

	OFFICE OF DRINKING WATER AND MUNICIPAL ASSISTANCE POLICY AND PROCEDURE		DEPARTMENT OF ENVIRONMENTAL QUALITY
Original Effective Date: October 20, 2003	Subject: Arsenic Treatment Systems and Compliance with the MCL		Category: <input type="checkbox"/> Internal/Administrative
Revised Date:	Division/Office and Program Names: ODWMA-Public Water System Supervision Program		<input type="checkbox"/> External/Noninterpretive <input checked="" type="checkbox"/> External/Interpretive
Reformatted Date: January 24, 2013	Number: ODWMA-399-020	Page: 1 of 8	

A Department of Environmental Quality (DEQ) Policy and Procedure cannot establish regulatory requirements for parties outside of the DEQ. This document provides direction to DEQ staff regarding the implementation of rules and laws administered by the DEQ. It is merely explanatory; does not affect the rights of, or procedures and practices available to, the public; and does not have the force and effect of law.

INTRODUCTION, PURPOSE, OR ISSUE:

Community water supplies and nontransient noncommunity water supplies must comply with the arsenic maximum contaminant level of 0.010 milligram per liter (mg/l), or 10 parts per billion (ppb). This policy establishes criteria for the design, installation, maintenance, and monitoring of an arsenic removal treatment system.

AUTHORITY:

R 325.10601 (Rule 601), R 325.10604c (Rule 604c), and R 325.10710 (Rule 710) of the Administrative Rules adopted under the Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), covering drinking water standards for specific contaminants, including inorganics, that shall be met by a supplier of water to assure the protection of public health. In addition, Section 325.1004(2) of Act 399 states, "Upon receipt of the plans and specifications for a proposed waterworks system, the department shall evaluate the adequacy of the proposed system to protect the public health by supplying water meeting the state drinking water standards."

STAKEHOLDER INVOLVEMENT:

Stakeholder input was solicited during informal meetings and public hearings held during the rule promulgation processes to adopt the arsenic rule of the National Primary Drinking Water Regulations as required by the Administrative Procedures Act, 1969 PA 306, as amended.

DEFINITIONS:

Community Water Supply (CWS) – A public water supply that provides year-round service to not fewer than 15 living units, or that regularly provides year-round service to not fewer than 25 residents. Examples include municipalities, such as cities, villages, and townships; apartment complexes; manufactured housing communities; condominiums; and nursing homes.

Nontransient Noncommunity Water Supply (NTNCWS) – A noncommunity supply that serves not fewer than 25 of the same individuals on an average daily basis more than six months of the year. Examples include places of employment, schools, and day care centers.

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Maximum Contaminant Level (MCL) – The maximum permissible level of a contaminant in water that is delivered to any user of a public water supply.

Operator In Charge (OIC) – A certified operator who is designated by the owner of a public water supply as the responsible individual in overall charge of a waterworks system, or portion of a waterworks system, who makes decisions regarding the daily operational activities of the system that will directly impact the quality or quantity of drinking water as defined in Rule 106.

Firm Capacity - As applied to wells, pumping stations, or units of treatment systems, means the production capacity of each respective part of the water system with the largest well, pump, or treatment unit out of service.

Entry Point to the Distribution System (EPTDS) – A point where treated water enters the distribution system, after treatment and before the first customer. In most cases, this is where public water systems collect samples to determine compliance with the arsenic standard. For purposes of this policy, the compliance sample location will be called the “entry point.”

Point-of-Entry Treatment Device (POE) – A treatment device applied to the drinking water entering a house or building for the purpose of reducing contaminants in the drinking water distributed throughout the house or building as defined in Rule 107. These treatment devices are usually installed on the service line as it enters a building.

Point-of-Use Treatment Device (POU) – A treatment device applied to a single tap used for the purpose of reducing contaminants in the drinking water at that one tap as defined in Rule 107. These treatment devices are usually installed near or at the kitchen tap. POU's are not allowed for compliance purposes for CWSs in Michigan because they are not protective of the entire household.

POLICY:

Monitoring Requirements

The arsenic rule requires monitoring for arsenic at each entry point once every three years for groundwater systems and annually for surface water systems. Systems with an entry point result over 10 ppb must collect quarterly samples at that sampling point. If the running annual average (RAA) after four quarters is greater than 10 ppb, the system exceeds the MCL.

Each new source must comply with the 10 ppb MCL before the source begins serving water to the public. Samples collected during the pump testing of the source (well) may be used to determine initial compliance. If the new source has arsenic levels over 10 ppb, the source may not serve the public until a treatment system, permitted and approved by the ODWMA, is installed.

