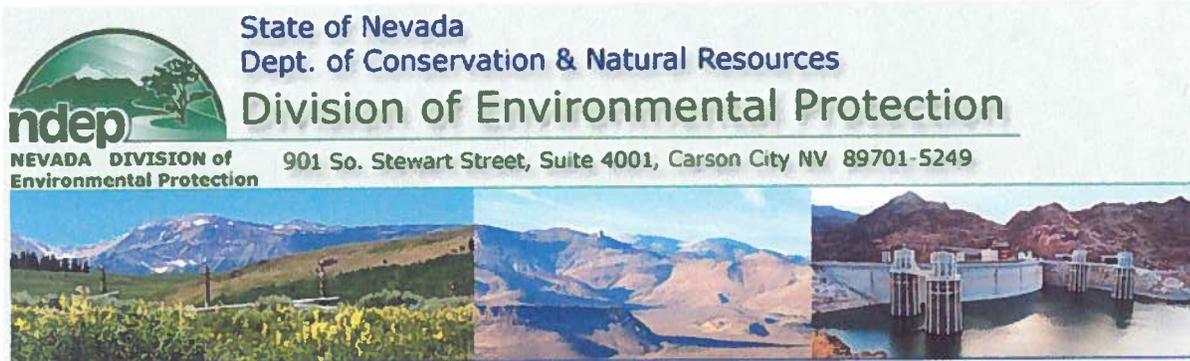


NEVADA POINT OF USE COMPLIANCE GUIDELINES

March 2011



Water systems considering utilizing POU devices must be aware that the requirements provided in this guidance may be subject to revision as treatment technologies evolve and as more knowledge in the operation and maintenance of POU devices becomes available.

1.0 INTRODUCTION

The United States Environmental Protection Agency (US EPA) lowered the maximum contaminant level (MCL) for arsenic in 2006 to 10 parts per billion (ppb). Various treatment technologies and configurations are identified as “Best Available Technologies” (BATs) by US EPA. These identified treatment configurations include; wellhead, centralized, point of entry (POE), and point of use (POU).

Since the US EPA allows the use of POU as a BAT, the Nevada Division of Environmental Protection (NDEP) Bureau of Safe Drinking Water (BSDW) may allow public water systems to employ POU devices as a means for compliance with certain primary and secondary drinking water maximum contaminant levels (MCL) if all other possible treatment options have been considered. Public water systems must understand that the use of POU is not a panacea and is typically the least preferred method because of the associated management costs and difficulty attaining 100 percent compliance. The use of POU devices will be considered by the BSDW on a case by case basis as a BAT option of last resort. Water systems with several sources, where a significant component of water production is not consumed and there are few connections might be candidates for POU.

This guidance document is designed to assist water systems in structuring a program that will meet NDEP's requirements for POU compliance. NDEP recognizes that POU might be the only compliance option for some small water systems, however, the use of POU devices must be justified by the water system and evidence that all other options have been exhausted must be demonstrated. In addition, documentation must be provided illustrating that the program established by a water system provides the level of public health protection required in the Safe Drinking Water Act (SDWA).

This document does not address POE guidance at this time. Water systems interested in POE must contact NDEP. Prior to reading this guidance document, it is recommended that the water systems considering POU devices for compliance treatment read the “Preliminary Checklist” contained at the end of this document in Appendix 1 which shows the main points which must be considered for POU treatment. The Application and Application Checklist are included in Appendix 2. Pursuing a POU compliance program is not as simple as going to the local home improvement store to purchase and install devices. Water systems must consider this guidance carefully.

2.0 POU COMPLIANCE PROGRAM OVERVIEW

A POU compliance program differs fundamentally from a centralized treatment compliance program. Under the POU program the water system is required to install a POU device that will treat only the water intended for direct consumption, typically installed at a single tap such as the kitchen sink. Centralized treatment treats all of the water produced by the public water system. Since only a very small percentage of the total water use is for direct consumption, typically 1-3 percent, a POU compliance program can result in significant cost savings for smaller water systems. Public education is a vital component to a successful POU program to ensure that customers are aware that the treated water will (typically) only be available at one tap.

Nevada Administrative Code (NAC) does not specifically address the use of POU devices for compliance with primary standards in the state of Nevada public drinking water systems, however, NAC 445A.66765 does state that a supplier of water may use POU devices to meet secondary standards based on NDEP approval. Approval for the use of POU devices for compliance with primary standards will also be subject to NDEP approval. Federal law 42 U.S.C. 300 g-1 (b)(4)(E)(ii) contains requirements that must be met by water systems using POU devices as a means of compliance. Any water system choosing to use POU as their means to comply with an established drinking water maximum contaminant level (MCL) will be required to meet all of the requirements of the federal law.

Federal law requires that the POU device be owned, controlled, and maintained by the public water system or by a person under contract with the public water system to ensure proper operation and maintenance and compliance with the MCL. Federal law also requires that the POU device be equipped with mechanical warnings to ensure that customers are automatically notified of operational problems and that the device be independently certified as conforming to an American National Standards Institute (ANSI) standard. Finally a POU device cannot be used to comply with a MCL or treatment technique requirement for a microbial contaminant.

