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EPA Implementation Guidance for Radionuclides

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Introduction

The purpose of this guidance manual is to provide assistance to EPA, States, and community water systems (CWSs) during the implementation of the Radionuclides Rule. This rule was published in the Federal Register on December 7, 2000 (65 FR 76708). This document does not substitute for EPA's regulation nor is this document regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances.

This manual was developed through a workgroup process involving Regions, States, and Stakeholders, and contains the following sections:

Section I summarizes the Radionuclides Rule and presents timelines of important dates of this rule. Section II addresses violation determination and associated reporting requirements, including a violation table to assist States in their compliance activities. Section III covers State Primacy Revision Requirements, including a timeframe for application review and approval. This section also contains guidance and references to help States adopt new special primacy requirements included in this rule. Section IV contains a series of "stand alone" guidance materials that will help States and PWSs comply with the new requirements.

The Appendices of this document provide information that will be useful to States and EPA Regions throughout the primacy revision application process. Appendix A contains a violation table arranged for data management and enforcement purposes. Appendix B contains the sample Extension Agreement between EPA and the States that will allow States and EPA to document how they will share rule implementation responsibilities if the State does not submit a primacy application by the deadline. Appendix C contains the primacy revision crosswalks for the rule. Appendix D contains the State reporting guidance. Appendix E is EPA's Statement of Principles on the effect of State audit immunity/privilege laws on enforcement authority for federal programs. Appendix F contains training presentation materials for each rule. Appendix G is a copy of the final Radionuclides Rule and Appendix H includes a copy of the beta and photon emitter conversion tables.

EPA and State decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions regarding a particular facility will be made based on the applicable statutes and regulations. Therefore, interested parties are free to raise questions and objections about the appropriateness of the application of this guidance to a particular situation, and EPA will consider whether or not the recommendations or interpretations in the guidance are appropriate in that situation. EPA may change this guidance in the future.

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Section I.
Rule Requirements

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I-A. Rule Executive Summary - Radionuclides Rule

Purpose

The purpose of this summary is to acquaint State decision-makers and other public health officials with the final rule for (non-radon) radionuclides in drinking water. The Radionuclides Rule was published in the *Federal Register* on December 7, 2000 (65 FR 76708). The rule is applicable to CWSs and includes requirements for uranium, which was not previously regulated, and revisions to the monitoring requirements for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon radioactivity. The rule retains the existing MCLs for combined radium-226 and radium-228, gross alpha particle radioactivity, and beta particle and photon radioactivity. Exposure to radionuclides from drinking water results in the increased risk of cancer. The uranium standard will protect drinking water customers from uranium levels that may cause toxic effects to the kidney and will reduce cancer risk.

Background

Regulations for radionuclides in drinking water were first promulgated in 1976 as interim regulations under the authority of the Safe Drinking Water Act (SDWA) of 1974. Standards were set for three groups of radionuclides: beta and photon emitters, radium (radium-226 and radium-228), and gross alpha radiation. These standards became effective in 1977. The 1986 SDWA Amendments added radon and uranium to the list of regulated radionuclides and required EPA to promulgate a revised radionuclide rule by June 1989. When EPA did not meet this deadline an Oregon plaintiff brought suit to require EPA to issue regulations. EPA entered into a series of consent agreements which set a schedule for the issuing the non- radon radionuclide regulations by November 21, 2000.

In 1991, EPA proposed new regulations for uranium and radon and revisions to the existing radionuclides regulations. This proposal was not promulgated as a final rule. The revised consent decree (mentioned above) required an action with respect to the final (non-radon) regulation by November 21, 2000. To meet this deadline, EPA published a Notice of Data Availability (NODA) in April 2000, which informed the public and the regulated community of new information concerning radionuclides in drinking water. The revised (non-radon) Radionuclides Rule, published on December 7, 2000 satisfies the requirements of the consent decree.

Benefits of the Radionuclides Rule

This rule promulgates new monitoring provisions that will ensure that all customers of community water systems will receive water that meets the Maximum Contaminant Levels for radionuclides in drinking water. Under the 1976 rule, water systems with multiple entry points to the distribution system were not required to test at every entry point, but rather to test at a "representative point to the distribution system." While the 1976 requirement did ensure that the "average customer" was protected, it did not ensure that all customers were protected. Under the new rule, all entry points will be tested and all CWS customers will be ensured of receiving water that meets the MCLs for radionuclides in drinking water. In addition, this requirement is more consistent with the monitoring requirements for other comparable drinking water contaminants.

The new standard for uranium in drinking water will result in reduced uranium exposures for 620,000 persons. The uranium standard will protect drinking water customers from uranium levels that may cause toxie effects to the kidney and will reduce cancer risk. The kidney toxicity benefits for the uranium

standard can not be quantified because limitations in existing health effects models at levels near the MCL. In addition to these non-quantified kidney toxicity benefits, 0.8 cancer cases per year are expected to be avoided, with estimated monetized cancer health effects benefits of $ 3 million annually. Water mitigation for uranium also removes other contaminants, which has associated benefits.

In addition, the new rule promulgates separate monitoring requirements for radium-228, which is expected to reduce exposure to 420,000 persons and result in the avoidance of 0.4 cancer cases per year, with estimated monetized health effects benefits of $2 million annually. Water mitigation for radium also tends to reduce iron and manganese levels and hardness, which also has significant associated benefits.

Applicability and Compliance Dates

The Radionuclides Rule applies to all community water systems (CWSs) (40 CFR §141.26). The regulations do not apply to noncommunity water systems.

The effective date of the Rule is December 7, 2003 (40 CFR §141.66(f)). Systems must monitor, in accordance with a State specified plan, between the effective date and December 31, 2007, unless they use grandfathered data (40 CFR §141.26(a)(1)).

Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs)

The revised Radionuclides Rule promulgates a MCL for uranium and retains the existing MCLs for combined radium-226/228, gross alpha particle, and beta particle and photon radioactivity. The Rule also finalizes MCLGs which are shown in Table I-1 (40 CFR §141.55).

Table I-1: MCLs and MCLGs for Regulated Radionuclides

Regulated Radionuclide	MCL	MCLG
Beta/photon emitters (mrem/yr)	4mrem/yr	Zero
Gross Alpha Particle (pCi/L)	15 pCi/L	Zero
Combined radium-226/228 (pCi/L)	5 pCi/L	Zero
Uranium (pCi/L)	30 ug/L	Zero

Requirements of the Rule

Record Keeping and Reporting

The standard record keeping and reporting requirements for pubic water system (PWS) monitoring programs apply to the Radionuclides Rule (see 40 CFR §§141.31 and 141.33 for PWS requirements and §142.14 for State requirements) and are discussed in detail in Sections I.C.2 and I.C.3 of this document.

Monitoring

The standardized monitoring framework for radionuclides is complex, in part, because of the inter-relationship of the analytes; i.e., the alpha emitters, radium-226, and uranium contribute to gross alpha activity. A detailed discussion on the monitoring requirements is included in Sections I.C.4 and I.C.5 of this document.

Grandfathered Data and Monitoring Waivers

Systems may not use grandfathered data to satisfy the monitoring requirements for beta and photon emitters (40 CFR §141.26(b)). However, States may allow data collected between June 2000 and December 8, 2003 to be used to comply with the initial monitoring requirements for gross alpha, radium-226/228, and uranium (40 CFR §141.26(a)(2)(ii)). A detailed discussion about grandfathering of data can be found in the Section I.C.6 of this document.

States cannot issue monitoring waivers under the Radionuclide Rule. However, States may waive the final two quarters of initial monitoring for gross alpha, uranium, radium-226, and radium-228, if the sampling results from the previous two quarters are below the detection limit[1] (40 CFR §141.26(a)(2)(iii)). See Section I.C.7 of this document for more detail on waiving of monitoring requirments.

Requirements for New Systems/Sources

New systems and systems that begin using a new source of supply must conduct initial monitoring for gross alpha, radium-226/228, and uranium the quarter after initiating use of the new supply (40 CFR §141.26(a)(1)(ii)). A detailed discussion along with an annotated example is included in Section I.C.8 of this document.

Laboratory Methods

Many testing procedures for regulated radionuclides were approved in 1976 and many additions or changes to analytical methods were included in the proposed 1991 Radionuclides Rule. EPA approved 66 radiochemical methods in the March 5, 1997 radionuclides methods rule (62 FR 10168, 40 CFR §141.25). Currently, 89 radiochemical methods are approved for compliance monitoring of radionuclides in drinking water. These methods and various quality control requirements are detailed in the Section I.C.9 of this document.

Treatment Technologies and Costs

EPA has evaluated several technologies for removing radionuclides from drinking water. Details on EPA's review of the 1999 draft of "Technologies and Costs," the EPA 1998 radium compliance cost study, the 1998 Federal Register notice of "Small Systems Compliance Technology Lists", and the November, 2000 Radionuclides Economic Analysis which provides national costs are included in Section I.C.10 of this document. Table I-2 provides a summary of the Best Available Technology (BAT) for complying with the MCLs for combined radium 226/228, gross alpha, beta particle and photon radioactivity, and uramium.

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[1]Regulatory detection limits are defined in 40 CFR §141.25(c).

Table I-2: Best Available Technologies for Complying with the MCLs for Radionuclides

Contaminant	BAT
Combined radium-226/228	Ion Exchange, Lime Softening, Reverse Osmosis
Gross alpha (excluding radon and uranium)	Reverse Osmosis
Beta particle and photon radioactivity	Ion Exchange and Reverse Osmosis
Uranium	Ion Exchange, Lime Softening, Reverse Osmosis, Enhanced Coagulation/Filtration*

* Assumes that the system already has coagulation/filtration in place.

Cost information is available in an Appendix to the 1999 "Technologies and Costs" document and in the 1998 radium compliance cost study. The cost study gathered data from 29 systems in 8 States to compare costs of different technologies. Reverse osmosis was the most expensive technology identified, and ion exchange was one of the least expensive.

Variance and Exemptions

Small System Variances - Small system variances are not available for any contaminant regulated under the Radionuclide Rule because EPA has identified affordable small system compliance technologies. See Section I.C.10 for a summary of small system compliance technologies including a table that summarizes the compliance technologies by system size category.

General Variances - All systems are eligible for general variances from the MCLs for gross alpha, combined radium-226/228, uranium, and beta particle and photon emitters. However, a system must meet the requirements in §1415(a) of SDWA to qualify for a general variance.

Exemptions - The maximum exemption period is nine years from the effective date of the MCLs, and since EPA retained the existing MCLs promulgated in 1976 for gross alpha, radium-226/228, total beta particle and photon emitters, the exemption period has expired. The Agency has promulgated a new regulation for uranium, therefore, a State may issue an exemption to a PWS for the uranium MCL if the system meets the criteria stated in SDWA §1416.

I-B. Key Dates of the Rule

The effective date for the revised Radionuclides Rule is December 7, 2003. The current Rule remains in effect until this date. Under the revised Rule, all CWSs are required to complete the initial monitoring requirements by December 31, 2007 (40 CFR §141.26). A system that collects samples for gross alpha, radium-226/228, and uranium contaminants between June 2000 and December 8, 2003 may be able to grandfather this data and therefore may not have to conduct initial monitoring (40 CFR §141.26(a)(2)(ii).

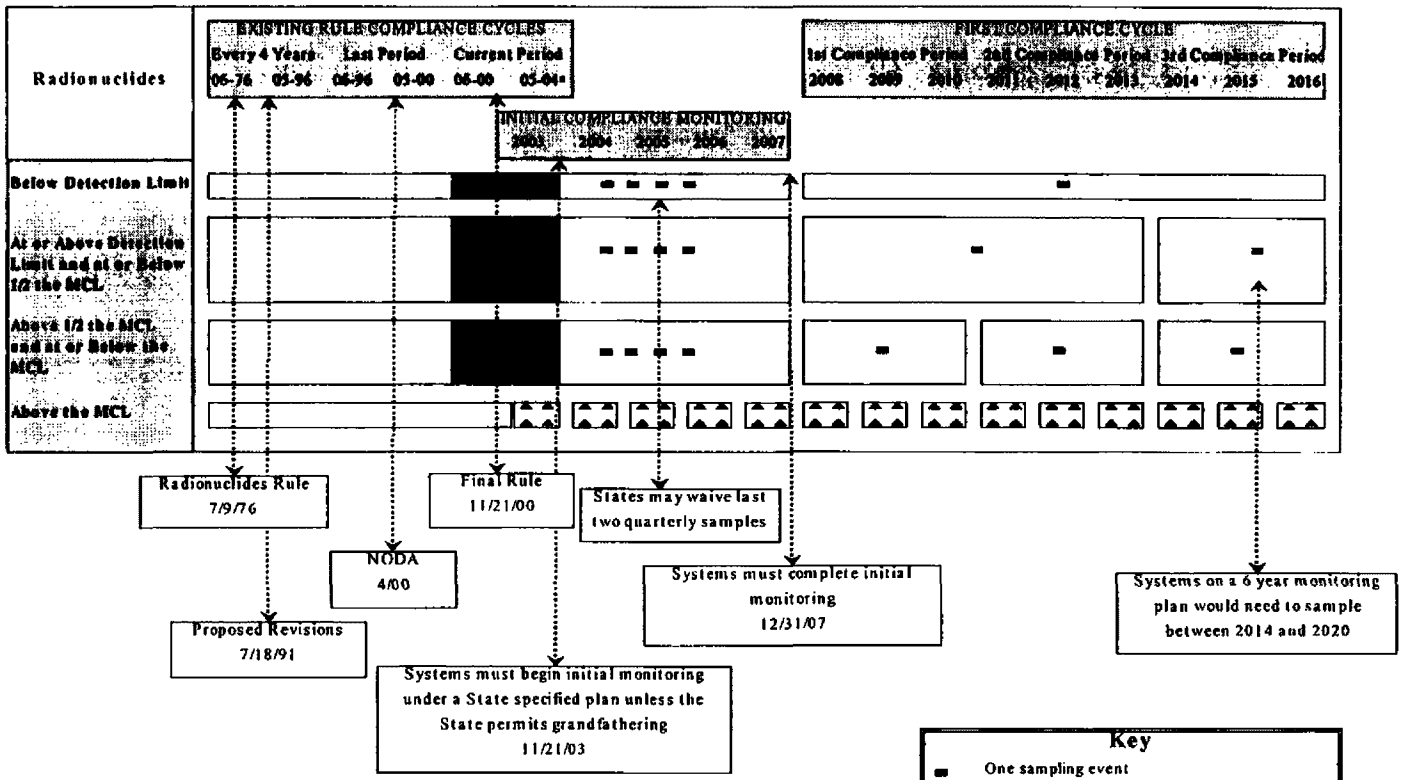
Systems must monitor, in accordance with a State specified plan, between December 7, 2003 and December 31, 2007. This will synchronize radionuclides monitoring with the standardized monitoring framework (specifically Phase II/V organic and inorganic monitoring), and to alleviate potential laboratory capacity problems. Systems will be able to collect radionuclide samples in conjunction with the inorganic, synthetic organic, and volatile organic contaminant samples which must be collected by December 31, 2007.

A timetable of key dates, and a time line illustrating the radionuclides monitoring requirements within the standardized monitoring framework are presented in Table I-3 and Figure I-1, respectively.

Table I-3: Public Water System Timetable for the Radionuclides Requirements

Date	Radionuclides Requirements
July 9, 1976	Radionuclides Drinking Water Regulation Final Rule
July 18, 1991	Revised Radionuclides Proposed Rule
April 2000	Revised Radionuclides Notice of Data Availability (NODA)
June 2000	Data collected between June 2000 and December 8, 2003 may be eligible for use as grandfathered data to satisfy the initial monitoring requirements for gross alpha, radium-226/228 and uranium. (Note: The use of grandfathered data is at the States discretion.)
December 7, 2000	Revised Radionuclides Final Rule
December 7, 2002	State primacy revision application package due
December 7, 2003	Rule effective date
December 7, 2003	Systems must begin initial monitoring under a State specified monitoring plan unless the State permits the grandfathering of data collected between June 2000 and December 8, 2003.
December 7, 2004	State primacy revision application package due for those States requesting 2 year extensions
December 31, 2007	All systems must complete initial monitoring

Figure I-1: Radionuclides Monitoring Within the Standardized Monitoring Framework



*There is an overlap between the current compliance period of the existing ruleand the initial monitoring period of the Revised Rule. The new rule is effective, and the initial compliance monitoring period begins, on November 21, 2003. In effect therefor

I-C. Rule Summary - Radionuclides Rule

I-C.1 Background

Regulations for radionuclides in drinking water were first promulgated in 1976 as interim regulations under the authority of the SDWA of 1974. The standards were set for three groups of radionuclides: beta and photon emitters, radium (radium-226 and radium-228), and gross alpha radiation. These standards became effective in 1977.

The 1986 SDWA Amendments identified 83 contaminants for EPA to regulate, including the regulated radionuclides, which lacked an MCLG, and two additional radionuclides, uranium and radon. The Amendments also declared the 1976 interim standards to be final National Primary Drinking Water Regulations (NPDWR). The 1986 SDWA Amendments provided a statutory deadline to promulgate a revised radionuclide rule by June 1989.

When EPA failed to meet this statutory deadline, an Oregon plaintiff brought suit to require EPA to issue the regulations. EPA entered into a series of consent agreements setting a schedule for issuing the regulations for non-radon radionuclides.

In 1991, EPA proposed new regulations for uranium and radon, as well as, revisions to the existing regulations. The proposal included the following features: (1) an MCLG of zero for all ionizing radiation; (2) revised MCLs for beta particle and photon radioactivity, radium- 226, radium-228, and gross alpha emitters; (3) proposed MCLs for uranium and radon; and (4) revisions to the categories of systems required to monitor, the monitoring frequencies, and the appropriate screening levels. EPA received comments on the new data and regulatory options presented in the 1991 proposal. However, the proposal was never promulgated as a final rule, in large part, because of controversy surrounding the proposed MCL for radon.

In accordance with the consent decree, EPA agreed to publish a final action with respect to the proposed regulation for uranium by November 21, 2000. EPA also agreed to either take final action by the same date with respect to radium, beta/photon emitters, and alpha emitters or publish a notice stating its reasons for not taking final action on the proposal. The 1996 Amendments also directed the Agency to withdraw the proposed MCL for radon, which was done on August 6, 1997 (62 FR 42221) and provided a framework for a radon specific regulation.

