's budget will be monitored in the future to ensure that revenues are in place to meet SDWA requirements before a budget shortfall exposes the public to the risk of unsafe drinking water. (40)

    Response: The Department attempted to increase permit fees and establish new annual fees in 2010 when program resources and performance first began to decline. The draft proposed rulemaking (Safe Drinking Water Program Fees) was presented to TAC on March 9, 2010, with further discussion on June 18, 2010. The proposed rulemaking was presented to the Board at its November 16, 2010 meeting, where it was approved to move forward as a proposed rulemaking. However, due to circumstances beyond the control of the Department at that time, the rulemaking was prohibited from moving forward beyond that point in the regulatory review process.

    Regarding the Department's protocols that will ensure the proper monitoring of the SDW Program's performance and budget in the future, please see the responses provided to Comments #4 and #14.

GENERAL UPDATES:

26. **Comment:** At a time when program staffing and resources are limited, it would be prudent to limit the requirements of the program to the minimum federal program elements, thereby reducing the program's responsibilities surrounding the permitting, verification, monitoring, and enforcement of these specific provisions. The IRRC asked the Board to explain the reasonableness of expanding regulatory requirements which would result in increased demands on the Department's staff and funding during a time when both staff and funding are decreasing. (28, 40)

    Response: The additional state provisions included in this final-form rulemaking are designed to help reduce the occurrence of violations, treatment breakdowns, and water supply emergencies;

thereby improving system resiliency and reliability, and reducing the need for staff resources to respond to these emergency situations. The provisions were developed with DEP staff input and are intended to address the highest priority issues of concern. Establishing proper safeguards under specific regulatory requirements that clearly outline violation prevention expectations for the regulated community is a critical means to improve public health protection. Prevention of violations and/or water supply emergencies is always important to the SDW Program; even more so when staff resources are limited. Please note, as well, that the Department amended several provisions in response to TAC and public comments. Several provisions that are more stringent were either modified or deleted, including the turbidity requirements under §§ 109.202 (relating to state MCLs, MRDLs or treatment technique requirements) and 109.701 (relating to reporting and recondkeeping), the monitoring and reporting requirements for "back-up" sources and entry points under §§ 109.301, 109.303, 109.703 and 109.717, and the system service and auxiliary power requirements under § 109.708.

27. **Comment:** We question whether the enhancements above the federal requirements is to justify the new fee schedule. (36)

    Response: The more stringent provisions are not intended to justify the new fee schedule. It is important to note that the majority of the provisions were originally proposed in an earlier regulatory package in 2014, which pre-dates the proposed fee rulemaking.

28. **Comment: Source water assessments and sanitary surveys:** Section 109.705 (iii) appears to require water suppliers to update their source water assessments annually for every source as part of their sanitary survey. This would create an undue burden and water suppliers should be given the opportunity to use alternative methods to accomplish this instead of the method dictated in the proposed language. The water supplier should be allowed to update their source water assessments for surface water systems no less than every 3 to 5 years and potentially longer for wellhead areas. Water suppliers should be given the chance to tailor their needs for an assessment update and submit the schedule to PADEP. (15)

    Response: Under the existing requirements under § 109.705 (relating to system evaluations and assessments), water suppliers have always been required to conduct annual sanitary surveys, which include a review of all sources and protection areas. For an existing source water protection area (i.e., the contributing area has been delineated), a source water assessment is essentially a sanitary survey. Also, systems with Department-approved local source water protection programs must review their source water protection plan annually and update the elements as needed. As the source water assessment is the basic framework of, and is incorporated into, a local source water protection plan, these updates should already be occurring and can be captured on the annual update form in many instances. If a water system would need to completely overhaul an assessment or protection plan and complicating factors were involved, the Department could consider an alternate timeframe.

29. **Comment:** In the proposed language PADEP does not define "actual or probable sources of contamination". PADEP should use language in Chapter 109 that is the same language and definitions used in Source Water Assessments and its Source Water Protection Program and Planning documents since 1996. (15)

Response: The phrase "actual or probable sources of contamination" was used in an earlier draft of the proposed regulatory revisions. The proposed rulemaking, which was adopted by the Board on May 17, 2017 and published for public comment on August 26, 2017, uses the phrase "actual or potential sources of contamination" in § 109.705, which is consistent with the language used in the Department's March 24, 2000 Source Water Assessment and Protection Program final technical guidance document.

30. **Comment: Pre-drilling plan:** The requirements in §109.503(a)(1)(A) for a "pre-drilling plan" establish a new step in the process, and should be clarified and adjusted to avoid duplication with similar aquifer test plan requirements administered by other agencies. Section 109.503(a)(1) also calls for submitting with the plan the preliminary results of source water assessments, a key part of which involves water quality samples – and such source samples can't be taken without some type of test well. The Department should be encouraging, not limiting, the installation of test wells and performance of hydrologic evaluations that gather better background geologic and water quality data as a predicate to production well design and aquifer testing. The Department should reconsider the concept of mandating "approval" of an aquifer test plan before proceeding with a test. At the very least, we would recommend that §109.503(a)(1) be modified to make clear that this is not a "pre-drilling plan" but rather a plan that would precede conduct of a formal aquifer test. Why is it necessary to establish a new approval requirement under which all public water systems must stop and wait for agency staff to review aquifer test plans before proceeding with the tests required for a full construction permit application. The IRRC asked the Board to clarify the requirements of §109.503(a)(1) (relating to PWS construction permits) in the final-form regulation. The IRRC also asked the Board to explain the reasonableness of the pre-drilling plan requirement, "[c]onsidering the Department's stated difficulty in addressing the minimum requirements for SDWA primacy noted in the Preamble [to the proposed rulemaking]." (23, 29, 40)

Response: Predrilling plans and source approvals are coordinated with other agencies, such as the Susquehanna River Basin Commission (SRBC), Delaware River Basin Commission (DRBC), and others. The individual components of a pre-drilling plan and subsequent approvals of potential production well site locations have been required as part of the permitting process since at least 1997. The individual components are currently listed in § 109.503(a)(1)(iii) of the existing regulations and are required to be submitted to the Department as part of a construction permit application. However, with these revisions, the predrilling plan will now be required to be submitted to the Department for review and approval prior to drilling the well. No change to this subsection has been made in the final-form rulemaking.

Test wells and exploratory activities would be undertaken first to determine potential <u>production</u> well site locations; and the Department encourages these valuable data gathering activities. Potential <u>production</u> well sites would then be addressed through the pre-drilling plan. Preliminary source water assessments do not involve water quality monitoring and are primarily intended to determine

nearby potential sources of contamination and the susceptibility of the production water source to contamination, not to assess existing water quality in the well. In addition, the Groundwater Monitoring Guidance Manual is used by the Department and other agencies to address groundwater sampling and monitoring issues.

31. **Comment: Monitoring of all entry points annually, monitoring of all sources at all entry points, and comprehensive monitoring plan requirements:** Water suppliers support the concept of monitoring all active sources to ensure the public is receiving water that is safe to drink. However, the proposed language is vague and will create more questions, won't address PADEPs concerns, and could create greater risks.

    1. Time to comply: If any version of this provision is adopted it needs to give water suppliers at least one year from the effective date to prepare in advance of its effective implementation date. Additional sampling will result in additional costs which must also be passed along to our customers. In addition, the comprehensive monitoring plans are significant and a year to develop them is needed.
    2. Source Status: Water suppliers recommend that the Department allow sources to be kept in reserve status.
    3. Requiring Annual operation of all sources and entry points is not feasible and increases risk: This provision appears to dictate to water suppliers how to operate their system and would force systems to supply water through an entry point annually for a particular source that is not in regular use. This seems to overreach the goal of representing sources in routine compliance monitoring and begins to dictate operation of the system.

    This approach would force systems to abandon reserve or backup sources and thus increase risk to respond to extreme events. (16, 22, 33, 40)

    Response: The Department continues to have concerns that gaps in the monitoring of back-up water sources and entry points put public health at risk. The scope and magnitude of these concerns were highlighted in the preamble to the proposed rulemaking at 47 Pa.B. pages 4997 - 4998 and 5004. However, the Department also acknowledges the concerns from TAC and several commentators. Therefore, the proposed rulemaking was amended in this final-form rulemaking to allow for the use of the designation "reserve" for select sources and entry points. Reserve sources will be tracked using special permit conditions and will require Department approval, complete monitoring, and a thorough assessment for treatment efficacy prior to use. These additional measures should ensure the safe use of these sources. All other sources are required to be included in routine compliance monitoring. These amendments are set forth in a new § 109.301(15) and in the comprehensive monitoring plan requirements under § 109.717 (related to comprehensive monitoring plan). The Department has also deferred the implementation date for these requirements to one year after the effective date of this rulemaking. Finally, the comprehensive monitoring plan requirements have been revised for clarity.

    These amendments are intended to clarify the monitoring requirements for entry points that do not provide water continuously, and address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As per Federal and Commonwealth regulations,

40 CFR 141.23(a), 141.24(f) and (h) and 141.26(a) and 25 Pa. Code §§ 109.301 and 109.303, respectively, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Currently, sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means no verifiable controls are in place to ensure that all sources and entry points meet safe drinking water standards.

These concerns were most recently highlighted in a 2010 report from EPA's Office of Inspector General entitled *"EPA Lacks Internal Controls to Prevent Misuse of Emergency Drinking Water Facilities"* (Report No. 11-P-0001). Note: The term "emergency" is often used to describe sources other than permanent sources. In this Commonwealth, some of these back-up sources have not been used in at least five years, and, therefore, the Department does not know the water quality for these sources.

In order to better understand the scope of the problem in this Commonwealth, the following data was retrieved from the Pennsylvania Drinking Water Information System (PADWIS).

Entry Points (EP)				
PWS Type	**Total No. EPs**	**No. Permanent EPs**	**No. Non-Permanent EPs**	**% Non-Permanent EPs**
CWSs	3,330	3,003	327	10%
Others	7,880	7,760	120	2%
Total	11,210	10,763	447	4%

An entry point is the place at which finished water representative of each source enters the distribution system. Routine compliance monitoring is not tracked at non-permanent entry points. Non-permanent entry points include the existing categories of seasonal, interim, reserve, and emergency entry points.

Based on the data, CWSs provide finished water to consumers through a total of 3,330 entry points, 327 (or 10%) of which are non-permanent. Therefore, as many as 10% of all entry points may not be included in all required monitoring prior to serving water to consumers.

The numbers are higher at the individual source level.

Water Supply Sources (wells, springs, surface water intakes, etc.)				
PWS Type	**Total No. Sources**	**No. Permanent Sources**	**No. Non-Permanent Sources**	**% Non-Permanent Sources**
CWSs	5,252	4,634	618	12%
Others	8,604	8,297	307	4%
Total	13,856	12,931	925	7%

For CWSs, as many as 12% of all sources may not be included in routine compliance monitoring, yet these sources can be used at any time.

The Department also reviewed the monitoring history of the 447 non-permanent entry points mentioned above.

Non-Permanent Entry Points (EP)			
PWS Type	**No. EPs**	**No. & % of EPs with No Monitoring Data (Since 1992)**	**No. of EPs with Some Monitoring Data**
CWSs	327	143 (44%)	184 (of these EPs, 47 were sampled in 2016, 37 were sampled during the 2012-2015 monitoring period, and the remaining 101 were sampled prior to 2012.
Others	120	7 (6%)	113 (55 EPs have recent data (2016)).
Total	447	150 (34%)	

For CWSs, 143 (or 44%) of all non-permanent entry points have **no** monitoring data since 1992. Of the 184 entry points with some data, most of the data are 5 to 10 years old.

The use of unmonitored sources and entry points could adversely impact basic water quality, including pH, alkalinity, turbidity, corrosivity and lead solubility, dissolved inorganic carbon, and natural organic matter. Water suppliers may have limited information about how these sources or entry points will impact treatment efficacy and distribution system water quality. In addition, back-up or emergency sources may have poor water quality or Maximum Contaminant Level (MCL) exceedances. The use of these sources without proper monitoring and verifiable controls could lead to an increased risk to public health.

Finally, treatment facilities and other appurtenances associated with these sources may no longer be in good working order. Back-up sources and entry points with unknown water quality or that have been unused or are no longer in good working order provide a false sense of security in terms of system resiliency and emergency response. While the Department understands that many facilities are not used on a 24/7 basis, these amendments will ensure that all permitted sources and entry points are monitored at least annually.

The Department anticipates that select purchased interconnections will be able to retain the "emergency" designation if the following criteria are met. The Department anticipates proposing technical guidance in the near future that includes these criteria. As noted previously, the term "emergency" is often used to describe sources other than permanent sources.

- Using the last three years of historical water use data, the water supplier can demonstrate that the purchased interconnection has only been used for emergency purposes.
- Emergency use has not occurred more than 14 days per year, excluding use under Commonwealth or Federal emergency declarations.

- The Department has conducted an annual compliance check using reported water use data.

On a case-by-case basis, the Department may allow the use of the "reserve" designation for select sources and entry points, without conducting routine annual compliance monitoring, if documentation is provided to the Department that supports the use of this designation. Select sources and entry points that meet these criteria will be covered by a special condition in the permit that requires Department notification and completion of compliance monitoring prior to use.

32. **Comment: Management of back-up water sources and entry points:** EPA has reviewed the revisions to §109.301(11)(i) and (ii), §109.303(a), and §109.303(i) related to addressing gaps in monitoring, reporting, and tracking of back-up sources. EPA commends the Department for taking proactive actions to better manage these sources which the EPA's Office of Inspector General cited as concerns in its 2010 report "EPA Lacks Internal Controls to Prevent Misuse of Emergency Drinking Water Facilities". EPA and IRRC suggest that the Department: (1) add a definition of the term "back-up sources" in §109.1 (Definitions); and (2) annotate "all entry points" as including those served by back-up sources in §109.301(ii) (monitoring requirements) and § 109.717(a) (comprehensive monitoring plan). EPA and IRRC also recommend that the Department incorporate language to clarify how the proposed revisions apply to interconnections. EPA has reviewed the revisions to §109.303(a)(4) which clarifies monitoring requirements to ensure representative sampling. In particular, for those sources not blended at a consistent ratio or alternated prior to the entry point, the revisions require additional samples be taken. EPA commends the Department for ensuring that samples collected are representative of all sources being used. The IRRC notes that the proposed rulemaking, in § 109.301(11)(ii), adds the requirement that "at a minimum, all entry points shall provide water to the public on an annual basis to ensure all sources and entry points are included in routine compliance monitoring." The IRRC asked the Board to address in the final preamble the economic impact and feasibility of requiring all entry points to provide water to the public, as well as the implementation schedule. (31, 40)

Response: The Department does not believe that a definition for "back-up sources" is needed because the term is not used in the regulations. The term was used in the background information for this rulemaking to better explain the scope of non-permanent facilities. Instead, the term "reserve" has been added to the final-form rulemaking. For the same reason, it is not necessary to add "back-up sources" to § 109.301. The definition of "entry point" is established in existing § 109.1.

Regarding interconnections, please see the summary of amendments to § 109.301 within Section E of the preamble to this final-form rulemaking, which clarifies how the revisions apply to interconnections. Additional information will be provided in guidance. The Department has revised this final-form rulemaking to include the designation "reserve" in § 109.717 rather than define the term "back-up sources" in § 109.1, to allow select sources and entry points to remain off-line until needed. Please see the discussion of §§ 109.301, 109.303, 109.703 and 109.717 in Section E of the preamble for this final-form rulemaking for more information, including an explanation of how interconnections will be affected. Regarding the economic impact and feasibility of requiring all entry points to provide water to the public, the final-form rulemaking no longer requires all entry points to be used on an annual basis. Instead, water suppliers will be able to determine when reserve

entry points are needed, and may request Department approval to use reserve entry points. Reserve entry points must be monitored when used.

In response to public comments, the effective date of these amendments will be deferred for one year following rule promulgation.

Please also see the response provided to Comment #31 for additional information.

33. **Comment: More stringent turbidity requirements:** The change from 0.3 NTU to 0.30 NTU and from 1 to 1.0 NTU represents a significant change in how turbidity is measured. EPA currently defines the turbidity measurements as 0.3 and 1 NTU and does not use two significant digits. PADEP should follow the federal requirements as they are sufficient. The IRRC notes that the Board proposes to reduce acceptable turbidity levels in § 109.202(c)(I)(i)(A), making the maximum level more stringent than Federal standards. The IRRC asks the Board to explain the reasonableness and economic impact of making this requirement more stringent than Federal standards. The IRRC's comment also applies to §109.701(a). (15, 16, 22, 24, 27, 40)

    Response: While the Department favors establishing more stringent individual filter effluent (IFE) and combined filter effluent (CFE) turbidity compliance and trigger levels of 0.30 NTU and 1.0 NTU for surface water filtration plants, in response to numerous comments from TAC and commentators, the Department is deferring such amendments to §§ 109.202(c)(I)(i)(A) and 109.701(a) until the EPA completes its six-year review of the Federal turbidity requirements established under the Surface Water Treatment Rules. This will allow the Department to consider EPA's proposed changes before moving forward with proposed modifications to applicable state regulatory requirements. Until that time, the Department encourages filter operators to voluntarily meet optimal water quality levels and respond to trends of increasing turbidity as quickly as possible. This can be accomplished through the use of the Department's existing programs, including the Area-Wide Optimization and Filter Plant Performance Evaluation and Partnership for Safe Water programs. Through these programs, the SDW program has always dedicated significant resources towards compliance assistance / violation prevention at surface water filtration plants.

    Additionally, the proposed alarm and shutdown capability amendments under § 109.602 (relating to acceptable design) remain in this final-form rulemaking, which are also targeted at surface water filtration plants. The automated plant shut down requirements are intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence. Therefore, the improved alarm and shutdown capabilities that will occur as a result of systems complying with this final-form rulemaking are a very important interim public health protection measure which will be in place while the Department awaits EPA's future actions on potential more stringent turbidity provisions.

34. **Comment:** There is no peer reviewed published data showing that the current approved online turbidity measurement systems can reliably provide measurements to support two significant digits for compliance. (15, 16, 22)

Response: The manufacturer's specifications for the most commonly used compliance monitoring turbidimeter in drinking water filtration plants throughout this Commonwealth specify capability better than two significant digits. The specifications include: Range 0.001–100 nephelometric turbidity units (NTU); Limit of Detection 0.0032 NTU (according to criteria specified by ISO 15839); Resolution (Displayed) 0.0001 NTU up to 9.9999 NTU; Repeatability Better than ±1.0% of reading or ±0.002 NTU, whichever is greater for each range. It is critical to note that in order to comply with existing turbidity requirements, water systems should routinely consider two significant digits when evaluating their individual and combined filter effluent turbidity data. The vast majority of filter plants throughout this Commonwealth have established turbidity related alarms and standard operating procedures which reference two significant digits; and, these have been in place since approximately the late 1990's. Additionally, in 2005, EPA established specific compliance criteria for membrane filtration plants to remove membrane filters from service and take investigative actions whenever filter effluent turbidity reached 0.15 NTU. Please also see the response provided to Comment #33 for information about this final-form rulemaking.

35. **Comment: Availability of CFE:** Under § 109.701(a)(2)(i)(A), the test results for performance monitoring for PWSs providing filtration and disinfection of surface water or GUDI sources is being revised to include "the combined filter effluent" turbidity performance monitoring. However, combined filter effluent may not be available in certain filter plants. (16, 22)

    Response: Every filter plant in this Commonwealth has been required to establish a CFE compliance monitoring location prior to obtaining an operations permit. For systems that do not have a CFE location which directly complies with the definition of this monitoring point, the Department has historically considered, and will continue to consider, on a case-by-case basis, alternative methodologies to comply. More specifically, if it is physically impossible for a system to obtain a representative sample (via sample line) from the actual CFE monitoring location, the Department will allow for instantaneous averaging of the IFE turbidity results to be reported for CFE compliance. In these instances, the water supplier would be required to make reasonable efforts to address the lack of CFE sampling during any future plant modifications. Sole reliance on an instantaneous average of IFE turbidity makes the water supplier more vulnerable to reporting violations in the long term, should the system experience a breakdown in IFE monitoring equipment. Therefore, it is to the water supplier's advantage to develop a true CFE monitoring location if at all feasible.

36. **Comment:** Can we assume the following does not pertain to permitted bulk spring sources (with PWS #s) that are groundwater (non-GUDI) sources? (a) <0.30 NTU in at least 95% of measurements per month, and (b) <1.0 NTU at all times? (23)

    Response: The proposed turbidity modifications referenced in the Department's response to Comment #33 are not included in the final-form rulemaking. However, to answer this specific question, the turbidity requirements do not apply to sources that have been adequately evaluated and confirmed to be ground water through proper testing protocols. Please see the response provided to Comment #33 for more information.

37. **Comment: Alarm and shutdown requirements:** Under §109.602(i)(2), alarm and shutdown capabilities must be established for the parameters, including, at minimum "*(i)(2)(iv) Any other operational parameter determined by the Department as necessary for the system to maintain compliance.*" This may be too far reaching and cost prohibitive. (16, 22)

Response: The Department agrees that this language may be overly broad and has removed it. The Department will rely on appropriate water system personnel (for example, properly certified operators and consulting engineers) to carefully evaluate what additional operational parameters may require alarms in order for their particular filter plant to consistently meet regulatory requirements. Additionally, if the lack of an alarm is linked to a treatment breakdown or other water supply emergency, the Department will address the system-specific deficiency through a permit or order on a case-by-case basis.

38. **Comment: Auxiliary power:** The issue of auxiliary power is one that should be addressed in each facility's Emergency Response Plan and up to the PWSs to decide whether such capital investment is worth the cost. (16, 22)

Response: Despite long-standing efforts to encourage water systems, through their Emergency Response Plan (ERP), to develop feasible plans for the continuous provision of adequate and safe water quantity and quality during emergency circumstances, many water suppliers are still inadequately prepared. In fact, the Department estimates that more than 400 CWSs in Pennsylvania do not have an up-to-date ERP. For those systems that have ERPs, many lack a feasible and effective plan to provide uninterrupted system service. This has resulted in significant impacts to consumers in the form of inadequate water quantity and/or quality and the resulting consumption advisories. These impacts may include:

- Lack of water for basic sanitary purposes, such as bathing, hand-washing and flushing toilets.
- Increased risk to public health when water systems experience a sharp reduction in supply, which can result in low or no pressure situations within the distribution system. Low pressure can allow intrusion of contaminants into distribution system piping from leaks, and backflow from cross connections.
- Dewatering of the distribution system can result in physical damage to pipes when the system is re-pressurized. This situation is exacerbated due to the nationwide problem with aging infrastructure.