The Nevada Administrative code does not outline any specific requirements of a POU system when using the treatment devices for a compliance program for a primary drinking water standard. However, the requirements for treatment outlined in NAC 445A do apply to any water system considering the use of POU treatment devices, including but not limited to the requirement that the design of a facility must be based on a pilot study unless the recommended technology has been tested on water with similar characteristics. The additional requirements for using POU treatment devices require the water system be responsible for developing and following an approved written monitoring plan, obtaining NDEP approval of the design of the POU device, installing a sufficient number of devices to ensure every person served by the system is protected, and ensuring that the rights and responsibilities of persons served by the water system convey with title upon sale of property. In addition, in the event that the waste stream from the chosen POU device is directed towards a wastewater treatment facility, approval must be obtained from the WWTP to accept the waste stream.

This guidance describes these requirements in greater detail and is designed to lead water systems through the analysis and decision making process for determining if a POU compliance program is right for you. This guidance will assist Nevada water systems in ensuring their POU compliance program meets all federal and State requirements and is, therefore, acceptable to NDEP. **Water systems considering utilizing POU devices must be aware that the requirements provided in this guidance may be subject to revision as treatment technologies evolve and as more knowledge in the operation and maintenance of POU devices becomes available.**

Further guidance can be found using the US EPA cost analysis tool developed to aid systems in determining the cost of utilizing a POU treatment approach. This tool and instructions on how to use it can be found at <http://www.epa.gov/safewater/smallsys/ssinfo.htm>. Also provided by US EPA is the *Point-of-Use or Point-of-Entry Treatment Options for Small Drinking Water Systems*

document which provides information on the technologies available as well as sample agreements addressing items such as access to POU devices, as well as model ordinances.

3.0 DETERMINING IF POU WILL WORK FOR YOUR SYSTEM

When considering POU as a compliance strategy, water systems must fully understand and weigh the obligations that come with implementing such a program. Factors to consider when determining the appropriateness of POU for your water system include:

- The number of service connections on your system
- The type of service connections on your system
 - Single family homes
 - Apartments
 - Restaurants
 - Office buildings
 - Medical offices
 - Commercial or Industrial
- The cost of central treatment versus POU must be detailed as central treatment is the preferable option to POU treatment
- The affordable rate for water and how it is effected by POU technology vs. central treatment
- The applicability of POU treatment technology with the source water
- The production and disposal of a waste stream, if any
- If a waste stream is produced, what type of sewage disposal system will receive it
- The additional sampling you will be required to conduct, the associated expense of the sampling and when it can be conducted
- The ability to gain entrance into 100% of your customers' households and businesses
- The maintenance frequency and associated workload
- The record keeping requirements
- The willingness of your customers to accept a POU compliance program
- The ability of the water system to gain authority to make participation in the program a condition of service
- Any liability and/or insurance coverage needs associated with such a program

A system must also consider that NDEP will not authorize a system to implement a POU/POE compliance program that does not have 100% customer participation at the inception of the program. The system must then have a plan to maintain participation and avoid any conflicts with customers. Conflicts between the customer and the water system may cause scheduled sampling and maintenance to be interrupted, which in turn would result in the water system being out of compliance. The system must also obtain written approval from all of the customers in the service area through an access agreement for the water system to maintain the POU devices.

The establishment of a POU program raises challenging issues for a water system, including increased liability and private property access issues. A water system may be wise to seek legal counsel to determine its best course of action.

4.0 WATER WASTING CONCERNS FOR A POU PROGRAM

When considering POU technologies, many water systems and their customers face concerns about potential water losses related to typical POU devices. In a desert state these concerns are valid and need to be addressed. Different POU technologies have different treatment methods and characteristics, including water loss. POU devices that use absorption technology use treatment media that chemically filter out contaminants by attracting them to the media. These units typically do not require backwashing and therefore do not result in water loss.

POU Reverse Osmosis (RO) units typically use two to four gallons of water to produce one gallon of drinking water. The fluctuation in efficiency is due to many factors that continually change within the RO system, including incoming water pressure, backpressure produced by the storage tank and age and condition of the RO membrane itself.

POE RO units are typically more efficient than POU RO units, however they generally still waste 1-2 gallons for each gallon of drinking water which is produced. The greater efficiency of these units can be affected by the pressure of incoming water, the size of the RO unit, and if there is a pump installed as part of the unit. A pump will increase the pressure of the water being filtered and result in a higher efficiency of the unit, but will also increase electrical costs.

This can sound like a large amount of wasted water when proposing to install 100 or more POU units. It is important to educate your customers on the water use patterns within a service connection that comprise the total monthly usage. Industry data shows between 1% and 3% of the total volume of water used at a connection is for drinking and cooking purposes. This usage percentage holds true for “typical” households; households that have larger than normal water usage due to irrigation or other activities will have a lower percentage of the total water usage being used for drinking and cooking. It is for these reasons that POU units could ultimately be a more economical choice than POE for certain communities.

This can be compared with typical centralized treatment, which has a backwashing cycle associated with it. Central treatment facilities will regularly backwash to either regenerate treatment media or to redistribute the filter bed. Whatever the purpose for backwashing, the plant will be using water that is not then delivered to customers, thus a certain amount of water wasting will occur.