I-C.2 Record Keeping

The standard record keeping requirements for PWS monitoring programs apply to the Radionuclides Rule (40 CFR §141.33 for CWS requirements and 40 CFR §142.14 for State requirements).

CWSs must keep:

- records of analyses for at least 10 years. Data may be kept as laboratory reports, or can be transferred to tabular summaries including the date, place, and time of sampling; the name of the person who collected the sample; identification of the sample as a routine distribution system sample, check sample, raw or process water sample, or other special purpose sample; date of analysis; laboratory and person responsible for performing analysis; the analytical technology/method used; and the results of the analysis.

- records of action taken by the system to correct violations of NPDWRs for at least 3 years after the last action taken with respect to the particular violation involved.

- records concerning a variance or exemption granted to the system for at least 5 years following the expiration of such variance or exemption.

Other required records include State determinations of a system's vulnerability to contamination from photon and beta emitters, records of current monitoring requirements, and records of the most recent monitoring frequency decision pertaining to each contaminant.

States exercising primary enforcement responsibility must keep all records of current monitoring requirements and the most recent monitoring frequency decisions pertaining to each contaminant, including the monitoring results and other data supporting the decision, and the State's findings based on the supporting data and any additional bases for such decision. These records must be kept in perpetuity or until a more recent monitoring frequency decision has been issued.

I-C.3 Reporting

The standard reporting requirements for PWS monitoring programs under the SDWA apply to the Radionuclides Rule (40 CFR §141.31) and are discussed below.

A water supplier must report analytical results, as stipulated by the State, within the first 10 days of the month following the month in which the results are received, or within the first 10 days following the end of the required monitoring period, whichever of these is shortest. The water supplier is not required to report analytical results to the State in cases where a State laboratory performs the analysis and reports the results to the State office. The water supplier must also report to the State within 48 hours the failure to comply with any NPDWRs (including failure to comply with monitoring requirements).

The laboratory or system must report the analytical result, including the standard deviation, to the State. However, the State should only report MCL violations to the EPA based on the analytical result. The analytical result is the value that the laboratory reports, not including (i.e. not adding or subtracting) the standard deviation. For example, if a laboratory report indicates that the gross alpha measurement for a sampling point is 18 ± 2 pCi/L, then compliance, reduced monitoring and reporting would be calculated using a value of 18 pCi/L. (40 CFR §141.26(c)(3)).

Systems must provide public notice in certain circumstances. After providing notice to consumers, the water system must send the primacy agency a copy of each type of public notice (e.g., newspaper, radio, mail notices, etc.) along with a letter certifying that the system has met all of the public notification requirements. The system must send this information to the State within 10 days of completion of each public notice.

The revised Public Notification (PN) Rule (40 CFR Part 141, Subpart Q) divides the public notice requirements into 3 tiers based on the seriousness of the violation or situation. "Tier 1" applies to violations and situations with significant potential to have serious adverse effects on human health as a result of short-term exposure. Notice is required within 24 hours of a Tier 1 violation. "Tier 2" applies to other violations and situations with potential to have serious adverse effects on human health. Notice is required within 30 days of a Tier 2 violation. Primacy agencies may grant extensions of up to 3 months from the time of the Tier 2 violation under certain conditions. "Tier 3" applies to all other violations and situations requiring a public notice not included in Tier 1 and Tier 2. Notices for Tier 3 violations can be combined into one annual notice, including the Consumer Confidence Report (CCR), if timing and delivery requirements can be met.

The Radionuclides Rule requires CWSs to provide a Tier 2 public notice for regulated radionuclides for MCL violations and to provide a Tier 3 public notice for violations of the monitoring and testing procedure requirements. (40 CFR Part 141, Subpart Q, Appendix A). For Direct Implementation programs, the revised PN Rule went into effect October 31, 2000. Primacy States may set a new compliance date that shall be no later than May 6, 2002.

All CWSs must deliver a CCR to their customers by July 1 of each year (40 CFR §141.152.(a)). Systems must include, among other things, water quality data, monitoring results and an explanation of their significance, and health effects language and "likely source" information for MCL and treatment technique violations. The Radionuclides Rule updates the specific health effects language and likely source information for uranium. (40 CFR Part 141, Subpart Q, Appendix B). The health effects language for radionuclides is shown in Table I-4.

Table I-4: Standard Health Effects Language for CCR and Public Notification

Contaminant	Standard Health Effects Language for CCR and Public Notification
Beta/photon emitters	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Alpha Emitters	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Combined Radium-226/228	Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer.
Uranium	Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.

I-C.4 Monitoring for Gross Alpha, Radium-226, Radium-228, and Uranium

This section presents the initial, reduced, and increased monitoring requirements for gross alpha, radium-226, radium-228, and uranium. The use of grandfathered data to satisfy the initial monitoring requirements is described in the Section I-C.6.

Also included in this section are tables which summarize the monitoring framework for radionuclides, figures which schematically illustrate initial and reduced monitoring scenarios, and examples that help explain the initial and reduced monitoring requirements. While the figures and the examples help to illustrate many of the potential scenarios, States may encounter many additional situations because of the unique characteristics of individual systems. The figures are only a guide to help determine monitoring frequencies for some systems.

I-C.4.a. Radium-224

Recent studies have shown that there is a positive correlation (1:1) between radium-228 and radium-224. Since systems with high radium-224 levels will likely also have high radium-228 levels, EPA expects

that the enforcement of a combined radium-226/228 MCL will mitigate the effects of high radium-224 levels. Although monitoring for radium-224 is not a requirement in this rule, a State, at its own discretion, may require water systems to analyze for radium-224.

I-C.4.b Initial Monitoring for Gross Alpha, Radium-226/228, and Uranium

Systems are required to conduct initial monitoring by December 31, 2007 for gross alpha, radium-226, radium-228, and uranium (40 CFR §141.26). Systems can substitute the gross alpha particle activity measurement for the required radium-226 measurement if the gross alpha particle activity does not exceed 5 pCi/L. Systems can also substitute the gross alpha particle activity measurement for the required uranium measurement if the gross alpha particle activity does not exceed 15 pCi/L. Ideally, a system would establish initial compliance by collecting 4 consecutive quarterly samples at each entry point to the distribution system (EPTDS) during the initial round of monitoring.[2] The annual average of the quarterly results would determine whether a system is eligible for reduced monitoring (See Section I-C.4.c below). Figure I-2 and the results from the initial sampling can be used to establish its reduced monitoring frequency.

I-C.4.c Reduced Monitoring for Gross Alpha, Combined Radium-226/228, and Uranium

Standard trigger levels are used to guide the determination of a system's reduced monitoring frequency: the method detection level, ½ the MCL, and the MCL. If a system's annual average from the initial four quarters of monitoring for gross alpha, uranium, combined radium-226/228 is below the detection limit, the system would be allowed to reduce monitoring to one sample every nine years. (40 CFR §141.26(a)(3)(i)). If a system's annual average for gross alpha, uranium and combined radium-226/228 is at or above the detection limit but at or below ½ the MCL, the system could reduce monitoring to one sample every six years. (40 CFR §141.26(a)(3)(ii)). If a system's annual average for gross alpha, uranium and combined radium-226/228 is above ½ the MCL but at or below the MCL, the system could reduce monitoring to one sample every three years. (40 CFR §141.26(a)(3)(iii)).

Systems on a reduced monitoring schedule must immediately revert back to quarterly sampling if a sample result exceeds the MCL. (40 CFR §141.26(a)(3)(v)). The system is eligible for reduced monitoring only if the average of the initial monitoring results are below the MCL or grandfathered data supports the reduction. The State can also specify a different schedule as part of a formal enforcement action, variance, or exemption.

ILLUSTRATION I-1

Gross Alpha = 7 pCi/L (initial monitoring result)
Gross Alpha = 8 pCi/L (reduced monitoring result)

A system collects 4 quarterly samples for gross alpha during the initial monitoring period. The annual average is 7pCi/L (above the detection limit but less than ½ the MCL). The system may reduce sampling to 1 sample every 6 years for gross alpha (1 sample between 2008 - 2013). The system collects its 6 year sample and the results show an increase in the gross alpha concentration to 8 pCi/L. The system is required to increase the monitoring frequency to once every 3 years (1 sample between 2014 - 2016) because the result was above ½ the MCL but at or below the MCL.

I-C.4.d Increased Monitoring for Gross Alpha, Radium-226/228, and Uranium

Systems on a reduced monitoring schedule (i.e., collecting one sample every 3, 6, or 9 years) may remain on that reduced schedule as long as

[2]States may waive the final two quarters of initial monitoring if the results of the first two quarters are below the detection limit. The system is then required, under the reduced monitoring requirements, to sample once every nine years. (40 CFR §141.26(a)(2)(iii)).

the most recent sample results support that monitoring schedule. An increase in a contaminant concentration may increase the monitoring frequency for that contaminant. See Illustration 1-1.

Any system that has an entry point monitoring result above the MCL while on reduced monitoring, must increase the frequency of monitoring at each entry point to quarterly sampling. Quarterly sampling must continue until 4 consecutive quarterly samples are below the MCL (40 CFR §141.26(a)(3)(v)).

I-C.4.e Use of Gross Alpha Measurements for Radium-226 and Uranium

The standard monitoring framework for radionuclides is complex, in part, because of the inter-relationship of the analytes (i.e., the alpha emitters, radium-226, and uranium contribute to gross alpha activity). Due to this relationship, gross alpha particle activity analytical results can be used to determine the reduced monitoring frequency for gross alpha, radium-226, and uranium. Systems that only submit gross alpha particle activity analytical results and do not sample for radium-226 may be required, under the reduced monitoring requirements, to sample once every three or six years rather than once every nine years. This is due to the fact that the detection limit for gross alpha will not allow you to confirm that radium-226 is below the respective detection limits as measured individually. See Illustration I-2.

ILLUSTRATION I-2
Use of Gross Alpha for Radium-226

The regulatory detection limit for gross alpha is 3pCi/L. The rule specifies that a system must use 1.5 pCi/L (½ the detection limit for gross alpha) as the value to determine future monitoring frequency if the system submits a gross alpha particle activity measurement for radium-226 (40 CFR §141.26(a)(7)). Since 1.5 pCi/L is not less than the regulatory detection limit for radium-226 (1pCi/L) the system would not be allowed to move to the reduced monitoring frequency of once every nine years.

Systems that do not have previous radionuclide sampling data should sample for gross alpha, radium-226, and radium-228. Data collected during the first quarter may serve as a baseline indicator of what will need to be collected in the following quarters. These systems will then collect subsequent quarterly samples concurrently with all other quarterly sampling events to determine compliance with the MCLs. See Illustration I-3.[3]

ILLUSTRATION I-3
Systems With No Previous Sampling Results

A system without any previous sampling results collects gross alpha, radium-226, and radium-228 samples during the first quarter of the initial monitoring period. All samples are less than the regulatory detection limit. The system will likely be able to use ½ the gross alpha detection limit to determine the value of radium-226 and uranium and avoid the cost of collecting quarterly samples for these radionuclides. Thus the system would continue to collect 3 additional quarterly samples for gross alpha and radium-228. The State may allow the system to reduce the monitoring frequency for radium-226 and radium-228 to one sample every 6 years and one sample every 9 years for uranium and gross alpha.

[3]For additional illustrations and examples please see Appendix D: SDWIS-FED DTF Reporting Requirements Guidance.

Systems with gross alpha activity greater than 15 pCi/L are required to monitor for uranium. (40 CFR 141.26(a)(5). Uranium analysis will serve a dual purpose for systems with high levels of gross alpha activity. First, systems can subtract the uranium activity from gross alpha to determine compliance with the gross alpha MCL; and second, the results can be used to determine the future monitoring frequency for uranium. See Illustration I-4.

ILLUSTRATION I-4
Systems with Gross Alpha Activity >15 pCi/L

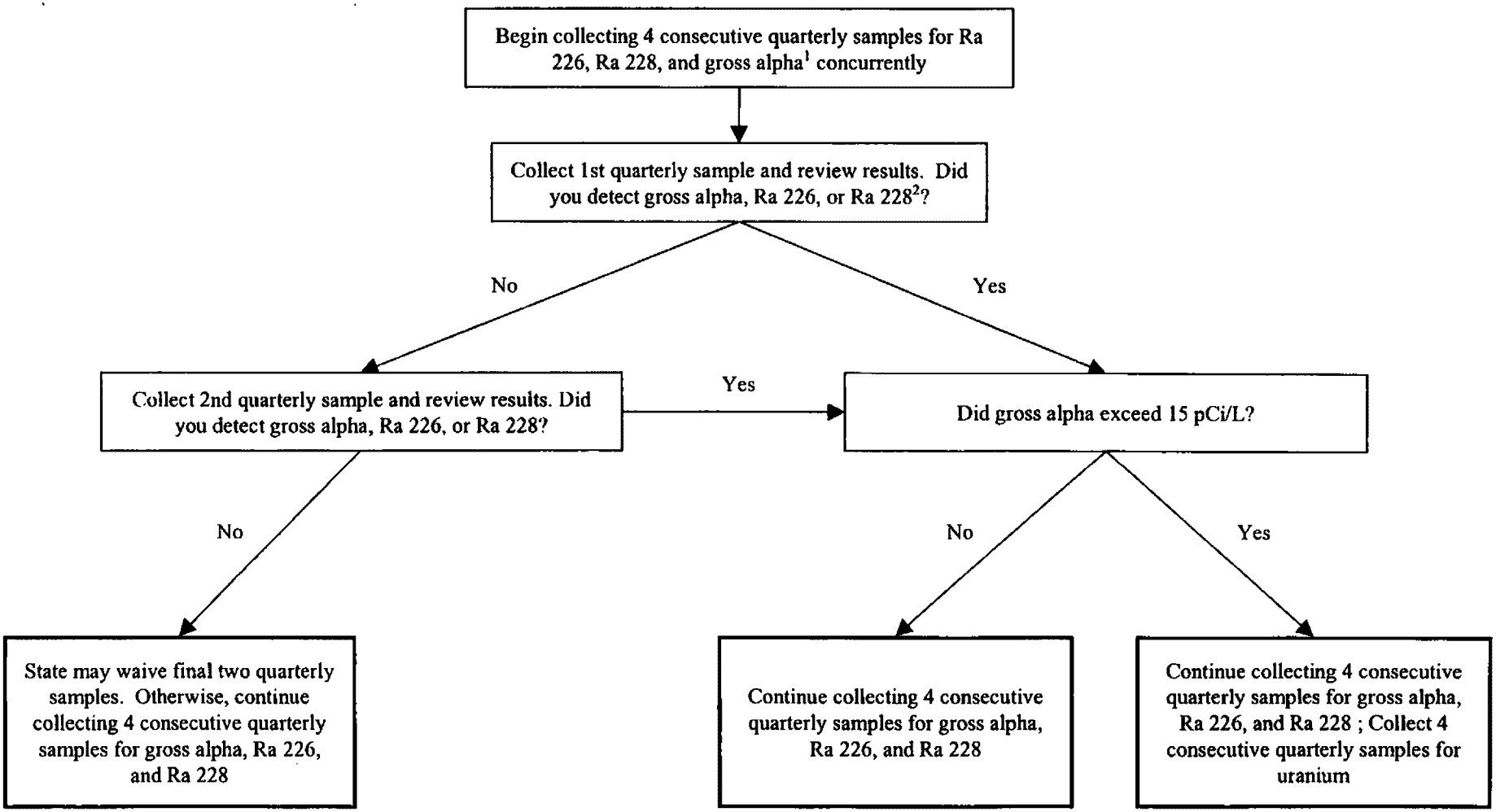
A system has data from a previous compliance period showing a gross alpha level of 20 pCi/L (above the MCL for gross alpha.) The system collects uranium monitoring samples to subtract the uranium activity from the gross alpha measurement to determine actual compliance with the gross alpha MCL. The system speciates for uranium and determines that the mass to activity ratio is 1:1. (i.e. 14 ug/L and 14 pCi/L). The system subtracts the uranium concentration from the gross alpha data which results in compliance with the gross alpha MCL and a reduced monitoring frequency of 1 sample every 6 years for [illegible] contaminants.

Table I-5: Monitoring Frequencies for Gross Alpha, Uranium, and Radium-226/228

<table>
<tr><th>Initial
40 CFR 141.26(a)(2)</th><th colspan="2">Reduced
40 CFR 141.26(a)(3)</th></tr>
<tr><td colspan="3">GROSS ALPHA AND URANIUM</td></tr>
<tr><td rowspan="3">Four consecutive quarters of monitoring at each entry point.*</td><td rowspan="3">One sample every:</td><td>Nine years if the average of the initial monitoring for each contaminant is below the detection limit listed in 40 CFR 141.25(c)</td></tr>
<tr><td>Six years if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below ½ the MCL.</td></tr>
<tr><td>Three years if the average of the initial monitoring results for each contaminant is above ½ the MCL but at or below the MCL.</td></tr>
<tr><td>Systems may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample.</td><td colspan="2">If the results from the composited sample is less than ½ the MCL reduce in accordance with the above schedule.</td></tr>
<tr><td colspan="3">COMBINED RADIUM-226 AND RADIUM-228</td></tr>
<tr><td rowspan="3">Four consecutive quarters of monitoring at each entry point.</td><td rowspan="3">One sample every:</td><td>Nine years if the average of the initial monitoring for combined radium-226/228 is below the detection limit listed in 40 CFR 141.25(c).</td></tr>
<tr><td>Six years if the average of the combined initial monitoring results for combined radium-226/228 is at or above the detection limit but at or below ½ the MCL.</td></tr>
<tr><td>Three years if the average of the initial monitoring results for combined radium-226/228 is above ½ the MCL but at or below the MCL.</td></tr>
<tr><td>Systems may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample.</td><td colspan="2">If the results from the composited sample is less than ½ the MCL reduce in accordance with the above schedule.</td></tr>
</table>

* Systems may substitute the gross alpha results that are less than or equal to 15 pCi/L for uranium to determine compliance and the reduced monitoring frequency. Systems with a gross alpha result greater than 15 pCi/L must collect uranium sample(s) to determine compliance and reduced monitoring. 40 CFR 141.26(a)(5).