Due to the significant public health risks and impacts to consumers, this is not simply an issue of water systems deciding whether capital investment is worth the cost. A complete cost to benefit analysis must take into account a wide variety of costs. For example, the cost of avoiding interruption of continuous supply of safe and potable water was evaluated using the Water Health and Economic Analysis Tool (WHEAT) software developed by EPA. The Department ran the model for a scenario of a water system serving 2,500 customers and experiencing a water outage for two days. The model outcomes regarding economic consequences are summarized as follows:

- The value of water sales that would have occurred if there was no disruption in water service is estimated to be $2,891.
- The value of additional operating costs incurred during the event, which may include bottled/replacement water, equipment, other remediation, or miscellaneous costs is estimated at $24,775.
- Total economic impact on the water utility due to the two-day outage (sum of the above losses) is estimated at $27,666.
- Regional economic consequences for this same event are estimated at $926,486. This is the total value of economic activity lost among businesses directly affected by the water service disruption, due to the contraction in business activity during the two-day event.

If the water utility complies with these amendments, the potential cost savings for this two-day outage, offsetting the costs to install additional auxiliary power, emergency interconnections with neighboring water systems, and/or finished water storage, are summarized above. These costs would increase with each additional day that the water outage continues. Additional costs savings to water systems and customers will be the prevention of dewatering of the distribution system piping and protection from damage to collapsed water lines (due to lack of ability to provide an adequate quantity of water to maintain positive pressure). An estimated 250 boil water advisories (BWA) occur in Pennsylvania each year and 25% or 63 BWAs are caused by water supply disruptions. The total annual cost savings to the regulated water systems is estimated at $1,742,958. However, the regional economic cost savings to businesses is estimated at more than $58 million. These overall cost savings are critical to consider.

After considering the TAC and public comments, the Department has modified the proposed rulemaking to include in this final-form rulemaking the option to submit a schedule for necessary improvements that have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the uninterrupted system service plan. This will help enable the cost for compliance with these provisions to be spread out over a longer period of time. Additionally, these revisions provide water suppliers with more flexibility in choosing the approach that best fits their particular water system, and adequate time to implement that plan in the most effective manner.

39. **Comment: Scope of auxiliary power:** Is the auxiliary power or alternative provisions requirement intended to apply to entry point facilities (e.g., source, treatment and associated pumping) or also to all types of distribution system facilities? Many PWSs have small distribution booster stations that have inadequate space or inappropriate conditions for installing onsite generators and usually located where dual power feeds are not feasible. In such instances, portable generators are utilized to meet emergency power needs. (22)

Response: CWSs will need to develop an overall plan to provide uninterrupted system service and provide adequate quantity and quality of water during emergency situations. Systems are encouraged to be prepared to utilize as many methods as possible to maximize their capability to provide uninterrupted system service for each critical operational facility. The auxiliary power / alternate provisions requirement of § 109.708 (relating to system service and auxiliary power)

applies to all critical facilities, both prior to the entry point and within the distribution system. Therefore, the Uninterrupted System Service Plan (USSP) should include each critical facility utilized by the CWS. A "critical facility" is any facility necessary to supply an adequate quantity and quality of water (for example, water treatment plants, raw and finished water pump stations, finished water storage tanks, booster chlorination facilities, and others). Water system personnel are responsible for determining which facilities are considered critical based on their standard and emergency operating procedures. The most effective plans must carefully consider both the duration of time needed to switch over to a particular system service option as well as the efficacy of each option to provide adequate quantity of safe and potable water. Developing detailed Standard Operating Procedures (SOPs) for utilizing each alternative is critical to insuring efficient and effective implementation during emergency situations. Portable generators are recognized as a potential alternative option; however, water systems need to document the details in their USSP of how they will obtain and operate a properly-sized generator in a timely manner during emergency situations. If a water system identifies that a certain facility is not critical, then the USSP will include an explanation of how an adequate quantity and quality of water will be supplied without this facility in service. After considering comments regarding the scope of system specific challenges, the Department has modified the proposed regulatory language to include the option to submit a schedule for corrective actions which have not been completed by the compliance deadlines specified in § 109.708(a) for submittal of the USSP..

40. **Comment: PaWARN as an alternate provision:** DEP has discounted the fact that systems may avail themselves of mutual aid networks like PaWARN to meet auxiliary power demands. (16, 22)

    Response: The Department disagrees with this comment. The Department fully recognizes the importance of PaWARN and encourages membership in this valuable mutual aid network. For this reason, PaWARN is listed as one critical component of a complete plan to provide uninterrupted system service. In the draft form (USSP) created for this provision, PaWARN is listed as an "alternative provision" option along with finished water storage capacity, interconnections with neighboring water systems, and rental agreements for generators. As of December 2017, PaWARN had approximately 104 members, approximately 92 of those members manage CWSs throughout this Commonwealth. This is a small subset of the 1,952 CWSs in this Commonwealth. PaWARN membership should prove valuable during small scale events; however, limited resources of PaWARN are likely to be overwhelmed during any large-scale emergency event. As more water systems join this valuable mutual aid network, its capability should increase, which would be beneficial to both water systems and customers throughout the Commonwealth.

41. **Comment: Finished water storage as alternate provision:** One of the alternate provisions/methods that DEP is considering (within auxiliary power or alternate provisions) is finished water storage. This should be accepted as one method to comply with this section. Backup power is very expensive upfront and also the ongoing O&M costs are substantial. Backup power can fail and does fail even with a good O&M schedule. For this reason, putting too much reliance on backup power is a mistake, when the real solution, in most cases, is adequate finished water storage. Are these regulations written only for large scale emergency events? (32)

Response: To comply with these provisions, water systems will need to develop a comprehensive plan to provide uninterrupted system service during various emergencies, both small scale and large scale, spanning both short and long-term duration. Finished water storage is recognized as one of several potential alternate provision options within the plan to provide uninterrupted system service. However, finished water storage alone provides limited resiliency, typically enabling water systems to provide adequate quantity and quality of water for limited duration emergency events. Therefore, a combination of methods and a detailed comprehensive plan are necessary to insure uninterrupted system service. After considering comments, the Department has expanded the alternate provision options even further to include a category of "other" alternate provisions. Within this category, system specific alternate provisions may be proposed to insure uninterrupted system service.

42. **Comment: Minor permit amendments as general permits:** Minor permit amendments are excellent candidates for general permit management. Minor amendments currently are required with tank paintings, equipment upgrades, and minor chemical changes, such as using sodium hydroxide in lieu of lime for pH adjustment. A general permit for some, if not all, minor permits would help PWSs obtain their operating permits quicker and would relieve some of the burden of DEP (also with lack of staff in the field) having to do site visits to confirm work done. (16, 22)

    Response: The new provisions under § 109.511 (relating to general permits) are needed to establish the regulatory basis for the issuance of general permits. The Department specifically requested comment on the types of modifications or activities that may be appropriate for a general permit. The Department is currently evaluating the types of modifications that may best be served by a general permit. The evaluation will include the amount of staff time required for review and any follow-up requirements after issuance of a permit. Public health protection requires adequate consideration during the permitting process and is of the upmost importance. When the Department is ready to move forward with issuing a draft general permit(s), the public participation process will ensure ample opportunity to provide comment on the scope and coverage of the general permit(s).

43. **Comment: Proposed modifications:** The new applications required by section 109.505 are proposed to cost $50 upon submission, which, if they were one-time application fees for approval of the water system, are limited, but paragraph 109.505(2)(ii) would also require the noncommunity water system to submit a new application any time there is a "proposed modification" (as opposed to a "substantial modification") or a "change of ownership." What is a "proposed modification", do changes such as conversions to LLCs, changes of partners or names, typos on applications included and a new application (additional paperwork) and would a $50 fee be required of the applicant each time? (28)

    Response: Noncommunity water systems require a permit or approval from the Department prior to making any modifications. A modification is any change to the public water system facilities. The requisite fee will be required for any such modifications. An additional fee is required for a request for a change in legal status, such as a transfer of ownership, incorporation or merger.

44. **Comment: Disinfection treatment at health care facilities:** Health care facilities face unique challenges when considering the installation of supplemental disinfection systems as they relate to current DEP regulations. We urge the DEP to take advantage of the proposed rulemaking process to

consider hospital water systems that purchase water from a public water system as a "single system"—therefore exempting them from unnecessary and undue regulatory burdens, which would be consistent with the guidance provided by the EPA. To the extent that DEP is unable or unwilling to take this step, we ask that DEP allow hospitals to take advantage of the general permit process outlined in the proposed rule to specifically address a health care facility's unique circumstances related to the implementation of supplemental disinfection to the health care facility's water supply. The IRRC asks the Board to ensure that the final-form Regulatory Analysis Form and regulation make clear who is required to comply with the regulation. (20, 40)

Response: The Department appreciates the comments and recognizes the unique challenges faced by healthcare facilities installing disinfection treatment. The comments relating to exemptions under the SDWA and regulations are outside the scope of this final-form rulemaking. Regarding the comments related to permitting requirements for disinfection treatment, the Department is in the process of evaluating which changes to a water system that are currently covered under minor amendments may best be served by a general permit. The evaluation will include the potential for risk to public health, the amount of staff time required for reviews, and any follow-up requirements after issuance of a permit. Please also see the response provided to Comment #42 for more information.

45. **Comment: NSF International (NSF) certification:** Section 109.606 provides for acceptability of certain equipment certified in conformance with Guidelines for Public Drinking Water Equipment Performance issued by NSF (referred to as "PDWEP"); the current wording in the regulation regarding "NSF certification for materials or equipment which may come into contact with or affect the quality of the water" is overly broad. For example, it makes no sense to attempt to provide DEP NSF/ ANSI certification for raw water facilities or materials such as concrete or raw stainless-steel materials which are commonly used in Water Treatment Plant facility construction. In other instances, NSF certification for equipment that is commonly used in the water industry is not readily available or in some cases not available at all. Some products such as magnetic chemical transfer pumps do not provide NSF certification but are preferred to be used because of their leak proof design characteristics. Finally, it is unclear how a standards agency, such as NSF, is going to certify performance of a given piece of equipment, such as a GAC contactor, when the unit's performance is directly related to source water quality characteristics and must be modelled on a case by case basis. The IRRC acknowledged the comment regarding overly broad wording. The IRRC also noted that a commentator commented that the term "equipment" and the expanded certification requirements in § 109.606 (relating to chemicals, materials and equipment) are unclear. The IRRC noted that the commentator stated that potentially requiring every pump or piece of equipment on a treatment facility to be certified will be very costly, and it is uncertain what public health risk this proposed change is designed to address. The IRRC asked that the Board to define "equipment," clarify its intent regarding certification, and explain the reasonableness of the expanded certification, including addressing economic impacts. (22, 27, 40)

Response: According to NSF, a 2016 survey of members of the Association of State Drinking Water Administrators (ASDWA) found that 48 states have legislation, regulations or policies requiring compliance with NSF standards. (NSF International (2016), "Survey of ASDWA Members on the Use of NSF/ANSI Standards," available at

http://www.nsf.org/newsroom_pdf/water_asdwa_survey.pdf) In this Commonwealth, NSF certification requirements under § 109.606 are long-standing and are intended to ensure the safety and efficacy of chemicals, materials and equipment that come into contact with water. NSF certification ensures that harmful metals such as cadmium, chromium and lead do not leech from materials and equipment. NSF certification also ensures that water treatment devices can meet manufacturers' claims and effectively treat the water. The intent of the revisions in § 109.606 is to clarify that "equipment" has always been included, as evidenced by the fact that "equipment" has always been part of the title of §109.606. Under existing Department protocols, water systems must take all steps necessary to identify and propose the use of NSF-approved equipment. If NSF-certified equipment is not available, the Department, on a case-by-case basis, will allow the use of other equipment, provided the equipment does not pose an increased risk to public health. The Department is not expanding the scope of equipment for which NSF certification requirements apply; therefore, no additional costs are expected to be incurred.

In response to public comments, the Department has revised the language in § 109.606 of the final-form rulemaking to clarify that chemicals, materials and equipment that come in contact with the water or may affect the quality of the water must be acceptable to the Department. In other words, this section applies to the wetted parts of materials and equipment, and excludes motors, casings and the like that do not come in contact with the water. The Department believes that this clarification should alleviate the need for a definition for "equipment."

Finally, the provisions under § 109.606 allow the use of other standards to meet these criteria. For example, the use of materials, such as concrete and stainless steel, which meet American Water Works Association (AWWA) standards, would be acceptable to the Department.

46. **Comment: Public notification provisions for Ground Water Rule:** DEP should retain the current provision in §109.1303 that allows for 5 successive *E. coli* tests prior to triggering corrective actions and public notification. DEP should also take this occasion to clarify in the regulations that no public notification should be required where the water system has in place an adequate treatment program. (23, 30, 40)

Response: EPA approves analytical methods based on the reliability of a method to have a low risk of samples being false positive or false negative. In the preamble to the proposed Federal Ground Water Rule, EPA states, "that, in the interest of public health, a positive sample by any of the methods listed in Table III-4 should be regarded as a fecal indicator-positive source water sample". 65 FR 30230 (May 10, 2000). The proposed and final Federal rule along with the Department's revisions to Chapter 109 provide a means for the laboratory or state to invalidate samples. Although EPA allowed the five additional *E. coli* samples as a concession relating to the rare event that a sample is false positive, EPA's commentary in the preamble to the final rule states "that in most cases these five additional samples should capture the fecal contamination event since the samples are taken within 24 hours". 71 FR 65594 (Nov. 8, 2006). This statement acknowledges that a risk to public health exists because the five additional samples may miss detecting the fecal contamination. In other words, the fecal contamination that was detected in the original sample was a true positive; however, because contamination is neither constant nor immobile, the five additional

samples may miss detecting the contamination event. This risk of missing the event is the main rationale for the Department's decision to delete the five additional samples.

Further supporting this position, the Federal regulations at 40 CFR 141.402(g) along with Chapter 109 acknowledge the risk to public health from a single *E. coli* positive sample by requiring Tier 1 public notification (PN) for any source water sample testing positive for *E. coli*. This Tier 1 PN is required to be issued within 24 hours of notification of the initial sample testing positive. Under the Federal rules, if five additional *E. coli* samples are allowed by a state, the Tier 1 PN must still be issued upon notification of the first positive sample and not be postponed while waiting for the results of additional samples. The deletion in the final-form rulemaking of the option for five additional samples makes Chapter 109 more consistent with the Food and Drug Administration's (FDA) regulations which bottled water systems are also required to follow. The FDA regulations at 21 CFR 129.35(a)(3)(i) provide in relevant part that "[b]efore a bottler can use source water from a source that has tested positive for *E. coli*, the bottler must take appropriate measures to rectify or otherwise eliminate the cause of *E. coli* contamination of that source in a manner sufficient to prevent its reoccurrence. A source previously found to contain *E. coli* will be considered negative for *E. coli* after five samples collected over a 24-hour period from the same sampling site that originally tested positive for *E. coli* are tested and found to be *E. coli* negative. Records of approval of the source water by government agencies having jurisdiction, records of sampling and analyses for which the plant is responsible, and records describing corrective measures taken in response to a finding of *E. coli* are to be maintained on file at the plant." The FDA regulations recognize the five additional samples as a means to show that a corrective action taken in response to a single positive sample has eliminated or established protection of the source from fecal contamination.

Concerning "adequate treatment" as it relates to 4-log inactivation and/or removal of viruses, the Federal rule at 40 CFR 141.403(b) only allows a system to be relieved of the requirement to conduct triggered source water monitoring if the system notifies the state in writing that it provides at least 4-log treatment of viruses and begins compliance monitoring in accordance with paragraph (b)(3). Notification to the State must include engineering, operational, or other information that the State requests to evaluate the submission, which in Pennsylvania is accomplished through the permitting process. The Federal rule does not allow systems, which have not provided notification and information to the State and are not conducting the required compliance monitoring, to retroactively demonstrate 4-log treatment had been provided in order to avoid public notification.

Regarding economic impact, water systems will no longer be required to collect the five additional *E. coli* samples, which will result in a cost savings. Further, all bottled water systems are already required to provide continuous disinfection. So, if 4-log treatment is triggered, no additional capital costs will be incurred—treatment already exists. However, some bottled water systems will need to modify operational practices using existing treatment, and improve associated monitoring and reporting practices, as specified in a revised operations permit, to insure adequate 4-log treatment is maintained.

47. Comment: It would be most helpful if the rulemaking would provide more specific details about the types of businesses these "small water systems" are because most of them likely do not

consider themselves to be "water systems," but rather campgrounds, motels, restaurants, gas stations, ski resorts, manufacturers, etc. (28)

Response: The various definitions and types of PWSs that must comply with the SDWA and regulations are not being amended by this final-form rulemaking. The longstanding existing State and Federal regulatory definitions and guidance provide more information about the types of water systems. In general, nontransient noncommunity water systems include facilities that serve 25 or more of the same people, but are not residential facilities. This includes schools and places of business with 25 or more employees. Transient noncommunity water systems generally serve a transient population and include restaurants and campgrounds. The lower fees for small water systems and businesses were established to bear a reasonable relationship to the actual cost of services provided and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost.

48. **Comment:** The requirements for provision of system maps under § 109.706 (relating to system map) should be limited to community and non-community systems; a map requirement is unnecessary and inappropriate for bottled water, vended water, and bulk hauling systems. (29, 40)

    Response: The Department agrees and has amended § 109.706(a) in the final-form rulemaking to clarify that system map requirements do not apply to BVRBs.

49. **Comment:** Regarding the revisions to §109.301(12) related to monitoring requirements for disinfection byproducts (DBPs) and disinfection byproduct precursors, consider changing "disinfection bypro-ducts" to "disinfection byproducts". (31)

    Response: The Department agrees and has modified the final-form rulemaking accordingly.

50. **Comment: Consumer Confidence Report (CCR):** The Department should continue to pursue electronic reporting of CCRs by community water suppliers as an efficient and environmentally friendly alternative. (31)

    Response: The Department will continue to pursue this option.

51. **Comment:** We strongly encourage the Department to organize additional stakeholder meetings with representatives from all segments of the regulated community in order to develop final-form regulations that are clear, reasonable and have the least adverse economic impact while protecting the public health, safety and welfare. We ask the Board to address the reasonableness, economic impact and implementation of changes made to these sections of the final-form regulation in the revised Preamble. (40)

    Response: The fees and other proposed amendments were thoroughly discussed with TAC and other stakeholders through several advisory committee meetings and a public webinar. Advisory committee meetings were announced publicly and are open to the public. Through the webinar and a series of letters from EPA and the resulting news articles regarding the Department's limited resources and resulting poor performance, information about the proposed rulemaking was broadcast

statewide. The additional focus from the news media resulted in several comments being submitted from the general public, which rarely happens with proposed drinking water regulations. With regard to reasonableness, economic impact and implementation of changes made to the rulemaking, please refer to the responses to Comments #16 and 24, and the preamble for the final-form rulemaking.

52. **Comment:** If significant revisions to the regulation are being considered as a result of this input, the regulated community and other interested parties should be afforded an opportunity to review and comment on the text of the regulation through publication of an Advanced Notice of Final Rulemaking (ANFR). An ANFR would provide the opportunity to review and reach consensus on remaining issues before submittal of a final-form regulation. (40)

    Response: The Department amended several sections of the proposed rulemaking in order to be responsive to TAC and public comments. TAC was generally supportive of the amendments that were made to the general update provisions of the final-form rulemaking regarding turbidity requirements and the use of the "reserve" designation for select sources and entry points. The Department does not believe that the amendments require publication through an ANFR.

53. **Comment:** We ask the Board to ensure that the final-form RAF and regulation make clear who is required to comply with the regulation and how the final-form regulation affects the various segments of the regulated community. We ask the Board to consider regulatory methods to minimize adverse impacts on small businesses or explain the reasonableness of not considering alternatives. (40)

    Response: The various definitions and types of PWSs that must comply with the SDWA and regulations are not being amended by this final-form rulemaking. The existing State and Federal regulatory definitions and guidance provide more information about the types of water systems subject to the regulatory requirements. In general, nontransient noncommunity water systems include facilities that serve 25 or more of the same people, but are not residential facilities. This includes schools and places of business with 25 or more employees. Transient noncommunity water systems generally serve a transient population and include restaurants and campgrounds. Finally, the fees for small water systems and businesses were established to bear a reasonable relationship to the actual cost of services provided by the Department and in a manner that minimizes the adverse impact on water systems with fewer customers to bear the cost. Please see Section F of the preamble for this final-form rulemaking and see the responses to Questions 17, 24, 26 and 27 of the Regulatory Analysis Form (RAF) for this final-form rulemaking for more information about who is required to comply with the regulation, how the final-form regulation affects the various segments of the regulated community, the costs for the various segments of the regulated community, including small businesses, and consideration of alternative regulatory approaches.

Annex A
TITLE 25. ENVIRONMENTAL PROTECTION
PART I. DEPARTMENT OF ENVIRONMENTAL PROTECTION
Subpart C. PROTECTION OF NATURAL RESOURCES
ARTICLE II. WATER RESOURCES
CHAPTER 109. SAFE DRINKING WATER
Subchapter A. GENERAL PROVISIONS

§ 109.1. Definitions.

The following words and terms, when used in this chapter, have the following meanings, unless the context clearly indicates otherwise:

* * * * *

Nontransient noncommunity water system—A noncommunity water system that regularly serves at least 25 of the same persons over 6 months per year.

***PDWEP*—Guidelines for Public Drinking Water Equipment Performance issued by NSF.**

Person—An individual, partnership, association, company, corporation, municipality, municipal authority, political subdivision, or an agency of Federal or State government. The term includes the officers, employees and agents of a partnership, association, company, corporation, municipality, municipal authority, political subdivision, or an agency of Federal or State government.

* * * * *

Source—The place from which water for a public water system originates or is derived, including, but not limited to, a well, spring, stream, reservoir, pond, lake or interconnection.

***Source water assessment*—An evaluation documented in writing of the contamination potential of a drinking water source used by a public water system which includes identifying the contributing area to the water source, an inventory of potential contaminant sources and a determination of the susceptibility of the water source to contamination.**

***Source water protection area*—A surface water intake protection area or a wellhead protection area, or both.**

***Source water protection program*—A surface water intake protection program or a wellhead protection program, or both.**

Spent filter backwash water—A stream containing particles dislodged from filter media when the filter is backwashed to clean the filter.

Substantial modification—A change in a public water system that may affect the quantity or quality of water served to the public or which may be prejudicial to the public health or safety and includes the addition of new sources; the expansion of existing facilities; changes in treatment processes; addition, removal, renovation or substitution of equipment or facilities; and interconnections.

Surface water—Water open to the atmosphere or subject to surface runoff. The term does not include finished water.

***Surface water intake protection area*—The surface and subsurface area surrounding a surface-water intake supplying a public water system through which contaminants are reasonably likely to move toward and reach the water source. A surface water intake protection area must consist of up to three zones:**

(i) *Zone A.* A 1/4-mile wide area inland from the edge of a waterway or surface water body and from an area 1/4-mile downstream of the intake to a 5-hour time-of-travel upstream.

(ii) *Zone B.* A 2-mile wide area inland from the edge of a waterway or surface water body and extending upstream to the 25-hour time-of-travel.

(iii) *Zone C.* For drainage basins greater than or equal to 100 square miles, the remainder of the upstream basin. Zone B and Zone C, if present, comprise the contributing area for the water source.