5.0 MANAGEMENT OF A POU COMPLIANCE PROGRAM

Management of a POU program will be significantly different than management of a central treatment plant. The majority of work will center on administrative activities and testing. In a central treatment plant the emphasis also includes a fair degree of technical and operational knowledge, elements not as onerous in POU compliance programs.

Systems considering a POU compliance program should evaluate the management factors associated with the program including:

- Maintaining a log of installed units
- Tracking the useful life of the units
- Staggering unit or component change-out
- Executing unit or component change-out
- Maintaining testing records for each unit
- Coordinating with customers to schedule testing and maintenance
- Regularly educating customers on the goals and functions of a POU program

Examples of logs and spreadsheets that can be used to track the maintenance and status of the POU units installed in a water system are included in Appendix 3. Included in the Appendix 4 are various examples of educational material on different types of POU units that can be distributed to water system customers to aid in the process of gaining acceptance and input when considering the use of POU units for compliance.

5.1 POU SYSTEM REQUIREMENTS

A POU system is considered a complete water treatment device that includes all components needed to connect it to a public water system under a POU compliance program. Additionally, the POU system must be certified by an American National Standards Institute (ANSI) accredited body under one of the National Sanitation Foundation (NSF)/ANSI water treatment unit standards. Currently recognized ANSI accredited certification organizations are:

- I. NSF
- II. Water Quality Association (WQA)
- III. Underwriters Laboratory (UL)

Currently recognized NSF/ANSI standards are:

- I. NSF/ANSI Standard 44
- II. NSF/ANSI Standard 53
- III. NSF/ANSI Standard 55
- IV. NSF/ANSI Standard 58

The water system must provide documentation from the treatment device manufacturer showing the treatment device is certified for the reduction of the specific contaminant(s) that the water system will be controlling, **if a NSF certification exists for a specific contaminant(s)**. POU manufacturers are aware of this certification requirement and should be able to readily provide this documentation.

POU units must all be installed according to the Uniform Plumbing Code (UPC) and International Plumbing Code (IPC). In particular, if utilizing RO units, there must be an air gap in the discharge drainage system. Other requirements also apply, therefore it is required that all units be installed by a licensed plumber.

5.2 PERFORMANCE INDICATOR DEVICE REQUIREMENTS

Each POU device must have a performance indication device (PID) which alerts the user when the unit is approaching the end of its useful life or no longer meeting treatment standards. The POU device certification must include certification of the PID. The PID must be capable of providing a visual or auditory alert and must be calibrated to signal the customer prior to the device reaching its exhaustion stage. This will allow the water system sufficient time to receive notification from customers of the PID alert and perform maintenance to return the device to effective operation prior to the dispensing of water that does not meet drinking water standards.

According to the SDWA, the POU unit can also include an automatic shutoff valve. However, a PID that emits a warning as described above is preferable to automatic shutoff of the unit to avoid any interruption of service to the customer and also avoid the possibility of the customer having to drink untreated water.

The type of PID that will be used must be specified in the engineering report/plans prepared for the system and on the application to use POU treatment technology for compliance purposes.

5.3 CUSTOMER PARTICIPATION REQUIREMENTS FOR POU DEVICES

Customer participation most likely represents the largest challenge to water systems selecting a POU compliance program. For a successful POU program it is necessary that the water system be permitted to enter the household or place of business of each customer to install, test, and maintain the POU device. Customer consent to allow the water system to install and regularly maintain the POU is the key to a successful POU program. A comprehensive education program will likely serve to assist water systems in obtaining acceptance from all customers.

Pilot studies using POU systems have been performed in at least two locations in Nevada. At one location, POU adsorption units were installed in 8 residences with MP (Mn-AA) filters and sampling was conducted over a period of 12 months. The units were successful in removing the desired constituents, and the average water usage for a household of 3 people was 2 gallons per day. Overall the community appeared to be satisfied with the study and may consider using the POU units for compliance purposes.

The second pilot study was conducted using POU RO units and was installed in a well house and run continuously to monitor the effectiveness of the units to remove arsenic and fluoride when running continuously. The units performed very well, removing the desired constituents to non-detect levels. However even with the positive results of the pilot study, the community in question (approximately 85 connections) determined that the monitoring requirements of the units, which includes entry into the homes, was not an acceptable solution. Further public education in this community could potentially have resulted in more favorable opinions. In instances such as this, it is necessary for the water system to pursue other alternatives for compliance, or work with the customer base to arrive at an agreement regarding POU units.

In the event that POU devices are the chosen method to achieve compliance, it must be kept in mind that SDWA establishes water quality standards that must be met for all customers. If a single customer refuses to allow POU installation, the water system will not be approved for compliance by BSDW, because that customer will not be receiving the same protection as those who have. In these instances it will be necessary for the water system to either pursue a different

form of treatment for compliance or take action to achieve 100% participation in the POU program. These actions may include one or more of the following:

- Obtaining legal authority to make installation of the POU device a condition of water service for existing customers and obtaining legal authority to continue the use of the POU device mandatory upon a transfer of ownership (real estate transactions).
- Obtaining access authority to customers' households through a homeowners association or Covenants, Conditions and Restrictions (CC &Rs), ordinances, or other legal authorities specific to the individual water system.