Figure I-2: Initial Monitoring Scenario for New Systems or Sources, or Existing Systems without Grandfathered Data



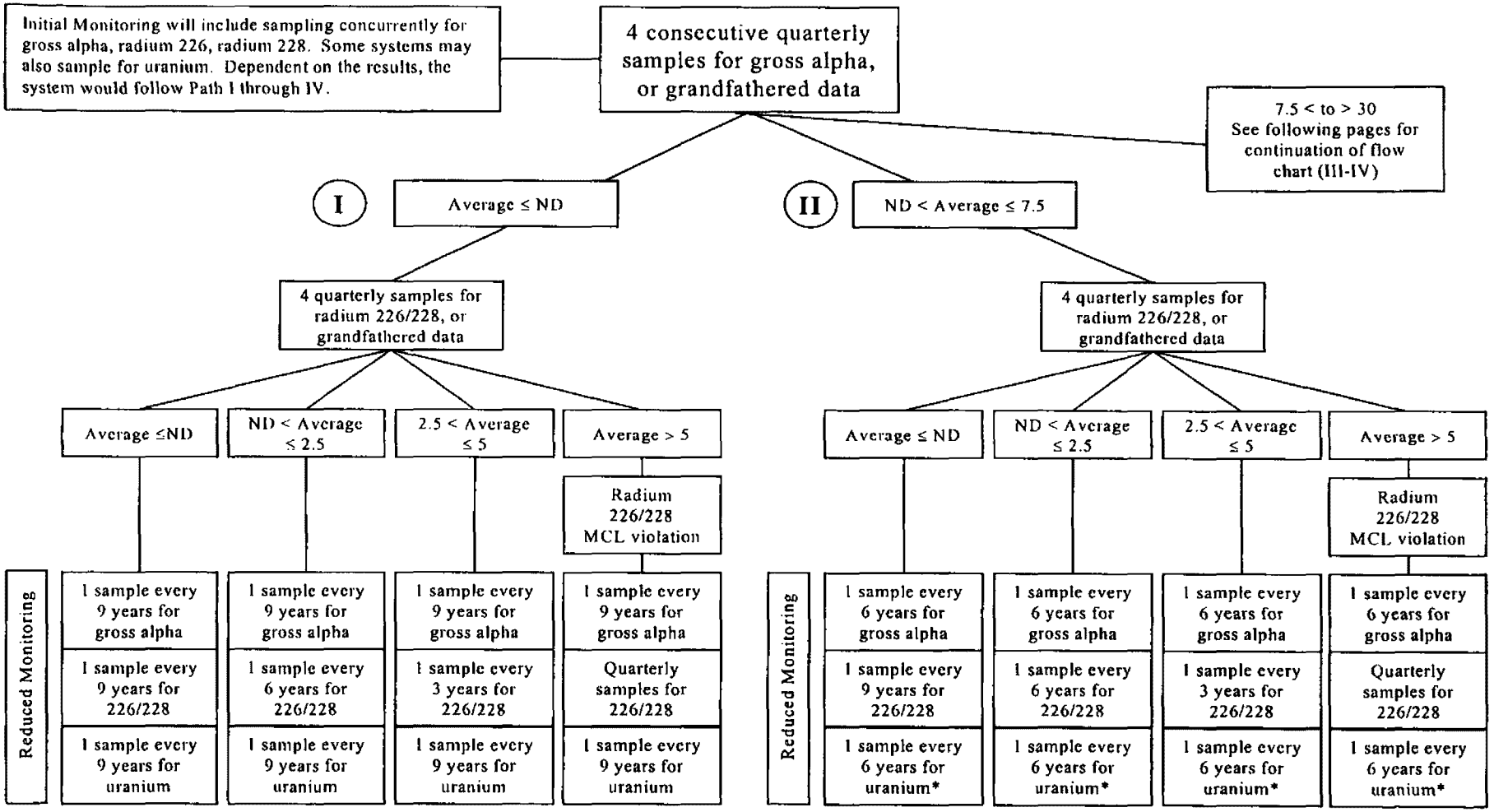
The analytical results from these samples can be used to direct the system into the decision path for repeat monitoring, outlined in Figure 2, paths I through V.

[1] Note that systems may also choose to monitor for gross alpha and uranium separately.

2If gross alpha results are below non-detect, then the system can substitute the gross alpha result for Ra 226 (40 CFR 141.26(a)(5)).

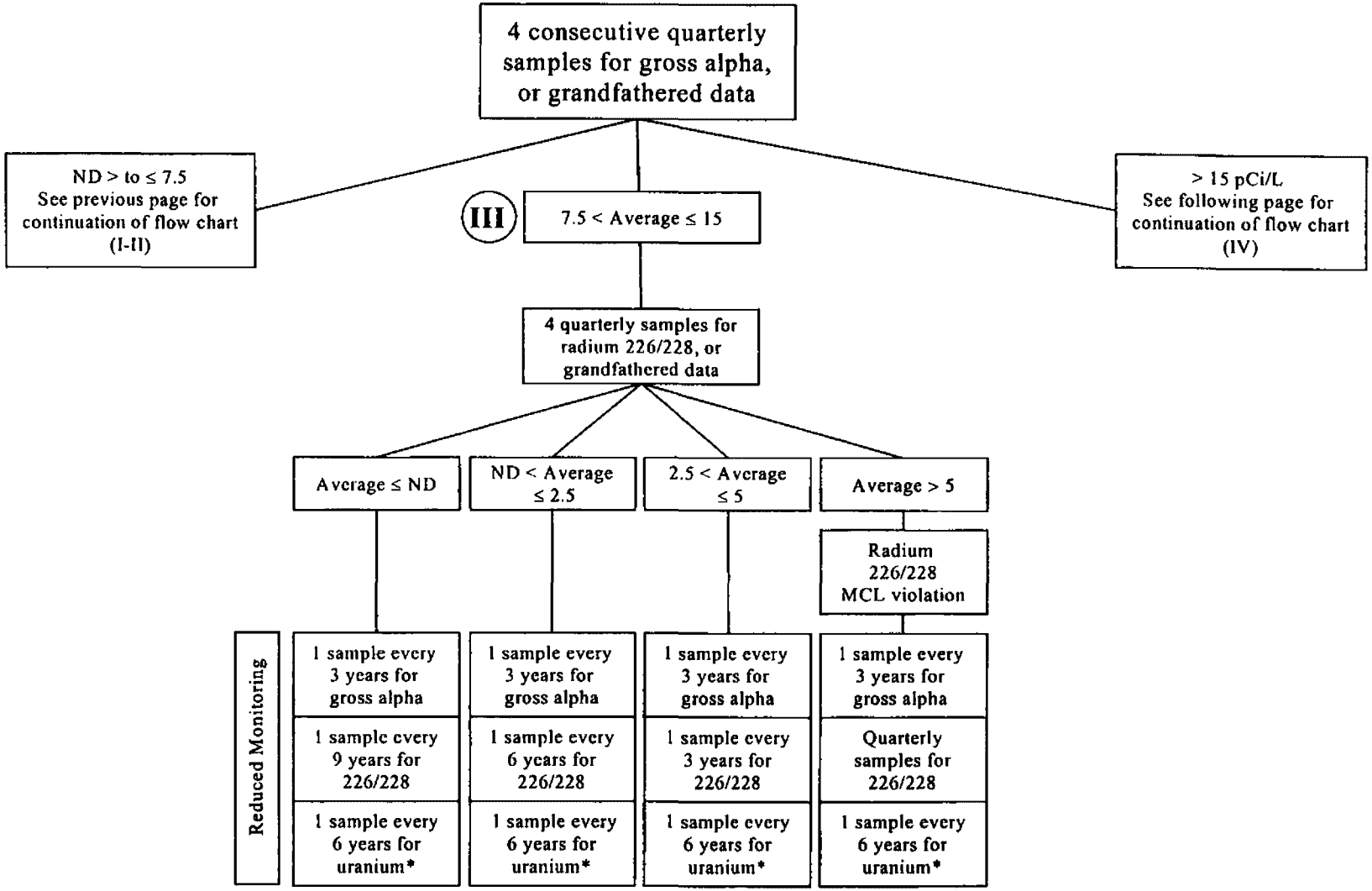
Figure I-3: Initial and Reduced Monitoring Requirements for Gross Alpha, Radium 228, Combined Radium 226/228, and Uranium

See Figure I-2 - Initial Monitoring Chart for Initial Monitoring Requirements. These flow charts are diagrammatic to show the decision path for reduced monitoring status.



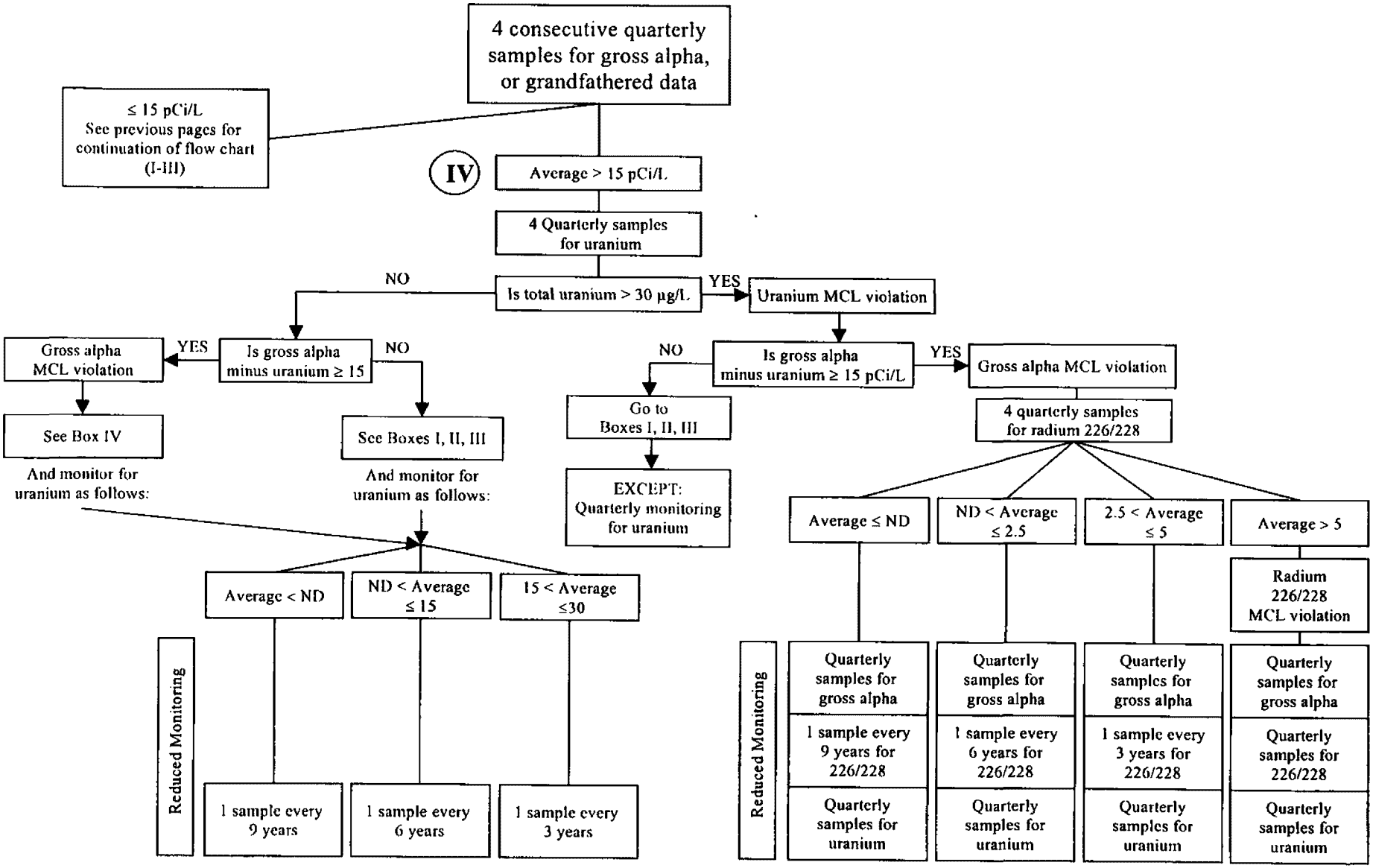
* Assumes system does not collect quarterly samples for uranium to determine the actual concentration of uranium. Systems with levels of gross alpha > 15 pCi/L must collect samples for uranium to determine compliance with the gross alpha and uranium MCLs.

Figure I-3, cont'd: Initial and Reduced Monitoring Requirements for Gross Alpha, Radium 228, Combined Radium 226/228, and Uranium



* Assumes system does not collect quarterly samples for uranium to determine the actual concentration of uranium. Systems levels of gross alpha > 15 pCi/l must collect samples for uranium to determine compliance with the gross alpha and uranium MCLs.

Figure I-3, cont'd: Initial and Reduced Monitoring Requirements for Gross Alpha, Radium 228, Combined Radium 226/228, and Uranium



I-C.5 Monitoring for Beta Particle and Photon Radioactivity

This section presents the initial, reduced, and increased monitoring requirements for the beta particle and photon radioactivity. Figure I-3 is a flowchart summarizing the beta particle and photon radioactivity monitoring requirements.

Under the existing rule, States had to evaluate a system's vulnerability to beta emitting sources. States should use these existing vulnerability assessments to notify systems of their status and of the monitoring requirements, if they have not provided that notification previously. The EPA is also encouraging States to re-evaluate a system's vulnerability to beta particle and photon radioactivity sources when conducting a system's source water assessment and provide immediate notification to those systems that have been deemed vulnerable.

I-C.5.a Routine Monitoring for Beta Particle and Photon Radioactivity

Under the Final Radionuclides Rule, systems must monitor for beta particle and photon radioactivity under the following circumstances:

- If the system is designated by the State as vulnerable;
- If the systems is designated by the State as utilizing waters contaminated by effluents from nuclear facilities; or,
- The State, at its own discretion, requires the system to collect samples (40 CFR § 141.26(b)).

Vulnerable systems must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (40 CFR § 141.26(b)(1)). Sampling must begin one quarter after being notified by the State. (See Figure I-3)

Systems designated by the State as utilizing waters contaminated by effluents from nuclear facilities must also collect quarterly samples for beta emitters and iodine-131, and annual samples for tritium and strontium-90 at each entry point to the distribution system (40 CFR § 141.26(b)(2)). More frequent monitoring is required if iodine-131 is found in finished water (40 CFR § 141.26(b)(2)(ii)). Sampling must begin one quarter after being notified by the State. (See Figure I-3)

I-C.5.b Reduced Monitoring for Beta Particle and Photon Radioactivity

A State may allow a system to reduce the frequency of monitoring to once every three years if:

- In a vulnerable system, the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity has a running annual average (computed quarterly) less than or equal to 50 pCi/L (40 CFR § 141.26(b)(1)(i)).
- In a system designated by the State as utilizing waters contaminated by effluents from nuclear facilities, the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity has a running annual average (computed quarterly) less than or equal to the 15pCi/L (40 CFR § 141.26(b)(2)(iv)).

I-C.5.c Increased Monitoring for Beta Particle and Photon Radioactivity

A system that exceeds the gross beta particle activity minus the naturally occuring potassium-40 beta particle screening level (50 pCi/L for vulnerable systems or 15 pCi/L for systems utilizing waters contaminated by effluents from nuclear facilities), must further analyze the sample for the major radioactive constituents[4] (40 CFR § 141.26(b)(5)). The system must determine compliance with the MCLs for beta particle and photon radioactivity by using the calculation described in 40 CFR § 141.66(d)(2).

If the results show an MCL violation for any of the constituents, the system must conduct monthly monitoring at any sampling point that exceeds the MCL. A system can resume quarterly monitoring if the rolling average of three months of samples is at or below the MCL (40 CFR § 141.26(b)(6)).

I-C.5.d Use of Environmental Surveillance Data for Beta Particle and Photon Radioactivity Measurements

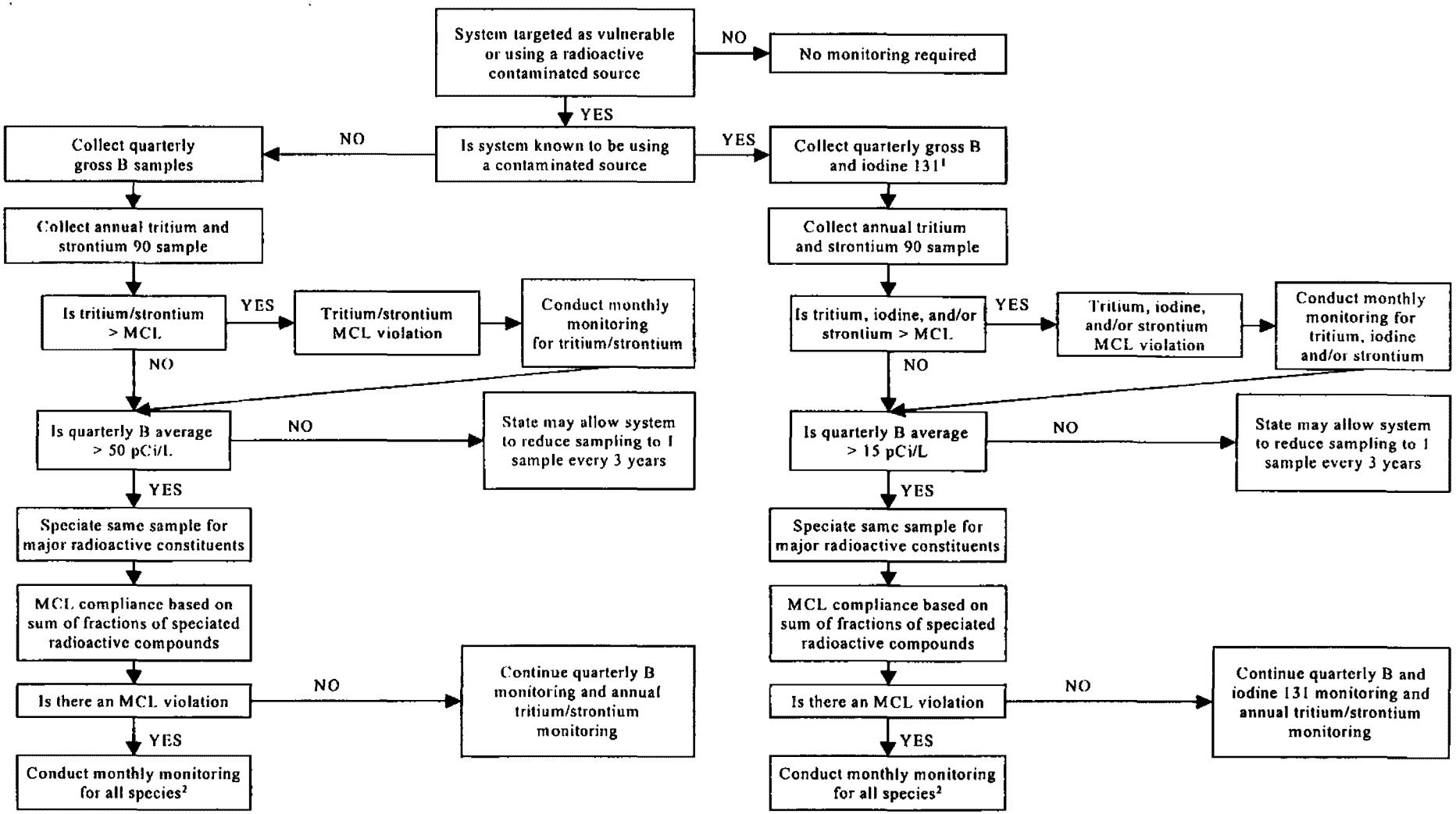
States that allow systems to use environmental surveillance data collected by a nuclear facility in lieu of the water system's required beta particle and photon radioactivity monitoring should review the data to determine if it is applicable to the water system. If the surveillance data indicates that there has been a release, systems must initiate collection of quarterly sampling for beta particle and photon radioactivity (40 CFR §§ 141.26(b)(1)(ii) and 141.26(b)(2)(v)).