If a water system plans to temporarily (not intermittently) use a standby or emergency source of water that has arsenic levels over 10 ppb, or plans to bypass or take out of service an arsenic treatment unit that will allow water to go to the distribution system with arsenic levels over 10 ppb, the system must contact the ODWMA immediately. Also, the system should issue a public notice to the affected water customers, preferably at the time the source is placed in service.

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Compliance Calculations

For systems monitoring more than once per year, compliance with the MCL is determined by an RAA at each entry point or other sampling point approved by the ODWMA. Systems monitoring annually or less frequently whose result exceeds 10 ppb must increase monitoring to quarterly. Systems triggered into increased monitoring will not be considered in violation of the MCL until they have completed one year of quarterly sampling. If any sample result causes the RAA to exceed the MCL at any sampling point (i.e., the result is greater than four times the MCL) the system is out of compliance with the MCL immediately.

Systems must not monitor more frequently than specified by the ODWMA to determine compliance unless they have applied to and obtained approval from the ODWMA. If a system does not collect all required samples when compliance is based on an RAA of quarterly samples, compliance will be based on the RAA of samples collected. If a sample result is less than the method detection limit, zero will be used to calculate the RAA.

The ODWMA may require confirmation samples for any results. All confirmation samples approved to be collected by the ODWMA within a specific monitoring period will be averaged with the original result to calculate a quarterly average. The quarterly averages will be used to determine the RAA.

A water system that violates the MCL must contact the ODWMA within 48 hours under Rule 734. A Tier 2 public notice must be issued in accordance with Rule 403 and Rule 405 as soon as possible, but no later than 30 days after the violation has occurred.

Design, Operation, Oversight, and Monitoring of Arsenic Removal Treatment Systems

Many treatment technologies are available to remove arsenic. Treatment options consist of coagulation/filtration, coagulation assisted microfiltration, lime softening, activated alumina, ion-exchange (anion), oxidation/filtration, and adsorptive/absorptive filter medias. Emerging treatment technologies may be considered. Water supplies planning to install an arsenic removal system may be required to run pilot studies. If a pilot study is not going to be completed, documentation must be submitted to the ODWMA showing adequate treatment of water at other water systems using the same type of proposed treatment and having similar raw water quality.

The design of arsenic removal systems is based on the number and location of wells, disposal options, and the proposed treatment technology. Treatment systems may be installed in parallel, in series, and as a single pass or multiple pass configurations. The design must accommodate taking treatment systems out of service periodically for routine maintenance and/or repair. Below are typical system layouts and items to consider when designing an arsenic removal system for each scenario.

Systems with several EPTDSs (i.e., two or more wells with each well located in a separate well house) -The firm capacity rating of the entire arsenic removal system must be greater than or equal to the firm capacity rating of the water system. Systems are strongly encouraged to install treatment systems at each EPTDS that may exceed the 10 ppb standard. While systems are not required to have redundant treatment units at each EPTDS, the rated capacity of the treatment units at each EPTDS should must be greater than or equal the raw water capacity serving that particular EPTDS.

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Systems with one EPTDS (i.e., two or more wells that have a common well house or one treatment plant) – As a minimum, two treatment units must be installed. The capacity of the entire arsenic removal system must be greater than or equal to the firm capacity rating of the water system. The preferred design is to have the firm capacity rating of the treatment system equal the firm capacity rating of the water system. This allows one unit to be off-line while the on-line unit(s) meet maximum day demands.

If an existing system has just one treatment unit, and the unit is satisfactorily removing arsenic below 10 ppb, a second treatment unit will not be required until major upgrades or improvements are needed to the treatment system.

Blending Options – This option is available for systems that have some sources of water (wells) above and some below 10 ppb of arsenic, and should only be considered in unusual circumstances. The water of two or more wells are blended before entering the distribution system to keep arsenic levels less than 10 ppb. For example, water from one well with arsenic of 2 ppb is blended with water from another well with arsenic of 14 ppb. If the wells have similar pumping capacities, the resulting arsenic concentration is 8 ppb, which meets the standard. The blending of water must take place prior to entering the distribution system and operational guidelines for using this option must be reviewed and approved by the ODWMA before being implemented. Using this option may reduce the firm capacity rating of the water systems since two blended wells may be considered as one pumping unit.