Different water systems may have different powers and authorities to regulate the delivery of water to customers depending on each system's legal authority and the regulating authorities governing the water system. A municipality or town may be able to write an ordinance or rule to condition service on the acceptance of a POU device. A domestic general water improvement district may also have the ability to condition service on the acceptance of a POU device. A water system's ability to require POU installation as a condition of receiving service is for the water system to determine.

5.4 PUBLIC EDUCATION FOR POU TREATMENT

Public education regarding POU technology will be key to the success of the program. If the customers are not made fully aware of the costs and strategies of all types of treatment which may be feasible for an area, they are less likely to be in favor of a program which requires them to allow water system personnel onto their private property. Information about the contaminant itself will help people become aware of why any treatment is necessary at all.

It is essential that systems that decide to utilize POU treatment make the customers fully aware that water for cooking, drinking, an teeth brushing will only be available from a single tap in the residence (typically). Water from any taps in the home without a treatment system still contain the contaminant and should not be ingested.

It is possible to connect refrigerator ice and water dispensers to a POU device. Typically this will require the treated effluent line of a unit to be split to have one line run to the tap at the sink, and the other line run to the refrigerator. However, in some new homes the refrigerator is connected to its own water line and not to the kitchen sink. In these instances, the water system will either need to arrange for a second POU unit to be installed or explore other treatment options.

6.0 LEGAL AUTHORITY TO MAKE INSTALLATION OF THE POU/POE DEVICE A CONDITION OF WATER SERVICE

Because a water system must obtain and ensure 100% POU customer compliance, the water system must determine what authorities it has to achieve and maintain complete customer compliance. After a customer fails or refuses to allow the installation of a POU, despite the water system's best efforts to obtain the customer's voluntary compliance, the water system must determine whether it has the legal authority to "require" the customer to accept the POU. A system may consider whether it has the authority to shut off a customer's water service due to a failure to accept a POU or the alternative solution, similar to the authority to shut off a customer's water for non-payment. As stated, whether a water system has this authority is for the

water system to determine. *NDEP cannot provide advice regarding a system's authority to require POU installation or to terminate service based upon a customer's failure to allow POU installation. NDEP recommends a water system obtain legal advice to determine its authority in such matters. NDEP cannot and is not making any representations that any water system has any such authority.*

Water service shut-off to a customer who fails or refuses to authorize a POU, if this authority is available to a water system, would be sought after other methods of achieving compliance had been tried without success. Additionally, a water system would not terminate service until after the customer receives clear notice and opportunities to comply with the POU program prior to any termination of service. Another tool that may assist a water system to obtain 100% compliance is for the water system to seek homeowner compliance through petitioning to amend a housing development's Covenants, Conditions and Restrictions (CC&Rs) to require POU installation and maintenance by the water system. If a customer fails or refuses to authorize a POU, the water system shall notify the NDEP.

6.1 OBTAINING LEGAL AUTHORITY TO MAKE CONTINUATION OF THE POU DEVICE AVAILABLE UPON A TRANSFER OF OWNERSHIP (REAL ESTATE TRANSACTIONS)

A water system may decide to seek to require POU installation and maintenance a mandatory requirement that binds new homeowners by making the requirement part of the sale of the home or commercial real estate. Such a requirement is a “restrictive covenant” which passes in the “chain-of-title” to the property and should be written to bind the current landowner and future landowners to allow POU installation and maintenance. Placing a restrictive covenant in the chain-of-title to a home or commercial real estate requires the written *consent* of the landowner. To be permanent and binding, a water system would need a restrictive covenant and also an easement to be able to enter the property to install and service the POU device. Although this would provide certainty, obtaining these on an individual basis from customers will likely be time-consuming and difficult to obtain.

7.0 COMPLIANCE STATUS OF WATER SYSTEM USING POU PROGRAM

A water system implementing a POU program will be considered to be in compliance with NDEP drinking water rules relating to compliance with the MCLs, which the POU program is designed to correct, only when a POU device has been installed at every connection.

It is imperative that a water system fully evaluate and plan for the course of action necessary to achieve 100% participation when considering a POU program. Because non-compliance would necessitate installation of centralized treatment, failure to achieve 100% customer participation could result in a significantly more expensive financial investment. Maintaining compliance = maintaining 100% continued participation.

8.0 POU PROGRAM MONITORING REQUIREMENTS

It will be necessary for the water system to test the water from each POU device over a specified period of time to ensure the device is working properly. *All samples must be collected prior to servicing the unit in order to determine if the unit was still functioning properly prior to*

maintenance. Compliance monitoring will use a combination of methods. First, the water system must collect a water sample from the POU device for analysis at a certified laboratory. The water system will be required to complete a sample plan and include it in their application for approval of the POU compliance program. The water system will then be required to follow the sample plan upon Division approval. The sample plan will include the following:

8.1 GENERAL TESTING REQUIREMENTS

During the first year of service, the POU units must all be sampled and inspected to ensure that they are working properly and removing the desired contaminant(s). A sample from each POU device must be submitted for analysis at a certified laboratory during this first year of service.