Table I-6: Monitoring Frequencies for Beta Particle and Photon Radioactivity

Initial	Reduced
BETA PARTICLE AND PHOTON RADIOACTIVITY	
Vulnerable CWSs (as designated by the State): Quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point, within one quarter after being notified by the State. Already designated systems must continue to sample in accordance with the compliance schedule (40 CFR § 141.26(b)(1)).	One sample every three years if the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity has a running annual average less than or equal to the screening level (50 pCi/L) (40 CFR § 141.26(b)(1)(i)).
CWSs utilizing waters contaminated by effluents from nuclear facilities (as designated by the State): Quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point, within one quarter of being notified by the State. Already designated systems must continue to sample in accordance with the compliance schedule (40 CFR § 141.26(b)(2)).	One sample every three years if the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity has a running annual average less than or equal to the screening level (15 pCi/L) (40 CFR § 141.26(b)(2)(iv)).

[4]A State may require a system to speciate the sample for the most likely emitters associated with the nearby source.

Figure I-4: Gross Beta Monitoring Requirements



[1]A composite of five consecutive daily samples for iodine-131 must be analyzed each quarter. 40 CFR 141.26(b)(2)(ii).
[2]Typically, a State will require a system to speciate the sample for the most likely emitters associated with the nearby source.

I-C.6 Grandfathered Data

The revised Radionuclides Rule balances the need to ensure that the concentrations of the regulated radionuclides are at or below the MCL at every entry point, with the recognition that some systems have been monitoring for certain radionuclides for almost 25 years. The rule also provides States the flexibility to decide, based on its own circumstances, whether to use grandfathered data. A State must provide, as part of its Primacy Application, a description of the procedures and criteria that it will use to determine the acceptability of grandfathered data. (40 CFR §142.16(l)(1)).

Systems are prohibited from using grandfathered data to satisfy the monitoring requirements for beta particle and photon radioactivity. This prohibition was established in the 1976 Radionuclides Rule and the revised Radionuclides Rules does not deviate from this standard (40 CFR §141.26(b)).

States may allow systems to use grandfathered data to comply with the initial monitoring requirements for gross alpha, radium-226/228, and uranium under some circumstances, including the following. (See Illustration I-5).

ILLUSTRATION I-5
Use of Grandfathered Data to Satisfy the Initial Monitoring Requirements

A system with 1 EPTDS has collected gross alpha samples for the two previous compliance periods under the existing Radionuclides Rule (1992-1996, 1996-2000). The State tells the system that if they collect EPTDS samples for gross alpha, radium-226, radium-228, and uranium between June 2000 and December 7, 2003 they can grandfather this data and will not be subject to the initial quarterly monitoring requirements when the new rule goes into effect. The system collects the samples during 2002 and finds concentrations of: 5piC/L for gross alpha, 2piC/L for Radium-226, 3piC/L for Radium-228, and non-detect for uranium.

The State uses this information to set a compliance schedule of:

- 1 sample every 6 years for gross alpha since the result was greater than the detection level but less than ½ the MCL;
- 1 sample every 3 years for combined radium-226/228 since the combined result (2piC/L + 3piC/L) is greater than ½ the MCL but less than or equal to the MCL; and
- 1 sample every nine years for uranium since the sample was less than the regulatory detection limit

- Systems with one entry point to the distribution system (EPTDS) that collect monitoring data between June 2000 and December 7, 2003;
- Systems with multiple EPTDS that have collected samples for each entry point between June 2000 and December 7, 2003; or,
- Systems with data collected from a representative point in the distribution system between June 2000 and December 7, 2003. The State must make a written finding that the data is representative of each entry point based on the variability of historical contaminant monitoring results and other factors listed in the special primacy section of the State Primacy Program application. (40 CFR §141.26(a)(2)(ii)).

I-C.7 Monitoring Waivers

A State cannot allow a system to forego initial or reduced monitoring (40 CFR §141.26). In some circumstances, a State may waive the final two quarters of initial monitoring for a sampling point if the results of the samples from the two previous quarters are below the detection limit.

I-C.8 Requirements for New Systems/Sources

New CWSs and systems that begin using a new source of supply must conduct initial monitoring for gross alpha, radium-226/228, and uranium (systems only have to collect sample(s) for uranium if the gross alpha is greater than 15 pCi/L). This monitoring must begin within the first quarter after initiating use of the new source (40 CFR §141.26(a)(1)(ii)). New systems or systems using a new source of supply may also have to sample for beta particle and photon radioactivity if required by the State. Figure I-2 is a flowchart that summarizes the monitoring requirements for new systems/sources.

ILLUSTRATION I-6
New System Monitoring

A water system that commences operation in 2004 collects its first quarterly sample for gross alpha, radium-226, and radium-228. The results for all the contaminants are less than the regulatory detection limit. The system decides to collect only radium-228 and gross alpha in the remaining quarters and substitute the gross alpha results for radium-226 and uranium. The results for the [illegible] waters are all below the detection limit for gross alpha and radium-228. The State allows the monitoring frequency for gross alpha and uranium to one sample every nine years and one sample every six years for combined radium-226/228.

States may require that new PWSs, systems that bring on new water sources, or systems that have no prior history of radionuclide monitoring, to develop an occurrence profile (i.e. collect 1 sample of gross alpha, radium-226, and radium-228) to determine if it is necessary to monitor for uranium. States can also use the profile to determine which radionuclides the system must monitor for during the initial monitoring period. All new systems must collect samples in accordance with the monitoring requirements outlined in Section I.C.4 of this document. (See Illustration I-6[5]).

I-C.9. Laboratory Methods

This section provides a summary of the testing procedures which have been approved by EPA to provide reliable compliance monitoring of radionuclides in drinking water. Many testing procedures for regulated radionuclides were approved in 1976 and additions or changes to analytical methods were proposed in the 1991 Radionuclides Rule. Most of these procedures and protocols were approved in the March 5, 1997 radionuclides methods rule (62 FR 10168, cited in 40 CFR §141.25). These methods and quality control requirements are summarized below.

I-C.9.a Radionuclides Methods

On July 18, 1991 (56 FR 33050), the Agency proposed to approve fifty-six methods for the measurement of radionuclides in drinking water (excluding radon). Of the fifty-six that were proposed, fifty-four were actually approved in the March 5, 1997 final methods rule (62 FR 10168). In response to the 1991 proposal, several commenters submitted other methods for EPA to consider. Of those methods submitted by commenters, EPA approved 12 radiochemical methods. In total, EPA approved 66 radiochemical methods in the March 5, 1997 final methods rule. Currently, including the 1976 methods, 89 radiochemical methods are approved for compliance monitoring of radionuclides in drinking water. Table I-7, below, summarizes the approved methods listed in 40 CFR 141.25 (July 1, 1999).

[5]For additional illustrations and examples please see Appendix D: SDWIS-FED DTF Reporting Requirements Guidance.

Table I-7: Analytical Methods Approved by EPA for Radionuclide Monitoring of Drinking Water (40 CFR 141.25)

Radioactive Contaminant	Source	Radiochemical Methodology	Reference Method and/or Page Number								
			EPA [1]	EPA [2]	EPA [3]	EPA [4]	SM [5]	ASTM [6]	USGS [7]	DOE [8]	Other
Gross alpha[11] and beta	Natural	Evaporation	900.0	p. 1	00-01	p. 1	302, 7110 B		R-1120-76		
Gross alpha[11]	Natural	Co-precipitation	.....		00-02		7110 C				
Radium-226	Natural	Radon emanation	903.1	p. 16 p. 13	Ra-04 Ra-03	p. 19	7500-Ra C... 304, 305	D 3454--91 D 2460-90	R-1141-76	Ra-05	N.Y. [9]
		Radiochemical	903.0				7500-Ra B		R-1140-76		
Radium-228	Natural	Radiochemical	904.0	p. 24	Ra-05	p. 19	304, 7500-Ra D		R-1142-76		N.Y. [9] N.J. [10]
Uranium[12]	Natural	Radiochemical	908.0				7500-U B				
		Fluorometric	908.1				7500-U C (17th Ed.)	D2907-91	R-1180-76 R-1181-76	U-04	
		Alpha spectrometry	.....		00-07	p. 33	7500-U C (18th or 19th Ed.)	D 3972-90	R-1182-76	U-02	
		Laser phosphorimetry	.....				.....	D 5174-91			
Radioactive Cesium-134	Man-Made	Radiochemical	901.0	p. 4			7500-Cs B	D 2459-72	R-1111-76		
		Gamma ray spectrometry	901.1			p. 92	7120 (19th Ed.)	D 3649-91	R-1110-76	4.5.2.3	

Radioactive Contaminant	Source	Radiochemical Methodology	Reference Method and/or Page Number								
			EPA [1]	EPA [2]	EPA [3]	EPA [4]	SM [5]	ASTM [6]	USGS [7]	DOE [8]	Other
Radioactive Iodine-131	Man-Made	Radiochemical	902.0	p. 6 p. 9			7500-I B 7500-I C 7500-I D	D3649-91		4.5.2.3	
		Gamma ray spectrometry	901.1			p. 92	7120 (19th Ed.)	D 4785-88		4.5.2.3	
Radioactive Strontium -89, -90	Man-Made	Radiochemical	905.0	p. 29	Sr-04	p. 65	303, 7500-Sr B		R-1160-76	Sr-01 Sr-02	
Tritium - ^3H	Man-Made	Liquid scintillation	906.0	p. 34	H-02	p. 87	306, 7500-3H B	D 4107-91	R-1171-76		
Gamma emitters		Gamma ray spectrometry	901.1			p. 92	7120 (19th Ed.)	D 3649-91	R-1110-76	4.5.2.3	
		Radiochemical	902.0 901.0				7500-Cs B 7500-I B	D 4785-88			

1 "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA 600/4-80-032 , August 1980. Available at U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (Telephone 800-553-6847), PB 80-224744.

2 "Interim Radiochemical Methodology for Drinking Water," EPA 600/4-75-008 (revised), March 1976. Available at NTIS, *ibid.* PB 253258.

3 "Radiochemistry Procedures Manual", EPA 520/5-84-006, December 1987. Available at NTIS, *ibid.* PB 84-215581.

4 "Radiochemical Analytical Procedures for Analysis of Environmental Samples," U.S. Department of Energy, March 1979. Available at NTIS, *ibid.* EMSL LV 053917.

5 "Standard Methods for the Examination of Water and Wastewater," 13th, 17th, 18th, and 19th Editions, 1971, 1989, 1992, 1995. Available at American Public Health Association, 1015 Fifteenth Street, N.W., Washington, D.C. 20005. All methods are in the 17th, 18th and 19th editions except 7500-U C Fluorometric Uranium. This method was discontinued after the 17th Edition. 7120 Gamma Emitters is only in the 19th Edition, and 302, 303, 304, 305 and 306 are only in the 13th Edition.

6 Annual Book of ASTM Standards, Vol. 11.02, 1994. Available at American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

7 "Methods for Determination of Radioactive Substances in Water and Fluvial Sediments," Chapter A5 in Book 5 of Techniques of Water-Resources Investigations of the United States Geological Survey, 1977. Available at U.S. Geological Survey Information Services, Box 25286, Federal Center, Denver, CO 80225-0425.

[8] "EML Procedures Manual," 27th Edition, Volume 1, 1990. Available at Environmental Measurements Laboratory, U.S. Department of Energy, 376 Hudson Street, New York, NY 10014-3621.

[9] "Determination of Ra-226 and Ra-228 (Ra-02)," January 1980; Revised June 1982. Available at Radiological Sciences Institute Center for Laboratories and Research, New York State Department of Health, Empire State Plaza, Albany, NY 12201.

[10] "Determination of Radium-228 in Drinking Water," August 1980. Available at State of New Jersey, Department of Environmental Protection, Division of Environmental Quality, Bureau of Radiation and Inorganic Analytical Services, 9 Ewing Street, Trenton, NJ 08625.

[11] Natural uranium and thorium-230 are approved as gross alpha-particle activity calibration standards for the gross alpha co-precipitation and evaporation methods; americium-241 is approved for use with the gross alpha co-precipitation methods.

[12] If uranium (U) is determined by mass-type methods (i.e., fluorometric or laser phosphorimetry), a 0.67 pCi/μg uranium conversion factor must be used. This conversion factor is conservative and is based on the 1:1 activity ratio of U-234 to U-238 that is characteristic of naturally-occurring uranium in rock.

Table I-8 outlines each method's quality control requirements for sample handling, preservation, holding times, and instrumentation as shown in laboratory certification manual (EPA 815-B-97-001).

Table I-8: Sample Handling, Preservation, Holding Times and Instrumentation

Parameter	Preservative [1]	Container [2]	Maximum Holding Time [3]	Instrumentation [4]
Gross Alpha	Concentrated HCl or HNO_3 to pH < 2[5]	P or G	6 months	A, B or G
Gross Beta	Concentrated HCl or HNO_3 to pH < 2[5]	P or G	6 months	A or G
Radium-226	Concentrated HCl or HNO_3 to pH < 2	P or G	6 months	A, B, D or G
Radium-228	Concentrated HCl or HNO_3 to pH < 2	P or G	6 months	A or G
Uranium natural	Concentrated HCl or HNO_3 to pH < 2	P or G	6 months	A or F
Cesium-134	Concentrated HCl to pH < 2	P or G	6 months	A, C or G
Strontium-89 and -90	Concentrated HCl or HNO_3 to pH < 2	P or G	6 months	A or G
Radioactive Iodine-131	None	P or G	8 days	A, C or G
Tritium	None	G	6 months	E
Gamma/Photon Emitters	Concentrated HCl or HNO_3 to pH < 2	P or G	6 months	C

[1] It is recommended that the preservative be added to the sample at the time of collection. It is recommended that samples be filtered if suspended or settleable solids are present at any level observable to the eye prior to adding preservative. This should be done at the time of collection. If the sample has to be shipped to a laboratory or storage area, however, acidification of the sample (in its original container) may be delayed

for a period not to exceed 5 days. A minimum of 16 hours must elapse between acidification and start of analysis.

[2] P = Plastic, hard or soft; G = Glass, hard or soft.

[3] Holding time is defined as the period from time of sampling to time of analysis. In all cases, samples should be analyzed as soon after collection as possible. If a composite sample is prepared, a holding time cannot exceed 12 months.

[4] A = Low background proportional system; B = Alpha and beta scintillation system; C = Gamma spectrometer [Ge(Hp) or Ge (Li)]; D = Scintillation cell system; E = Liquid scintillation system; F = Fluorometer; G = Low background alpha and beta counting system other than gas-flow proportional; O = Other approved methods (e.g., laser phosphorimetry and alpha spectrometry for uranium).

[5] If HCl is used to acidify samples which are to be analyzed for gross alpha or gross beta activities, the acid salts must be converted to nitrate salts before transfer of the samples to planchets.

I-C.9.b Updates Regarding Analytical Techniques

In the 1997 radionuclides methods final rule (62 FR 10168), the Agency approved several methods for gross alpha, gross beta, uranium, and the radium-226 and 228 isotopes. The March 5, 1997 *Federal Register* also approved suitable calibration standards for the analysis of gross alpha-emitting particles and gross beta-emitting particles.

In the 1991 proposed rule (56 FR 33050), the gross beta method could have been used to screen for the presence of radium-228 at the proposed MCL of 20 pCi/L for radium-228. However, with the combined radium-226 and 228 MCL at 5 pCi/L, the Agency can not recommend the use of the gross beta-particle activity method for screening of radium-228. Instead, a specific analysis for radium-228 will be necessary.

As stated in the April 21, 2000, Radionuclides NODA (65 FR 21576), radium-224, a short-lived alpha emitter, has recently been found in drinking water supplies. The Agency strongly recommends that States and utilities perform an alpha analysis within 48 to 72 hours after sample collection to capture the contribution of the alpha particles from the decay of the radium-224 isotope. Appendix IV of the NODA presents several recommendations for determining the presence of the short-lived, alpha-emitting radium-224 isotope in drinking water.