***Surface water intake protection program*—A comprehensive program designed to protect each surface water source used by a public water system from contamination.**

System—

(i) A group of facilities used to provide water for human consumption including facilities used for collection, treatment, storage and distribution. The facilities shall constitute a system if they are adjacent or geographically proximate to each other and meet at least one of the following criteria:

* * * * *

Wellhead protection area—The surface and subsurface area surrounding a water well, well field, spring or infiltration gallery supplying a public water system, through which contaminants are reasonably likely to move toward and reach the water source. A wellhead protection area **[shall consist of the following]** **must consist of up to three** zones:

(i) *Zone I.* The protective zone immediately surrounding a well, spring or infiltration gallery which shall be a 100-to-400-foot radius depending on site-specific source and aquifer characteristics.

(ii) *Zone II.* The zone encompassing the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery. Zone II shall be a **[1/2 mile]** **1/2-mile** radius around the source unless a more detailed delineation is approved.

(iii) *Zone III.* **[The zone beyond Zone II that contributes surface water and groundwater to Zones I and II.]** **As hydrogeologic conditions warrant, the zone beyond Zone II that provides groundwater recharge to Zones I and II. Zone II and Zone III, if present, comprise the contributing area for the water source.**

Wellhead protection program—A comprehensive program designed to protect **[a]** **each** well, spring or infiltration gallery used by a public water system from contamination.

Wholesale system—A public water system that treats source water as necessary to produce finished water and then delivers some or all of that finished water to another public water system. Delivery may be through a direct connection or through the distribution system of one or more public water systems.

§ 109.5. Organization of chapter.

(a) This subchapter and **[Subchapter H]** **Subchapters H and N** (relating to laboratory certification**; and drinking water fees**) apply to all public water systems.

* * * * *

Subchapter B. MCLs, MRDLs OR TREATMENT TECHNIQUE REQUIREMENTS

§ 109.202. State MCLs, MRDLs and treatment technique requirements.

* * * * *

(c) *Treatment technique requirements for pathogenic bacteria, viruses and protozoan cysts.* A public water system shall provide adequate treatment to reliably protect users from the adverse health effects of microbiological contaminants, including pathogenic bacteria, viruses and protozoan cysts. The number and type of treatment barriers and the efficacy of treatment provided shall be commensurate with the type, degree and likelihood of contamination in the source water.

(1) A public water supplier shall provide, as a minimum, continuous filtration and disinfection for surface water and GUDI sources. The treatment technique must provide at least 99.9% removal and inactivation of *Giardia lamblia* cysts, and at least 99.99% removal and inactivation of enteric viruses. Beginning January 1, 2002, public water suppliers serving 10,000 or more people shall provide at least 99% removal of *Cryptosporidium* oocysts. Beginning January 1, 2005, public water suppliers serving fewer than 10,000 people shall provide at least 99% removal of *Cryptosporidium* oocysts. The Department, depending on source water quality conditions, may require additional treatment as necessary to meet the requirements of this chapter and to protect the public health.

(i) The filtration process shall meet the following performance requirements:

(A) *Conventional or direct filtration.*

* * * * *

(IV) Beginning January 1, 2005, for public water systems serving fewer than 10,000 persons, the filtered water turbidity shall meet the following criteria:

(-a-) Be less than or equal to 0.3 NTU in at least 95% of the measurements taken each month under § 109.301(1).

(-b-) Be less than or equal to 1 NTU at all times, measured under § 109.301(1).

~~**(V) Beginning (*Editor's Note:* The blank refers to 1 year after the effective date of adoption of this proposed rulemaking.), for all public water systems, the filtered water turbidity must meet the following criteria:**~~

~~**(-a-) Be less than or equal to 0.30 NTU in at least 95% of the measurements taken each month under § 109.301(1).**~~

~~**(-b-) Be less than or equal to 1.0 NTU at all times measured under § 109.301(1).**~~

(B) *Slow sand or diatomaceous earth filtration.*

(I) The filtered water turbidity shall be less than or equal to 1.0 NTU in 95% of the measurements taken each month under § 109.301(1).

(II) The filtered water turbidity shall be less than or equal to 2.0 NTU at all times, measured under § 109.301(1).

(C) *Membrane filtration.*

(I) Beginning (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for all public water systems, the filtered water turbidity must be less than or equal to 0.15 NTU in at least 95% of the measurements taken each month under § 109.301(1).

(II) Beginning (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for all public water systems, the filtered water turbidity must be less than or equal to 1.0 NTU at all times, measured under § 109.301(1).

[(C)] **(D)** *Other filtration technologies.* The same performance criteria as those given for conventional filtration and direct filtration in clause (A) shall be achieved unless the Department specifies more stringent performance criteria based upon onsite studies, including pilot plant studies, where appropriate.

(ii) The combined total effect of disinfection processes utilized in a filtration plant shall achieve at least a 90% inactivation of Giardia cysts and a 99.9% inactivation of viruses, as determined by CTs and measurement methods established by the EPA. The residual disinfectant concentration in the water delivered to the distribution system prior to the first customer may not be less than .2 mg/L for more than 4 hours, as demonstrated by measurement taken under § 109.301(1). Failure to maintain this level that extends beyond 4 hours constitutes a breakdown in treatment. A system that experiences a breakdown in treatment shall, under § 109.701(a)(3) (relating to reporting and recordkeeping), notify the Department within 1 hour after the water system learns of the violation or the situation, and shall provide public notice in accordance with § 109.408 (relating to Tier 1 public notice—categories, timing and delivery of notice).

(iii) For an unfiltered surface water source permitted for use prior to March 25, 1989, the public water supplier shall:

* * * * *

(B) Provide continuous filtration and disinfection in accordance with this paragraph according to the following schedule:

(I) By December 31, 1991, for a public water system that, prior to March 25, 1989, had a waterborne disease outbreak or Giardia contamination in its surface water source.

(II) Within 48 months after the discovery of one of the following conditions, or by December 31, 1995, whichever is earlier, for a public water system that experiences the condition after March 25, 1989.

(-a-) A waterborne disease outbreak.

(-b-) Giardia contamination in its surface water source.

(-c-) A violation of the microbiological MCL, the turbidity MCL or the monitoring or reporting requirements for the microbiological MCL.

(-d-) A violation of the source microbiological or turbidity monitoring requirements under **[§ 109.301(2)(i)(A) and (B)]** **<u>§ 109.301(2)(i)</u>** or the related reporting requirements.

* * * * *

§ 109.204. Disinfection profiling and benchmarking.

(a) The disinfection profiling and benchmarking requirements, established by the EPA under the National Primary Drinking Water Regulations in 40 CFR 141.172, 141.530—141.536, 141.540—141.544, 141.570(c) and (d) **[and]**, 141.708 **[—]** **<u>and</u>** 141.709 are incorporated by reference except as otherwise established by this chapter.

(b) Public water suppliers that did not conduct TTHM and HAA5 monitoring under this section because they served fewer than 10,000 persons when the monitoring was required, but serve 10,000 or more persons before January 1, 2005, shall comply with this section. These suppliers shall also establish a disinfection benchmark **[and consult with the Department for approval]**. **[A supplier that decides to make a significant change to its disinfection practice, as described in this section, shall consult with the Department before making such a change.]**

(c) The public water supplier shall conduct disinfection profiling in accordance with the procedures and methods in the most current edition of the *Disinfection Profiling and Benchmarking Guidance Manual* published by the EPA. The results of the disinfection profiling and the benchmark, including raw data and analysis, shall be retained indefinitely on the water system premises or at a convenient location near the premises. Public water suppliers serving 10,000 or more persons and required to conduct disinfection profiling shall submit the disinfection profiling data and the benchmark data to the Department by June 1, 2001, in a format acceptable to the Department. Public water suppliers serving 500 to 9,999 persons shall submit the disinfection profiling data and the benchmark to the Department by October 1, 2004. Public water suppliers serving less than 500 persons shall submit the disinfection profiling data and the benchmark to the Department by April 1, 2005, in a format acceptable to the Department.

(d) A public water supplier that obtains a permit or permit modification for filtration treatment for a surface water or GUDI source after (*Editor's Note*: The blank refers to the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), shall submit documentation with the permit application relative to operational parameters which will be used to maintain *Giardia lamblia* inactivation throughout the expected range of operating conditions.

(e) A public water supplier using surface water or GUDI sources shall consult with the Department before making a significant change to its disinfection practice or operating treatment processes in a manner that may result in an inactivation level that is lower than the level needed to meet the *Giardia lamblia* inactivation requirements specified in § 109.202(c)(1)(ii) (relating to State MCLs, MRDLs and treatment technique requirements). As part of the consultation, the water supplier shall submit the following information to the Department:

(1) A completed disinfection profile and disinfection benchmark for *Giardia lamblia* and viruses.

(2) A description of the proposed change.

(3) An analysis of how the proposed change will affect the current level of disinfection.

Subchapter C. MONITORING REQUIREMENTS

§ 109.301. General monitoring requirements.

Public water suppliers shall monitor for compliance with MCLs, MRDLs and treatment technique requirements in accordance with the requirements established by the EPA under the National Primary Drinking Water Regulations, 40 CFR Part 141 (relating to National primary drinking water regulations), except as otherwise established by this chapter unless increased monitoring is required by the Department under § 109.302 (relating to special monitoring requirements). Alternative monitoring requirements may be established by the Department and may be implemented in lieu of monitoring requirements for a particular National Primary Drinking Water Regulation if the alternative monitoring requirements are in conformance with the Federal act and regulations. The monitoring requirements shall be applied as follows:

(1) *Performance monitoring for filtration and disinfection.* A public water supplier providing filtration and disinfection of surface water or GUDI sources shall conduct the performance monitoring requirements established by the EPA under the National Primary Drinking Water Regulations, unless increased monitoring is required by the Department under § 109.302.

(i) Except as provided under **[subparagraphs (ii) and (iii)]** **subparagraph (ii),** a public water supplier:

(A) Shall determine and record the turbidity level of representative samples of the system's filtered water as follows **until (*Editor's Note:* The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.)**:

(I) For systems that operate continuously, at least once every 4 hours that the system is in operation, except as provided in clause (B).

(II) For systems that do not operate continuously, at start-up, at least once every 4 hours that the system is in operation, and also prior to shutting down the plant, except as provided in clause (B).

(B) May substitute continuous turbidity monitoring and recording for grab sample monitoring and manual recording **until (*Editor's Note:* The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.),** if it validates the continuous measurement for accuracy on a regular basis using a procedure specified by the manufacturer. At a minimum, calibration with an EPA-approved primary standard shall be conducted at least quarterly. For systems using slow sand filtration or filtration treatment other than conventional filtration, direct filtration or diatomaceous earth filtration, the Department may reduce the sampling frequency to once per day.

(C) Shall continuously monitor the turbidity level of the combined filter effluent beginning (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), using an analytical method specified in 40 CFR 141.74(a) (relating to analytical and monitoring requirements) and record the results at least every 15 minutes while the plant is operating. For systems that do not operate continuously, the turbidity level shall also be measured and recorded at start-up and immediately prior to shutting down the plant.

[(C)] **(D)** Shall continuously monitor and record the residual disinfectant concentration of the water being supplied to the distribution system and record both the lowest value for each day and the number of periods each day when the value is less than .2 mg/L for more than 4 hours. If a public water system's continuous monitoring or recording equipment fails, the public water supplier may, upon notification of the Department under § 109.701(a)(3) (relating to reporting and recordkeeping), substitute grab sampling or manual recording every 4 hours in lieu of continuous monitoring. Grab sampling or manual recording may not be substituted for continuous monitoring or recording for longer than 5 days after the equipment fails.

[(D)] **(E)** Shall measure and record the residual disinfectant concentration at representative points in the distribution system no less frequently than the frequency required for total coliform sampling for compliance with the MCL for microbiological contaminants.

[(ii) For a public water supplier serving 3,300 or fewer people, the Department may reduce the residual disinfectant concentration monitoring for the water being supplied to the distribution system to a minimum of 2 hours between samples at the grab sampling frequencies prescribed as follows if the historical performance and operation of the system indicate the system can meet the residual disinfectant concentration at all times:

System Size (People)	*Samples/Day*
<500	**1**
500—1,000	**2**
1,001—2,500	**3**
2,501—3,300	**4**

If the Department reduces the monitoring, the supplier shall nevertheless collect and analyze another residual disinfectant measurement as soon as possible, but no longer than 4 hours from any measurement which is less than .2 mg/L.

(iii) For] **(ii) Until** _____ **(*Editor's Note:* The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for** a public water supplier serving fewer than 500 people, the Department may reduce the filtered water turbidity monitoring to one grab sample per day, if the historical performance and operation of the system indicate effective turbidity removal is maintained under the range of conditions expected to occur in the system's source water.

[(iv)] **(iii)** A public water supplier providing conventional filtration treatment or direct filtration and serving 10,000 or more people and using surface water or GUDI sources shall, beginning January 1, 2002, conduct continuous monitoring of turbidity for each individual filter using an approved method under the EPA regulation in 40 CFR 141.74(a) **[(relating to analytical and monitoring requirements)]** and record the results at least every 15 minutes. Beginning January 1, 2005, public water suppliers providing conventional or direct filtration and serving fewer than 10,000 people and using surface water or GUDI sources shall conduct continuous monitoring of turbidity for each individual filter using an approved method under the EPA regulation in 40 CFR 141.74(a) and record the results at least every 15 minutes. **Beginning** _____

(*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), a public water supplier using surface water or GUDI sources and providing filtration treatment other than conventional or direct filtration shall conduct continuous monitoring of turbidity for each individual filter using an approved method under 40 CFR 141.74(a) and record the results at least every 15 minutes.

[(A) The water supplier shall calibrate turbidimeters using the procedure specified by the manufacturer. At a minimum, calibration with an EPA-approved primary standard shall be conducted at least quarterly.

(B) If there is failure in the continuous turbidity monitoring or recording equipment, or both, the system shall conduct grab sampling or manual recording, or both, every 4 hours in lieu of continuous monitoring or recording.

(C) A public water supplier serving 10,000 or more persons has a maximum of 5 working days following the failure of the equipment to repair or replace the equipment before a violation is incurred.

(D) A public water supplier serving fewer than 10,000 persons has a maximum of 14 days following the failure of the equipment to repair or replace the equipment before a violation is incurred.]

(iv) In addition to the requirements of subparagraphs (i)—(iii), a public water supplier shall conduct grab sampling or manual recording, or both, every 4 hours in lieu of continuous monitoring or recording if there is a failure in the continuous monitoring or recording equipment, or both. The public water supplier shall notify the Department within 24 hours of the equipment failure. Grab sampling or manual recording may not be substituted for continuous monitoring for longer than 5 working days after the equipment fails. The Department will consider case-by-case extensions of the time frame to comply if the water supplier provides written documentation that it was unable to repair or replace the malfunctioning equipment within 5 working days due to circumstances beyond its control.

(2) *Performance monitoring for unfiltered surface water and GUDI.* A public water supplier using unfiltered surface water or GUDI sources shall conduct the following source water and performance monitoring requirements on an interim basis until filtration is provided, unless increased monitoring is required by the Department under § 109.302:

(i) Except as provided under subparagraphs (ii) and (iii), a public water supplier:

(A) Shall perform fecal coliform or total coliform density determinations on samples of the source water immediately prior to disinfection. Regardless of source water turbidity, the minimum frequency of sampling for fecal or total coliform determination may be no less than the following:

System Size (People)	*Samples/Week*
<500	1
500—3,299	2
3,300—10,000	3
10,001—25,000	4
25,001 or more	5

(B) Shall measure the turbidity of a representative grab sample of the source water immediately prior to disinfection as follows **until _____ (*Editor's Note:* The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.)**:

(I) For systems that operate continuously, at least once every 4 hours that the system is in operation, except as provided in clause (C).

(II) For systems that do not operate continuously, at start-up, at least once every 4 hours that the system is in operation, and also prior to shutting down the plant, except as provided in clause (C).

(C) May substitute continuous turbidity monitoring for grab sample monitoring **until _____ (*Editor's Note:* The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.),** if it validates the continuous measurement for accuracy on a regular basis using a procedure specified by the manufacturer. At a minimum, calibration with an EPA-approved primary standard shall be conducted at least quarterly.

(D) Shall continuously monitor and record the turbidity of the source water immediately prior to disinfection beginning _____ (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), using an analytical method specified in 40 CFR 141.74(a) and record the results at least every 15 minutes while the source is operating. If there is a failure in the continuous turbidity monitoring or recording equipment, or both, the supplier shall conduct grab sampling or manual recording, or both, every 4 hours in lieu of continuous monitoring or recording. The public water supplier shall notify the Department within 24 hours of the equipment failure. Grab sampling or manual recording may not be substituted for continuous monitoring for longer than 5 working days after the equipment fails. The Department will consider case-by-case extensions of the time frame to comply if the water supplier provides written documentation that it was unable to repair or replace the malfunctioning equipment within 5 working days due to circumstances beyond its control.

[(D)] (E) Shall continuously monitor and record the residual disinfectant concentration required under § 109.202(c)(1)(iii) (relating to State MCLs, MRDLs and treatment technique requirements) of the water being supplied to the distribution system and record the lowest value for each day. If a public water system's continuous monitoring or recording equipment fails, the public water supplier may, upon notification of the Department under § 109.701(a)(3), substitute grab sampling or manual recording, or both, every 4 hours in lieu of continuous monitoring.

Grab sampling or manual recording may not be substituted for continuous monitoring for longer than 5 days after the equipment fails.

[(E)] (F) Shall measure the residual disinfectant concentration at representative points in the distribution system no less frequently than the frequency required for total coliform sampling for compliance with the MCL for microbiological contaminants.

(ii) **[For] Until** ***(Editor's Note:*** **The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for** a public water supplier serving 3,300 or fewer people, the Department may reduce the residual disinfectant concentration monitoring for the water being supplied to the distribution system to a minimum of 2 hours between samples at the grab sampling frequencies prescribed as follows if the historical performance and operation of the system indicate the system can meet the residual disinfectant concentration at all times:

System Size (People)	*Samples/Day*
<500	1
500—1,000	2
1,001—2,500	3
2,501—3,300	4

If the Department reduces the monitoring, the supplier shall nevertheless collect and analyze another residual disinfectant measurement as soon as possible, but no longer than 4 hours from any measurement which is less than the residual disinfectant concentration approved under § 109.202(c)(1)(iii).

(iii) **[For] Until** ***(Editor's Note:*** **The blank refers to 1 year after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for** a public water supplier serving fewer than 500 people, the Department may reduce the source water turbidity monitoring to one grab sample per day, if the historical performance and operation of the system indicate effective disinfection is maintained under the range of conditions expected to occur in the system's source water.

* * * * *

(11) *Monitoring requirements for entry points that do not provide water continuously.*

~~(i)~~ Entry points from which water is not provided during every quarter of the year shall monitor in accordance with paragraphs (5)—(7) **and (14)**, except that monitoring is not required during a quarter when water is not provided to the public, unless special monitoring is required by the Department under § 109.302.

~~**(ii) At a minimum, all entry points shall provide water to the public on an annual basis to ensure all sources and entry points are included in routine compliance monitoring.**~~

(12) *Monitoring requirements for disinfection byproducts and disinfection byproduct precursors.* Community water systems and nontransient noncommunity water systems that use a chemical disinfectant or oxidant shall monitor for disinfection byproducts and disinfection byproduct precursors in accordance with this paragraph. Community water systems and nontransient noncommunity water systems that obtain finished water from another public water system that uses a chemical disinfectant or oxidant to treat the finished water shall monitor for TTHM and HAA5 in accordance with this paragraph. Systems that use either surface water or GUDI sources and that serve at least 10,000 persons shall begin monitoring by January 1, 2002. Systems that use either surface water or GUDI sources and that serve fewer than 10,000 persons, or systems that use groundwater sources, shall begin monitoring by January 1, 2004. Systems monitoring for disinfection byproducts and disinfection byproduct precursors shall take all samples during normal operating conditions. Systems monitoring for disinfection byproducts and disinfection byproduct precursors shall use only data collected under this chapter to qualify for reduced monitoring. Compliance with the MCLs and monitoring requirements for TTHM, HAA5, chlorite (where applicable) and bromate (where applicable) shall be determined in accordance with 40 CFR 141.132 and 141.133 (relating to monitoring requirements; and compliance requirements) which are incorporated herein by reference.

* * * * *

(15) *MONITORING REQUIREMENTS FOR RESERVE ENTRY POINTS AND ENTRY POINTS SUPPLIED BY ONE OR MORE RESERVE SOURCES.* BEGINNING _____, (*EDITOR'S NOTE:* THE BLANK REFERS TO 1 YEAR AFTER THE EFFECTIVE DATE OF THIS FINAL-FORM RULEMAKING.), A WATER SUPPLIER USING RESERVE SOURCES OR RESERVE ENTRY POINTS AS DEFINED AND IDENTIFIED IN THE COMPREHENSIVE MONITORING PLAN IN § 109.717(A) SHALL:

(I) MONITOR RESERVE ENTRY POINTS AT THE INITIAL FREQUENCIES SPECIFIED IN PARAGRAPHS (5) – (7) AND (14).

(II) MONITOR PERMANENT ENTRY POINTS AT THE INITIAL FREQUENCIES SPECIFIED IN PARAGRAPHS (5) – (7) AND (14) WHILE THE ENTRY POINT IS RECEIVING WATER FROM A RESERVE SOURCE.

(III) CONDUCT SPECIAL MONITORING AS REQUIRED BY THE DEPARTMENT UNDER § 109.302.

§ 109.302. Special monitoring requirements.

(a) The Department may require a public water supplier to conduct monitoring in addition to that required by § 109.301 (relating to general monitoring requirements) if the Department has reason to believe the public water system is not in compliance with the **action level,** MCL, MRDL or treatment technique requirement for the contaminant.

* * * * *

§ 109.303. Sampling requirements.

(a) **[The samples taken to determine a public water system's compliance with MCLs or MRDLs or to determine compliance with monitoring requirements shall be taken at the locations identified in §§ 109.301 and 109.302 (relating to general monitoring requirements; and special monitoring requirements), or as follows:]** **The samples taken to determine a public water system's compliance with MCLs, MRDLs or treatment technique requirements or to determine compliance with monitoring requirements shall be taken at the locations identified in §§ 109.301, 109.302, 109.1003, 109.1103, 109.1202 and 109.1303 and as follows:**

* * * * *

(4) Samples for determining compliance with MCLs for organic contaminants listed by the EPA under 40 CFR 141.61 (relating to maximum contaminant levels for organic contaminants) **[and]**, inorganic contaminants listed by the EPA under 40 CFR 141.62 (relating to maximum contaminant levels (MCLs) for inorganic contaminants)**, radionuclide contaminants listed by the EPA under 40 CFR 141.66 (relating to maximum contaminant levels for radionuclides)** and with the special monitoring requirements for unregulated contaminants under § 109.302(f) **(relating to special monitoring requirements)** shall be taken at each entry point to the distribution system **which is representative of each source** after an application of treatment during periods of normal operating conditions. **[If a system draws water from more than one source and the sources are combined prior to distribution, the system shall sample at the entry point where the water is representative of combined sources being used during normal operating conditions.]** **If a system draws water from more than one source and the sources are combined prior to distribution, the system shall sample at the entry point during periods of normal operating conditions when water is representative of all sources being used.** ~~**If sources are blended at a consistent ratio prior to the entry point, a blended sample may be taken to determine compliance. If sources are not blended at a consistent ratio or if sources are alternated prior to the entry point, more than one sample shall be taken to ensure that the samples are representative of all sources.**~~

* * * * *

(h) Samples taken to determine compliance with beta particle and photon radioactivity under 40 CFR 141.66(d) may be composited as follows:

(1) Monitoring for gross beta-particle activity may be based on the analysis of a composite of 3 monthly samples.