Prior to installation of the devices: a community sample plan must be developed for subsequent years. On a map, the water system should divide its distribution system into three sections so that 1/3 of the service connections are located in each section. This map must be submitted with a POU compliance program application for review and approval. The water system will be required to collect a sample from 1/3 of the system's total service connections every year and submit all samples to a licensed certified laboratory for analysis. Analytical results obtained through the use of certified laboratories are required to be submitted, on approved reporting forms, to NDEP pursuant to NAC 445A.0654. All records for chemical analyses shall be maintained by the water system for a minimum of 10 years pursuant to NAC 445A.0654. The water system will be required to repeat the testing of a 1/3 of the systems' total connections every year to ensure that each connection is sampled and submitted for testing once every 3 years. The following illustrates this sampling procedure:

<i>3 year Compliance Cycle</i>		
<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>
Sample 1/3 of connections and submit to Lab	Sample 1/3 of connections and submit to Lab	Sample 1/3 of connections and submit to Lab

This sampling plan may be altered based on information gathered during the first year of service of the devices, or later years of service. The sampling plan will depend on the results of the samples collected and the information about the devices gathered during maintenance visits.

The water system should also be aware of the possibility of bacterial growth on granular activated carbon (GAC) filters which are typically used with RO devices to remove chlorine and for finishing filtering. This is typically not a problem for POU RO units where the source water arriving at the treatment device does not contain pathogenic organisms and filters are changed on a regular basis. However, the water system will be required to perform periodic monitoring of heterotrophic bacteria in the POU treated water to determine if the filters are being changed frequently enough. ***Each connection must be tested for heterotrophic bacteria a minimum of once every three years. More frequent monitoring may be required as deemed necessary by NDEP.*** Additionally, water that remains unused for extended periods of time may become stagnant and subject to bacteriological growth. Individuals not using water from their POU device (i.e. during long vacations) may wish to have their water tested for heterotrophic bacteria.

8.2 IDENTIFICATION OF DEVICES TO SAMPLE

The water system will be required to develop a sampling plan that ensures that each device is tested over the three year compliance cycle, and also ensures units are tested in various areas of the distribution system in order to provide assurance that units are working properly. When developing the sampling plan, develop a map of the system's distribution system that divides the distribution system into three sections with each having an equal number of connections.

9.0 APPLICATION FOR POU PROGRAM APPROVAL

Water systems considering a POU program must complete an application packet and submit it to NDEP for approval. This packet must include all of the following information:

1. POU program application form (see Appendix 2)
2. Plan prepared by Engineer with water quality information and results of pilot study, if applicable
3. Manufacturer certification of effectiveness
4. Description of PID and how it will warn users
5. Customer participation information with verification of 100% participation
6. Installation schedule including parties responsible for installation and their qualifications
7. Preliminary maintenance schedule
8. Monitoring plan and system map showing sections
9. Initial and ongoing customer education and outreach plans

All POU Programs must be approved by NDEP prior to installation.

9.1 POU PROGRAM INSTALLATION REQUIREMENTS

It will be necessary for the water system to obtain NDEP approval prior to installing POU devices. Proper installation of the POU devices, in the correct location, is critical if the water system is to meet compliance requirements.

The water system will be responsible for the installation of the individual POU devices. The water system owner will need to ensure that ***all POU installations are performed by a licensed plumber***. Only those qualified individuals identified in the application packet will be permitted to perform the installation work under the NDEP approved program.

Generally, the water system will legally own the POU devices, and the water system will always be responsible for the operation and maintenance of the POU devices. The water system will need to ensure that, in the event of a transfer of ownership of the property, the POU device will stay with the property. The water system may enter in to a rental agreement with a POU vendor, however the water system shall maintain responsibility for the device including maintenance and recordkeeping requirements.

In the event a resident already has a water treatment device in their dwelling or business, the water system may offer to replace the existing POU device with the new one used by the water system's POU program. If the customer refuses, the water system should provide for the following:

- The customer's device must be certified by an accredited organization for the reduction of the contaminant of concern
- The customer's device must have, or be fitted with, a performance indication device that meets the requirements for the POU program
- The water system must obtain legal ownership of the device by obtaining the customer's consent to the transfer of ownership
- The water system will be responsible for the proper operation and maintenance of the POU device
- The customer's device must be sampled and tested. If the customer's device does not adequately treat the contaminants of concern, and cannot be retrofitted, the water system must inform the customer and obtain consent to install and maintain the new water treatment device.

Special installations (such as routing treated water to ice makers or additional faucets) must be performed by the water system or by a licensed and approved plumber with the water system's knowledge and consent. The water system must inspect and ensure individual homeowners and other users do not modify or alter the system after the installation.

9.2 POU PROGRAM OPERATION AND MAINTENANCE REQUIREMENTS

It is the responsibility of the water system to maintain and service the individual POU devices. In no instances may the water system allow individual homeowners to perform maintenance on the units. POU device maintenance must be performed in accordance with the manufacturer's specifications. Failure to follow these specifications will be considered non-compliance.