I-C.9.c Externalization of the Performance Evaluation Program

On July 18, 1996 (61 FR 37464), EPA proposed options for the externalization of the Performance Evaluation (PE) studies program (now referred to as the Proficiency Testing or PT program). After evaluating public comment, in the June 12, 1997 final notice EPA (62 FR 32112):

> *"...decided on a program where EPA would issue standards for the operation of the program, the National Institute of Standards and Technology (NIST) would develop standards for private sector PE* (PT) *suppliers and would evaluate and accredit PE suppliers, and the private sector would develop and manufacture PE* (PT) *materials and conduct PE* (PT) *studies. In addition, as part of the program, the PE* (PT) *providers would report the results of the studies to the study participants and to those organizations that have responsibility for administering programs supported by the studies."*

In the April 21, 2000, NODA, EPA stated that the externalization of the PT program could effect laboratory capacity and the costs of analyses. The PT externalization may also impact the implementation of the Radionuclides Rule by causing a short-term disruption in laboratory accreditation and impacting the capacity and workloads of laboratories. EPA solicited comments on how to alleviate these effects.

To alleviate concerns about the costs of PT samples, States have the option of approving their own PT sample providers that can be used instead of the independent third party provider who will be accredited by NIST. EPA anticipates that radionuclide PT samples will be available in time to allow for laboratory certification before compliance monitoring is required.

To alleviate concerns about potential laboratory capacity problems, EPA extended the initial monitoring period from three to four years so that it would end on December 31, 2007. Also, EPA is allowing systems to grandfather and composite data under certain circumstances. In addition, EPA is not requiring NTNCWSs to monitor for radionuclides and is not requiring a 48 to 72 hour turn around time for gross alpha particle activity.

I-C.9.d The Detection Limits as the Required Measures of Sensitivity

In 1976, the National Primary Drinking Water Regulations defined the *detection limit* (DL) as "the concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level (1.96 σ, where σ is the standard deviation of the net counting rate of the sample)." (40 CFR 141.25(c)). In the 1991 proposal (56 FR 33096), EPA proposed using the *method detection limit* (MDL) and the *practical quantitation level* (PQL) as measures of performance for specific radioanalytical methods. Acceptance limits based on the PQLs that were derived from performance evaluation studies were also proposed in the 1991 rule. Some commenters found the use of acceptance limits confusing and the relationship to the actual method performance was not clear. EPA has decided not to use the proposed acceptance limits, PQL, or MDL but will instead maintain the DLs from the 1976 rule. Table I-9 cites the DLs or the required sensitivity for the specific radioanalyses that were listed in the 1976 rule and are also cited in 40 CFR 141.25.

Table I-9: Required Regulatory Detection Limits for the Various Radiochemical Contaminants (40 CFR 141.25)

Contaminant	Detection Limit (pCi/L)
Gross Alpha	3
Gross Beta	4
Radium-226	1
Radium-228	1
Cesium-134	10
Strontium-89	10
Strontium-90	2
Iodine-131	1
Tritium	1,000
Other Radionuclides	1/10th of the applicable limit

A DL for uranium is not listed in 40 CFR 141.25 and none was proposed in the 1991 proposal. EPA did propose a PQL and an acceptance limit but in order to be consistent with other regulated radionuclides, is not adopting the PQL. The Agency will propose a detection limit for uranium in future rulemaking and will set the limit before December 7, 2003 (the compliance date for the Rule).

I-C.10 Treatment Technologies

Under the SDWA, EPA must specify best available technologies (BATs) for each MCL. EPA must also make small system technology assessments in regulations that establish an MCL or treatment technique[6]. This section describes the BATs and small system compliance technologies for the removal of radionuclides from drinking water.

I-C.10.a Best Available Technologies

EPA evaluated "Technologies and Costs" for radionuclides in drinking water in 1992 (EPA 1992). The evaluations were updated in a Technologies and Costs (T&C) draft (1999) and a radium compliance cost study (1998). Table I-10 provides a summary of the Best Available Technology (BAT) for complying with the MCLs for combined radium 226/228, gross alpha, beta particle and photon radioactivity, and uranium.

[6]EPA must make small system compliance and variance technology assessments for systems serving populations between 25 and 500, 501 and 3,300, and 3,301 and 10,000.

Table I-10: BATs for Radionuclides in Drinking Water

Contaminant	BAT
Combined radium-226 and radium-228	Ion Exchange, Lime Softening, Reverse Osmosis
Gross alpha (excluding radon and uranium)	Reverse Osmosis
Beta particle and photon radioactivity	Ion Exchange and Reverse Osmosis
Uranium	Ion Exchange, Lime Softening; Reverse Osmosis, Enhanced Coagulation/Filtration*

* This assumes that a system already has coagulation/filtration in place.

I-C.10.b Small Systems Compliance Technologies

Under the SDWA, compliance technologies may be listed for NPDWRs MCLs or treatment techniques. In the case of an MCL, "compliance technology" refers to a technology or other means that is affordable (if applicable) and that achieves compliance. Possible compliance technologies include packaged or modular systems[7] and point-of-entry (POE) or point-of-use (POU) treatment units[8].

Small systems compliance technologies for combined radium-226 and -228, gross alpha emitters, and total beta and photon activity, were listed and described in the August 1998 *Announcement of Small System Compliance Technology Lists for Existing National Primary Drinking Water Regulations and Findings Concerning Variance Technologies* (63 FR 42032) and in the September 1998 *Small System Compliance Technology Lists for Non-microbial Contaminants Regulated Before 1996* (the Guidance) (EPA 815-R-98-002) which included information regarding small systems treatment and waste disposal concerns relevant to radionuclide contaminants. Further evaluations of small systems treatment technology applicability and affordability for radionuclides, including an analysis of small system compliance technologies for uranium, were also included in the Guidance. Both of the Announcement and the Guidance can be obtained on-line at *http://www.epa.gov/OGWDW/standard/tretech.html*.

Small systems compliance technologies for uranium (proposed for regulation in 1991) were evaluated in the updated Technologies and Cost document published in 1999. The technologies were evaluated in terms of removal capabilities, contaminant concentration applicability ranges, other water quality concerns, treatment costs, and operational/maintenance requirements. The SSCT list for uranium is technology specific, but not product (manufacturer) specific. Product specific lists were determined to be inappropriate due to the potential resource intensiveness involved. Information on specific products will be available through another mechanism. EPA's Office of Research and Development has a pilot project

[7]Package plants are skid mounted factory assembled centralized treatment units that arrive on site virtually ready to use. Package plants offer several advantages. First, since they combine elements of the treatment process into a compact assembly (such as a chemical feeders, mixers, flocculators, basins, and filters), they tend to require lesser construction and engineering costs. Another advantage is that many package plant technologies are becoming more automated and thus can be less demanding of operators than their fully engineered counterparts. (*Small System Compliance Technology Lists for Non-microbial Contaminants Regulated Before 1996.*)

[8]POE treatment units treat all of the water entering a household or other building, with the result being treated water from any tap. POU treatment units treat only the water at a particular tap or faucet. The result is treated water at that one tap and untreated water at the other taps. POE and POU treatment units often use the same technological concepts employed in the analogous central treatment processes, the main difference being the much smaller scale of the device itself and the flows being treated. (*Small System Compliance Technology Lists for Non-microbial Contaminants Regulated Before 1996.*)

under the Environmental Technology Verification (ETV) Program to provide treatment system purchasers with performance data from independent third parties.

Tables I- 11 lists the small system compliance technologies for radionuclides and the limitations of their use. Table I-12 presents the technologies that are appropriate for the three size categories designated in the SDWA.

Table I-11: List of Small Systems Compliance Technologies for Radionuclides and Limitations of Use

Unit Technologies	Limitations (see footnotes)	Operator Skill Level Required[1]	Raw Water Quality Range & Considerations[1]
1. Ion Exchange (IE)	(a)	Intermediate	All groundwaters
2. Point of Use (POU[2]) IE	(b)	Basic	All ground waters
3. Reverse Osmosis (RO)	(c)	Advanced	Surface waters usually require pre-filtration
4. POU[2] RO	(b)	Basic	Surface waters usually require pre-filtration
5. Lime Softening	(d)	Advanced	All waters
6. Green Sand Filtration	(e)	Basic	
7. Co-precipitation with Barium Sulfate	(f)	Intermediate to Advanced	Ground waters with suitable water quality
8. Electrodialysis/ Electrodialysis Reversal		Basic to Intermediate	All ground waters
9. Pre-formed Hydrous Manganese Oxide Filtration	(g)	Intermediate	All ground waters
10. Activated alumina	(a), (h)	Advanced	All ground waters; competing anion concentrations may affect regeneration frequency
11. Enhanced Coagulation/filtration	(i)	Advanced	Can treat a wide range of water qualities

1 National Research Council (NRC). *Safe Water from Every Tap: Improving Water Service to Small Communities*. National Academy Press. Washington, D.C. 1997.

2 A POU, or "point-of-use" technology is a treatment device installed at a single tap used for the purpose of reducing contaminants in drinking water at that one tap. POU devices are typically installed at the kitchen tap. See the April 21, 2000 NODA for more details.

Limitations Footnotes: Technologies for Radionuclides

a The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

b When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

[c] Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

[d] The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

[e] Removal efficiencies can vary depending on water quality.

[f] This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place

[g] This technology is most applicable to small systems that already have filtration in place.

[h] Handling of chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.

[i] Assumes modification to a coagulation/filtration process already in place.

Table I-12 lists the Small Systems Compliance Technologies for the currently regulated radionuclides. Technology numbers refer to the technologies listed in Table I-11.

Table I-12: Compliance Technologies by System Size Category for Radionuclide NPDWRs (Affordability Not Considered, Except for Uranium, Due to Statutory Limitations)

	Compliance Technologies for System Size Categories (Population Served)		
Contaminant	**25 - 500**	**501 - 3,300**	**3,301 - 10,000**
Combined radium-226 and radium-228	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9
Gross alpha particle activity	3, 4	3, 4	3, 4
Beta particle activity and photon activity	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
Uranium	1, 2, 4, 10, 11	1, 2, 3, 4, 5, 10, 11	1, 2, 3, 4, 5, 10, 11

Note: (1) Numbers correspond to those technologies found listed in the table I-11.

I-C.10.c Waste Treatment, Handling and Disposal Guidance

EPA has developed guidance for system managers, engineers, and State agencies responsible for the safe handling and disposal of treatment wastes that, in many cases, are not specifically addressed by any statute ("Suggested Guidelines for Disposal of Drinking Water Treatment Wastes Containing Naturally-Occurring Radionuclides," EPA 1994, Updated 11/2000. The Guidelines will be posted on http://www.epa.gov). The guidance provides information on the following: (1) background on water treatment processes and characteristics of wastes generated; (2) rationale for radiation protection, including citation of programs and regulations affecting other sources of such waste; (3) guidelines for several methods of disposal of solid and liquid type wastes containing the subject radionuclides; and, (4) the specification of practical guidance to protect workers and others who may handle or be exposed to water-treatment wastes containing radiation above background levels.

I-C.11 Variances and Exemptions

Under SDWA §1415(a) if a system cannot comply with an MCL or a treatment technique and EPA has not listed a compliance technology, the State may issue a variance. See Section C.10.b, and Tables I-11 and I-12 for more details on compliance technologies. A variance generally allows the system to provide water above the MCL on the condition that the water quality is still protective of public health. The system is required to install, operate, and maintain a variance technology that is affordable considering the size of the system and the quality of the source of supply.

I-C.11.a Small System Variances

Small system variances[9] are not available for any contaminant regulated under the Radionuclide Rule because:

- EPA has identified affordable compliance technologies for all of the contaminants including uranium.

I-C.11.b General System Variances

Under SDWA §1415(a) States may grant a variance to any size system if the raw water available to the system cannot meet the MCL requirements of a regulation after the BAT is installed and alternative sources of water are not reasonably available. Systems must install, operate, and maintain a State approved BAT and enter into a compliance schedule.

All systems are eligible for general variances from the MCLs for gross alpha, combined radium-2226/228, uranium, and beta particle and photon emitters. However, a system must meet the requirements in §1415(a) of SDWA to qualify for a general variance.

I-C.11.c Exemptions

The MCLs for gross alpha, radium-226/228, total beta particle and photon emitters were promulgated in 1976. The maximum exemption period is nine years from the effective date of the MCLs. Therefore, the exemption period has expired for these contaminants. The Agency has promulgated a new MCL for uranium in the 2000 Radionuclides Rule. A State may issue an exemption to a PWS for the uranium MCL if the system meets the criteria stated in SDWA §1416.

[9]Systems serving fewer than 3,300 people are eligible for a small system variance. Systems serving between 3,300 and 10,000 people are also eligible for a small system variance however the EPA Administrator must approve of the State's variance decision.

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Section II.

SDWIS Reporting, Violation Determination, and SNC Definitions

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II-A. SDWIS Reporting

The following table (Table II-1) is a summary of Safe Drinking Water Information System/Federal (SDWIS/FED) reporting requirements for the Revised Radionuclides Final Rule. The summary contains SDWIS/FED violation and contaminant codes.

This table only lists potential federal violations. Appendix D provides SDWIS/FED DTF reporting guidance on how to place these violations in the appropriate structure so that SDWIS/FED can accept them, when reported.

Table II-1: Revised Radionuclides Final Rule Federal Reporting Violations

Contaminant Code	Contaminant	Violation
4000	Gross Alpha	02, 03, 06
4010	Combined Radium (-226 &-228)	02, 03, 06
4006	Combined Uranium	02, 03, 06
4101	Man-Made Beta Particle and Photon Emitters	02, 03, 06
4102	Tritium	02, 03, 06
4174	Strontium-90	02, 03, 06
4264	Iodine-131	02, 03, 06
4270	Cesium-134	02, 03, 06
4172	Strontium-89	02, 03, 06

Note: Violation Types and Definitions
- 02 - MCL, Average
- 03 - Failure to Monitor/Report
- 06 - Failure to Provide the Appropriate Public Notification

II-B. Violation Determination

II-B.1 Violation/Compliance Determination for Gross Alpha, Radium-226/228, and Uranium

Compliance will be determined based on a running annual average of quarterly samples collected at each entry point. If the running annual average at any entry point exceeds an MCL, the CWS would be in violation (40 CFR §141.26(c)(3)). Noncommunity water systems are not subject to the requirements of the Radionuclides Rule

An immediate violation will occur for any individual sample analytical result or combination of sample analytical results, that would place the system in violation before four quarters of data are collected (e.g., the sample is greater than 4 times the MCL, or the average of the first two samples is greater than twice the MCL). CWSs that exceed an MCL while on reduced monitoring must begin quarterly monitoring the quarter following the one in which the exceedance occurred, and compliance will be based on four consecutive quarters of analytical results beginning with the initial exceedance. Quarterly monitoring is continued until 4 consecutive quarterly samples do not exceed the MCL, or until a monitoring schedule, as a condition to a variance, exemption, or enforcement action, becomes effective (40 CFR §141.26(a)(2)).

If a system fails to collect all samples required during any year, compliance will be calculated based on available data (40 CFR §141.26(c)(3)(ii)). If a system collects 3 of the 4 required quarterly samples the annual average will be based on the samples collected.

II-B.2 Violation/Compliance Determination for Gross Beta and Photon Emitters

The Radionuclides Rule uses a "sum-of-the-fractions" method to determine whether a system is in compliance with the MCL for beta particle and photon radioactivity (40 CFR §141.66(d)). This method is used because each photon emitter targets a different organ of the body which results in a different magnitude of risk. The sum of the beta and photon emitters shall not exceed 4 millirems/year (40 CFR §141.66(d)(2)).

While the measure used to determine risk is "millirems," contaminants are analyzed in the "pCi/L". Therefore, to determine compliance, each beta and photon emitter must be converted from pCi/L to millirems using the conversion tables listed in "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air or Water for Occupational Exposure" (MBS Handbook 69 as amended August, 1963, U.S. Department of Commerce). See Appendix H for the conversion tables.

The column titled, "1976 limits based on critical organ at 4 mrem/yr" indicates what 4 mrem of exposure would be for that contaminant in pCi/L. For each emitter that is detected by the laboratory, the system must divide the pCi/L found in the sample by the value in the conversion tables. This provides a fraction of how much the particular beta or photon emitter is providing towards the maximum of 4 mrem/yr for the all of the beta photon emitters.

$$\frac{\text{pCi/L found in sample (from laboratory results)}}{\text{pCi/L equivalent of 4 mrem of exposure (from conversion table)}} = \text{fraction of the maximum 4 mrem/year exposure limit}$$

If the sum of the fractions is greater than one, the system has exceeded the 4 millirem/year MCL for beta particle and photon radioactivity. (See Illustration II-1).

ILLUSTRATION II-1
Conversion of Beta Photon Emitters

A water system near a nuclear power facility collects a sample which the laboratory speciates by gamma spec analysis. The analysis indicates the following:

Cesium-134 (Cs-131):	4,023 pCi/L
Iodine-131 (I-131):	1 pCi/L
Bromine-82 (Br-82):	11 pCi/L
Rubidium-87 (Rb-87):	148 pCi/L

To determine compliance the following calculations are completed:

Emitter	(X) Lab Analysis (pCi/L)	(Y) Conversion from table (pCi/L)	(X/Y) Calculate Fraction
Cs-131	4,023	20,000	0.20
I-131	1	3	0.33
Br-82	11	100	0.11
Rb-87	148	300	0.49
Sum-of-the-fractions			1.13

The system is in violation of the MCL because the "sum-of-the-fractions" exceeds 1, which indicates that the sum of the annual dose equivalent to the total body, or to any internal organ, has exceeded 4 millirems/year.

II-C. SNC Definitions

The following SNC definition is applicable to the current radionuclide rule. The definition has been taken from an EPA Memorandum dated May 22, 1990. The SNC definition is part of a three-tiered prioritization scheme for all violators of the National Primary Drinking Water Regulations (NPDWRs). Tier 1 is composed of the SNCs - those violators which present the greatest risk to health and which, therefore, are generally primary enforcement targets. Tier 2 represents an intermediate set of violators. Some of these are in violation of an MCL, but the level of the contaminant is sufficiently low that it does not pose an immediate threat to public health. Tier 3 contains the rest of the violators of the NPDWRs.

A Radiological SNC is a PWS which meets any of the following Tier 1 criteria:

(a) Exceeds the unreasonable risk to health level identified for that contaminant. The unreasonable health level is 2 times the MCL.