(2) Monitoring for strontium-90 and tritium may be based on the analysis of a composite of 4 consecutive quarterly samples.

(i) Samples taken to determine compliance with this chapter shall be taken in accordance with a written comprehensive monitoring plan as specified in § 109.717~~**(relating to**~~

~~comprehensive monitoring plan~~). **These plans are subject to Department review and revision.**

§ 109.304. Analytical requirements.

* * * * *

(c) For the purpose of determining compliance with the monitoring and analytical requirements established under this subchapter and Subchapters K, L and M (relating to lead and copper; long-term 2 enhanced surface water treatment rule; and additional requirements for groundwater sources), the Department will consider only samples analyzed by a laboratory accredited by the Department, except that measurements for turbidity, fluoridation operation, residual disinfectant concentration, temperature, pH, alkalinity, orthophosphates, silica, calcium, conductivity, daily chlorite[,] and magnesium hardness may be performed by a person meeting one of the following requirements:

(1) A person meeting the requirements of § 109.704 (relating to operator certification).

(2) A person using a standard operating procedure as provided under authority of the Water and Wastewater Systems Operators' Certification Act (63 P.S. §§ 1001—1015.1) **and the regulations promulgated thereunder**.

(3) An environmental laboratory meeting the requirements of Chapter 252 (relating to environmental laboratory accreditation).

(d) A system shall have *Cryptosporidium* samples analyzed by a laboratory that is approved under the EPA's Laboratory Quality Assurance Evaluation Program for Analysis of *Cryptosporidium* in Water or a laboratory that has been accredited for *Cryptosporidium* analysis by an equivalent Department laboratory accreditation program.

(e) A water supplier shall calibrate all turbidimeters used for compliance monitoring using the procedure specified by the manufacturer. At a minimum, calibration with an EPA-approved primary standard shall be conducted at least every 90 days. The Department may extend this 90-day calibration frequency if the calibration due date coincides with a holiday or weekend, or during a water system emergency which prevents timely calibration.

§ 109.305. **[Fees]** **(Reserved)**.

[(a) ***Data management fees.*** **Community water systems shall submit the following data management fees to the Department by December 31, 1995:**

System Size (population served)	*Fee*
<100	**$ 120**
100—1,000	**$ 120**
1,001—3,300	**$ 240**

3,301—10,000	**$ 360**
10,001—50,000	**$ 600**
>50,000	**$1,200**

(b) *Waivers.* A request for a waiver from the monitoring requirements in § § 109.301 and 109.302 (relating to general monitoring requirements; and special monitoring requirements) shall be accompanied by the appropriate fee as follow:

System Size (population served)	***Fee***
<100	**$ 100**
100—1,000	**$ 200**
1,001—3,300	**$ 400**
3,301—10,000	**$ 500**
10,001—50,000	**$1,000**
>50,000	**$2,000**

Fees will be based on system size, taking into consideration the following conditions:

(1) For systems with one or more sources all in the same contribution area—for groundwater systems, the contribution area is the surface area overlying the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery—the fee will be as indicated in this subsection.

(2) For systems with a single wellfield—one contribution area—the fee will be as indicated in this subsection.

(3) For systems with sources in two or more contribution areas, the fee will be as indicated in this subsection plus 1/2 of the system size fee as indicated in this subsection for each additional contribution area in which a source is located.]

Subchapter D. PUBLIC NOTIFICATION

§ 109.416. CCR requirements.

This section applies only to community water systems and establishes the minimum requirements for the content of the annual CCR that each system **[must]** **<u>shall</u>** deliver to its customers. This report **[shall]** **<u>must</u>** contain information on the quality of the water delivered by the system and characterize the risks, if any, from exposure to contaminants detected in the drinking water in an accurate and understandable manner.

* * * * *

(4) [***Report delivery and recordkeeping.***] Each community water system shall do the following:

(i) Mail or otherwise directly deliver to each customer **[and to the Department one copy of the annual CCR no later than the date the water system is required to distribute the CCR to its customers]** **one copy of the annual CCR no later than the date specified in paragraph (2)**.

(ii) Mail a paper copy of the annual CCR to the Department no later than the date the water system is required to distribute the CCR to its customers.

[(ii)] **(iii)** Make a good faith effort to reach consumers who do not get water bills. The Department will determine "good faith" based on those methods identified in 40 CFR 141.155(b) (relating to **report** delivery **[requirements]** **and recordkeeping**), which are incorporated by reference.

[(iii)] **(iv)** Submit in writing to the Department no later than 3 months after the delivery of the annual CCR:

(A) A certification that the annual CCR has been distributed to customers and that the information contained in the report is correct and consistent with the compliance monitoring data previously submitted to the Department.

(B) A description of what was done to meet the good faith effort requirement described in subparagraph **[(ii)]** **(iii)**.

[(iv)] **(v)** If another State agency or commission also regulates the community water system, submit a copy of the system's annual CCR to the other agency or commission upon the specific request of that agency or commission no later than the date the water system is required to distribute the CCR to its customers. Each State agency or commission shall determine the way it requests a copy of the system's CCR. Those agencies or commissions may include, but are not limited to, the following:

(A) The Pennsylvania Public Utility Commission and the Office of Consumer Advocate in the Office of the Attorney General, for water systems that are public utilities regulated under 66 Pa.C.S. (relating to Public Utility Code).

(B) The Department of **[Public Welfare]** **Human Services,** for self-contained community water systems serving personal care or other group housing facilities.

(C) The Department of Health, for self-contained community water systems serving skilled healthcare facilities.

[(v)] **(vi)** Make copies of its annual CCR available to the public on request.

[(vi)] **(vii)** If a community water system serves 100,000 or more people, post its current year's report to a publicly accessible site on the Internet.

[(vii)] **(viii)** Retain copies of each annual CCR and the related information required in paragraph (3) on the premises of the system or at a convenient location near the premises for no less than 3 years after the date of its delivery to customers.

Subchapter E. PERMIT REQUIREMENTS

§ 109.503. Public water system construction permits.

(a) *Permit application requirements.* An application for a public water system construction permit shall be submitted in writing on forms provided by the Department and shall be accompanied by plans, specifications, engineer's report, water quality analyses and other data, information or documentation reasonably necessary to enable the Department to determine compliance with the act and this chapter. The Department will make available to the applicant the *Public Water Supply Manual*, available from the Bureau of **[Water Standards and Facility Regulation]** **Safe Drinking Water**, Post Office Box **[8774]** **8467**, Harrisburg, Pennsylvania 17105 which contains acceptable design standards and technical guidance. Water quality analyses shall be conducted by a laboratory accredited under this chapter.

(1) *General requirements.* An application must include:

* * * * *

(iii) *Information describing new sources.* **Information describing new sources must include the items specified in clauses (A)—(F). The information specified in clauses (C) and (D) may not be more than 2 years old from the date the permit application is submitted unless the Department approves the use of data more than 2 years old.** The Department may accept approval of an out-of-State source by the agency having jurisdiction over drinking water in that state if the supplier submits adequate proof of the approval and the agency's standards are at least as stringent as this chapter. **[Information describing sources must include:**

(A) A comprehensive sanitary survey of the physical surroundings of each new source of raw water and its proximity to potential sources of contamination. For surface water, this information shall include a description of the watershed topography and land uses within the watershed. For systems using wells, springs or infiltration galleries, this information shall include a hydrogeological report prepared and signed by a professional geologist who has complied with the requirements of the Engineer, Land Surveyor and Geologist Registration Law (63 P.S. §§ 148—158.2) describing the geology of the area including the source aquifers, overlying formations, hydrogeologic boundaries, aquifer porosity estimates, water table contour or potentiometric surface maps depicting prepumping conditions and other information deemed necessary to evaluate the hydraulic characteristics of the aquifer and demonstrate the suitability of the proposed source. At the discretion of the Department, these requirements may be altered for a proposed well, wellfield, spring or infiltration gallery that will be pumping less than or yielding less than 100,000 gallons per day.

(B) An evaluation of the quality of the raw water from each new source. This clause does not apply when the new source is finished water obtained from an existing permitted community water system unless the Department provides written notice that an evaluation is required. The evaluation must include analysis of the following:

(I) VOCs for which MCLs have been established by the EPA under the National Primary Drinking Water Regulations in 40 CFR 141.61(a) (relating to maximum contaminant levels for organic contaminants). Vinyl chloride monitoring is required only if one or more of the two-carbon organic compounds specified under § 109.301(5)(i) (relating to general monitoring requirements) are detected. Samples for VOCs shall be collected in accordance with § 109.303(d) (relating to sampling requirements).

(II) Except for asbestos, IOCs for which MCLs have been established by the EPA under the National Primary Drinking Water Regulations in 40 CFR 141.62 (relating to maximum contaminant levels for inorganic contaminants). The new source shall be monitored for asbestos if the Department has reason to believe the source water is vulnerable to asbestos contamination.

(III) Lead.

(IV) Copper.

(V) Total coliform concentration and, if total coliform-positive, analyze for the presence of *E. coli*.

(VI) SOCs.

(-a-) Except for SOCs that have been granted a Statewide waiver, SOCs for which MCLs have been established by the EPA under the National Primary Drinking Water Regulations in 40 CFR 141.61(c).

(-b-) Dioxin where there is a source of dioxin contamination within 1,000 feet of a groundwater source or within 1 mile upstream of a surface water source.

(-c-) Polychlorinated biphenyls (PCBs) where there is a source of PCB contamination within 1,000 feet of a groundwater source or within 1 mile upstream of a surface water source.

(VII) Gross Alpha (α), radium-226, radium-228, uranium and Gross Beta (ß).

(VIII) Aluminum, chloride, color, foaming agents, iron, manganese, pH, silver, sulfate, total dissolved solids and zinc for which MCLs have been established by the EPA under the National Secondary Drinking Water Regulations in 40 CFR 143.3 (relating to secondary maximum containment levels).

(IX) Alkalinity.

(X) Hardness.

(XI) Temperature.

(XII) For surface water or GUDI sources, *E. coli* or *Cryptosporidium*, or both, as specified in § 109.1202 (relating to monitoring requirements).

(XIII) Other contaminants that the Department determines necessary to evaluate the potability of the source.]

(A) A source water assessment of each new raw water source.

(B) A pre-drilling plan for a new groundwater source prepared and signed by a professional geologist licensed to practice in this Commonwealth. The pre-drilling plan shall be submitted and approved by the Department prior to well construction and conducting an aquifer test. At a minimum, the pre-drilling plan must include preliminary results of the source water assessment, a hydrogeologic description, an aquifer test monitoring plan and the proposed well construction design.

(C) An evaluation of the quantity of the raw water from each new source. Flow data shall be submitted for springs, infiltration galleries or surface water sources. Aquifer test data, including drawdown and recovery data and the derivation of hydraulic conductivity, transmissivity and storage coefficient of the aquifer, shall be submitted for wells. At the discretion of the Department, these requirements may be altered for wells or wellfields pumping less than 100,000 gallons per day. The Department may require **[that other information be submitted]** **additional information** to evaluate the safe **or sustainable** yield of the source. The safe **or sustainable** yield is the amount of water that can be withdrawn from an aquifer without causing an undesired result, such as adverse dewatering of an aquifer, induced potential health threats or impacts upon stream uses.

(D) **[A Department approved delineation of the Zone I wellhead protection area for community water system wells, springs or infiltration galleries.]** **An evaluation of the quality of the raw water from each new source. For groundwater sources, the evaluation shall be conducted at the conclusion of the constant rate aquifer test. This clause does not apply when the new source is finished water obtained from an existing permitted community water system unless the Department provides written notice that an evaluation is required. The evaluation must include analysis of all of the following:**

(I) VOCs for which MCLs have been established by the EPA in 40 CFR 141.61(a) (relating to maximum contaminant levels for organic contaminants). Vinyl chloride monitoring is required only if one or more of the two-carbon organic compounds specified in § 109.301(5)(i) (relating to general monitoring requirements) are detected. Samples for VOCs shall be collected in accordance with § 109.303(d) (relating to sampling requirements).

(II) IOCs, including asbestos, for which MCLs have been established by the EPA in 40 CFR 141.62 (relating to maximum contaminant levels for inorganic contaminants).

(III) Lead.

(IV) Copper.

(V) Total coliform and *E. coli* concentration.

(VI) SOCs, including dioxin and PCBs, for which MCLs have been established by the EPA in 40 CFR 141.61(c).

(VII) Gross Alpha (α), radium-226, radium-228, uranium and Gross Beta (ß).

(VIII) Aluminum, chloride, color, foaming agents, iron, manganese, pH, silver, sulfate, total dissolved solids and zinc for which MCLs have been established by the EPA in 40 CFR 143.3 (relating to secondary MCLs).

(IX) Alkalinity.

(X) Hardness.

(XI) Temperature.

(XII) For surface water or GUDI sources, *E. coli* or *Cryptosporidium*, or both, as specified in § 109.1202 (relating to monitoring requirements).

(XIII) Turbidity.

(XIV) For groundwater sources, the monitoring specified in § 109.302(f) (relating to special monitoring requirements) if the Department determines that the source is susceptible to surface water influence.

(XV) Other contaminants that the Department determines necessary to evaluate the potability of the source.

(E) A hydrogeologic report for a new groundwater source. For wells, springs or infiltration galleries, this information must include a description of the geology of the area including the source aquifers, overlying formations, hydrogeologic boundaries, aquifer porosity estimates, water table contour or potentiometric surface maps depicting prepumping conditions and other information deemed necessary to evaluate the hydraulic characteristics of the aquifer and demonstrate the suitability of the proposed source and a Department approved delineation of the Zone 1 and Zone II wellhead protection areas. All information included in the source water assessment, in addition to the results of the water quantity and quality evaluations as specified in clauses (C) and (D), must be included in a

hydrogeological report prepared and signed by a professional geologist licensed to practice in this Commonwealth.

(F) A description of the watershed topography and land uses within the watershed for a new surface water source.

(iv) *Chapter 102 requirements.* An erosion and sedimentation control plan which meets the requirements contained in Chapter 102 (relating to erosion and sediment control) when earth-moving activities are involved.

* * * * *

(b) *Amendments.* A water supplier operating under a public water system permit shall obtain an amended construction permit before making a substantial modification to the public water system.

(1) A water supplier shall submit an application for an amended construction permit under the application requirements in subsection (a), if the proposed modification constitutes a major change to the public water system. Typical modifications which may be considered major changes are proposed new sources, additions or deletions of treatment techniques or processes, pumping stations and storage reservoirs.

(2) A water supplier shall submit a written request to the Department if the proposed modification constitutes a relatively minor change to the public water system. A request for an amended construction permit under this paragraph shall describe the proposed change in sufficient detail to allow the Department to adequately evaluate the proposal. Typical modifications which may be considered minor changes are changes in treatment chemicals; replacement of tank or reservoir linings or similar materials in contact with the water supply; interconnections; covering of reservoirs; construction of covered storage tanks and standpipes designed to standard specifications; transmission mains; and changes in legal status, such as transfers of ownership, incorporation or mergers. **ADDITIONALLY, REQUESTS TO CHANGE THE PERMITTED AVAILABILITY CATEGORY OF A SOURCE, PURCHASED INTERCONNECT, TREATMENT PLANT OR ENTRY POINT IDENTIFIED IN THE COMPREHENSIVE MONITORING PLAN IN ACCORDANCE WITH § 109.717 MAY BE CONSIDERED A MINOR CHANGE.**

(3) The Department determines whether a particular modification is a substantial modification and requires the construction permit to be amended under paragraph (1) or (2). A substantial modification is a modification which may affect the quality or quantity of water served to the public or may be prejudicial to the public health or safety. The Department's determination of whether the substantial modification is a major or minor change will include consideration of the expected amount of staff time required to review and process the proposal, the magnitude and complexity of the proposed change and the compliance history of the public water system.

(c) *Permit fees.* **<u>An application for a permit from the Department under this subchapter must be accompanied by a fee in the amount specified in Subchapter N (relating to drinking water fees).</u>**

[(1) An application for a permit or a major permit amendment under subsection (a)(1), except for an application for construction or modification of corrosion control treatment facilities under § 109.1105 (relating to permit requirements), shall be accompanied by a check in the amount of $750, payable to the "Commonwealth of Pennsylvania," except a fee is not required for an application submitted by a State regulatory agency, or an application submitted for a public water system serving 100 or fewer individuals. The fees for permitting and related services under § 109.1105 for corrosion control treatment facilities are established under § 109.1108 (relating to fees).

(2) A fee is not required for an application for an emergency permit under § 109.506 (relating to emergency permits) or an amendment under subsection (b)(2).]

(d) *Department's review.*

* * * * *

§ 109.505. Requirements for noncommunity water systems.

(a) A noncommunity water system shall obtain a construction permit under § 109.503 (relating to public water system construction permits) and an operation permit under § 109.504 (relating to public water system operation permits), unless the noncommunity water system satisfies paragraph (1) or (2). The Department retains the right to require a noncommunity water system that meets the requirements of paragraph (1) or (2) to obtain a construction and an operation permit, if, in the judgment of the Department, the noncommunity water system cannot be adequately regulated through standardized specifications and conditions. A noncommunity water system which is released from the obligation to obtain a construction and an operation permit shall comply with the other requirements of this chapter, including design, construction and operation requirements described in Subchapters F and G (relating to design and construction standards; and system management responsibilities).

* * * * *

(2) A noncommunity water system not covered under paragraph (1) is not required to obtain a construction and an operation permit if it satisfies the following specifications and conditions:

(i) The sources of supply for the system are groundwater sources requiring treatment no greater than **[disinfection to]** **<u>hypochlorite or ultraviolet light disinfection to reduce total coliform bacteria concentrations to undetectable levels in the finished water, and otherwise</u>** provide water of a quality that meets the primary MCLs established under Subchapter B (relating to MCLs, MRDLs or treatment technique requirements).

(ii) **[The water supplier files a brief description of the system, including raw source quality data, on forms acceptable to the Department. Amendments to the system description shall be filed when a substantial modification is made to the system. Descriptions of new systems or modifications shall be submitted and approved by the Department prior to construction.]** **The water supplier submits a noncommunity water system application, including raw source water quality data, on forms acceptable to the Department, and receives Department approval of the facilities prior to construction or operation. The water supplier shall also submit a noncommunity water system application to the Department for proposed modifications to the system or a change of ownership, and receive Department approval prior to construction or operation.**

(3) A noncommunity water system which satisfies the requirements of paragraphs (1) and (2) shall provide the Department with the following information describing new sources, including an evaluation of the quality of the raw water from each new source. Water quality analyses shall be conducted by a laboratory certified under this chapter. This paragraph does not apply when the new source is finished water obtained from an existing permitted community water system or an existing permitted or approved noncommunity water system unless the Department provides written notice that one or more of the provisions of this paragraph apply.

* * * * *

(ii) For nontransient noncommunity water systems, the evaluation must include the information required under **[§ 109.503(a)(1)(iii)(B)]** **§ 109.503(a)(1)(iii)(D)**.

* * * * *

§ 109.511. General permits.

(a) The Department may issue a general permit, instead of issuing a construction and operation permit under this subchapter, for a specific category of modifications if all of the following conditions are met:

(1) The modifications in the category are the same or substantially similar in nature.

(2) The modifications in the category are not prejudicial to the public health and can be adequately regulated utilizing standardized specifications and conditions.

(3) The modifications in the category will comply with the design and construction standards under Subchapter F (relating to design and construction standards).

(b) The Department may suspend, revoke, modify, reissue or terminate coverage under a general permit issued under this chapter for noncompliance with a condition of the permit, or upon a finding of a condition prejudicial to the public health.

(c) Issuance of a general permit does not exempt a person from compliance with this chapter.

Subchapter F. DESIGN AND CONSTRUCTION STANDARDS

§ 109.602. Acceptable design.

(a) A public water system shall be designed to provide an adequate and reliable quantity and quality of water to the public. The design must ensure that the system will, upon completion, be capable of providing water that complies with the primary and secondary MCLs, MRDLs and treatment techniques established in Subchapters B, **K,** L and M **[(relating to MCLs, MRDLs or treatment technique requirements; long-term 2 enhanced surface water treatment rule; and additional requirements for groundwater sources)]** except as further provided in this section.

* * * * *

(e) Point-of-use devices which are treatment devices applied to a single tap are not an acceptable treatment method for complying with an MCL**, MRDL** or treatment technique requirement.

(f) A public water system that provides filtration of surface water or GUDI sources must be equipped with alarm capabilities that meet the requirements of subsection (i) by _____ (*Editor's Note:* The blank refers to ~~12 months~~1 YEAR after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.). THE DEPARTMENT MAY APPROVE IN WRITING AN ALTERNATE COMPLIANCE SCHEDULE IF THE WATER SUPPLIER SUBMITS A WRITTEN REQUEST WITH SUPPORTING DOCUMENTATION BY _____ (*EDITOR'S NOTE*: THE BLANK REFERS TO 1 YEAR AFTER THE EFFECTIVE DATE OF THIS FINAL-FORM REGULATION.).

(g) A public water system that provides filtration of surface water or GUDI sources and that is not staffed continuously while the plant is operating must be equipped with alarm and shutdown capabilities that meet the requirements of subsection (i) by _____ (*Editor's Note:* The blank refers to ~~12 months~~1 YEAR after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.). THE DEPARTMENT MAY APPROVE IN WRITING AN ALTERNATE COMPLIANCE SCHEDULE IF THE WATER SUPPLIER SUBMITS A WRITTEN REQUEST WITH SUPPORTING DOCUMENTATION BY _____ (*EDITOR'S NOTE*: THE BLANK REFERS TO 1 YEAR AFTER THE EFFECTIVE DATE OF THIS FINAL-FORM REGULATION.).

(h) In addition to public water systems covered under subsection (f) or (g), the Department may require a public water system to meet the requirements of subsection (i), according to a schedule set forth in a permit or order issued by the Department.

(i) Alarm and shutdown capabilities must conform to all of the following:

(1) Be set forth in the water system's operation and maintenance plan and set at a level no less stringent than the level needed for the facility to continuously maintain compliance with applicable MCLs, MRDLs and treatment technique requirements.

(2) Be established for the following parameters, at a minimum:

(i) Individual filter effluent turbidity and combined filter effluent turbidity for filter plants treating surface water or GUDI sources.

(ii) Entry point disinfectant residual.

(iii) ~~Clearwell water levels~~ WATER LEVELS TO MAINTAIN ADEQUATE CT FOR GIARDIA INACTIVATION.

~~(iv) Any other operational parameter determined by the Department as necessary for the system to maintain compliance.~~

(3) Be capable of notifying the available operator on duty of events triggering an alarm or plant shutdown.