POUs and POEs – Due to capital and operational costs, this option should only be considered by small systems, typically fewer than 100 service connections. POU's are usually installed near or at the kitchen sink and are not allowed for compliance for CWSs. POEs are installed on the service line as it enters a building. POE treatment units must be owned, controlled, and maintained by the public water supply and must be equipped with alarms to indicate the unit has failed or is not operating properly. All or 100 percent of customers must participate for a system to be eligible for this option. If the American Standards National Institute/NSF International has issued product standards applicable to a specific type of POE treatment device, units meeting those standards shall be used. Review the supply's POE operational oversight and monitoring plans before approving POE devices.

Operation and Oversight - Systems with arsenic removal treatment units must designate an OIC and backup operator under Rule 1905. The OIC must hold, as a minimum, a limited treatment or "D" certification. Establish a schedule of regular visits to the water supply in accordance with the ODWMA's Policy and Procedure Number ODWMA-399-017, Community Water Supply Systems-Required Operations Oversight.

Monitoring – Monitoring of treatment systems will be determined on a case-by-case basis at the discretion of the ODWMA. Upon start-up, individual treatment units (i.e., each filter) should be sampled at least once per week. Over time, the weekly sampling may be reduced or eliminated and replaced with monthly entry point monitoring. Samples collected at each treatment unit effluent may be analyzed by either a certified lab or a field test kit acceptable to the ODWMA, while compliance samples must be analyzed at a laboratory certified for arsenic analysis. Compliance monitoring at each EPTDS for supplies that have arsenic removal systems shall not be reduced to less frequently than quarterly. Refer to the example sampling scenarios attached to this policy for additional guidance.

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Disposal of Waste Streams – Arsenic removal systems are periodically backwashed or regenerated. Disposal of the backwash or regeneration water depends on the treatment used and the characteristics of the backwash water. Disposal options include pumping to an existing sanitary sewer line, groundwater discharge or surface water discharge. Approval for groundwater and/or surface water discharges may require additional permits from the DEQ. For further information, refer to the ODWMA's Policy and Procedure number ODWMA-399-023 Disposal of Backwash Water from Arsenic Removal Units.

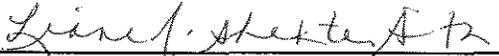
PROCEDURE:

WHO	DOES WHAT
District Staff	Incorporates this policy and procedure as part of the permit process to construct arsenic treatment systems and uses this policy and procedure to evaluate proposals from consulting engineers, developers, and water systems.
District Staff	Returns to the applicant, plans, specifications, and/or permit applications for arsenic treatment systems that are inadequate in design or application.
District Staff	Reviews arsenic monitoring results collected by the water systems and operational data for the treatment system to determine compliance with the MCL.

REFERENCES:

Safe Drinking Water Act, 1976 PA 399, as amended, being MCL 325.1001 *et seq.*, and the administrative rules promulgated thereunder, being R 325.10101 *et seq.*

OFFICE CHIEF APPROVAL:



Liane J. Shekter Smith, P.E., Chief
Office of Drinking Water and Municipal Assistance

1/18/2013
Date

DEPUTY DIRECTOR APPROVAL:



Jim Sygo, Deputy Director

1/24/2013
Date

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EXAMPLES – ARSENIC REMOVAL SYSTEM DESIGN, MONITORING, AND OPERATIONAL OVERSIGHT

Example No. 1: One Entry Point – a water supply has two wells, each 100 gallons per minute (gpm) and share a common well house (i.e., one EPTDS). Arsenic levels at both wells are over 10 ppb. The firm capacity rating of 100 gpm is adequate to meet maximum day demands. The firm capacity rating of the treatment system should be greater than or equal the firm capacity rating of the water system.

Design – Two arrangements are possible. Both allow one treatment unit to be taken off-line while still meeting maximum day demands.

- Install three, 50 gpm treatment units (adsorptive media, activated alumina, etc.) in parallel within the well house, which results in a total treatment capacity of 150 gpm and a firm capacity rating of 100 gpm.
- Install two 100 gpm treatment units in parallel that results in a total treatment capacity of 200 gpm and a firm capacity rating of 100 gpm.

Oversight – For D-4 systems, an OIC shall visit the water treatment facilities at least once per week. For D-1, D-2, and D-3 systems, the OIC shall visit the water treatment facilities daily. Initially, effluent from each treatment unit (filter) should be tested weekly for arsenic using a field test kit. A quarterly entry point sample shall be collected and submitted and analyzed at a laboratory certified for arsenic analysis. It is recommended that a split sample should be tested with the field test kit at the same time the quarterly entry point sample is collected for verification analysis.

If a treatment unit effluent sample result is greater than 10 ppb, the treatment unit shall be taken out of service immediately and a sample collected from the entry point and submitted to a state approved laboratory for arsenic analysis. If backwashing does not return the concentration to less than 10 ppb, the treatment unit shall remain out of service until the arsenic concentration in the effluent meets the MCL.