(b) Fails to monitor for or report the results of any of the currently regulated contaminants for two consecutive compliance periods if they monitor more than once a year, or failure to monitor or report results once if they monitor once a year or less.

A Tier 2 violator is a PWS which meets any of the following criteria:

(a) All violations of the radiological MCLs where the concentration of the contaminant does not exceed the unreasonable risk to health level.

(b) Any monitoring/reporting violation.

A Tier 3 Violation is not applicable to radiological contaminants, because all violations of radiological MCLs and/or monitoring and reporting requirements begin as Tier 2 violations.

Section III.

Primacy Revision Applications

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III-A. State Primacy Program Revision

40 CFR §142 sets out requirements for States to obtain and/or retain primary enforcement responsibility (primacy) for the Public Water System Supervision (PWSS) program as authorized by §1413 of the Safe Drinking Water Act (SDWA). The 1996 SDWA Amendments update the process for States to obtain and/or retain primacy. On April 28, 1998, EPA promulgated the Primacy Rule to reflect these statutory changes (63 FR 23361).

Pursuant to 40 CFR §142.12, **Revision of State Programs**, complete and final requests for approval of program revisions to adopt new or revised EPA regulations must be submitted to the Administrator no later than 2 years after promulgation of the new or revised federal regulations (see Table III-1). Until those applications are approved, EPA Regions have responsibility for directly implementing the Radionuclides Rule. The State and EPA can agree to implement the rule together during this period. EPA anticipates that for the Radionuclides Rule, those responsibilities will involve only outreach to ensure that systems desiring flexibility for initial monitoring are able to grandfather appropriate data. However, if a State is eligible for interim primacy, once it submits a complete and final revision package, it will have full implementation and enforcement authority. A State may be granted an extension of time, up to two years, to submit its application package. During any extension period, an extension agreement outlining the State's and EPA's responsibilities is required.

Table III-1: State Rule Implementation and Revision Timetable for Radionuclides Rule

EPA/State Action	Time Frame
Rule published by EPA	December 7, 2000
State and Region establish a process and agree upon a schedule for application review and approval	May 2001
State, at its option, submits *draft* program revision package including: Preliminary Approval Request Draft State Regulations and/or Statutes Regulation Crosswalk	September 2001 (Suggested)
Regional (and Headquarters if necessary) review of draft	Completed within 90 days of State submittal of Draft
State submits final program revision package including: Adopted State Regulations Regulation Crosswalk 40 *CFR* 142.10 Primacy Update Checklist 40 *CFR* 142.14 and 142.15 Reporting and Recordkeeping 40 *CFR* 142.16 Special Primacy Requirements Attorney General's Enforceability Certification	by September 7, 2002*
EPA final review and determination: Regional review (program and ORC) Headquarters concurrence and waivers (OGWDW, OECA, OGC) Public Notice Opportunity for hearing EPA's Determination	Completed within 90 days of State submittal of final 45 days Region 45 days Headquarters
Rule Effective Date	December 7, 2003

* EPA suggests submitting an application by September 2002, to ensure timely approval. EPA regulations allow until December 7, 2002 for this submittal. An extension of up to 2 additional years may be requested by the State.

III-A.1 The Revision Process

The approval of State program revisions is recommended to be a two-step process comprised of submission of a draft request (optional) and then submission of a complete and final request for program approval. Figure III-1 diagrams these processes and their timing.

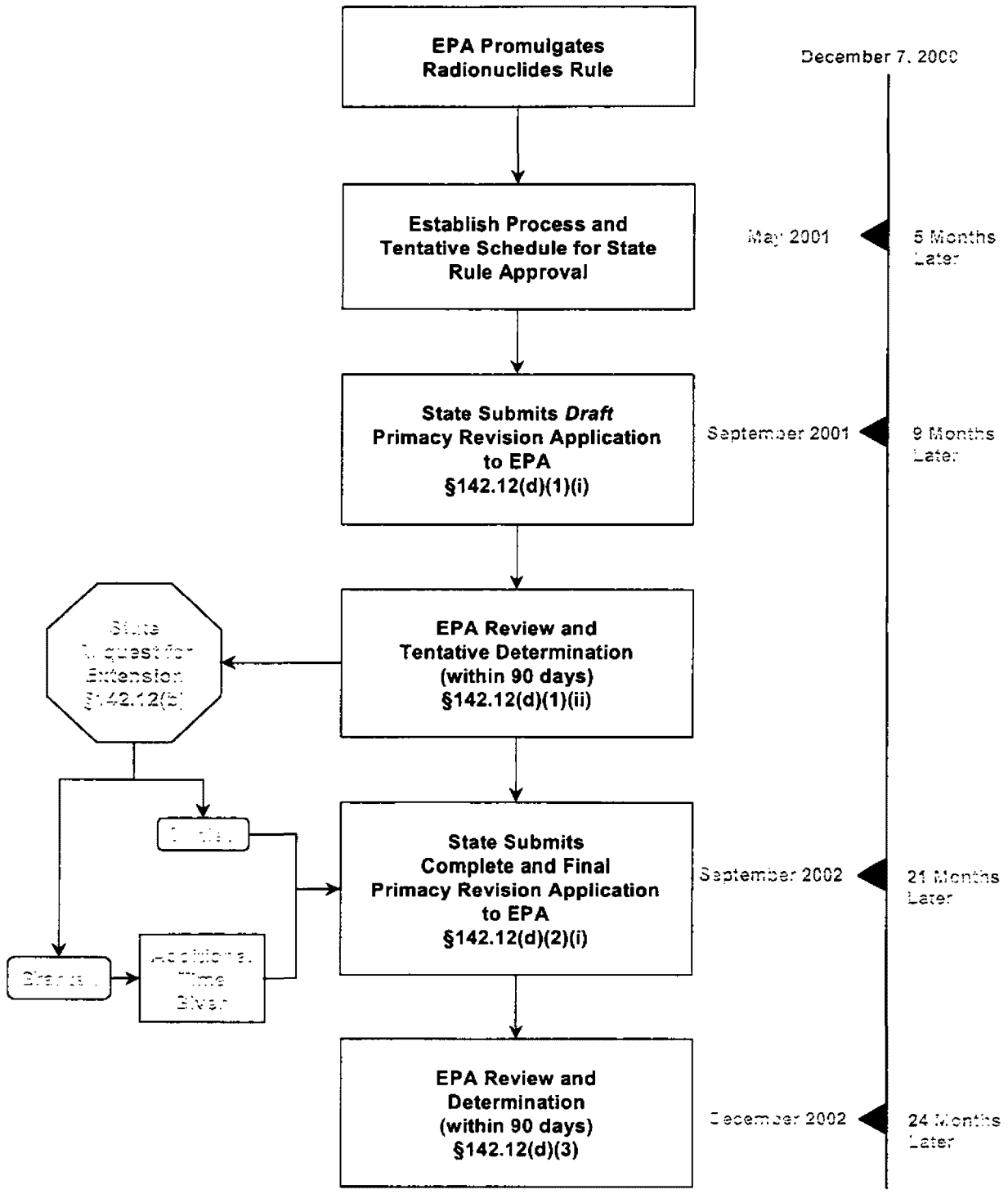
Draft Request — At the State's option, it may submit a draft request for EPA review and tentative determination. The request should contain drafts of all required primacy application materials. A draft request should be submitted by 9 months after rule promulgation. EPA will make a tentative determination on whether the State program meets the applicable requirements. The tentative determination should be made within 90 days.

Complete and Final Request — This submission must be in accordance with 40 CFR §142.12(c)(1) and (2) and include the Attorney General's statement. The State should also include its response to any comments and/or program deficiencies identified in the tentative determination (if applicable). EPA Regions should make States aware that submission of only a final request may make it more difficult for the States to address any necessary changes within the allowable time for State rule adoption.

EPA requests that States submit their complete and final revision package within 21 months of rule promulgation. This will ensure that States will have interim primacy within 24 months and will prevent States from becoming backlogged with revision applications to adopt future federal requirements.

The State and Region should agree to a plan and timetable for submitting the State primacy revision application as soon as possible after rule promulgation—ideally within 5 months of promulgation.

Figure III-1: Recommended Review Process for State Request for Approval of Program Revisions



III-A.2 The Final Review Process

Once a State application is complete and final, EPA has a regulatory (and statutory) deadline of 90 days to review and approve or disapprove of the revised program. The Office of Ground Water and Drinking Water (OGWDW) will conduct detailed reviews of the first State package from each Region. We ask that the Region submit their comments with the State's package for Headquarters review. Where the Region has identified all significant issues, OGWDW will waive concurrence on all other State programs in that Region, although they will retain the option to review additional State programs with cause. The Office of General Counsel (OGC) and the Office of Enforcement and Compliance (OECA) has delegated its review and approval to the Office of Regional Counsel (ORC).

In order to meet the 90 day deadline for packages undergoing Headquarters review, the review period will be equally split giving both the Regions and Headquarters 45 days to conduct their respective reviews. For the first package in each Region, Regions should forward copies of the primacy revision applications to the Drinking Water Protection Division Director in OGWDW, who will take the lead on the review process.

III-B. State Primacy Program Revision Extensions

III-B.1 The Extension Process

Under §142.12(b), States may request that the 2-year deadline for submitting the complete and final request for EPA approval of program revisions be extended for up to 2 additional years in certain circumstances. The extension request must be submitted to EPA within 2 years of the date that EPA published the regulation. The Regional Administrator has been delegated authority to approve extension applications. Headquarters concurrence on extensions is not required.

III-B.2 Criteria that an Extension Request Must Meet

For an extension to be granted, the State must demonstrate that it is requesting the extension because it cannot meet the original deadline for reasons beyond its control, despite a good faith effort to do so. A critical part of the extension application is the State's proposed schedule for submission of its complete and final request for approval of a revised primacy program. The application must also demonstrate at least one of the following:

(i) That the State currently lacks the legislative or regulatory authority to enforce the new or revised requirements; or,

(ii) That the State currently lacks the program capability adequate to implement the new or revised requirements; or,

(iii) That the State is requesting the extension to group two or more program revisions in a single legislative or regulatory action.

In addition, the State must be implementing the EPA requirements to be adopted in its program revision within the scope of its current authority and capabilities.

III-B.3 Conditions of the Extension

To be granted an extension, the State must agree to certain conditions that must be met during the extension period. These conditions will be negotiated by the Region and the State during the extension approval process and are decided on a case-by-case basis. The conditions must be included in an extension agreement between the State and the EPA Regional office. Appendix B contains a sample extension agreement

Conditions of an extension agreement may include:

- Informing PWSs of the new EPA (and upcoming State) requirements and that the Region will be overseeing implementation of the requirements until they approve the State program revisions or until the State submits a complete and final revision package if the State qualifies for interim primacy.
- Collecting, storing and managing laboratory results, public notices, and other compliance and operation data required by the EPA regulations.
- Assisting the Region in the development of the technical aspects of enforcement actions and conducting informal follow-up on violations (telephone calls, letters, etc.).

- Providing technical assistance to PWSs.
- For States whose request for an extension is based on a current lack of program capability adequate to implement the new requirements, taking steps agreed to by the Region and the State during the extension period to remedy the deficiency.
- Providing the Region with all the information required under §142.15 on State reporting.

Table III-2 provides a checklist the Region can use to review State extensions.

Table III-2: Extension Request Checklist

I. Reason for State Request

_____ Clustering of Program Revisions

_____ Statutory Barrier

_____ Regulatory Barrier

_____ Lack of Program Capability

- _____ Insufficient Resources
- _____ Funding Level
- _____ Staffing
- _____ Lack of Adequately Trained Staff
- _____ Inadequate Procedures, Guidelines, and Policies

_____ Other _____

II. Actions Taken by the State to Justify an Extension

	Schedule Dates (or attachments)
_____ Seeking Increases in Program Resources	_____
_____ Training Existing Personnel/Revising Training Programs	_____
_____ Revising State Regulations or Statutes	_____
_____ Developing Revised/New Procedures, Guidelines, Policies	_____
_____ Other _____	_____
_____	

III. Extension Decision

_____ Extension Request Approved Date: ___/___/___

- _____ Period of Extension Request: ___/___/___ to ___/___/___

_____ Extension Request Denied Date: ___/___/___

- _____ Reason Cited: _____

IV. Conditions of the Extension

During the extension period the State will (check all that apply):

_____ Inform public water systems of the new requirements and the fact that EPA will be overseeing their implementation until the State's program is approved or submitted if the State qualifies for interim primacy

_____ Collect and store laboratory results and other compliance data

_____ Provide technical assistance to public water systems

_____ Provide EPA with the information required under section 142.15 of the primacy rule

_____ Other _____

III-C. State Primacy Package

The Primacy Revision Application package should consist of the following sections:

III-C.1 The State Primacy Revision Checklist (40 *CFR* 142.10)

This section is a checklist of general primacy requirements, taken from 40 *CFR* 142.10, as shown in Table III-3. In completing this checklist, the State must identify the program elements that it has revised in response to new Federal requirements. If an element has been revised the State should indicate a "Yes" answer in the second column next to the list of program elements and should submit appropriate documentation. For elements that need not be revised, the State need only list the citation and date of adoption in the second column. During the application review process, EPA will insert findings and comments in the third column.

Table III-3: State Primacy Revision Checklist

Required Program Elements		Revision to State Program	EPA Findings/Comments
§142.10	Primary Enforcement -- Definition of Public Water System*		
§142.10(a)	Regulations No Less Stringent		
§142.10(b)(1)	Maintain Inventory		
§142.10(b)(2)	Sanitary Survey Program		
§142.10(b)(3)	Laboratory Certification Program		
§142.10(b)(4)	Laboratory Capability		
§142.10(b)(5)	Plan Review Program		
§142.10(b)(6)(i)	Authority to apply regulations		
§142.10(b)(6)(ii)	Authority to sue in courts of competent jurisdiction		
§142.10(b)(6)(iii)	Right of Entry		
§142.10(b)(6)(iv)	Authority to require records		
§142.10(b)(6)(v)	Authority to require public notification		
§142.10(b)(6)(vi)	Authority to assess civil and criminal penalties		
§142.10(b)(6)(vii)	Authority to Require CWSs to Provide CCRs**		
§142.10(c)	Maintenance of Records		
§142.10(d)	Variance/Exemption Conditions (if applicable)***		
§142.10(e)	Emergency Plans		
§142.10(f)	Administrative Penalty Authority*		

* New requirement from the 1996 Amendments. Regulations published in the April 28, 1998 *Federal Register*.
** New regulation published in the August 19, 1998 *Federal Register*.
*** New regulations published in the August 14, 1998 *Federal Register*.

The 1996 SDWA Amendments include new provisions for PWS definition and administrative penalty authority. States must adopt provisions at least as stringent as these new provisions, now codified at *CFR* 142.2 and 142.10. Failure to revise primacy for these new provisions can affect primacy for the Radionuclides Rule. However, States may still receive interim primacy for the Radionuclides Rule even if they have not yet revised their base program to comply with the new statutory requirements provided that the State has received an extension to adopt these requirements and that this extension period has not expired (up to April 2002 with full extension).

Rule Bundling — States may bundle the primacy revision packages for multiple rules so long as the submittal date (two years plus two year extension) has not lapsed. The Attorney General statement should reference the new requirements.

III-C.2 Text of the State's Regulation

Each primacy application package must include a citation to the applicable State regulation. 40 CFR §142(c)(l)(i).

III-C.3 Primacy Revision Crosswalk

The Primacy Revision Crosswalk, found in Appendix C, should be completed by States in order to identify State statutory or regulatory provisions that correspond to each Federal requirement. If the State's provisions differ from Federal requirements, the State should explain how its requirements are "no less stringent."

III-C.4 State Reporting and Recordkeeping (40 *CFR* 142.14 and 142.15)

There are no new State recordkeeping requirements (40 *CFR* §142.14) under the Radionuclides Rule. However, States must continue to comply with existing reporting and recordkeeping requirements that pertain to Radionuclides.

III-C.5 Special Primacy Requirements (40 *CFR* 142.16)

Section III-D provides guidance on how States may choose to meet each special primacy requirement.

III-C.6 Attorney General's Statement of Enforceability

The complete and final primacy revision application must include an Attorney General statement certifying that the State regulations were duly adopted and are enforceable. The Attorney General statement should also certify that the State does not have any audit privilege or immunity laws, or if it has such laws, that these laws do not prevent the State from meeting the requirements of the Safe Drinking Water Act. If a State has submitted this certification with a previous revision package, then the State should indicate the date of submittal and the Attorney General need only certify that the status of the audit laws has not changed since the prior submittal. An example of an Attorney General statement for the Radionuclides Rule is presented in Table III-5.

III-C.7 Variances and Exemptions

States wishing to have the ability to grant general variances or exemptions for uranium for this rule must also adopt 40 *CFR* §142.65. See Section I-C.11 for more information on variances and exemptions.

Table III-4: Example of Attorney General Statement

Model Language

I hereby certify, pursuant to my authority as (1) and in accordance with the Safe Drinking Water Act as amended, and (2), that in my opinion the laws of the [State / Commonwealth of (3)] [or tribal ordinances of (4)] to carry out the program set forth in the "Program Description" submitted by the (5) have been duly adopted and are enforceable. The specific authorities provided are contained in statutes or regulations that are lawfully adopted at the time this Statement is approved and signed, and will be fully effective by the time the program is approved.

Guidance For States on Audit Privilege and/or Immunity Laws

In order for EPA to properly evaluate the State's request for approval, the State Attorney General or independent legal counsel should certify that the State's environmental audit immunity and/or privilege and immunity law does not affect its ability to meet enforcement and information gathering requirements under the Safe Drinking Water Act. This certification should be reasonably consistent with the wording of the State audit laws and should demonstrate how State program approval criteria are satisfied.