9.3 POU RECORD KEEPING REQUIREMENTS

The water systems must maintain records related to the POU for a minimum of ten years according to NAC 445A.0654. These records must be available for inspection at the water system:

- POU maintenance records and purchase orders
- Results from certified laboratory analysis

10.0 POU DEVICES AND SYSTEM CLASSIFICATION

Systems adding a POU program are adding a treatment technology. If the system is currently graded as a "distribution system" (as outlined in NAC 445A.629), the addition of a POU program would change the system's classification to a "treatment system" as well. Systems installing POU treatment will require operators with the appropriate grade of Water Treatment Certification as outlined in NAC 445A.629.

POU technology is a stand alone technology and will be treated as such when NDEP is determining system characteristics and will result in the requirement of a Level I Certificate.

That is, a POU device will not be assigned points based on the underlying technology used to treat the water (e.g. adsorption, RO), but will be graded as a separate technology*. In addition, once the POU program has been established, the number of individual POU devices installed will not impact the overall grade of the system. Additional units would not result in additional points being assigned to the system's overall grade.

References

Arizona Department of Environmental Quality (ADEQ). 2005. *Arizona Point of Use Compliance Program Guidance*. Guidance Document. Phoenix, AZ

AWWA Research Foundation. 2005. *POU/POE Implementation Feasibility Study for Arsenic Treatment*. Prepared by Narasimhan Consulting Services Inc., Malcolm Pirnie Inc., and Lowry Environmental Engineering.

USEPA. 2003. *Arsenic Treatment Technology Evaluation Handbook for Small Systems*. EPA 816-R-03-014

APPENDIX 1

Preliminary Checklist

- Is there a POU technology available for the contaminant to be treated for?
- Will the chosen technology function well with your water quality?
- Is POU economically feasible in comparison to Centralized Treatment?
 - Consider both Capital and Operation and Maintenance Costs
 - Consider costs over the life of the POU device vs. the life of a Centralized Treatment Plant
- Is there a majority public support for using POU technology?
- Do you have 100% customer participation?
- Who will be installing the treatment units?
- Do you have a monitoring plan formulated?
- Do you have the staff available to conduct the extensive monitoring and maintenance?
- Is the staff available at various hours and days to accommodate the schedules of the customers if necessary?
- How will you handle non-compliance issues?
- Has the treatment system been pilot tested?

APPENDIX 2

Point-of-Use Water Treatment Application Checklist:

- POU Program Application (attached)
- Results of Pilot Study (if applicable)
- Manufacturer Certification of Effectiveness
- Detailed Description of Performance Indication Device (PID)
- Plan Schematic
- Customer Participation Information
- Installation Schedule (including parties responsible for installation and their qualifications)
- Preliminary Maintenance Schedule
- Monitoring Plan Showing Areas to be Sampled on Annual Basis
- Customer Education and Outreach Plans

Application for Approval to Use Point-of-Use or Point-of-Entry Water Treatment
 (Submit to NDEP Bureau of Safe Drinking Water)

System ID _____	System Name _____	System Location (city/area) _____	Number of Hookups _____
Type of POU/POE device used _____		Contaminant	Action Level
Manufacturer of Device _____		<input type="checkbox"/> Arsenic	0.010 mg/L
Model Number of Device _____		<input type="checkbox"/> Copper	1.3 mg/L
		<input type="checkbox"/> Fluoride	2.0 mg/L
		<input type="checkbox"/> Lead	0.015 mg/L
		<input type="checkbox"/> Radium	5 pCi/L
		<input type="checkbox"/> Other _____	

Verified ANSI Certification on device? Yes No

Who is installing the Units?
 Company Name: _____
 License Number: _____
 Foreman: _____
 Signature: _____

What Type of performance indication device does the unit have?
 TDS Monitor (for RO units)
 Timer
 Total Flow

For timer and flow meters, please provide details regarding how the performance indicator will warn the user when the system is not performing: _____

Provide overview of the maintenance requirements for the POU/POE devices planned to be installed: _____

I hereby certify that the information provided in this application is accurate and correct to the best of my knowledge.
 Authorizer Name: _____ Signature _____
 Phone Number _____ Date _____

APPENDIX 3

APPENDIX 4

Arsenic Information

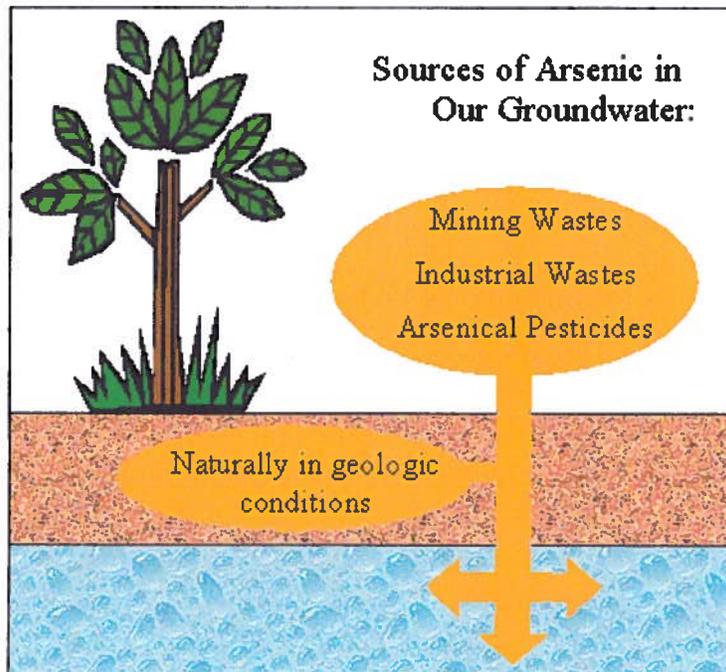
Over the past seven years, arsenic in drinking water has become a primary concern for many communities in the State of Nevada. While arsenic has been monitored in drinking water for decades, the United States Environmental Protection Agency (USEPA) recently lowered the standard for arsenic concentrations in drinking water from 50 parts per billion to 10 parts per billion. This change in concentration limits directly effects numerous communities with Nevada whose drinking water contains between 10 and 50 ppb of arsenic and must implement some type of water treatment to lower the arsenic concentration of the water prior to consumption in order to be in compliance with State and Federal regulations.