§ 109.606. Chemicals, materials and equipment.

(a) Chemicals **[or],** materials **or equipment** which ~~may~~ come in contact with the water or **MAY** affect the quality of the water may not be used unless the chemicals **[or],** materials **or equipment** are acceptable to the Department.

(b) Chemicals used by a public water supplier which ~~may~~ come in contact with **THE WATER** or **MAY** affect the quality of the water and which are certified for conformance with ANSI/NSF Standard 60 (Drinking Water Treatment Chemicals—Health Effects—~~National Sanitation Foundation~~ **NSF**) or meet the food grade standards of the *United States Pharmacopeia* are deemed acceptable to the Department.

(c) Materials **or equipment** used in the construction or modification of a public water system, including waterline extensions**, mechanical devices and drinking water treatment equipment,** which ~~may~~ come into contact with **THE WATER** or **MAY** affect the quality of the water and which are certified for conformance with ANSI/NSF Standard 61 (Drinking Water System Components—Health Effects—~~National Sanitation Foundation~~ **NSF**) are deemed acceptable to the Department.

(d) Drinking water treatment equipment used in the construction or modification of a public water system ~~that~~ WHICH ~~may come~~ COMES into contact with THE WATER or ~~affects~~ MAY AFFECT the quality of the water and ~~that~~ WHICH is certified for inactivation, reduction or removal performance in conformance with PDWEP is deemed acceptable to the Department.

[(d)] **(e)** Acceptable certification under subsection (b) **[or (c)], (c) or (d)** related to ANSI/NSF Standards 60 and 61 **or PDWEP** includes that performed by NSF International or other certification organization acceptable to the Department. To be acceptable to the Department, a

certification organization shall be accredited by ANSI as a third party certification organization and meet the following requirements. The organization shall:

(1) Demonstrate it is independent of manufacturers using the certification organization's services.

(2) Require that a registered mark or seal be placed upon each product certified under ANSI/NSF Standard 60 or 61 **or PDWEP**, as applicable.

(3) Maintain an ongoing quality assurance and quality control program that includes, at a minimum, the following:

(i) Periodic announced and unannounced factory follow-ups and audits at sufficient frequency and in sufficient detail to assure the product evaluated is the same as the product being manufactured.

(ii) Maintenance of or accessibility to a laboratory certified by the Department meeting the minimum laboratory certification criteria for drinking water analysis.

(iii) Maintenance of staff toxicologists or accessibility to toxicologists to perform the toxicological review and evaluation portions of the product assessments.

(iv) Maintenance of procedures for notification and recall of the use of the registered mark or seal for previously certified products which do not meet the certification requirements of ANSI/NSF Standards 60 and 61 **or PDWEP**.

(v) For equipment that is claimed to remove or reduce a specific contaminant, the name of the organization that meets the accreditation standards of the ~~American National Standards Institute~~ ANSI and that has certified the device to verify its inactivation, reduction or removal performance for that contaminant, the name of the testing protocol or standard used to test the device, a statement from the testing laboratory giving the date of the test, a summary of the results and the date, if any, by which the device shall be retested for verification of the removal or reduction performance to remain effective.

(4) Require appropriate product reevaluation depending upon the results of the factory follow-ups and audits and changes in the standards themselves.

(5) Perform certification evaluations for any manufacturer or applicant.

(6) Evaluate and certify an appropriately broad range of products—additives, direct additives or indirect additives.

(7) Maintain and publish a listing of certified products and distribute the listing to State regulatory agencies and others, as appropriate, at least annually.

[(e)] (f) Facilities or equipment, including, but not limited to, pipes, pumping facilities and storage tanks, previously or currently used for the treatment, storage or transportation of wastewater, petroleum products or other nonfood products, except for facilities or equipment used to store or transport chemicals used in treating drinking water, may not be used for the treatment, transportation or storage of drinking water.

§ 109.612. POE devices.

* * * * *

(b) POE devices ~~and~~ **OR components** used by a public water supplier shall be tested and certified by the NSF or other certification organization acceptable to the Department against ANSI/NSF standards established for drinking water treatment devices. To be acceptable to the Department a certification organization other than NSF shall have a program at least as stringent as the NSF program and meet the requirements under **[§ 109.606(d)]** **§ 109.606(e)** (relating to chemicals, materials and equipment) as applicable to ANSI/NSF standards for drinking water treatment devices.

* * * * *

Subchapter G. SYSTEM MANAGEMENT RESPONSIBILITIES

§ 109.701. Reporting and recordkeeping.

(a) *Reporting requirements for public water systems.* Public water systems shall comply with the following requirements:

* * * * *

(2) *Monthly reporting requirements for performance monitoring.*

(i) The test results of performance monitoring required under § 109.301(1) (relating to general monitoring requirements) for public water suppliers providing filtration and disinfection of surface water or GUDI sources must include the following at a minimum:

(A) For **the combined filter effluent** turbidity performance monitoring:

* * * * *

(VII) Instead of subclauses (III) and (IV), beginning January 1, 2002, for public water systems that serve 10,000 or more people and use other filtration technologies:

(-a-) The number of filtered water turbidity measurements that are less than or equal to 0.3 NTU or a more stringent turbidity performance level requirement that is based upon onsite studies and is specified by the Department.

(-b-) The date, time and values of any filtered water turbidity measurements exceeding 1 NTU or a more stringent turbidity performance level requirement that is based upon onsite studies and is specified by the Department.

(VIII) ~~Instead of subclauses (III) – (VII), beginning~~ BEGINNING (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), the number of filtered water turbidity measurements that are less than or equal to ~~all of the following:~~

~~(-a-) 0.30 NTU for conventional or direct filtration technologies.~~

~~(-b-) 1.0 NTU for slow sand or diatomaceous earth filtration technologies.~~

~~(-c-)~~ 0.15 NTU for membrane filtration technologies.

~~(-d-) 0.30 NTU for other filtration technologies unless a more stringent turbidity performance level requirement is specified by the Department.~~

(IX) ~~Instead of subclauses (III) – (VII), beginning~~ BEGINNING (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), the date, time and values of any filtered water turbidity measurements exceeding ~~all of the following:~~

~~(-a-)~~ 1.~~0~~ NTU for ~~conventional, direct or~~ membrane filtration technologies.

~~(-b-) 2.0 NTU for slow sand or diatomaceous earth filtration technologies.~~

~~(-c-) 1.0 NTU for other filtration technologies unless a more stringent turbidity performance level requirement is specified by the Department.~~

(B) For performance monitoring of the residual disinfectant concentration of the water being supplied to the distribution system:

* * * * *

(ii) The test results of performance monitoring required under § 109.301(2) for public water suppliers using unfiltered surface water or GUDI sources **[shall]** **must** include the following, at a minimum:

(A) For turbidity performance monitoring:

(I) The date, time and value of each sample that exceeds 1.0 NTU.

(II) The date, time and highest turbidity value, if the turbidity does not exceed 1.0 NTU in a sample.

(III) Instead of subclauses (I) and (II), beginning _____ (*Editor's Note:* The blank refers to 1 year AND 1 DAY after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.):

(-a-) The number of source water turbidity measurements taken each month.

(-b-) For measurements in which the source water turbidity is greater than 1.0 NTU, the date, time and value for each occurrence that the turbidity exceeds 1.0 NTU and the subsequent date, time and value that the turbidity is less than or equal to 1.0 NTU.

(-c-) The date, time and highest turbidity value for each day the source water turbidity remains less than or equal to 1.0 NTU.

(B) For performance monitoring of the residual disinfectant concentration of the water being supplied to the distribution system:

* * * * *

(3) *One-hour reporting requirements.* A public water supplier shall report the circumstances to the Department within 1 hour of discovery for the following violations or situations:

(i) A primary MCL or an MRDL has been exceeded or a treatment technique requirement has been violated under Subchapter B, K, L or M.

(ii) A sample result requires the collection of check samples under § 109.301.

(iii) Circumstances exist which may adversely affect the quality or quantity of drinking water including, but not limited to:

(A) The occurrence of a waterborne disease outbreak.

(B) A failure **[or]**, significant interruption **or breakdown** in key water treatment processes.

(C) A **[natural]** disaster that disrupts the water supply or distribution system.

* * * * *

(9) *Level 1 and Level 2 assessments.* A public water supplier shall:

(i) Submit an assessment form completed in accordance with § 109.705(b) (relating to system evaluations and assessments) to the Department within 30 days after the system learns that it has exceeded a trigger under § 109.202(c)(4).

(ii) Submit a revised assessment form in accordance with § 109.705(b) within 30 days of notification from the Department that revisions are necessary.

(10) ***Reporting requirements for disinfection byproducts.*** **In addition to the reporting requirements specified in paragraph (1), public water systems monitoring for disinfection byproducts under § 109.301(12) shall report the individual constituents for total trihalomethanes and haloacetic acids.**

[(10)] **(11)** *Noncompliance report.* Except where a different reporting period is specified in this chapter, the water supplier shall report to the Department within 48 hours the failure to comply with any National Primary Drinking Water Regulation, including the failure to comply with any monitoring requirement set forth in this chapter.

* * * * *

(e) *Reporting requirements for public water systems required to perform individual filter monitoring under § 109.301(1)(iv).*

(1) Public water systems required to perform individual filter monitoring shall report that they have conducted individual filter monitoring within 10 days following the end of each month that the system serves water to the public.

(2) Public water systems required to perform individual monitoring **under § 109.301(1)(iii)** shall report individual filter turbidity results if individual filter turbidity measurements demonstrate that one or more of the following conditions exist:

(i) An individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart.

(ii) An individual filter has a measured turbidity level of greater than 0.5 NTU in two consecutive measurements taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after the filter has been backwashed or otherwise taken offline.

(iii) An individual filter has a measured turbidity level greater than 1.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 3-consecutive months.

(iv) An individual filter has a measured turbidity level greater than 2.0 NTU in two consecutive measurements taken 15 minutes apart at any time in each of 2-consecutive months.

~~**(v) Instead of subparagraph (i), beginning _____ (*Editor's Note:* The blank refers to 1 year after the effective date of adoption of this proposed rulemaking.), an individual filter has a measured turbidity level greater than 0.30 NTU for conventional, direct or other filtration technologies, 0.15 NTU for membrane filtration technologies or 1.0 NTU for slow sand or diatomaceous earth filtration technologies in two consecutive measurements taken 15 minutes apart.**~~

~~**(vi) Instead of subparagraph (ii), beginning _____ (*Editor's Note:* The blank refers to 1 year after the effective date of adoption of this proposed rulemaking.), an individual filter has a measured turbidity level of greater than 0.30 NTU for conventional, direct or**~~

~~other filtration technologies, 0.15 NTU for membrane filtration technologies or 1.0 NTU for slow sand or diatomaceous earth filtration technologies in two consecutive measurements taken 15 minutes apart at the end of the first 4 hours of continuous filter operation after the filter has been backwashed or otherwise taken offline.~~

~~(vii) Instead of subparagraph (iii), beginning _____ (*Editor's Note:* The blank refers to 1 year after the effective date of adoption of this proposed rulemaking.), an individual filter has a measured turbidity level greater than 0.30 NTU for conventional, direct or other filtration technologies, 0.15 NTU for membrane filtration technologies or 1.0 NTU for slow sand or diatomaceous earth filtration technologies in two consecutive measurements taken 15 minutes apart at any time in each of 3 consecutive months.~~

~~(viii) Instead of subparagraph (iv), beginning _____ (*Editor's Note:* The blank refers to 1 year after the effective date of adoption of this proposed rulemaking.), an individual filter has a measured turbidity level greater than 1.0 NTU for conventional, direct, membrane or other filtration technologies, or 2.0 NTU for slow sand or diatomaceous earth filtration technologies in two consecutive measurements taken 15 minutes apart at any time in each of 2 consecutive months.~~

(3) Individual filter turbidity monitoring reported as required under paragraph (2) **[shall]** **must** include the following at a minimum:

* * * * *

(N) ***ADDITIONAL REPORTING REQUIREMENTS FOR SYSTEMS USING RESERVE SOURCES, TREATMENT PLANTS OR ENTRY POINTS.***

(1) SYSTEMS MUST PROVIDE A REPORT EACH QUARTER CERTIFYING THE NUMBER OF DAYS THAT A RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT WAS USED DURING THE PREVIOUS QUARTER AND ESTIMATING THE EXPECTED TIMEFRAME THE RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT WILL REMAIN IN OPERATION.

(2) SYSTEMS MUST PROVIDE NOTIFICATION TO THE DEPARTMENT WITHIN TEN DAYS AFTER A RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT IS NO LONGER IN USE.

§ 109.702. Operation and maintenance plan.

(a) A community water supplier shall develop an operation and maintenance plan for the community water system. The operation and maintenance plan must generally conform to the guidelines contained in the Department's *Public Water Supply Manual* and **must** contain at least the following information:

* * * * *

(13) An interconnect, valve **[and blowoff]**, **blowoff, alarm and shutdown, and auxiliary power equipment** exercise and testing program.

* * * * *

§ 109.703. Facilities operation.

(a) Public water system facilities approved by written permit from the Department shall be operated in a manner consistent with the terms and conditions of the permit to achieve the level of treatment for which the facilities were designed.

(b) For surface water or GUDI sources, a public water supplier using filtration shall comply with the following requirements:

(1) **[By July 1, 1990, suppliers using conventional or direct filtration shall, after filter backwash, and before putting the backwashed filter back on line, filter-to-waste until the filter bed effluent turbidity is less than 0.5 NTU at the normal production flow rate.]** **Water suppliers using conventional or direct filtration shall, prior to returning a filter to service, filter-to-waste for one full filter volume and until the filter bed effluent turbidity is less than 0.30 NTU at the normal production flow rate. Water suppliers may implement filter-to-waste for a period of time less than one full filter bed volume if an alternate operating technique is properly utilized to minimize the postbackwash turbidity spike to less than 0.15 NTU. Alternate techniques may include extended terminal subfluidization backwash, permitted addition of coagulant during the backwash or a post-backwash offline filter resting period. Water suppliers implementing alternate techniques shall keep records to document consistent and proper utilization of the technique.**

(2) **[Beginning May 16, 1992, a]** **A water** supplier using slow sand filtration shall, following sanding, scraping or resanding of slow sand filters, filter-to-waste until one of the following occurs:

(i) The filter bed effluent turbidity is less than 1.0 NTU at the normal production flow rate.

(ii) A reduction in turbidity is achieved when the source water turbidity is less than 1.0 NTU.

(3) **[Beginning May 16, 1992, a]** **A water** supplier using diatomaceous earth filtration shall, following backwashing and recoating of diatomaceous earth filters, filter-to-waste until one of the following occurs:

(i) The filter bed effluent turbidity is less than 1.0 NTU at the normal production flow rate.

(ii) A reduction in turbidity is achieved when the source water turbidity is less than 1.0 NTU.

(4) For a conventional or direct filtration facility permitted prior to March 25, 1989, without filter-to-waste capability, the Department, upon the supplier's request, may allow the supplier to utilize other operating techniques which minimize the initial increased turbidity peak when a

filter is initially placed back into service after backwashing. The technique, which may include filter settling periods, ramping open the effluent valve or use of a coagulant in the backwash water, shall be justified by a filter performance study approved by the Department.

(5) [Except for public water systems covered under § 109.301(1)(iv) (relating to general monitoring requirements), a system with conventional or direct filtration facilities permitted prior to March 25, 1989, without individual filter bed turbidity monitoring capabilities shall conduct an annual filter bed evaluation program, acceptable to the Department, which includes an evaluation of filter media, valves, surface sweep and sampling of filter turbidities over one entire filter run; and shall submit to the Department, with the Annual Water Supply Report, a study that demonstrates that the water supplier's filter-to-waste or alternate approved operating procedures are meeting the operating conditions under paragraph (1) or (4).] A system with filtration facilities shall implement a filter bed evaluation program, acceptable to the Department, which includes an evaluation of filter media, filter bed expansion, valves, surface sweep and sampling of filter turbidities over one entire filter run. The results of the evaluation shall be maintained on file and submitted to the Department upon request.

(c) A public water supplier required to install alarm or shutdown capabilities, or both, under § 109.602 (relating to acceptable design) shall comply with the following:

(1) Test the alarm and shutdown capabilities at least quarterly and document the results in the plant's operational log. To avoid unnecessary disruptions in treatment, simulated testing of shutdown capabilities is acceptable.

(2) For any failures of alarm or shutdown equipment:

(i) Ensure the plant is adequately staffed until the equipment is operational.

(ii) Notify the Department as soon as possible of any failure that cannot be corrected within 24 hours.

(iii) Restore the equipment to operation within 5 working days of the failure unless a longer period of time is approved by the Department.

(d) RESERVE SOURCES, TREATMENT PLANTS OR ENTRY POINTS IDENTIFIED IN § 109.717(a)(1)(ii) MAY NOT BE USED WITHOUT PRIOR WRITTEN APPROVAL FROM THE DEPARTMENT. APPROVAL TO USE A RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT WILL EXPIRE UPON SUBMISSION OF THE NOTIFICATION SPECIFIED IN § 109.701(n)(2). DEPARTMENT APPROVAL WILL BE CONTINGENT ON THE FOLLOWING, AT A MINIMUM:

(1) COMPLETION OF SOURCE WATER MONITORING IN ACCORDANCE WITH § 109.503(a)(1)(iii)(D)(I)-(XI), (XIII) AND (XV) (RELATING TO PUBLIC WATER SYSTEM CONSTRUCTION PERMITS) PRIOR TO USE. THE DEPARTMENT WILL CONSIDER PREVIOUS SOURCE WATER MONITORING RESULTS FOR SAMPLES

THAT WERE COLLECTED WITHIN THE MOST RECENT 3 YEARS. COMPLIANCE MONITORING IN ACCORDANCE WITH § 109.301(15) FOR RESERVE ENTRY POINTS SHALL CONTINUE SO LONG AS THE RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT IS IN USE.

(2) DOCUMENTATION THAT SOURCE WATER MONITORING SPECIFIED IN § 109.503(a)(1)(iii)(D)(XII) AND (XIV) HAS BEEN COMPLETED.

(3) A DETERMINATION AND CERTIFICATION BY THE WATER SUPPLIER, AFTER REVIEWING MONITORING DATA OBTAINED IN ACCORDANCE WITH PARAGRAPH (1) THAT USE OF THE RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINT WILL NOT ADVERSELY IMPACT TREATMENT EFFICACY AND THAT AN ADEQUATE TREATMENT STRATEGY IS IN PLACE SUCH THAT THE FINISHED WATER WILL COMPLY WITH ALL APPLICABLE DRINKING WATER STANDARDS.

§ 109.704. Operator certification.

(a) Community and nontransient noncommunity water systems shall have personnel certified under the Water and Wastewater Systems Operators' Certification Act (63 P.S. §§ 1001—1015.1) **and the regulations promulgated thereunder** to operate and maintain a public water system.

(b) Transient noncommunity water systems shall have competent personnel qualified to operate and maintain the system's facilities.

§ 109.705. System evaluations and assessments.

(a) A community water supplier shall conduct an evaluation of the water system at least annually. The evaluation shall include the following activities:

(1) **[Watershed surveillance consisting of an]** **An** inspection of portions of the **[drainage area or wellhead]** **source water** protection area necessary to identify and evaluate actual and **[probable]** **potential** sources of contamination.

(i) An inspection of a **[wellhead]** **source water** protection area shall include a review of available information pertaining to possible sources of contamination such as underground storage tanks, onlot disposal systems and other activities that may have an adverse impact on water quality or quantity.

(ii) Specific hydrogeological studies of sources of contamination are not necessary unless required under § 109.4, § 109.602 or § 109.603 (relating to general requirements; acceptable design; and source quality and quantity) or other rules of the Department.

(iii) Revisions to the source water assessment if the inspection identified changes to actual or potential sources of contamination.

(2) Evaluation of **[source protection,]** intake structures and transmission facilities.

(3) Treatment facilities inspection consisting of an evaluation of the effectiveness of the operation and maintenance procedures and the condition and operability of permitted facilities.

(4) Evaluation of finished water storage facilities and the distribution system.

(5) Pressure surveys consisting of a measurement of pressures at representative points in the distribution system, which shall include new water line extensions. Surveys shall be made during periods of maximum and minimum usage. Records of these surveys shall show the date and time of the beginning and end of the test and the location at which the test was made.

(6) The results of the annual system evaluation must be documented and made available to the Department upon request.

(b) A public water system shall conduct Level 1 and 2 assessments required under § 109.202(c)(4) (relating to State MCLs, MRDLs and treatment technique requirements). The public water system shall also comply with any expedited actions or additional actions required by the Department in the case of an *E. coli* MCL violation.

* * * * *

(9) At any time during the assessment or corrective action phase, either the public water system or the Department may request a consultation with the other party to determine the appropriate actions to be taken. The public water system may consult with the Department on all relevant information that may impact its ability to comply with a requirement of this subsection.

[(c) The following apply to significant deficiencies identified at public water systems supplied by a surface water source and public water systems supplied by a groundwater source under the direct influence of surface water:

(1) For sanitary surveys performed by the Department, a system shall respond in writing to significant deficiencies identified in sanitary survey reports no later than 45 days after receipt of the report, indicating how and on what schedule the system will address significant deficiencies noted in the survey.

(2) A system shall correct significant deficiencies identified in sanitary survey reports according to the schedule approved by the Department, or if there is no approved schedule, according to the schedule reported under paragraph (1) if the deficiencies are within the control of the system.

(d) Significant deficiencies identified by the Department at public water systems using groundwater shall comply with § 109.1302(c) (relating to treatment technique requirements).]

§ 109.706. System **[distribution]** map.

(a) **[The community]** **A public** water **SYSTEM THAT IS NOT A BOTTLED OR VENDED WATER SYSTEM OR A RETAIL WATER FACILITY OR A BULK WATER HAULING SYSTEM** shall prepare and maintain on file a detailed map of the water **[system's transmission and distribution facilities]** **system**. **A copy of the map shall be submitted to the Department upon request.**

(b) **[A noncommunity water supplier shall submit a detailed map of the water system's transmission and distribution facilities at the request of the Department.]** **At a minimum the map must include all of the following:**

(1) Source and treatment plant locations.

(2) Size and location of storage facilities.

(3) Pump station locations.

(4) Size, location and construction material of pipes.

(5) Pressure zones.

(6) Interconnections with other public water systems.

(7) Monitoring locations.

(c) **[The map shall include information sufficient to allow the Department to analyze the distribution system and determine quantity, pressure and direction of flow from the sources to the customers, and shall include the type and size of pipes within the distribution system. The map shall be updated at least annually.]** **The map shall be reviewed by the water supplier at least annually and updated as necessary. Water suppliers may meet this requirement by maintaining a calibrated hydraulic model instead of paper maps.**

§ 109.708. **[Planned service interruptions]** **System service and auxiliary power**.