EPA will apply the criteria outlined in its "Statement of Principles" memo issued on 2/14/97 (see Appendix E) in determining whether States with audit laws have retained adequate enforcement authority for any authorized federal programs. The principles articulated in the guidance are based on the requirements of federal law, specifically the enforcement and compliance and State program approval provisions of environmental statutes and their corresponding regulations. The Principles provide that if provisions of State law are ambiguous, it will be important to obtain opinions from the State Attorney General or independent legal counsel interpreting the law as meeting specific federal requirements. If the law cannot be so interpreted, changes to State laws may be necessary to obtain federal program approval. Before submitting a package for approval, States with audit privilege and/or immunity laws should initiate communications with appropriate EPA Regional Offices to identify and discuss the issues raised by the State's audit privilege and/or immunity law.

Model Language

I. **For States with No Audit Privilege and/or Immunity Laws**

Furthermore, I certify that [State / Commonwealth of (3)] has not enacted any environmental audit privilege and/or immunity laws.

II. **For States with Audit Laws that do Not Apply to the State Agency Administering the Safe Drinking Water Act**

Furthermore, I certify that the environmental [audit privilege and/or immunity law] of the [State / Commonwealth of (3)] does not affect (3) ability to meet enforcement and information gathering requirements under the Safe Drinking Water Act because the [audit privilege and/or immunity law] does not apply to the program set forth in the "Program Description." The Safe Drinking Water Act program set forth in the "Program Description" is administered by (5); the [audit privilege and/or immunity law] does not affect programs implemented by (5), thus the program set forth in the "Program Description" is unaffected by the provisions of [State / Commonwealth of (3)] [audit privilege and/or immunity law].

III. **For States with Audit Privilege and/or Immunity Laws that Worked with EPA to Satisfy Requirements for Federally Authorized, Delegated or Approved Environmental Programs**

Furthermore, I certify that the environmental [audit privilege and/or immunity law] of the [State / Commonwealth of (3)] does not affect (3) ability to meet enforcement and information gathering requirements under the Safe Drinking Water Act because [State / Commonwealth of (3)] has enacted statutory revisions and/or issued a clarifying Attorney General's statement to satisfy requirements for federally authorized, delegated or approved environmental programs.

Seal of Office

Signature

Name and Title

Date

(1) State Attorney General or attorney for the primacy agency if it has independent legal counsel
(2) 40 CFR 142.11(a)(6)(i) for initial primacy applications or 142.12(c)(1)(iii) for primacy program revision applications..
(3) Name of State or Commonwealth
(4) Name of Tribe
(5) Name of Primacy Agency

III-D. Guidance for Special Primacy Requirements

This section contains guidance States can use when addressing the special primacy requirements of 40 *CFR* 142.16. It specifically addresses the special primacy conditions added for implementation of the Radionuclides Rule. The guidance addresses special primacy conditions in the same order that they occur in the rule.

States should note that, in several sections, the guidance makes suggestions and offers alternatives that go beyond the minimum requirements indicated by reading the subsections of §142.16. EPA does this to provide States with information and/or suggestions that may be helpful to States' implementation efforts. Such suggestions are prefaced by "may" or "should" and are to be considered advisory. They are not required elements of States' applications for program revision.

III-D.1 Special Primacy Requirements

§142.16 Special primacy requirements. *(l) An application for approval of a State program revision for Radionuclides which adopts the requirements specified in 141.26(a)(2)(ii)(C) must contain the following (in addition to the general primacy requirements enumerated in this part, including that State regulations be at least as stringent as the Federal requirements):*

(1)If a State chooses to use grandfathered data in the manner described in §141.26(a)(2)(ii)(C), then the State must describe the procedures and criteria which it will use to make these determinations (whether distribution system or entry point sampling points are used).

(i) The decision criteria that the State will use to determine that data collected in the distribution system are representative of the drinking water supplied from each entry point to the distribution system. These determinations must consider:

(A) All previous monitoring data.
(B) The variation in reported activity levels.
(C) Other factors affecting the representativeness of the data (e.g. geology).

Guidance

The Revised Radionuclides rule requires systems to collect compliance samples from each entry point to the distribution system (EPTDS). 40 CFR § 141.26(a)(2)(ii)(E) gives States the flexibility to allow systems to use monitoring data collected from the distribution system to satisfy the initial monitoring requirements.

EPA believes that requests for use of grandfathered data are best handled by States on a case-by-case basis. Therefore, to meet this special primacy requirement, States' applications for program revision must demonstrate that each request for use of previously collected data will be evaluated on its merits. The application must include an explanation of how the State will use all previous monitoring data, and the variation in reported activity levels. It must also explain what other factors affecting the representativeness of the data the State will use to determine if the data can be used for the initial monitoring requirement.

For example, a State may find that the distribution samples are representative of each entry point for a system that has:

- Three wells, drawing from the same aquifer, that are from different parts of a well field,
- Three EPTDS, and
- Good historical data showing low to no uniform radionuclide occurrence from the raw water and the distribution system samples.

(2) A monitoring plan by which the State will assure all systems complete the required monitoring within the regulatory deadlines. States may update their existing monitoring plan or use the same monitoring plan submitted for the requirements in §142.16(e)(5) under the National Primary Drinking Water Regulations for the inorganic and organic contaminants (i.e. the Phase II/V Rules). States may note in their application any revision to an existing monitoring plan or note that the same monitoring plan will be used. The State must demonstrate that the monitoring plan is enforceable under State law.

Guidance

For 40 CFR §142.16(l)(2), States should simply explain how they will modify their monitoring plan for radionuclides to fit within their existing monitoring plan for Phase II/V organic and inorganic contaminants. EPA recommends that States without Phase II/V primacy establish a schedule for initial monitoring for all of their systems. Some States may choose to phase-in the monitoring over the 3 year compliance period based on system size or source of water. Other States may simply require 1/3 of their systems to monitor during each year of the 3 year compliance period. States may prepare and submit such a schedule with their primacy revision application. States could also specify that they will use the schedule they developed for implementing the Phase II/V rules (standardized monitoring framework) for inorganic and organic contaminants. The Revised Radionuclides Rule was developed so that radionuclides monitoring would fit into the standardized monitoring framework. The State must also describe how the schedule will be enforced and the authority that will allow the State to enforce the schedule.

Section IV.

Other Resources and Guidance

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IV-A. Fact Sheet

EPA United States Environmental Protection Agency
Office of Water

Ground Water and Drinking Water

EPA 815-F-00-014
November 2000

Final Radionuclides National Primary Drinking Water Regulations

EPA has revised the current radionuclides regulation, which has been in effect since 1977, by requiring new monitoring provisions that will ensure that all customers of community water systems will receive water that meets the Maximum Contaminant Levels for radionuclides in drinking water and has promulgated a standard for uranium as required by the 1986 amendments to the Safe Drinking Water Act. The current standards are: combined radium 226/228 of 5 pCi/L; a gross alpha standard for all alphas of 15 pCi/L, not including radon and uranium; a combined standard of 4 mrem/year for beta emitters. The new MCL for uranium is 30 µg/L. This final rule will provide improved health protection for 420,000 persons through monitoring improvements for the combined radium-226/-228 standard (a carcinogen) and for an additional 620,000 persons through a new standard for uranium (a kidney toxin and carcinogen) in drinking water.

Final Standards

The regulated radioactive drinking water contaminants are:

Contaminant	MCL	Source	Health Effect (Year Promulgated)
Combined radium-226/-228	5 pCi/L (1976)	Naturally occurs in some drinking water sources.	Some people who drink water containing radium -226 or -228 in excess of the MCL over many years may have an increased risk of getting cancer.
(Adjusted) Gross Alpha	15 pCi/L (not including radon or uranium)	Naturally occurs in some drinking water sources.	Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer. (1976)
Beta Particle and Photon Radioactivity	4 mrem/year (look-up table)	May occur due to contamination from facilities using or producing radioactive materials.	Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer. (1976)
Uranium	30 µg/L	Naturally occurs in some drinking water sources.	Exposure to uranium in drinking water may result in toxic effects to the kidney. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer. (2000)

Background

Radionuclides emit "ionizing radiation," a known human carcinogen, when they radioactively decay. Long-term exposure to radionuclides (see table above) in drinking water may cause cancer. As described in the Notice of Data Availability published on April 21, 2000, EPA has performed new health effects analyses based on improved scientific models and data. These new analyses demonstrate that the health effects analyses performed in 1991 generally understated the risks associated with the proposed Maximum Contaminant Level(MCL) changes. In fact, the new health effects analytical results indicate that radionuclides in drinking water are as risky (in some cases riskier) than originally estimated in 1976. For this reason, EPA has retained the more stringent 1976 MCLs in the final rule, since the proposed MCL changes were determined to be insufficiently protective of human health.

In addition, exposure to uranium in drinking water may cause toxic effects to the kidney. In 1991, EPA proposed an MCL of 20 µg/L, which was determined to be as close as feasible to the Maximum Contaminant Level Goal (MCLG). Based on human kidney toxicity data collected since then and on its estimate of the costs and benefits of regulating uranium in drinking water, EPA has determined that the benefits of a uranium MCL of 20 µg/L do not justify the costs. Instead, EPA has determined that 30 µg/L is the appropriate MCL, since it maximizes the net benefits (benefits minus costs), while being protective of kidney toxicity and carcinogenicity with an adequate margin of safety.

Provisions of the Final Radionuclides Rule

In addition to the MCLs discussed above, this final rule requires community water systems to ensure that all water served to all customers meets the MCLs for radionuclides in drinking water. This provision will be accomplished by the requirement that all future monitoring be performed such that all water entering the distribution system is tested. Under the old rule, community water systems only tested water from a "representative point" in the distribution system. The old monitoring requirements did not protect every customer, since water quality may vary significantly within the distribution system.

The monitoring frequency requirements have changed to be more consistent with the "Standardized Monitoring Framework" that are used for other drinking water standards. This improvement will result in increased consistency in monitoring requirements and will provide monitoring relief for those water systems that have very low contaminant levels.

In addition, the new rule corrects a monitoring deficiency in the 1976 framework for monitoring for combined radium-226 and -228. Under the old rule, it was assumed that radium-226 and gross alpha levels could be used to screen for radium-228. Since then, EPA has collected substantial evidence that this assumption is false. The correction involves separate monitoring requirements for radium-228 and radium-226, further ensuring that drinking water system customers will be protected from harmful radioactive contaminant levels.

This final rule will apply only to community water systems, which are water systems with at least 15 service connections or that serve 25 or more persons year-round. EPA will further consider whether or not to regulate radionuclides levels in drinking water served by non-transient non-community water systems, which are water systems that serve at least 25 of the same people more than six months per year, such as schools, churches, nursing homes, and factories that supply their own water. EPA is consulting with the National Drinking Water Advisory Council to determine the best course of action to take with respect to regulating chronic contaminant levels for non-transient non-community water systems, including radionuclides.

Occurrence of Radionuclides in Drinking Water

Most drinking water sources have very low levels of radioactive contaminants ("radionuclides"). These very low levels are not considered to be a public health concern. Of the small percentage of drinking water systems with radioactive contaminant levels high enough to be of concern, most of the radioactivity is naturally occurring. Certain rock types have naturally occurring trace amounts of "mildly radioactive" elements (radioactive elements with very long half-lives) that serve as the "parent" of other radioactive contaminants ("daughter products"). These radioactive contaminants, depending on their chemical properties, may accumulate in drinking water sources at levels of concern. The "parent radionuclide" often behaves very differently from the "daughter radionuclide" in the environment. Because of this, parent and daughter radionuclides may have very different drinking water occurrence patterns. For example, ground water with high radium levels tend to have low uranium levels and vice versa, even though uranium-238 is the parent of radium-226.

Most parts of the United States have very low "average radionuclide occurrence" in drinking water sources. However, some parts of the country have, on average, elevated levels of particular radionuclides compared to the national average. For example, some parts of the mid-West have significantly higher average combined radium-226/-228 levels. On the other hand, some Western states have elevated average uranium levels compared to the national average. However, in general, average uranium levels are very low compared to the MCL throughout the United States. While there are other radionuclides that have been known to occur in a small number of drinking water supplies, their occurrence is thought to be rare compared to radium-226, radium-228, and uranium.

A very small percentage of drinking water systems are located in areas that have potential sources of man-made radioactive contamination from facilities that use, manufacture, or dispose of radioactive substances. Drinking water contamination may occur through accidental releases of radioactivity or through improper disposal practices. Water systems that are vulnerable to this type of contamination are required to perform extensive monitoring for radioactive contamination to ensure that their drinking water is safe. These radionuclides are regulated under the "beta particle and photon radioactivity" standard.

Costs

For the small percentage of households that are served by water systems that will be required to take corrective actions because of this rule, it is estimated that households served by typical large water systems will experience increased water bills of less than $30 per year and that households served by typical small water systems (those serving 10,000 persons or fewer) will experience increased water bills of $50 - $100 per year. Over 96 percent of the cost to water systems comes from mitigation of radionuclide levels through treatment, purchasing water, developing alternative water sources, and other compliance measures.

Since 1996, EPA's drinking water state revolving fund program has made available $3.6 billion to assist drinking water systems with projects to improve their infrastructure. EPA has funded over 1000 loans for projects around the country.

For More Information

For general information on radionuclides in drinking water, contact the Safe Drinking Water Hotline, at 1-800-426-4791, or visit the EPA Safewater website at http://www.epa.gov/safewater/ or the radionuclides website at http://www.epa.gov/safewater/radionuc.html.

EPA United States Environmental Protection Agency
Office of Water

Ground Water and Drinking Water

EPA 815-F-00-013
November 2000

Technical Fact Sheet:
Final Rule for (Non-Radon) Radionuclides in Drinking Water

1. What are we announcing?

EPA is promulgating the final drinking water standards for (non-radon) radionuclides in drinking water: combined radium-226/-228, (adjusted) gross alpha, beta particle and photon radioactivity, and uranium. This promulgation consists of revisions to the 1976 rule, as proposed in 1991.

2. What are the requirements of this final rule?

Community water systems (CWSs), which are public water systems that serve at least 15 locations or 25 residents regularly year round, are required to meet the final MCLs and to meet the requirements for monitoring and reporting.

Non-transient, non-community water systems (NTNCWSs) will not be regulated at this time. EPA will further consider this matter and may propose to regulate radionuclides at these systems in the future. NTNCWSs are public water systems that are not a CWS and serve at least 25 of the same people more than 6 months per year (e.g. schools and nursing homes).

The final rule requires that all new monitoring be conducted at each entry point to the distribution system under a schedule designed to be consistent with the Standardized Monitoring Framework.

3. How soon after publishing the final rule will the changes take effect?

The rule will become effective three years after the December 7, 2000 promulgation date (December 7, 2003). New monitoring requirements will be phased-in between that date and the beginning of the next Standardized Monitoring Framework period, December 31 of 2007. "Phased-in monitoring" refers to the fact that States will require some fraction of water systems to complete their initial monitoring requirements each year of the period between the effective date (December 7, 2003) and the beginning of the new cycle (December 31, 2007). Water systems will determine initial compliance under the new monitoring requirements using the average of four quarterly samples or, at State discretion, using appropriate grandfathered data. Compliance will be determined immediately based on the annual average of the quarterly samples for that fraction of systems required by the State to monitor in any given year or based on the results from the grandfathered data. Water systems with existing radionuclides monitoring data demonstrating that the system is out of compliance with new provisions will be out of compliance on the effective date of December 7, 2003. Water systems with existing data that demonstrates non-compliance with the current (1976) rule are currently in violation of the radionuclides National Primary Drinking Water Regulations.

4. Why is this rule significant?

This rule promulgates new monitoring provisions that will ensure that all customers of community water systems will receive water that meets the Maximum Contaminant Levels for radionuclides in drinking water. Under the 1976 rule, water systems with multiple entry points to the distribution system were not required to test at every entry point, but rather to test at a "representative point to the distribution system." While the 1976 requirement did ensure that the "average customer" was protected, it did not ensure that all customers were protected. Under the new rule, all entry points will be tested and all CWS customers will be ensured of receiving water that meets the MCLs for radionuclides in drinking water. In addition, this requirement is more consistent with the monitoring requirements for other comparable drinking water contaminants.

This rule promulgates a new standard for uranium in drinking water, which will result in reduced uranium exposures for 620,000 persons. The uranium standard, which is required by the Safe Drinking Water Act, will protect drinking water customers from uranium levels that may cause toxic effects to the kidney and will reduce cancer risk. In addition, the new rule promulgates separate monitoring requirements for radium-228, which is expected to result in reduced exposure to 420,000 persons. This monitoring correction is based on sound science and is necessary for ensuring compliance with the combined radium-226/-228 standard.

5. What health effects are associated with exposure to radionuclides from drinking water?

Exposure to radionuclides from drinking water results in the increased risk of cancer. The radioactive particles (alpha, beta and gamma particles) emitted by radionuclides are called "ionizing radiation" because they ionize ("destabilize") nearby atoms as they travel through a cell or other material. In living tissue, this ionization process can damage chromosomes or other parts of the cell. This cellular damage can lead to the death of the cell or to unnatural reproduction of the cell. When a cell reproduces uncontrollably, it becomes a cancer. Certain elements accumulate in specific organs: radium (like calcium) accumulates in the bones and iodine accumulates in the thyroid.

For uranium, we must consider not only the carcinogenic health effects from its radioactive decay and the decay of its daughter products ("radiotoxicity"), but also damage to the kidneys from exposure to the uranium itself ("chemical toxicity"). Exposure to elevated uranium levels in drinking water has been shown to lead to changes in kidney function that are indicators of potential future kidney failure.

6. What are the sources of radionuclides in water?

Most drinking water sources have very low levels of radioactive contaminants ("radionuclides"), levels low enough not to be considered a public health concern. Of the radionuclides that have been observed to occur in drinking water sources, most are naturally occurring. However, contamination of drinking water sources by anthropogenic ("human-made") nuclear materials also occurs. Naturally occurring radionuclides are found in the Earth's crust and are created in the upper atmosphere. For example, trace amounts of long-lived isotopes (e.g., uranium-238, which has a half-life of almost five billion years) have been present in earth's crust since the crust first formed. As these long-lived trace radionuclides decay, shorter-lived ("more radioactive") daughter products are formed. Of particular concern are naturally occurring uranium and the naturally occurring radium isotopes, radium-226 and radium-228, which have been observed to accumulate to levels of concern in drinking water sources.