The Basics

What is arsenic?

Arsenic is a semi-metal element in the periodic table. It is odorless and tasteless. Arsenic occurs naturally in rocks and soil, water, air, and plants and animals. It can be further released into the environment through natural activities such as volcanic action, erosion of rocks and forest fires, or through human actions. Approximately 90 percent of industrial arsenic in the U.S. is currently used as a wood preservative, but arsenic is also used in paints, dyes, metals, drugs, soaps and semi-conductors. High arsenic levels can also come from certain fertilizers and animal feeding operations. Industry practices such as copper smelting, mining and coal burning also contribute to arsenic in our environment.

As



Arsenic Information

Why do we care about arsenic in our drinking water?

Human exposure to arsenic can cause both short and long term health effects. Short or acute effects can occur within hours or days of exposure. Long or chronic effects occur over many years. Long term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. Short term exposure to high doses of arsenic can cause other adverse health effects, but such effects are unlikely to occur from U.S. public water supplies that are in compliance with the arsenic standard.

What is considered to be the acceptable amount of arsenic in our drinking water?

On January 22, 2001 EPA adopted a new standard for arsenic in drinking water at 10 parts per billion (ppb), replacing the old standard of 50 ppb. The rule became effective on February 22, 2002. The date by which systems must comply with the new 10 ppb standard is January 23, 2006. All systems were given five years from the date the rule was published (January 22, 2001) to achieve compliance. Exemptions for an additional three years can be made available to qualified systems by their state. For those qualified systems serving 3,300 persons or less, up to three additional two-year extensions to the exemption are possible, for a total exemption duration of nine years. When added to the five years provided for compliance by the rule, this allows up to 14 years for small systems serving up to 3,300 people to achieve compliance.

Water Treatment Options and Selection

Options

What are the Options?

When a water system has water that has an undesirable constituent in it, there are a few options available to the system to bring it into compliance. Some of the options include water treatment and others do not, and the possibility to utilize various options depends on the number of water sources a community has, the type of contaminant in the water, the water quality of those sources, and sometimes the overall layout of a water system.

The non-treatment options that are useful for certain types of contaminants, such as arsenic and uranium, include the following;

- **Seasonal Use** – this is an option for water systems that more than one source of water, and at least one of those sources is in compliance without the need for treatment. This can allow the water system to use the source that is in compliance for the majority of the year, and only use the source of water that is out of compliance when water demand is high or during an emergency.
- **Blending** – this option may be viable if a water system has one well out of compliance and one in compliance. The two sources of water could potentially be blended together to result in a production of water that is in compliance with all water standards.
- **Abandonment** – this is an option for water systems that have more than one water source. If there are sufficient sources of water in compliance to supply the community with water, then it can be an option to abandon the source of water that is out of compliance with one or more of the water standards.
- **Replacement** – it can be possible to abandon a source of water with poor water quality and construct a new well in hopes that it will have acceptable water quality. However, prior drilling a new well is generally uncertain due to the fact that the new well may also have poor water quality that does not meet the required standards for drinking water.

Treatment technologies are varied for different contaminants; for example for arsenic they include traditional filtration, adsorptive medias, and reverse osmosis. These various ways to implement the different treatment technologies, and each water system must implement the best option specific to their needs. Some water systems have installed wellhead treatment, when the treatment facility is installed to treat water at a single well. Centralized treatment is also commonly used, where all sources of water are conveyed to a single central location and the water is treated prior to being distributed to customers. These two options generally require a building to house the treatment facility and they also require certified operators to maintain and operate them.

There are also two smaller treatment facility options available for various unwanted contaminants, these treatment units include Point-of-Entry and Point-of-Use treatment units. These treatment units are typically used for small very communities or businesses. The POE unit treats all water coming into a building, while the POU treats water at a tap in the building that is used only for consumption. These two types of treatment consist of some of the technologies previously listed (RO, adsorptive media) as well as technologies specific to other contaminants.

Water Treatment Options and Selection

Selection

How Do You Choose?

First a water system must determine if a non-treatment option is viable. Non-treatment options are the least expensive, however for many of the small systems in Nevada non-treatment options are not viable. This can be due to the fact that many communities only have one or two sources of water, and both may have high concentrations of the contaminant. Drilling a new well is very expensive, and there is no guarantee that a contaminant free source of water will be found. Due to these factors non-treatment options may not be possible.