(a) ***System service.*** **No later than the dates specified in paragraphs (1)—(3), a community water supplier shall SUBMIT A CERTIFICATION ON A CERTIFICATION FORM PROVIDED BY THE DEPARTMENT VERIFYING COMPLETION OF THE UNINTERRUPTED SYSTEM SERVICE PLAN (USSP) WHICH WAS COMPLETED USING THE USSP FORM PROVIDED BY THE DEPARTMENT TO ensure operation of the sources, treatment and pumping facilities necessary to ensure that safe and potable water is continuously supplied to users in accordance with subsection (b) or (c), or both. A continuous supply of safe and potable water is one that meets all applicable MCLs, MRDLs and treatment techniques specified in § 109.202 (relating to State MCLs, MRDLs and treatment technique requirements) and is sufficent to maintain system pressure specified in § 109.607 (relating to pressures) throughout the distribution system.**

(1) By _____ (*Editor's Note:* The blank refers to 1 YEAR after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for systems serving 3,300 or fewer persons.

(2) By _____ (*Editor's Note:* The blank refers to 2 YEARS after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for systems serving 3,301—10,000 persons.

(3) By _____ (*Editor's Note:* The blank refers to 3 YEARS after the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), for systems serving greater than 10,000 persons.

(b) *Auxiliary power AND ALTERNATE PROVISIONS.* System service must be provided through one or more of the following methods:

(1) Connection to at least two independent power feeds from separate substations.

(i) The power feeds may not be located in the same conduit or supported from the same utility pole.

(ii) If overhead power feeds are used, the power feeds may not cross or be located in an area where a single plausible occurrence (for example, a fallen tree) could disrupt both power feeds.

(2) Onsite auxiliary power sources (that is, generators or engines).

(3) A COMBINATION OF ALTERNATE PROVISIONS, SUCH AS FINISHED WATER STORAGE CAPACITY, INTERCONNECTIONS WITH ANOTHER PUBLIC WATER SYSTEM, PORTABLE GENERATORS, AND OTHER SYSTEM SPECIFIC ALTERNATE PROVISIONS TO MEET THE REQUIREMENTS OF SUBSECTION (a).

(c) ~~*Alternate provisions.* The Department may approve alternate provisions, such as finished water storage capacity or interconnections with another public water system, to meet the requirements of subsection (a).~~ *CORRECTIVE ACTION SCHEDULE.* IF THE UNINTERRUPTED SYSTEM SERVICE PLAN AND CERTIFICATION FORM COMPLETED IN SUBSECTION (a) IDENTIFY THAT DEFICIENCIES EXIST WHICH PREVENT A CONTINUOUS SUPPLY OF SAFE AND POTABLE WATER AS SPECIFIED IN SUBSECTION (a), AND THESE DEFICIENCIES ARE NOT CORRECTED BY THE DATES SPECIFIED IN PARAGRAPHS (a)(1)–(3), A COMMUNITY WATER SUPPLIER SHALL SUBMIT TO THE DEPARTMENT, WITHIN 6 MONTHS AFTER THE DATES SPECIFIED IN PARAGRAPHS (a)(1)–(3), A SCHEDULE WHICH INCLUDES DETAILED CORRECTIVE ACTIONS TO ADDRESS THESE DEFICIENCIES, INCLUDING CORRESPONDING COMPLETION DATES. THE SCHEDULE FOR COMPLETION OF EACH CORRECTIVE ACTION MUST BE

COMMENSURATE WITH THE COMPLEXITY OF THE ASSOCIATED CORRECTIVE ACTION.

(d) ***Planned service interruptions.*** The public water supplier shall give reasonable notice to the affected customers prior to a planned service interruption affecting quantity or quality of the water delivered to the customer. If the interruption is scheduled to exceed 8 hours and affect 15 or more service connections the water supplier shall also notify the Department.

§ 109.713. **[Wellhead]** **Source water** protection program.

(a) For water suppliers seeking to obtain Department approval for a **[wellhead]** **source water** protection program, the **[wellhead]** **source water** protection program shall**, at a minimum,** consist of **all of** the following **elements**:

(1) A steering committee composed of the necessary representatives, including, but not limited to, the water supplier, local government officials from the affected jurisdictions and potentially affected industry, to designate responsibilities for the planning and implementation of **[wellhead]** **source water** protection activities.

(2) Public participation and education activities to promote awareness and encourage local support of **[wellhead]** **source water** protection activities.

(3) **[Zone II and Zone III wellhead protection area delineation performed in accordance with methodology provided by the Department. Methods applicable to that hydrogeologic setting shall be utilized and site-specific hydraulic and hydrogeologic information shall include, but is not limited to, pumping rate or yield, aquifer properties, water table or potentiometric surface configuration and hydrogeologic mapping.]** **A map depicting the source water protection areas that were delineated in accordance with the methodology provided by the Department.**

(4) **[Identification of existing and potential sources of contamination within each wellhead protection area.]** **A source water assessment for each source. If a source water assessment has not been previously conducted, identification of the source's susceptibility to potential and existing sources of contamination within each source's contributing area conducted in accordance with the methodology provided by the Department.**

(5) Development and implementation of **[wellhead]** **source water** protection area management approaches to protect the water supply source from activities that may contaminate the source. These approaches may include, but are not limited to, one or more of the following actions:

(i) Purchase of the **[wellhead]** **source water** protection area by the water system.

(ii) Adoption of municipal ordinances or regulations controlling, limiting or prohibiting future potential sources of contamination within the **[wellhead]** **source water** protection area.

(iii) Adoption of municipal ordinances or regulations establishing design and performance standards for potential sources of contamination within the **[wellhead]** **source water** protection area.

(iv) Transfer of development rights within the **[wellhead]** **source water** protection area to land outside of the **[wellhead]** **source water** protection area.

(v) **[A]** **For groundwater sources, a** groundwater monitoring network that serves as an early warning system.

(vi) Public education programs.

(vii) Other methods approved by the Department which will ensure an adequate degree of protection for the source.

(6) Contingency planning for the provision of alternate water supplies in the event of contamination of a **[well, spring or infiltration gallery]** **source** and emergency responses to incidents that may impact water supply source quality.

(7) **[New water supply source siting provisions to ensure the protection of new wells, springs or infiltration galleries.]** **Provisions to ensure the protection of sites identified for development as new water sources.**

(b) Water suppliers with an approved source water protection program shall review and update the program on an annual basis to ensure it is accurate and reflects current activities, and shall complete and submit the current version of the Department-provided annual update form.

§ 109.716. Significant deficiencies.

The following apply to significant deficiencies identified by the Department:

(1) Within 30 days of receiving written notification, the public water supplier shall consult with the Department regarding appropriate corrective actions unless the Department directs the system to implement a specific corrective action.

(2) The public water supplier shall respond in writing to significant deficiencies no later than 45 days after receipt of written notification from the Department, indicating how and on what schedule the system will address significant deficiencies.

(3) Corrective actions shall be completed in accordance with applicable Department plan review processes or other Department guidance or direction, if any, including Department-specified interim measures.

(4) The public water supplier shall correct significant deficiencies identified within 120 days of receiving written notification from the Department, or earlier if directed by the Department, or according to the schedule approved by the Department.

(5) If the Department specifies interim measures for protection of the public health pending Department approval of the corrective action plan and schedule or pending completion of the corrective action plan, the public water supplier shall comply with these interim measures as well as with any schedule specified by the Department.

(6) The public water supplier shall request and obtain approval, in writing, from the Department for any subsequent modifications to a Department-approved corrective action plan and schedule.

§ 109.717. Comprehensive monitoring plan.

(a) BY _____ (*EDITOR'S NOTE:* THE BLANK REFERS TO 1 YEAR AFTER THE EFFECTIVE DATE OF THIS FINAL-FORM RULEMAKING.), ~~A~~ A community or nontransient noncommunity water supplier shall develop a comprehensive monitoring plan to assure that all sources, PURCHASED INTERCONNECTIONS and entry points are included in ~~routine~~ compliance monitoring at the entry points and within the distribution system. The plan must contain at least all of the following:

(1) A list of all sources, PURCHASED INTERCONNECTIONS, ~~and~~ treatment plants, and entry points PERMITTED UNDER THIS CHAPTER. ~~This list must also include purchased interconnections.~~ THE AVAILABILITY OF EACH SOURCE, TREATMENT PLANT, AND ENTRY POINT MUST BE DESIGNATED AS EITHER PERMANENT OR RESERVE. THE AVAILABILITY OF EACH PURCHASED INTERCONNECTION MUST BE DESIGNATED AS EITHER PERMANENT OR EMERGENCY. PERMANENT, RESERVE AND EMERGENCY AVAILABILITY CATEGORIES ARE AS FOLLOWS:

(i) PERMANENT—A SOURCE, TREATMENT PLANT, ENTRY POINT OR PURCHASED INTERCONNECTION PERMITTED UNDER THIS CHAPTER THAT IS USED ON A REGULAR BASIS. PERMANENT FACILITIES MUST BE INCLUDED IN COMPLIANCE MONITORING. PERMANENT ENTRY POINTS RECEIVING WATER FROM A RESERVE SOURCE MUST BE MONITORED IN ACCORDANCE WITH § 109.301(15).

(ii) RESERVE—A SOURCE, TREATMENT PLANT OR ENTRY POINT PERMITTED UNDER THIS CHAPTER WHICH IS NOT USED ON A REGULAR BASIS, BUT REMAINS ON STANDBY TO AUGMENT OR SUPPLEMENT PERMANENT SOURCES, TREATMENT PLANTS OR ENTRY POINTS. A RESERVE SOURCE, TREATMENT PLANT OR ENTRY POINTS MAY NOT BE USED WITHOUT PRIOR WRITTEN APPROVAL FROM THE DEPARTMENT UNDER § 109.703(d).

(iii) EMERGENCY—A PURCHASED INTERCONNECTION PERMITTED UNDER THIS CHAPTER WHICH IS USED DURING TEMPORARY EMERGENCY SITUATIONS.

(2) A schematic of all sources and associated treatment plants and entry points, purchased interconnections and the relative locations of the points of entry into the distribution system.

(3) For each entry point, a description of ~~system operations~~ NORMAL OPERATING CONDITIONS, including whether the entry point provides water continuously, whether each source CONTRIBUTING TO THE ENTRY POINT provides water continuously, AND whether sources are alternated or blended ~~and on what cycle or blending ratio, and whether the blending ratio is consistent.~~ FOR ALTERNATED SOURCES, INCLUDE THE OPERATION SCHEDULE FOR EACH SOURCE. FOR BLENDED SOURCES, INCLUDE A DESCRIPTION OF THE RANGE OF BLENDING RATIOS.

(4) A description of how all PERMANENT sources and PERMANENT entry points are included in compliance monitoring.

(b) The plan must include the sample siting plans and monitoring plans required under other sections of this chapter, including the total coliform sample siting plan required under § 109.701(a)(5) (relating to reporting and recordkeeping), the monitoring plan for disinfectants, DBPs and DBP precursors required under § 109.701(g), the lead and copper sample site location plan required under § 109.1107(a)(1) (relating to system management responsibilities) and the source water sampling plan required under § 109.1202(h) (relating to monitoring requirements).

(c) The water supplier shall review and update the plan at least annually and as necessary to reflect changes to facilities or operations. The date of each update must be recorded on the plan.

(d) BY _____ (*EDITOR'S NOTE:* THE BLANK REFERS TO 1 YEAR AFTER THE EFFECTIVE DATE OF THIS FINAL-FORM RULEMAKING.), ~~The~~ THE water supplier shall submit the initial plan TO THE DEPARTMENT. The water supplier shall review the plan annually and submit an updated plan to the Department, if revisions are made. These plans are subject to Department review and revision.

Subchapter H. LABORATORY CERTIFICATION

§ 109.810. Reporting and notification requirements.

* * * * *

(b) A laboratory accredited under Chapter 252 shall whenever the results of test measurements or analyses performed by the laboratory under this chapter indicate an MCL, MRDL or a treatment technique performance requirement under § 109.202 (relating to State MCLs, MRDLs and

treatment technique requirements) is exceeded, or **[an action level under]** **<u>any individual tap sample result exceeds the action level value specified in</u>** § 109.1102(a) (relating to action levels and treatment technique requirements) **[is exceeded]**, or a sample result requires the collection of check or confirmation samples under § 109.301 (relating to general monitoring requirements), or any check sample collected under § 109.301(3) is total coliform-positive, or a sample collected by a seasonal system as part of a Department-approved start-up procedure under § 109.301(3)(i)(c) is total coliform-positive, or a sample collected under Subchapter M (relating to additional requirements for groundwater sources) is *E. coli*-positive:

* * * * *

Subchapter J. BOTTLED WATER AND VENDED WATER SYSTEMS, RETAIL WATER FACILITIES AND BULK WATER HAULING SYSTEMS

§ 109.1003. Monitoring requirements.

* * * * *

(b) *Sampling requirements.*

* * * * *

(3) **[Public water suppliers shall assure that samples for laboratory analysis are properly collected and preserved, are collected in proper containers, do not exceed maximum holding times between collection and analysis and are handled in accordance with guidelines governing quality control which may be established by the Department. A public water supplier who utilizes a certified laboratory for sample collection as well as analysis satisfies the requirements of this subsection.]** **<u>Sampling and analysis shall be performed in accordance with analytical techniques adopted by the EPA under the Federal act or methods approved by the Department.</u>**

* * * * *

§ 109.1005. Permit requirements.

* * * * *

(c) *Special permit by rule requirement for bottled water systems.* A person owning or operating a bottled water system in this Commonwealth permitted under this chapter shall obtain an amended permit before making substantial modifications to the processing and bottling facilities unless the bottled water system satisfies the conditions in paragraphs (1)—(5). The permit-by-rule does not apply to the collection facilities. The Department retains the right to require a bottled water system that meets the requirements of paragraphs (1)—(5) to obtain a permit, if, in the judgment of the Department, the bottled water system cannot be adequately regulated through the standardized specifications and conditions. A bottled water system which is released from the obligation to obtain a permit shall comply with the other requirements of this

subchapter, including design, construction and operation requirements. The following are the conditions for a permit-by-rule:

* * * * *

(5) A bottled water system operating under this subsection shall file descriptions of substantial modifications made to the system to the Department within 30 days of operation of the modification. The description **[shall]** **must** include documentation that the modification meets the following requirements as applicable:

(i) Compliance with the product water-contact materials and treatment chemical additives toxicological requirements of § 109.606 (relating to chemicals, materials and equipment) or alternatively, the Food and Drug Administration standards in 21 CFR Part 129.

(ii) Validated treatment technologies for the reduction of contaminants. Validated treatment technologies are those that have been permitted by the Department under this chapter at the bottled water system operating under the permit by rule or certified to an applicable ANSI/NSF standard by NSF or other certification organization acceptable to the Department or verified under the EPA Environmental Technology Verification Program. To be acceptable to the Department, a certification organization other than NSF shall be accredited by ANSI as a third-party certification organization and meet the requirements under **[§ 109.606(d)]** **§ 109.606(e)** as applicable to the appropriate ANSI/NSF standard for the treatment technology.

* * * * *

(e) *Permit applications.* An application for a public water system permit for a bottled water or vended water system, retail water facility or bulk water hauling system shall be submitted in writing on forms provided by the Department and shall be accompanied by plans, specifications, engineer's report, water quality analyses and other data, information or documentation reasonably necessary to enable the Department to determine compliance with the act and this chapter. The Department will make available to the applicant the *Public Water Supply Manual*, available from the Bureau of **[Water Standards and Facility Regulation]** **Safe Drinking Water**, Post Office Box 8467, Harrisburg, Pennsylvania 17105-8467 which contains acceptable design standards and technical guidance. Water quality analyses shall be conducted by a laboratory certified under this chapter. An application for a public water system permit for a bottled water or vended water system, retail water facility or bulk water hauling system **[shall]** **must** include:

* * * * *

(i) *Permit fees.* **An application for a permit from the Department under this subchapter must be accompanied by a fee in the amount specified in Subchapter N (relating to drinking water fees).**

[(1) An application for a new permit or major permit amendment under subsection (f)(1) for a bottled water or vended water system, retail water facility or bulk water hauling

system shall be accompanied by a check in the amount of $750 payable to the "Commonwealth of Pennsylvania," except that:

(i) An application from an out-of-State bottled water system submitting proof of out-of-State approval under subsection (e)(6) shall be accompanied by a fee of $100.

(ii) An application from a bottled water system, retail water facility or bulk water hauling system purchasing finished water, as its sole source of water, from a public water system operating under a permit issued under this chapter, and a vended water system permitted by rule, shall submit a fee of $300.

(2) A fee is not required for an emergency permit under subsection (g) or a minor permit amendment under subsection (f)(2).]

Subchapter K. LEAD AND COPPER

§ 109.1105. Permit requirements.

(a) *General permit requirements.* A person may not construct, substantially modify or operate corrosion control treatment facilities to comply with this subchapter without having obtained the appropriate permit approvals under Subchapter E (relating to permit requirements) and this section.

(b) *Construction permits and permit amendments.* The water supplier shall submit an application for a public water system construction permit for a newly-created system or an amended construction permit for a currently-permitted system for corrosion control treatment facilities by the applicable deadline established in § 109.1102(b)(2) (relating to action levels and treatment technique requirements), unless the system complies with paragraph (1) or (2) or otherwise qualifies for a minor permit amendment under § 109.503(b) (relating to public water system construction permits). The permit application must comply with § 109.503 and contain the applicable information specified therein. The application must include recommended water quality parameter performance requirements for optimal corrosion control treatment as specified in § 109.1102(b)(5) and other data, information or documentation necessary to enable the Department to consider the application for a permit for construction of the facilities.

(1) *Community water system minor permit amendments.* **[The]** **Until _____ *(Editor's Note:* The blank refers to the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), a** community water supplier may submit a written request for an amended construction permit to the Department if the system satisfies the conditions under subparagraphs (i)—(iv). A request for an amended construction permit under this paragraph **[shall]** **must** describe the proposed change in sufficient detail to allow the Department to adequately evaluate the proposal.

(i) The system is a small water system.

(ii) The sources of supply for the system are not surface water sources.

(iii) Except for corrosion control treatment, the sources require treatment no greater than disinfection to provide water of a quality that meets the MCLs and treatment technique requirements established under Subchapter B (relating to MCLs, MRDLs or treatment technique requirements).

(iv) The proposed corrosion control treatment is limited to alkalinity or pH adjustment, or both.

(2) *Nontransient noncommunity water system permits.* **[The] Until (*Editor's Note:* The blank refers to the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), a** nontransient noncommunity water supplier is not required to obtain a construction permit or permit amendment under subsection (b) if the system satisfies the following specifications and conditions:

(i) The system is a small water system.

(ii) The sources of supply for the system are not surface water sources.

(iii) Except for corrosion control treatment, the sources require treatment no greater than disinfection to provide water of a quality that meets the MCLs and treatment technique requirements established under Subchapter B.

(iv) The proposed corrosion control treatment is limited to alkalinity or pH adjustment, or both.

(v) The water supplier files a brief description of the proposed treatment, including recommended water quality parameter performance requirements for optimal corrosion control treatment as specified in § 109.1102(b)(5), on forms acceptable to the Department. Descriptions of modifications shall be submitted and approved by the Department prior to construction.

(3) Beginning (*Editor's Note:* The blank refers to 1 DAY AFTER the effective date of ~~adoption of~~ this ~~proposed~~ FINAL-FORM rulemaking.), community water systems and nontransient noncommunity water systems required to install optimal corrosion control treatment in accordance with § 109.1102(b) shall obtain a construction and operation permit.

(c) *Operation permits.* Except for nontransient noncommunity water systems complying with subsection (b)(2), the water supplier shall obtain an operation permit or amended operation permit following completion of construction and prior to initiation of operation of corrosion control treatment facilities. The permit will be issued in accordance with § 109.504 (relating to public water system operation permits). The Department will not issue an operation permit under this subchapter unless the water system complies with the operation and maintenance plan requirements under § 109.1107(b) (relating to system management responsibilities) and the operator certification requirements under § 109.1107(c). The water supplier for a community water system or nontransient noncommunity water system shall submit a request for Department designation of optimal corrosion control treatment performance requirements in accordance with

§ 109.1102(b)(2) and the Department will issue an amended operation permit designating the performance requirements as specified in § 109.1102(b)(5).

§ 109.1107. System management responsibilities.

(a) *Reporting and recordkeeping.* Systems shall comply with the following requirements and otherwise comply with § 109.701 (relating to reporting and recordkeeping):

* * * * *

(2) *Reporting of monitoring results.* The water supplier shall assure that the results of analyses conducted in accordance with § 109.1103 are reported to the Department within the first 10 days following the end of each applicable monitoring period as stipulated by § 109.1103. Additional monitoring results beyond that required under § 109.1103 shall be kept on record by the water supplier and presented or submitted to the Department upon request.

(i) *Lead and copper tap monitoring results.* The following minimum information is required when reporting lead and copper tap monitoring results to the Department.

(A) The name, address and public water system identification number (PWSID) of the public water system from which the samples are taken.

(B) The contaminant ID.

(C) The parameter name.

(D) The sample period.

(E) The sample type.

[(F) The number of samples required and the number of samples taken.

(G)] <u>(F)</u> The analytical methods used.

[(H)] <u>(G)</u> The results of analyses conducted in accordance with this subchapter for lead and copper tap monitoring.

[(I)] <u>(H)</u> The sample location.

[(J) The 90th percentile result.

(K) Whether an action level has been exceeded.

(L)] <u>(I)</u> The name, address and identification number of the certified laboratory performing the analysis.

* * * * *

§ 109.1108. Fees.

[A system receiving permitting and related services from the Department under § 109.1105 (relating to permit requirements) for corrosion control treatment facilities shall pay the applicable fees in this section by a check in the amount specified in this section to the "Commonwealth of Pennsylvania."

(1) An application for a construction permit or major permit amendment under § 109.1105(b) shall be accompanied by payment for the applicable fee as follows:

System size	*Fee*
Small	**$250**
Medium	**$500**
Large	**$1,750**

(2) A system not required to submit an application for a construction permit or major permit amendment under § 109.1105(b) shall submit payment for the applicable fee with its request for Department designation of optimal corrosion control treatment performance requirements in accordance with § 109.1102(b)(2) (relating to action levels and treatment technique requirements):

System size	*Fee*
Small	**$125**
Medium	**$375**
Large	**$1,250]**

<u>An application for the review of a corrosion control treatment feasibility study under § 109.1102(b)(3) (relating to action levels and treatment technique requirements), a permit from the Department under this subchapter or a Department designation of optimal corrosion control treatment performance requirements in accordance with § 109.1102(b)(2)(ii) must be accompanied by a fee in the amount specified in Subchapter N (relating to drinking water fees).</u>

Subchapter L. LONG-TERM 2 ENHANCED SURFACE WATER TREATMENT RULE

§ 109.1202. Monitoring requirements.

* * * * *

(i) *Source water sample collection period.* Systems shall collect samples within 2 days before or 2 days after the dates indicated in their sampling schedule (that is, within a 5 day period

around the schedule date) unless one of the conditions of **PARAGRAPHS** ~~**subsection (b)**~~(1) or (2) applies.