After a period of satisfactory operation and operator oversight, the weekly testing of each filter and quarterly sampling of the entry point may be replaced with monthly entry point sampling. The monthly samples must be analyzed at an approved lab and all samples will be used to determine compliance. If monthly entry point sampling indicates the arsenic level is increasing, sampling of each filter should resume.

Example No. 2: Several Entry Points – a water system has four wells (100, 200, 250, and 300 gpm) located in different locations within separate well houses (i.e., four EPTDS's). All the wells have arsenic levels over 10 ppb. The firm capacity of the water system (550 gpm) is adequate to meet maximum day demands. The firm capacity rating of the treatment system must equal the firm capacity rating of the water system.

Design – Install treatment units in each well house in some combination so the capacity is greater than or equal to the well capacity serving that well house. For example, install three, 100 gpm treatment units or one 300 gpm unit in the well house where the 300 gpm well is located. This

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arrangement allows either the largest capacity well or the largest capacity treatment unit to be taken out of service while still meeting maximum day demands.

Oversight – Operational oversight and sampling of each treatment unit is the same as Example No. 1.

Example No. 3: One Entry Point with Existing Iron Removal - a water system has four wells (200, 250, 350, and 400 gpm) that pump to a common pipe that leads to an existing iron/arsenic treatment plant, which consists of one 1,200 gpm treatment unit (i.e., one EPTDS). All of the wells have arsenic levels over 10 ppb. The firm capacity of the wells (800 gpm) and the total capacity of the treatment plant are adequate to meet maximum day demands.

Design - A single treatment unit means the system's firm capacity rating is 0 gpm. Though not preferred, this design is allowed if the existing treatment system is reliably and consistently removing arsenic to below 10 ppb. When major improvements are needed to the treatment system, a minimum of two treatment units equal to the firm capacity of the system will be required.

Oversight – For D-4 systems, the OIC must visit the plant weekly. For D-1, D-2, and D-3 systems, the OIC must visit the plant daily. The entry point should be sampled weekly using a field test kit. A quarterly entry point sample shall be collected and analyzed at a laboratory certified for arsenic analysis. It is recommended that a split sample should be tested with the field test kit at the same time the quarterly entry point sample is collected for verification analysis. Quarterly sampling may be reduced to monthly entry point sampling with the monthly samples analyzed at an approved lab and all samples will be used for compliance determinations.

Example No. 4: Blending – a water system has two wells, one well with an arsenic concentration of 2 ppb and the other with an arsenic concentration of 14 ppb. The wells have equal pumping capacities and pump to a common pipe before entering the distribution system. Therefore, the resulting arsenic concentration when both wells are operating is 8 ppb.

Design – In this case, treatment must be installed on the source with arsenic levels of 14 ppb. If treatment is not an option, waive the requirement only if the following criteria are met. The telemetry or well system controls must be set so both wells operate simultaneously to achieve adequate blending and dilution. Water meters or hour meters shall be installed for each well to ensure both wells pump the same amount of water. The supply must assume that the well with the lower arsenic level will eventually be out of service leaving the supply with only the higher arsenic level well. Therefore, treatment at sources of high arsenic levels is preferred.

Oversight – For D-4 systems, the OIC must visit the plant weekly. For D-1, D-2, and D-3 systems, the OIC must visit the plant daily. Both wells and the entry point should be sampled monthly using a field test kit. The entry point must also be sampled quarterly and submitted to a state approved lab for MCL compliance determination. It is recommended that a split sample should be tested with the field test kit at the same time the quarterly entry point sample is collected for verification analysis.

Example No. 5: POE – a 30-home subdivision has two wells that both have arsenic levels over 10 ppb. The homeowners have chosen to install POEs in each home to comply with the arsenic MCL.

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All 30 homeowners have agreed to participate.

Design – The POEs must be installed on the service lines entering the homes and all units must be owned, controlled, and maintained by the owner of the water system (homeowners association, developer, private utility company, etc.). All treatment units must have alarms indicating that the unit is not working properly or has reached its maximum design life.

Oversight – Since this is a D-4 system, the OIC must visit the water system weekly. Approximately 10 percent of the treatment units shall be sampled quarterly and analyzed at a laboratory certified for arsenic analysis. The quarterly sampling should be rotated among the homes so that every unit is sampled at least once every three years.

If any sample result exceeds 10 ppb, a confirmation sample must be collected from the same location as soon as possible. If the confirmation sample also exceeds 10 ppb, that particular treatment unit must be replaced or repaired immediately and all other units must be scheduled for repair or replacement as soon as possible.