In the event that treatment is necessary, water systems that are faced with the challenge of contaminants in their water go through an extensive process to determine what type of technology is applicable for their water, and then what type of treatment facility is suited to their water system as well as being cost effective. The first step that a water system will take is to analyze the water quality by sending samples to a certified lab. Once this step is complete, a treatment technology is chosen based on the water quality. The water quality directly effects which types of treatment can be used.

Once the treatment technology is decided upon, it is necessary to decide upon the location of the treatment based on the size and configuration of the water system. Large water systems typically use centralized treatment, while medium and small sized water systems often use either wellhead treatment or centralized treatment depending on the configuration of the water system, cost and need. Very small water systems are in the unique position of having to provide drinking water that meets all of the State and Federal Standards, but they often do not have the funding available to install centralized or wellhead treatment, or the customer base to support a long term loan to fund treatment. In these cases, some of these very small water systems may consider using Point-of-Use water treatment systems.

Point of Use Water Treatment

POU Treatment

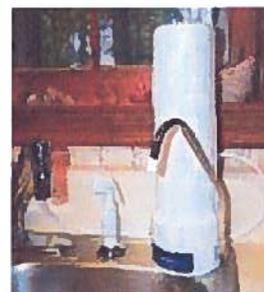
Point-of-Use Treatment

Point-of-Use (POU) devices treat only the water intended for direct consumption, typically installed at a single tap such as the kitchen sink. Centralized treatment treats all of the water produced by the public water system. Since only a very small percentage of the total water use is for direct consumption, typically 1-3 percent, installing POU devices for treatment purposes can result in cost savings for small water systems. **While the main concern for most systems in Nevada is currently arsenic, POU treatment units can be used to remove many other unwanted constituents in drinking water including odor, taste, radionuclides, etc. The basic information regarding POU units is similar for the removal of all contaminants.**

A typical home uses water for showers, laundry, lawns and drinking (consumption). In order to treat all of the water that arrives at a home, a large treatment facility is necessary, but to treat only the 2 to 3 gallons of drinking water that is used for drinking or cooking in a home each day, a much smaller treatment system can be used. POU units typically fit beneath the kitchen sink as shown in the picture to the right.



The impact a typical POU device has on a household very limited due to its size. While it does generally require space beneath the kitchen sink, above the sink only a small drinking water tap is installed. This causes little interruption to normal activities in the kitchen. There are also types of POU devices that sit on top of the kitchen sink as shown to the right. These units are also fairly small and cause little disturbance to the space in the kitchen.



Different treatment technologies can be used in a POU device. The most commonly referred to technology for POU devices is Reverse Osmosis. Other types of devices utilize adsorptive media filters. Adsorptive media attracts contaminants such as arsenic or iron (depending on the type of media that is used) to the media and causes it to stick to the media, thereby filtering it out of the water so it is not consumed. Granular Activated Carbon (GAC) is another common filter material that helps remove unwanted tastes and odors from water.

All types of the POU devices have their limitations and require some periodic maintenance. An RO membrane for example eventually becomes less and less efficient due to the fact that it is constantly filtering out unwanted material from the drinking water, and therefore the membrane

Point of Use Water Treatment

eventually becomes clogged and must be replaced. The same is true for adsorptive medias, eventually all of the adsorptive space on the media is occupied and it is no longer able to function properly. In this case the media must be thrown away and replaced with a new media filter.

Using POU Treatment for Compliance

If your water system is interested in utilizing POU treatment devices for compliance with the arsenic rule, or any other primary drinking water standard, certain steps must be taken.

- 100% Customer Participation – all customers within the water system’s service area must agree to utilize a POU device. The POU device must be installed by the water system’s operator and a licensed plumber. Customers are not allowed to install or maintain the POU devices. The POU device is the property of the water system.
- Maintenance and Sampling – all customers must agree to allow water system personnel into their homes periodically to maintain the POU devices as well as to take occasional water samples to ensure that the POU device is working properly. Customers cannot maintain the unit installed in their home.
- Calling for Maintenance – each POU device must be equipped with an alarm, either audio or visual, to alert the customer when the device is either not working properly or is in need of service. Customers must agree to call the water system personnel when the alarm indicates that the POU needs attention. Customers are not allowed to perform any maintenance on the POU device.

Cost Benefits

POU devices can be much more cost effective than installing a large treatment facility for a small water system. The initial capital cost of POU devices is fairly low in comparison to a large treatment facility. However, the operations and maintenance costs of the devices can be somewhat higher than what is expected due to the fact an employee of the water system has to enter the home of each customer to perform maintenance when necessary. This causes the need for additional paperwork as well as tracking of various POU devices.

Summary

POU devices can be a cost effective way for a water system to reach compliance. However, customer participation and support is required, without customer support it will not be possible for the water system to be in compliance with State and Federal regulations. If POU devices have been determined to be the most cost effective way for the system to be brought into compliance, and there is not customer support, the water system will be required to find an alternate way to bring the system into compliance. This could result in the need for a centralized water treatment or consolidation with another water system if possible.

Further information about POU regulations can be found in the Nevada Point of Use Compliance Guidelines from NDEP Bureau of Safe Drinking Water.