(1) *Extreme sample collection conditions.* If an extreme condition or situation exists that may pose danger to the sample collector, or that cannot be avoided and causes the system to be unable to sample in the scheduled 5-day period, the system shall sample as close to the scheduled date as is feasible unless the Department approves an alternative sampling date. The system shall submit an explanation for the delayed sampling date to the Department concurrent with the shipment of the sample to the laboratory.

* * * * *

(l) [***Chemical treatment prior to sampling location.***] ***Source water sample locations for plants with chemical treatment.*** Systems shall collect source water samples prior to chemical treatment, such as coagulants, oxidants and disinfectants.

* * * * *

(n) [***Bank filtration.***] ***Source water sample locations for systems with bank filtration.***

(1) Systems that receive *Cryptosporidium* treatment credit for bank filtration to meet existing treatment technique requirements of § 109.202(c) (relating to State MCLs, MRDLs and treatment technique requirements), as applicable, shall collect source water samples in the surface water prior to bank filtration.

* * * * *

(o) [***Multiple sources.***] ***Source water sample locations for systems with multiple sources.*** Systems with plants that use multiple water sources, including multiple surface water sources and blended surface water and groundwater sources, shall collect samples as specified in paragraph (1) or (2). The use of multiple sources during monitoring **[must]** **shall** be consistent with routine operational practice. Sources not adequately evaluated during the monitoring period will be considered new sources and the requirements under subsection (f) will apply. Systems may begin monitoring a new source as soon as a sampling schedule and plan have been approved by the Department.

* * * * *

§ 109.1203. Bin classification and treatment technique requirements.

* * * * *

(f) *Treatment and management options for filtered systems, microbial toolbox.*

(1) Filtered systems shall use one or more of the treatment and management options listed in § 109.1204 (relating to requirements for microbial toolbox components), termed the microbial toolbox, to comply with the additional *Cryptosporidium* treatment required in subsection (e).

(2) Systems using sources classified in Bin 3 and Bin 4 shall achieve at least 1-log of the additional *Cryptosporidium* treatment required under § 109.1204(a) using either one or a combination of the following: bag filters, bank filtration, cartridge filters, chlorine dioxide, membranes, ozone or UV, as described in **[§ 109.1204(b), (c) and (n)—(q) (relating to requirements for microbial toolbox components)]** **§ 109.1204**.

(g) *Failure to meet treatment credit.* Failure by a system in any month to achieve treatment credit by meeting criteria in **[§ 109.1204(b), (c) and (n)—(q)]** **§ 109.1204** for microbial toolbox options that is at least equal to the level of treatment required in subsection (e) is a violation of the treatment technique requirement.

* * * * *

§ 109.1204. Requirements for microbial toolbox components.

* * * * *

(h) *Individual filter performance.* Systems using conventional filtration treatment or direct filtration treatment will receive 0.5-log *Cryptosporidium* treatment credit, which can be in addition to the 0.5-log credit under subsection (g), during any month the system meets the criteria in this subsection. Compliance with these criteria must be based on individual filter turbidity monitoring as described in **[§ 109.301(1)(iv)]** **§ 109.301(1)(ii)** (relating to general monitoring requirements), as applicable.

* * * * *

§ 109.1206. Reporting and recordkeeping requirements.

* * * * *

(e) *Source water reporting data elements.* Systems shall report the applicable information in paragraphs (1) and (2) for the source water monitoring required under § 109.1202.

(1) *Cryptosporidium data elements.* Systems shall report data elements in subparagraphs (i)— **[(vii)]** **(viii)** for each *Cryptosporidium* analysis. Systems shall report, in a form acceptable to the Department, data elements in subparagraphs **[(viii)—(x)]** **(ix)—(xi)** as applicable.

* * * * *

(vii) Number of oocysts occurred.

(viii) The concentration of oocysts per liter.

[(viii)] **(ix)** For matrix spike samples, systems shall also report the sample volume spiked and estimated number of oocysts spiked. These data are not required for field samples.

[(ix)] **(x)** For samples in which less than 10 L is filtered or less than 100% of the sample volume is examined, systems shall also report the number of filters used and the packed pellet volume.

[(x)] **(xi)** For samples in which less than 100% of sample volume is examined, systems shall also report the volume of resuspended concentrate and volume of this resuspension processed through immunomagnetic separation.

* * * * *

Subchapter M. ADDITIONAL REQUIREMENTS FOR GROUNDWATER SOURCES

§ 109.1302. Treatment technique requirements.

* * * * *

(c) *Groundwater systems with* ***[significant deficiencies or]*** *source water E. coli contamination* ***or significant deficiencies****.*

(1) A groundwater system with **[a significant deficiency or]** an *E. coli*-positive groundwater source sample collected under § 109.505(a)(3), § 109.1303(a) or § 109.1304(a) (relating to requirements for noncommunity water systems; triggered monitoring requirements for groundwater sources; and assessment source water monitoring) **[shall correct all significant deficiencies and, if directed by the Department,]** shall implement one or more of the following corrective actions:

(i) Provide an alternative source of water.

(ii) Eliminate the source of contamination.

(iii) Submit information required under § 109.1306 and provide treatment that reliably achieves at least 4-log treatment of viruses before the first customer for the groundwater source or sources and comply with compliance monitoring requirements under § 109.1305.

(2) A groundwater system with a significant deficiency or an *E. coli*-positive groundwater source sample collected under § 109.1303(a) or § 109.1304(a) will receive one of the following forms of notification:

(i) Written notice from the Department of a significant deficiency.

(ii) Notification from a laboratory under § 109.810(b) (relating to reporting and notification requirements) that a groundwater source sample collected under § 109.1303(a) or § 109.1304(a) was found to be *E. coli*-positive.

[(iii) Direction from the Department that an *E. coli* positive sample collected under § 109.1303(a) requires corrective action.]

(3) **[Within 30 days of receiving initial notification under paragraph (2), the groundwater system shall consult with the Department regarding the appropriate corrective action unless the Department directs the groundwater system to implement a specific corrective action.]** **A groundwater system with a significant deficiency or an *E. coli*-positive source water sample collected under § 109.1303(a) or § 109.1304(a) shall comply with § 109.716 (relating to significant deficiencies).**

[(4) Within 120 days of receiving initial notification under paragraph (2), or earlier if directed by the Department, the groundwater system shall correct all significant deficiencies if applicable and shall either:

(i) Have completed corrective action in accordance with applicable Department plan review processes or other Department guidance or direction, if any, including Department-specified interim measures.

(ii) Be in compliance with a Department-approved corrective action plan and schedule subject to the following conditions:

(A) The groundwater system shall request and obtain approval from the Department for any subsequent modifications to a Department-approved corrective action plan and schedule.

(B) If the Department specifies interim measures for protection of the public health pending Department approval of the corrective action plan and schedule or pending completion of the corrective action plan, the system shall comply with these interim measures as well as with any schedule specified by the Department.]

§ 109.1303. Triggered monitoring requirements for groundwater sources.

* * * * *

(h) For an *E. coli*-positive source water sample collected under subsection (a) that is not invalidated under subsection (g)**[:]**, **the system shall comply with Tier 1 public notification requirements under § 109.408 (relating to Tier 1 public notice—categories, timing and delivery of notice).**

[(1) The Department may require a groundwater system to perform a corrective action as described under § 109.1302(c) (relating to treatment technique requirements).

(2) If the Department does not require corrective action under § 109.1302(c), the system shall collect five additional source water samples from the same source within 24 hours of being notified of the *E. coli*-positive sample. If one of the additional samples collected under this paragraph is *E. coli*-positive, the groundwater system shall perform a corrective action as described under § 109.1302(c).

(3) The system shall comply with Tier 1 public notification requirements under § 109.408 (relating to Tier 1 category, timing and delivery of notice).]

(i) Systems providing water to another public water system receiving notification under subsection (e) shall comply with subsection (a).

§ 109.1305. Compliance monitoring.

(a) *Chemical disinfection*. Groundwater systems demonstrating at least 4-log treatment of viruses using chemical disinfection shall monitor for and maintain the Department-approved residual disinfection concentration every day the system serves the public from the groundwater source.

(1) A groundwater system serving greater than 3,300 people shall:

(i) Continuously monitor the residual disinfectant concentration at the entry point or other location approved by the Department and record the results at least every 15 minutes each day that water from the groundwater source is served to the public.

(ii) Maintain the Department-approved minimum residual disinfectant concentration every day the public water system serves water from the groundwater source to the public.

(iii) Conduct grab sampling every 4 hours until the continuous monitoring equipment is returned to service if there is a failure in the continuous monitoring equipment **and notify the Department within 24 hours of the equipment failure that grab sampling is being conducted**. **[The system shall resume continuous residual disinfectant monitoring within 14 days.]** **Grab sampling or manual recording may not be substituted for continuous monitoring for longer than 5 working days after the equipment fails unless a longer period of time is approved by the Department.**

(2) A groundwater system serving 3,300 or fewer people shall comply with one of the following subparagraphs:

(i) The groundwater system shall maintain the Department-approved minimum residual disinfectant concentration every day the public water system serves water from the groundwater source to the public. The groundwater system shall take a daily grab sample at the entry point or other location approved by the Department during the hour of peak flow or at any other time specified by the Department. If any daily grab sample measurement falls below the Department-approved minimum residual disinfectant concentration, the groundwater system shall take follow up samples every 4 hours **and record the results** until the residual disinfectant concentration is restored to the Department-approved minimum level.

* * * * *

§ 109.1306. Information describing 4-log treatment and compliance monitoring.

* * * * *

(b) A noncommunity water system not covered under subsection (a) demonstrating at least 4-log treatment of viruses under § 109.1302 (relating to treatment technique requirements) shall:

* * * * *

(3) Submit plans, specifications, engineer's report, water quality analyses and other data, information or documentation reasonably necessary to enable the Department to determine compliance with the act and this chapter. The Department will make available to the applicant the *Public Water Supply Manual*, available from the Bureau of **[Water Standards and Facility Regulation]** **Safe Drinking Water**, Post Office Box **[8774]** **8467**, Harrisburg, Pennsylvania 17105 which contains acceptable design standards and technical guidance. Water quality analyses shall be conducted by a laboratory accredited under this chapter.

* * * * *

§ 109.1307. System management responsibilities.

(a) *Reporting*. Groundwater systems shall comply with the following requirements and otherwise comply with § 109.701 (relating to reporting and recordkeeping):

(1) A groundwater system conducting compliance monitoring under § 109.1305 (relating to compliance monitoring):

* * * * *

(ii) That experiences a breakdown in treatment shall notify the Department within 1 hour after the water system learns of the violation or the situation and provide public notice in accordance with § 109.408 (relating to Tier 1 public notice—categories, timing and delivery **of notice**). A breakdown in treatment occurs whenever the system fails to meet, for greater than 4 **[continuous]** hours **of operation**, any Department-specified requirements relating to:

* * * * *

(.)

Subchapter N. DRINKING WATER FEES

Sec.
109.1401. General.
109.1402. Annual fees.
109.1403. Monitoring waiver fees.
109.1404. Community and noncommunity water system permitting fees.
109.1405. Permitting fees for general permits.
109.1406. Permitting fees for bottled water and vended water systems, retail water facilities and bulk water hauling systems.

109.1407. Feasibility study.
109.1408. Noncommunity water system application for approval.
109.1409. Noncommunity water system 4-log permit.
109.1410. Payment of fees.
109.1411. Disposition of funds.
109.1412. Failure to remit fees.
109.1413. Evaluation of fees.

§ 109.1401. General.

(a) This subchapter establishes fees for each public water system for services provided by the Department to implement the act, retain primacy, and protect the public health and safety.

(b) This subchapter applies to each public water system.

§ 109.1402. Annual fees.

(a) *Annual fee.* BEGINNING JANUARY 1, 2019, ~~Each~~ EACH public water system shall pay an annual fee as set forth in this section.

(1) For community water systems, the annual fees are as follows:

Population Served	*Fee*
~~25~~—100 OR LESS	$250
101—500	$500
501—1,000	$1,000
1,001—2,000	$2,000
2,001—3,300	$4,000
3,301—5,000	$6,500
5,001—10,000	$10,000
10,001—25,000	$20,000
25,001—50,000	$25,000
50,001—75,000	$30,000
75,001—100,000	$35,000
100,001 or more	$40,000

(2) For nontransient noncommunity water systems, the annual fees are as follows:

Population Served	*Fee*
~~25~~—100 OR LESS	$100
101—500	$250
501—1,000	$500
1,001—3,300	$750
3,301 or more	$1,000

(3) For transient noncommunity water systems, the annual fees are as follows:

Population Served	*Fee*
~~25~~—100 OR LESS	$50
101—500	$100$200
501—1,000	$500
1,001 or more	

(4) For bottled water or vended water systems, retail water facilities or bulk water hauling systems, the annual fees are as follows:

Type	*Fee*
Bottled—in-State	$2,500
Bottled—out-of-State	$2,500
Vended	$1,000
Retail	$1,000
Bulk	$1,000

(b) *Basis for "population served."* The "population served" shall be based on the Department's public water system inventory at the time of billing.

(c) *Payment of fees.*

(1) All fees payable under this section are due according to the following schedule:

Population Served	*Submit Annual Fee By*
~~25—100~~ 3,301 OR MORE	~~September 30~~MARCH 31
~~101—500~~501-3,300	~~December 31~~JUNE 30
~~501—3,300~~ 101-500	~~March 31~~SEPTEMBER 30
~~3,301 or more~~ 100 OR LESS	~~June 30~~DECEMBER 31

(2) New systems that begin operation after January 1 will not be assessed an annual fee for partial calendar year periods. Annual fees shall be payable on or before the date indicated in paragraph (1) of the next calendar year, and each year thereafter.

(3) For annual fees of ~~$10,000~~6,500 or more, a public water system may request to divide its annual fee payment into equal quarterly installments by submitting a written request to the Department. Quarterly installments shall be due on March 31, June 30, September 30 and December 31.

§ 109.1403. Monitoring waiver fees.

(a) *New waivers.* An application for a new waiver from the monitoring requirements in §§ 109.301 and 109.302 (relating to general monitoring requirements; and special monitoring requirements) for a single source must be accompanied by a fee as follows:

Waiver Type	*New Waiver Fee*
VOC use waiver	$100
SOC use waiver	$100
SOC susceptibility waiver	$300
IOC waiver	$100

(b) *Waiver renewals.* An application for a waiver renewal from the monitoring requirements in §§ 109.301 and 109.302 for a single source must be accompanied by the appropriate fee as follows:

(1) For renewal applications with no changes in land uses or potential sources of contamination, the fee is $50.

(2) For renewal applications with changes in land uses or potential sources of contamination, the fee will be based on the type of waiver and the fee for that waiver set forth in subsection (a).

(c) *Waiver fees for systems with more than one source.*

(1) For systems with multiple sources all in the same contributing area, the fee will be as indicated in subsection (a) or (b), as applicable. For groundwater systems, the contributing area is the surface area overlying the portion of the aquifer through which water is diverted to a well or flows to a spring or infiltration gallery.

(2) For systems with sources in two or more contributing areas, the fee will be as indicated in subsection (a) or (b), as applicable, for the first source, plus 1/2 of the applicable fee for each additional contributing area in which a source is located.

§ 109.1404. Community and noncommunity water system permitting fees.

(a) An application for a construction permit or a major construction permit amendment under § 109.503 (relating to public water system construction permits), except for an application for ~~BVRB facilities~~ A BOTTLED WATER OR VENDED WATER SYSTEM, RETAIL WATER FACILITY OR BULK WATER HAULING SYSTEM FACILITY under § 109.1005 (relating to permit requirements), must be accompanied by a fee as follows:

Population Served	*Fee*
~~25~~—100 OR LESS	$300
101—500	$600
501—3,300	$1,000
3,301—10,000	$2,500
10,001—50,000	$5,000
50,001—100,000	$7,500
100,001 or more	$10,000

(b) A written request for a minor construction permit amendment under § 109.503, except for a change in legal status must be accompanied by a fee as follows:

Population Served	*Fee*
~~25~~—100 OR LESS	$100
101—500	$250
501—3,300	$500
3,301—10,000	$750
10,001—50,000	$1,000
50,001—100,000	$2,500
100,001 or more	$5,000

(c) A written request for a change in legal status, such as a transfer of ownership, incorporation or merger, must be accompanied by a fee of $100.

(d) A written request for a new or amended operations permit under § 109.504 (relating to public water system operating permits) must be accompanied by a fee of $50.

(e) A written request for an emergency permit must be accompanied by a fee of $100.

§ 109.1405. Permitting fees for general permits.

Fees for coverage under a general permit under § 109.511 (relating to general permits) will be established in the general permit. Fees may not exceed $500. An eligible person shall submit to the Department the applicable fee before the Department approves coverage under the general permit for that person.

§ 109.1406. Permitting fees for bottled water and vended water systems, retail water facilities and bulk water hauling systems.

(a) An application for a construction permit or a major construction permit amendment under § 109.1005 (relating to permit requirements), except an out-of-State facility or system using finished water as its sole source of water, must be accompanied by a fee as follows:

System Type	*Fee*
Bottled water system (population served)	
~~25~~—100 OR LESS	$500
101—500	$750
501—3,300	$1,000
3,301—10,000	$2,500
10,001—50,000	$5,000
50,001—100,000	$7,500
100,001 or more	$10,000

Vended water system	$100
Retail water ~~facilities~~ FACILITY	$250
Bulk water hauling system	$500

(b) An application from a bottled water system, retail water facility or bulk water hauling system whose sole source of water is finished water purchased from another public water system must be accompanied by a fee as follows:

System Type	*Fee*
Bottled water system (population served)	
~~25~~—100 OR LESS	$100
101—500	$250
501—3,300	$500
3,301—10,000	$750
10,001—50,000	$1,000
50,001—100,000	$2,500
100,001 or more	$5,000
Retail water ~~facilities~~ FACILITY	$100
Bulk water hauling system	$100

(c) An application from an out-of-State bottled water system submitting proof of out-of-State approval under § 109.1005 must be accompanied by a fee of $1,000.

(d) A written request for a minor construction permit amendment under § 109.1005, except for a change in legal status, must be accompanied by a fee as follows:

System Type	*Fee*
Bottled water system	$1,000
Vended water system	$100
Retail water ~~facilities~~ FACILITY	$100
Bulk water hauling system	$100

(e) A request for a change in legal status, such as a transfer of ownership, incorporation or merger, must be accompanied by a fee of $100.

(f) A written request for a new or amended operations permit must be accompanied by a fee of $50.

(g) A written request for an emergency permit must be accompanied by a fee of $100.

§ 109.1407. Feasibility study.

An application for a review of a feasibility study or pilot study must be accompanied by a fee as follows:

Population Served	*Fee*

~~25~~—100 OR LESS	$300
101—500	$600
501—3,300	$1,000
3,301—10,000	$2,500
10,001—50,000	$5,000
50,001—100,000	$7,500
100,001 or more	$10,000

§ 109.1408. Noncommunity water system application for approval.

For a noncommunity water system that is released from the obligation to obtain a construction and an operation permit under § 109.505 (relating to requirements for noncommunity water systems), the application for approval required under § 109.505(a)(2)(ii) must be accompanied by a fee of $50.

§ 109.1409. Noncommunity water system 4-log permit.

For noncommunity water systems demonstrating 4-log treatment of viruses under Subchapter M (relating to additional requirements for groundwater sources), the permit application must be accompanied by a fee of $50.

§ 109.1410. Payment of fees.

All fees under this subchapter shall be payable by a check to the "Commonwealth of Pennsylvania" or through a secure computer application provided by the Department.

§ 109.1411. Disposition of funds.

All fees shall be paid into the State Treasury into a special restricted revenue account in the General Fund known as the Safe Drinking Water Account administered by the Department for use in protecting the public from the hazards of unsafe drinking water and which funds are hereby appropriated to the Department for the purposes as are authorized in the act.

§ 109.1412. Failure to remit fees.

(a) If fees are not remitted as required under § 109.1402 (relating to annual fees), interest will accrue on the entire amount from the original date payment was due at a rate of 6% per annum until payment is remitted.

(b) For any system delinquent in payment of fees in excess of 180 days, the Department may suspend technical services provided by the Department until payment is remitted.

§ 109.1413. Evaluation of fees.

At least every 3 years, the Department will provide the EQB with an evaluation of the fees in this chapter and recommend regulatory changes to the EQB to address any disparity

between the program income generated by the fees and the Department's cost of administering the program with the objective of ensuring fees meet all program costs and programs are self-sustaining. The evaluation will include an assessment of program complement and workload.

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

May 11, 2018

David Sumner
Executive Director
Independent Regulatory Review Commission
333 Market Street, 14th Floor
Harrisburg, PA 17120

Re: Final Rulemaking: Control of VOC Emissions from Industrial Cleaning Solvents; General Provisions; Aerospace Manufacturing and Rework; and Additional RACT Requirements for Major Sources of NO_x And VOCs **(#7-492)**
Final Rulemaking: Safe Drinking Water General Update and Fees **(#7-521)**

Dear Mr. Sumner:

Pursuant to Section 5(a) of the Regulatory Review Act, please find enclosed copies of two final-form rulemakings for review and comment by the Independent Regulatory Review Commission (IRRC). The Environmental Quality Board (Board) adopted these rulemakings at its April 17, 2018 meeting.

The **Control of VOC Emissions from Industrial Cleaning Solvents; General Provisions; Aerospace Manufacturing and Rework; and Additional RACT Requirements for Major Sources of NO_x And VOCs (#7-492)** final-form rulemaking addresses the control of volatile organic compound (VOC) emissions from stationary source industrial cleaning solvents that are not regulated elsewhere in 25 Pa. Code Chapters 129 or 130, by adopting Reasonably Available Control Technology (RACT) requirements and RACT emission limitations. The rulemaking is mandated by the Clean Air Act. The final-form rulemaking adds § 129.63a (relating to control of VOC emissions from industrial cleaning solvents) to address VOC emissions from industrial cleaning solvents and amends §§ 121.1 and 129.51 (relating to definitions; and general) to support the addition of § 129.63a. Minor clarifying amendments are made to § 129.73 (relating to aerospace manufacturing and rework) and specified sections of the recently promulgated additional (RACT) requirements for major sources of nitrogen oxides (NO_x) and VOCs (RACT 2). The final-form rulemaking establishes VOC emission limitations, work practice standards, and monthly recordkeeping and reporting requirements consistent with the RACT recommendations of the U.S. Environmental Protection Agency's (EPA) 2006 Industrial Cleaning Solvents Control Techniques Guidelines (2006 ICS CTG).

The Department of Environmental Protection (Department or DEP) must proceed expeditiously with the final-form rulemaking to submit it as a state implementation plan (SIP) revision to the EPA in time for EPA to make a completeness determination by September 6, 2018, for Pennsylvania to avoid the mandatory imposition of sanctions. This follows from a February 3, 2017 (82 FR 9158) EPA finding of failure to submit specific SIP elements for the 2008 ozone National Ambient Air Quality Standards (NAAQS).

The requirements included in this rulemaking apply statewide to the owner and the operator of a facility at which an industrial cleaning solvent is used or applied in a cleaning activity to remove a contaminant, including an adhesive, ink, paint, dirt, soil, oil, or grease, at a cleaning unit operation, a work production-related work area or a part, product, tool, machinery, equipment, vessel, floor, or wall, except as otherwise specified in § 129.63a(c). The VOC emission limitations and work practice standards apply statewide to the owner and the operator of a facility at which the total combined actual VOC emissions from all subject cleaning unit operations at the facility are equal to or greater than 2.7 tons per 12-month rolling period, before consideration of controls. An owner and operator with total combined actual VOC emissions less than 2.7 tons per 12-month rolling period, before consideration of controls, from subject cleaning unit operations is only subject to the monthly recordkeeping and, if requested by the Department, reporting requirements.

The affected owners and operators have two options for bringing VOC emissions into compliance: the use of complying industrial cleaning solvents or the installation and operation of a VOC emissions capture system and an add-on air pollution control device.

The Department estimates that the owners and operators of about 576 facilities across the Commonwealth may be affected by the final-form rulemaking. Of these facility owners and operators, about 253 may meet the definition of small business across this Commonwealth. The Department expects that the impact on these small businesses will be minimal. The owner and the operator of a facility that is subject to final § 129.63a will likely incur little, if any, cost to implement these requirements. Industrial cleaning solvents such as Stoddard solvent, mineral spirits, and most other common solvents provided by suppliers have vapor pressures well below the proposed 8 millimeters of mercury composite vapor pressure compliance limit. The owners and operators of potentially affected facilities such as automobile repair garages and metal parts manufacturing facilities using these common industrial cleaning solvents will likely not have to make any changes to their cleaning materials. Reporting, recordkeeping, and administrative costs have been minimized in the final § 129.63a.

The Department estimates that the annual financial impact on potentially affected facility owners and operators could range from an average savings of $282 per affected facility owner and operator to an average cost of $27 per affected facility owner and operator. The estimated amount of VOC emission reductions could be as much as 12,499 tons per year (tpy). The estimated average amount of potential VOC emission reductions per affected owner and operator could be approximately 22 tpy per affected facility (12,499 tpy/576 facilities).

The Independent Regulatory Review Commission (IRRC), in its comments on the rulemaking, incorporated the EPA's comments because the EPA raised concerns relating to IRRC's review criteria. IRRC requested clarification and explanation of the reasonableness of an exemption for aerospace manufacturing and rework operations due to two industry commentators sharing concerns about the use of the term "aerospace coatings" in proposed § 129.63a(c). IRRC also asked for explanation of the reasonableness of exemptions and compliance options regarding the feasibility of proposed § 129.63a to battery cleaning operations due to the concern of an industry commentator. The exempted category of aerospace coatings was changed to aerospace manufacturing and rework operations. Battery cleaning operations are already an exempted category in § 129.63a. All concerns put forward in comments have been addressed and there are no unresolved issues.

On January 24, 2018, the Department briefed the Small Business Compliance Advisory Committee (SBCAC) on the final-form rulemaking and on the comments received on the proposed rulemaking. The SBCAC recommended the Department conduct education and outreach for the regulated community on the final-form rulemaking and voted unanimously to concur with the Department's recommendation to move the rulemaking forward to the Board for consideration. On February 8, 2018, the Department briefed the Air Quality Technical Advisory Committee (AQTAC) on the final-form rulemaking and on the comments received on the proposed rulemaking. The AQTAC members had no concerns and voted unanimously to concur with the Department's recommendation to move the rulemaking forward to the Board. Further, the Department discussed the final-form rulemaking with the Citizens Advisory Council's (CAC) Policy and Regulatory Oversight Committee on February 9, 2018. On the recommendation of the Committee, on February 20, 2018, the CAC also concurred with the Department's recommendation to move the rulemaking forward to the Board.

The **Safe Drinking Water General Update and Fees (#7-521)** final-form rulemaking amends 25 Pa. Code, Chapter 109 to: (1) incorporate the remaining general update provisions that were separated from the proposed Revised Total Coliform Rule (RTCR), including revisions to treatment technique requirements for pathogens, clarifications to permitting requirements, and new requirements for alarms, shutdown capabilities, and auxiliary power; (2) amend existing permit fees and add new annual fees to supplement state costs and fill the funding gap ($7.5 million); and (3) add new provisions to establish the regulatory basis for issuing general permits, clarify that noncommunity water systems (NCWS) require a permit or approval from the Department prior to construction and operation, and address concerns related to gaps in the monitoring, reporting and tracking of back-up sources of supply.

Collectively, these amendments will provide for the increased protection of public health by every public water system (PWS) within the Commonwealth, and ensure that the Department has adequate funding to enforce the applicable drinking water laws, meet state and Federal minimum program elements, and retain primacy (primary enforcement authority). Safe drinking water is vital to maintaining healthy and sustainable communities. Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidence of illness, and reduce health care costs. Proper investment in PWS infrastructure and operations helps ensure a continuous supply of safe drinking water, enables communities to plan and build future capacity for economic growth, and ensures their long-term sustainability for years to come.

Part I: General Update Provisions
These general updates:

- Clarify the source water assessment, source water protection area, and source water protection program elements and requirements.
- Revise the treatment technique requirements for pathogenic bacteria, viruses and protozoan cysts by adding specific turbidity performance requirements for membrane filtration.
- Revise the disinfection profiling and benchmarking requirements to clarify that all PWSs using filtered surface water or groundwater under the direct influence of surface water (GUDI) must consult with the Department prior to making significant changes to disinfection practices to ensure adequate Giardia inactivation is maintained.

- Revise and clarify the monitoring, calibration, recording and reporting requirements for the measurement of turbidity.
- Revise the permit requirements to clarify the components that must be included in a permit application for a new source, including a source water assessment, a pre-drilling plan, an evaluation of water quantity and quality, and a hydrogeologic report.
- Revise the design and construction standards to require PWSs using surface water or GUDI sources to be equipped with alarm and shutdown capabilities. These provisions are required for plants that are not staffed continuously while the plant is in operation.
- Clarify that treatment technologies must be certified for efficacy through an approved third party.
- Update the system management requirements for community water systems (CWSs) to strengthen system service and resiliency by requiring completion of an uninterrupted system service plan (USSP) which focuses on utilizing auxiliary power or a combination of alternate provisions such as finished water storage and interconnections.
- Clarify system management responsibilities relating to source water assessments and sanitary surveys.
- Revise the corrective action timeframes in response to a significant deficiency for PWSs using groundwater and surface water sources to be consistent.
- Delete the provision that allows a PWS to avoid the requirement for a corrective action by collecting five additional source water samples after an *E. coli*-positive triggered source water sample.

Part II: New Annual Fees and Amended Permit Fees

The current funding available to administer the Safe Drinking Water Program from State and Federal sources is $ 19.7 million. The fees are expected to generate approximately $7.5 million, which will allow the Safe Drinking Water Program to restore staffing levels and reverse the decline in services that has occurred since 2009. The fees will provide nearly 50% of the Commonwealth's share of funding for the Safe Drinking Water Program. The remaining portion of the Commonwealth's share ($7.7 million) is expected to be provided through annual General Fund appropriations. If appropriations from the General Fund do not keep pace with program costs, a funding gap could remain even with this final-form rulemaking.

The annual fees range from $250 - $40,000 for CWSs, $50 - $1,000 for NCWSs, and $1,000 - $2,500 for bottled, vended, retail, and bulk water haulers (BVRB). The fees will most likely be passed on to the 11.3 million customers of these PWSs as a user fee. Per person costs are expected to range from $0.35 to $10 per year, depending on the water system size.

Part III: New Provisions

The remaining component of this final-form rulemaking includes amendments to other parts of Chapter 109 to:

- Establish the regulatory basis for the issuance of general permits for high volume, low risk modifications or activities to streamline the permitting process.
- Clarify that NCWSs that are not required to obtain a permit must still obtain Department approval of the facilities prior to construction and operation.
- Address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points.

One or more of these proposed amendments will apply to all 8,521 PWSs. More specifically:

- The amended source water protection and new source permitting requirements will apply to all 1,952 CWS. Based on historical permit submissions, approximately 50 CWSs per year will be required to comply.
- The revised turbidity treatment technique requirements, filter assessment requirements, and alarm/shutdown capabilities will apply to some or all 353 filter plants in Pennsylvania which are operated by 319 water systems.
- The resiliency requirements for back-up power or alternate provisions will apply to all 1,952 CWSs.
- The new annual fees and amended permit fees will apply to all 8,521 PWSs.
- Clarifications to the monitoring requirements for back-up sources of supply and the comprehensive monitoring plan requirements will apply to all 8,521 PWSs. However, only those PWSs with sources designated as emergency, interim and reserve will see any changes to their monitoring and reporting requirements. The majority of PWSs only have one permanent source and entry point.

Benefits

One or more of these amendments will affect all 8,521 PWSs serving approximately 11.3 million Pennsylvanians. The residents of the Commonwealth will benefit from: (1) the avoidance of a full range of adverse health effects from the consumption of contaminated drinking water such as acute and chronic illness, endemic and epidemic disease, waterborne disease outbreaks, and death; (2) the continuity of a safe and adequate supply of potable water; and (3) the protection of public drinking water sources, which will result in maintaining the highest source water quality available, thereby minimizing drinking water treatment costs.

Source Water Assessment, Protection and Permitting Requirements: Source water protection represents the first barrier to drinking water contamination. A vulnerable drinking water source puts a water utility and the community it serves at risk and at a disadvantage in planning and building future capacity for economic growth. Contamination of a CWS source is costly for the water supplier and the public.

In addition to those benefits, the amendments in the final-form rulemaking more clearly define the requirements regarding the proper order of the permitting process for developing a new PWS source. These clarifications are needed to help insure that the proper level of treatment is designed and installed in a timely manner, thereby resulting in less delay for permitting a new source that may be needed to meet public health protection requirements, or provide redundancy in the event of contamination of existing sources. These amendments should result in cost savings due to the avoidance of expensive permitting mistakes.

Turbidity and Filtration Requirements: Some of the amendments to the monitoring, calibration, recording and reporting requirements for the measurement of turbidity are more stringent than Federal requirements. These amendments will benefit more than 8 million Pennsylvanians that are supplied water by PWSs using filtration technologies. The amendments for combined filter effluent (CFE) turbidity monitoring will require continuous monitoring and recording of the results every 15 minutes. This will enable operators to identify problematic water quality trends and respond more quickly with necessary process control adjustments.

Health effects associated with microbial contaminants tend to be due to short-term, single dose exposure rather than long-term exposure. Therefore, if a short duration single turbidity exceedance of the existing maximum allowable turbidity limit occurs and goes unnoticed, consumers are at risk of exposure to microbial pathogens. By requiring continuous monitoring and recording of the results at least every 15 minutes for CFE at all filter plants, water suppliers will be better able to identify problems before an exceedance occurs and determine compliance with the maximum allowable turbidity limit at all times.

An additional revision will require all surface water filtration plants to implement a filter bed evaluation program that assesses the overall integrity of each filter to identify and correct problems before a turbidity exceedance or catastrophic filter failure occurs. Filters are the final barrier for removal of acute pathogens, and are therefore critical to public health protection.

Automatic Alarms and Shutdown Capabilities: Automated alarms and shutdown capabilities play an important role in modern water treatment and public health protection. Many water suppliers have already taken advantage of readily available technology to reduce personnel costs while still providing safe water to their customers. The amendments will ensure that all surface water filtration plants have the minimum controls in place to ensure that operators are immediately alerted to major treatment problems. The amendments will also ensure that unmanned filter plants are automatically shut down when the plant is producing water that is not safe to drink, which prevents contaminated water from being provided to customers for extended periods of time. These alarms and shutdown capabilities will allow operators at both attended and unattended filtration plants to promptly respond to the water quality problems and treatment needs of the plant. The automated plant shut down is intended to prevent poor quality water from reaching customers, which will protect public health, reduce PWS costs related to corrective actions and issuing public notice, reduce costs to the community, and maintain consumer confidence.

Filter-To-Waste Requirements: The Department's Filter Plant Performance Evaluation (FPPE) program has evaluated approximately 1,250 filters since 1999. The results of these evaluations show that filters are most likely to shed turbidity, particles, and microbial organisms at the beginning of a filter run when the filter is first placed into service following filter backwash and/or maintenance. The amendments will require all filter plants that have the ability to filter-to-waste to do so following filter backwash and/or maintenance and before placing the filter into service. Filtering to waste will reduce the likelihood of pathogens passing through filters and into the finished drinking water.

Strengthen Resiliency Through Auxiliary Power or Alternate Provisions: The revisions to system service and auxiliary power requirements will strengthen system resiliency and ensure that safe and potable water is continuously supplied to consumers and businesses. A continuous and adequate supply of safe drinking water is vital to maintaining healthy and sustainable communities.

New Annual Fees and Amended Permit Fees: To improve program performance, the final-form rulemaking will supplement Commonwealth costs for administering the Safe Drinking Water Program by filling the funding gap. The fees will total approximately $7.5 million annually and will account for nearly 50% of the Program's Commonwealth funding. The fees will augment the Program funding currently coming from the General Fund ($7.7 million).

General Permits: These amendments will establish the regulatory basis for the issuance of general permits for high volume, low risk modifications or activities to streamline the permitting process. General permits provide a cost-effective method for a PWS to obtain a permit and for the Department to regulate such activities.

Requirements for NCWSs: These amendments will clarify that NCWSs that are not required to obtain a permit must still obtain the Department approval of the facilities prior to construction and operation. The Department's public water supply well construction standards are measures that can prevent pollution from surface runoff and shallow aquifer zones that are above the source aquifer used for public water supply. Obtaining approval prior to constructing a source and associate water system facilities (such as treatment and storage) ensures the facility is planning and constructing a source and water system facilities that meet Pennsylvania's construction standards. This will avoid the costs for rehabilitating an improperly constructed source and avoid delays in obtaining approvals to operate the water system.

Address Gaps in Monitoring, Reporting and Tracking Back-up Sources: These amendments address concerns related to gaps in the monitoring, reporting and tracking of back-up water sources and entry points. As required under Commonwealth and Federal regulations, all sources and entry points must be included in routine compliance monitoring to ensure water quality meets safe drinking water standards. Sources and entry points that do not provide water continuously are required to be monitored when used. However, monitoring requirements for back-up sources are not currently tracked, which means that verifiable controls are not in place to ensure that all sources and entry points meet safe drinking water standards. Some of these sources have not been used in 5 to 10 years, and, therefore, the Department does not know the water quality for these sources. These amendments will ensure that all sources and entry points are monitored when used. PWSs will also be required to document in a comprehensive monitoring plan how routine compliance monitoring will include all sources and entry points.

Compliance Costs

Proactively avoiding incidents such as waterborne disease outbreaks can prevent loss of life, reduce the incidents of illness and reduce health care costs. For example, it is estimated that the total cost of the May 2000 *E. coli* contamination incident in Walkerton, Ontario was $64.5 million. Costs related to the 1993 waterborne outbreak of cryptosporidiosis in Milwaukee, Wisconsin were $96.2 million. Waterborne disease outbreaks result in significant economic and health impacts and can have long-term impacts due to the loss of trust in public water systems.

The fees are necessary to improve program performance and will supplement Commonwealth costs for administering the Safe Drinking Water Program. Program costs are directly tied to the resources needed to meet Federal and Commonwealth mandates for minimum program elements and for the administration of an effective State Drinking Water Program. Failure to meet minimum program elements may result in an increased risk to public health and the loss of primacy for the Safe Drinking Water Program and associated Federal funding.

Source water protection and permitting requirements: Approximately 30 new CWS sources are permitted each year. The Department estimates that an additional 8 hours of work completed for the CWS by a professional geologist will be needed to comply with the new source permitting

amendments. This extra time will amount to approximately $1,176 per source permitted, based on current hourly rates charged by consulting firms.

Revisions to turbidity monitoring, recording and reporting requirements: Filter plants that need to install continuous monitoring and recording devices will need to spend about $3,000 - $4,000 per monitoring site (includes turbidimeter, controller and installation), with estimated annual costs for maintenance and calibration of $500 per plant. It is estimated that 21 filter plants will need to install this equipment on individual filters and 52 filter plants will need to install this equipment at their combined filter effluent monitoring site.

Automatic Alarms and Shutdown Capabilities: Depending on options chosen, systems may incur $8,860 to $11,980 per treatment plant with annual maintenance costs of $600. Note: it is estimated that 317 of the 353 filter plants already meet these provisions and therefore will not incur any additional costs.

Major comments received on the proposed rulemaking are described as follows. IRRC commented that the current state of the Program, which is the cumulative result of numerous decisions made over many years, is cause for serious concern regarding protection of the public health, safety and welfare. The Safe Drinking Water Act (SDWA) not only envisions, but directs the Board to establish fees to cover services. IRRC asked for explanation as to why services were cut rather than gradually raising fees over time and how the budget will be monitored going forward. The Department explained that a fee increase was put forward in 2010 but halted due to circumstances beyond the control of the Department at that time. The Department provided assurance that protocols have been put into place to ensure the budget will be properly monitored going forward and the SDW program will provide updates to the Board every three years to ensure ongoing monitoring and tracking. Further, the Department is accountable to the EPA to ensure that the SDW Program meets all primacy and grant conditions and is at least as stringent as the Federal program. Annual and triennial reports are required to track performance. Also, the Department provides on its website all compliance monitoring results, violations and enforcement actions, and inspection results for all 8,521 PWSs.

Public comments opposing the proposed fees, and even those supporting them, challenged the methodology for assessing the fees. Commenters questioned whether fees based on parameters including population served, public water system identification number and system construction, bear a reasonable relationship to the actual cost of the services provided by the Department. The Department analyzed the cost of providing services to administer the SDWA and its regulations. The cost of some services can be estimated, while the cost of other services depends on specific circumstances and will vary widely. The annual fees could have been based solely on the costs for the services that could be estimated. However, that approach would have resulted in a disproportionate impact on the smallest CWSs and would have failed to account for the additional costs incurred by the Department to provide services that cannot be readily estimated, which result in substantially higher costs for medium and large water systems. Thus, the annual fees were developed, to the extent possible, to bear a reasonable relationship to the actual costs of the services provided while achieving a reasonable cost to the 11.3 million customers served.

Commenters discussed areas of the proposed regulation that were more stringent than Federal requirements, and they noted concern with the increased regulation relative to lack of staff and increased fees. The Department amended or deleted several provisions in response to the Small Water

Systems Technical Assistance Center Advisory Board (TAC) and public comments. The more stringent provisions are designed to help reduce the occurrence of violations, treatment breakdowns and water supply emergencies, thereby improving system resiliency and reliability and reducing the need for the Department staff resources to respond to these emergency situations.

IRRC noted the comments related to the proposal to reduce acceptable turbidity levels, making the maximum level more stringent than Federal standards. The Department deleted those provisions, deferring action at this time.

The rulemaking adds the requirement that "at a minimum, all entry points shall provide water to the public on an annual basis to ensure all sources and entry points are included in routine compliance monitoring." IRRC requested that the preamble address the economic impact and feasibility of requiring all entry points to provide water to the public, as well as the implementation schedule. Clarifications were made to this section of the rulemaking in response to public, TAC, and IRRC comments.

IRRC asked for clarification related to the pre-drilling plan and source water assessment requirements of this provision in the final regulation. The Department explained that predrilling plans and source approvals are coordinated with other agencies such as the Susquehanna River Basin Commission (SRBC), the Delaware River Basin Commission (DRBC), etc. Pre-drilling plans and subsequent approvals of potential production well site locations have required as part of the permitting process since at least 1997. Other more detailed explanation is provided in the preamble.

IRRC requested clarification related to NSF certification requirements. NSF certification requirements are long-standing and are intended to ensure the safety and efficacy of materials and equipment that come into contact with water.

Public commenters and IRRC also requested clarification and explanation related to triggered monitoring requirements for groundwater sources, specifically related to the deletion of the existing opportunity to collect five additional source water samples to confirm if there is a problem. EPA approves analytical methods based on the reliability of a method to have a low risk of samples being false positive or false negative. A risk to public health exists because the five additional samples may miss detecting the fecal contamination. In other words, the fecal contamination that was detected in the original sample was a true positive; however, because contamination is neither constant nor immobile, the five additional samples may miss detecting the contamination event.

The final-form rulemaking was presented to the TAC Board on December 7, 2017. Final written comments were received on December 22, 2017. The TAC Board made ten recommendations:

- Five of the recommendations were incorporated into this final-form rulemaking.
- TAC recommended that electronic submission of Consumer Confidence Reports (CCRs) to DEP be allowed as an environmentally prudent option. DEP continues to investigate options for water suppliers to submit reports electronically, and intends to move forward with promulgating a regulation to implement this recommendation as soon as a system is available to accept electronic submissions.

- TAC made three recommendations regarding NSF certification. These were not incorporated because NSF certification has been a long-standing requirement to ensure the safety and efficacy of materials and equipment that come into contact with water.
- TAC made recommendations regarding the elimination of the fees and whether the fees bear a reasonable relationship to the cost of services. These comments are addressed throughout the preamble to the final rule.

TAC Board comments on the final rulemaking as well as all public comments and IRRC comments have been addressed. Responses to all public comments and IRRC comments are included in the comment and response document that is included with this rulemaking package.

The Department will provide assistance as necessary to facilitate IRRC's review of the enclosed rulemakings under Section 5.1(e) of the Regulatory Review Act.

Please contact me by e-mail at ledinger@pa.gov or by telephone at 717.783.8727 if you have any questions or need additional information.

Sincerely,

Laura F. Edinger

Laura Edinger
Regulatory Coordinator

Enclosures

0120-FM-PO0011 6/2015

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
POLICY OFFICE

TRANSMITTAL SHEET FOR REGULATIONS SUBJECT TO THE REGULATORY REVIEW ACT

I.D. NUMBER: 7- 521

SUBJECT: Safe Drinking Water - General Update & Fees

AGENCY: DEPARTMENT OF ENVIRONMENTAL PROTECTION

RECEIVED
IRRC
2018 MAY 11 A 11: 34

TYPE OF REGULATION

- ☐ Proposed Regulation
- ☒ Final Regulation
- ☐ Final Regulation with Notice of Proposed Rulemaking Omitted
- ☐ 120-day Emergency Certification of the Attorney General
- ☐ 120-day Emergency Certification of the Governor
- ☐ Delivery of Tolled Regulation
  - a. ☐ With Revisions
  - b. ☐ Without Revisions

FILING OF REGULATION

DATE	SIGNATURE	DESIGNATION
5/11/18	Shelly K. Werner	Majority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY Representative John Maher
5/11/18	Sandy Nettenberg	Minority Chair, HOUSE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY Representative Mike Carroll
5/11/18	Patricia Calvey	Majority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY Senator Gene Yaw
5/11/18	Carly Simpson	Minority Chair, SENATE COMMITTEE ON ENVIRONMENTAL RESOURCES & ENERGY Senator John Yudichak
5/11/18	[illegible]	INDEPENDENT REGULATORY REVIEW COMMISSION David Sumner
		ATTORNEY GENERAL (for Final Omitted only)
		LEGISLATIVE REFERENCE BUREAU (for Proposed only)