Most of the naturally occurring radionuclides are alpha particle emitters (e.g., the uranium isotopes and radium-226), but naturally occurring beta particle emitters do occur (e.g., radium-228 and potassium-40). Certain rock types contain trace amounts of the radioactive isotopes of uranium, thorium, and/or actinium. As these parent rocks weather, the resulting clays and other aquifer-forming materials may

become a source of naturally-occurring radionuclides to drinking water sources. Other naturally occurring radionuclides include tritium, a beta particle emitter, which forms in the upper atmosphere through interactions between cosmic rays (nuclear particles coming from outer space) and the gases comprising the atmosphere. Tritium can be deposited from the atmosphere onto surface waters via rain or snow and can accumulate in ground water via seepage. Tritium is also formed from human activities, as described below. Natural tritium tends not to occur at levels of concern, but contamination from human activities can result in relatively high levels.

The man-made radionuclides, which are primarily beta and photon emitters, are produced by any of a number activities that involve the use of concentrated radioactive materials. These radioactive materials are used in various ways in the production of electricity, nuclear weapons, nuclear medicines used in therapy and diagnosis, and various commercial products (such as televisions or smoke detectors), as well as in various academic and government research activities. Release of man-made radionuclides to the environment, which may include drinking water sources, are primarily the result of improper waste storage, leaks, or transportation accidents.

7. How many people and how many systems will be affected by this rule?

Higher levels of radionuclides tend to be found more in ground water sources than in surface water sources, likes rivers and lakes. While most water systems do not have detectable radionuclide activities, there are some areas of the country that have levels significantly higher than the national average levels. For example, some areas of the Mid-West have elevated radium-226 levels and some Western States have elevated uranium levels compared to the rest of the United States. Separate monitoring for radium is expected to result in roughly half of one percent of the nation's 54,000 CWSs needing to take measures to lower radium in their drinking water. The uranium standard is expected to result in slightly less than one percent of CWSs needing to take measures to reduce uranium in their drinking water. Table 1 below shows the estimated number of CWSs that would be affected by this rule and the estimated population served by these public water systems.

Table 1. Estimates of the Community Water Systems That Would Need to Mitigate Contaminant Levels and the Population Served by These CWSs

Regulatory Action	Number of CWSs Affected	Total Population Served
Radium-228 Monitoring Correction	~ 300	~ 420 thousand
Uranium MCL of 30 µg/L	~ 500	~ 620 thousand

8. How much will this rule cost?

Over 96% of the cost of this final rule is expected to come from the mitigation of radionuclide levels through treatment, purchasing water, developing alternate water sources, and other compliance measures. Table 2 below shows the total annualized costs of mitigation, monitoring, reporting, recordkeeping, and administration for this rule.

Table 2. Total National Annualized Costs of the Radionuclides Rule (Mitigation, monitoring, reporting, recordkeeping, and administration)	
Regulatory Action	**Annual Costs**
Radium-228 Monitoring Correction, Mitigation Costs	~ $ 26 million
Uranium MCL of 30 µg/L, Mitigation Costs	~ $ 50 million
New Monitoring, Reporting, Recordingkeeping, and Administration Costs for all Radionuclides	~ $ 5 million

- For systems that need to take corrective action to comply with the new rule, the annual costs per system will range from $9,000 per year for the smallest community water systems to over $150,000 annually for systems serving 3,300 to 10,000, and over $0.5 million annually for larger systems.

- For the small percentage of households that are served by water systems that will be required to take corrective actions because of this rule, it is estimated that households served by typical large water systems will experience increased water bills of less than $30 per year and that households served by typical small water systems (those serving 10,000 persons or fewer) will experience increased water bills of $50 - $100 per year. Costs will vary depending on the system size.

9. What are the benefits of this rule?

- The requirement for separate radium-228 monitoring is expected to result in the avoidance of 0.4 cancer cases per year, with estimated monetized health effects benefits of $ 2 million annually. Water mitigation for radium also tends to reduce iron and manganese levels and hardness, which also has significant associated benefits.

- The kidney toxicity benefits for the uranium standard can not be quantified because limitations in existing health effects models at levels near the MCL. In addition to these non-quantified kidney toxicity benefits, 0.8 cancer cases per year are expected to be avoided, with estimated monetized cancer health effects benefits of $ 3 million annually. Water mitigation for uranium also removes other contaminants, which has associated benefits.

10. Is there funding associated with this rule?

Since 1996, the Drinking Water State Revolving Loan Fund has made over $3.6. billion available for loans to help water systems improve their infrastructure. This program has now made over 1000 loans. EPA also provides funding to States that have primary enforcement responsibility for their drinking water programs through the Public Water Systems Supervision (PWSS) grants program. Other federal funds are available through Housing and Urban Development's Community Development Block Grant Program, and the Rural Utilities Service of the U.S. Department of Agriculture.

11. How did EPA consult with stakeholders?

In 1997, EPA conducted a public meeting regarding the finalization of portions of the 1991 radionuclides proposal. This meeting was advertised in the *Federal Register*. During the meeting, we discussed a range of regulation development issues with the stakeholders, including the statutory requirements, court stipulated agreement, MCLs for each of the radionuclides, the current and proposed monitoring

frameworks, and new scientific information regarding health effects, occurrence, analytical methods, and treatment technologies. The presentations generated useful discussion and provided us feedback regarding technical issues, stakeholder concerns and possible regulatory options. Participants in the stakeholder meeting included representatives from water utilities, environmental and citizens groups, State drinking water programs and health departments, other federal agencies, and other groups.

In addition, during the regulation development process, we gave presentations on the radionuclides regulation at various professional conferences, meetings between State programs and EPA Regions, the American Water Works Association's Technical Advisory Workgroup (TAW), and at Tribal meetings in Nevada, Alaska, and California. Finally, we held a one-day meeting with associations that represent State, county, and local government elected officials on May 30, 2000 and discussed five upcoming drinking water regulations, including radionuclides.

Stakeholders were also asked to comment on a variety of issues in the April 21, 2000 Notice of Data Availability. We utilized the feedback received from the stakeholders during all these meetings and comments from the NODA in developing the final radionuclides rule.

12. Where can the public get more information about the radionuclides rule?

For general information on radionuclides in drinking water, contact the Safe Drinking Water Hotline, at (800) 426-4791, or visit the EPA Safewater website at http://www.epa.gov/safewater/ or the radionuclides website at http://www.epa.gov/safewater/radionuc.html.

In addition to this technical fact sheet, the following documents and fact sheets are available to the public at EPA's web site on radionuclides in drinking water:

- *Federal Register* notice of the Notice of Data Availability
- A Technical Support Document
- Consumer Fact Sheet on Radionuclides in Drinking Water
- The Economic Analysis for the final rule

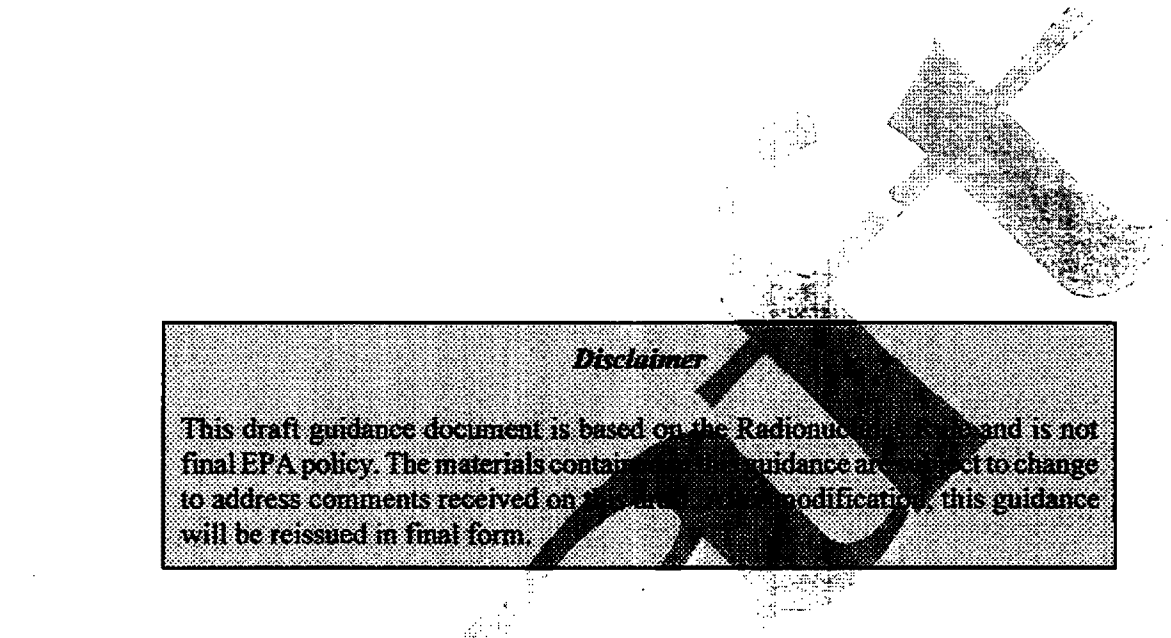
A copy of the *Federal Register* notice of the final regulation, the Notice of Data Availability, or supporting material can be obtained by contacting the Safe Drinking Water Hotline at (800) 426-4791. The Safe Drinking Water Hotline is open Monday through Friday, excluding Federal holidays, from 9:00 a.m. to 5:30 p.m. Eastern Time.

United States Environmental Protection Agency | Office of Water (4606) | EPA 816-D-00-002 December 2000

EPA

Implementation Guidance for Radionuclides

Appendices A - H



Disclaimer

This draft guidance document is based on the Radionuclide [illegible] and is not final EPA policy. The materials contained in this guidance are subject to change to address comments received on [illegible] modifications, this guidance will be reissued in final form.

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Appendix A

Violation Tables for Data Management and Enforcement Purposes

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For additional information on the Violation Tables for Data Management and Enforcement Purposes please contact:

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Appendix B

Sample Extension Agreement

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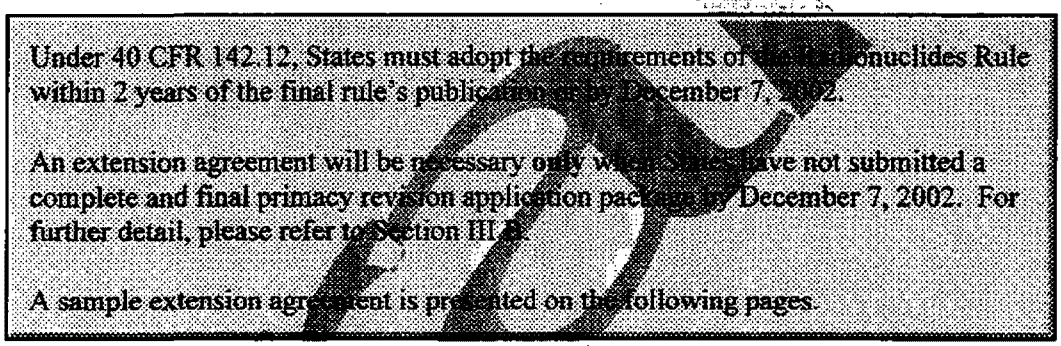

Under 40 CFR 142.12, States must adopt the requirements of the Radionuclides Rule within 2 years of the final rule's publication or by December 7, 2002.

An extension agreement will be necessary only where States have not submitted a complete and final primacy revision application package by December 7, 2002. For further detail, please refer to Section III.B.

A sample extension agreement is presented on the following pages.

EXTENSION AGREEMENT

On December 7, 2000, the U.S. Environmental Protection Agency (EPA) published the final Radionuclides Rule. This rule amends the National Primary Drinking Water Regulations, 40 CFR Part 141 and the regulations for implementation of the National Primary Drinking Water Regulations, 40 CFR Part 142. Provisions of the rule take effect on December 7, 21, 2003.

The April 28, 1998 revisions to the Primacy Rule extend the time allowed for States to adopt new Federal regulations from 18 months to 2 years. Therefore, the State must adopt regulations pertaining to the Radionuclides Rule and submit a complete and final primacy revision application by December 7, 2002 unless it requests an extension of up to 2 years to adopt the new or revised regulations.

Until the State Primacy Revision Application has been submitted, the State and appropriate EPA Regional office will share responsibility for implementing the primary program elements as indicated in the extension agreement. The State and the EPA Regional office should discuss these elements and address terms of responsibility in the agreement. The State and EPA should be viewed as partners in this effort, working toward two very specific public health-related goals. The first goal is to achieve a high level of compliance with the regulation. The second goal is to facilitate successful implementation of the regulation during the transition period before the State has interim primacy for the rule. In order to accomplish these goals, education, training, and technical assistance will need to be provided to water suppliers on their responsibilities under the Radionuclides Rule.

This document will record the terms of a Primacy Extension Agreement between the State and the EPA for the Radionuclides Rule, and shall remain effective from the date this agreement is signed until either December 7, 2002 or the date the State's primacy application is submitted under 40 C.F.R. §142.12. To retain primacy the State must submit a final and approvable Primacy Revision Application incorporating the above-referenced provisions of the Federal Register to EPA by December 7, 2002, or no later than December 7, 2004, if the State has been granted an extension.

{Date}

{Regional Administrator}
Regional Administrator
U.S. EPA Region **{Region}**
{Street Address}
{City, State, Zip}

RE: Request/approval for an Extension Agreement

Dear **{Regional Administrator}**:

The State of **{State}** is requesting an extension to the date that final primacy revisions are due to EPA for the Radionuclides Rule until **{insert date - no later than December 7, 2002}**, as allowed by 40 CFR 142.12 and would appreciate your approval. Staff of the **{State Department/Agency}** have conferred with your staff and has agreed to the requirements listed below for this extension. This extension is being requested because the State of **{State}**:

❑ Is planning to group two or more program revisions into a single legislative or regulatory action.

❑ Currently lacks the legislative or regulatory authority to enforce the new or revised requirements.

❑ Currently lacks adequate program capability to implement the new or revised requirements.

{State Department/Agency} will be implementing the Radionuclides Rule within the scope of its current authority and capability as outlined in the six areas identified in 142.12(b)(3)(i-vi):

i) Informing PWSs of the new EPA (and upcoming State) requirements and that EPA will be overseeing implementation of the requirements until EPA approves the State revision.

State	EPA	
____	____	Provide copies of regulation and guidance to other State agencies, PWSs, technical assistance providers, associations, or other interested parties.
____	____	Educate and coordinate with State staff, public water supplies (PWSs), the public, and other water associations about the requirements of this regulation
____	____	Notify affected systems of their requirements under the Radionuclides Rule.
____	____	Other

ii) Collecting, storing and managing laboratory results, public notices, and other compliance and operation data required by the EPA regulations.

State	EPA	
____	____	Devise a tracking system for PWS reporting pursuant to the Radionuclides Rule.
____	____	Keep States informed of SDWIS reporting requirements during development and implementation.
____	____	Report Radionuclides Rule violations and enforcement information to SDWIS as required.
____	____	Other

iii) Assisting EPA in the development of the technical aspects of the enforcement actions and conducting informal follow-up and violations (telephones calls, letters, etc.).

State	EPA	
____	____	Issue notices of violation (NOVs) for treatment technique and monitoring/reporting violations of the Radionuclides Rule
____	____	Provide immediate technical assistance to PWSs with treatment technique and/or monitoring/reporting violations to try to bring them into compliance.
____	____	Refer all violations to EPA for enforcement if they have not been resolved within 60 days of the period that triggered the violation. Provide information as requested to conduct and complete any enforcement action referred to EPA.
____	____	Other

iv) Providing technical assistance to public water systems.

State	EPA	
____	____	Conduct training within the State for PWSs on Radionuclides rule requirements.
____	____	Provide technical assistance through written and/or verbal correspondence to PWSs.
____	____	Provide on-site technical assistance to PWSs as requested and needed to ensure compliance with this regulation.
____	____	Evaluate requests for alternate recycle return locations in an expedient manner.
____	____	Coordinate with other technical assistance providers and organization to provide accurate information and aid in a timely manner.
____	____	Other

v) Providing EPA with all information prescribed by the State Reporting Requirements in 142.15.

State	EPA	
____	____	Report any violations incurred by PWSs for these regulations each quarter.
____	____	Report any enforcement actions taken against PWSs for these regulations each quarter.
____	____	Report any variances or exemptions granted for PWSs for these regulations each quarter.
____	____	Other

vi) For States whose request for an extension is based on a current lack of program capability to implement the new or revised requirements agrees to take the following steps to remedy the capability deficiency.

State	EPA	
____	____	Acquire additional resources to implement these regulations (List of specific steps being taken attached as {Appendix A}).
____	____	Provide quarterly updates describing the status of acquiring additional resources.
____	____	Other

I affirm that the **{State Department/Agency}** will implement provisions of the Radionuclides Rule as outlined above.

_____

{Agency Director or Secretary} Date

_____

{Name of State Agency}

I have consulted with my staff and approve your extension for the aforementioned regulation. I affirm that EPA Region **{Region}** will implement provisions of the Radionuclides Rule as outlined above.

_____

Regional Administrator Date
EPA Region **{Region}**

This Extension Agreement will take effect upon the date of the last signature.

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Appendix C

Primacy Revision Crosswalks

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Primacy Revision Crosswalk for the Radionuclides Rule

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
SUBPART B - MAXIMUM CONTAMINANT LEVELS			
§141.25 ANALYTICAL METHODS FOR RADIOACTIVITY			
Analysis for the following contaminants shall be conducted to determine compliance with § 141.66 (radioactivity) in accordance with the methods in the following table, or their equivalent determined by EPA in accordance with § 141.27.	§141.25 (a)		
To determine compliance with §141.66(b)(c) and (e) the detection limit shall not exceed the concentrations in Table B.	§141.25 (c)(1)		
Detection Limits for Gross alpha particle activity, Radium 226, Radium 228, and Uranium Contaminant — Detection Limit Gross alpha particle activity.....3 pCi/L Radium 226 .....1 pCi/L Radium 228.....1 pCi/L Uranium.....Reserve	§141.25 (c)(1) Table B		
To determine compliance with §141.66 (d) the detection limits shall not exceed the concentrations listed in Table C.	§141.25 (c)(2)		
Table C–Detection Limits for Man-Made Beta Particle and Photon Emitters [Note: name revised]	§141.25 (c)(2) Table C		
To judge compliance with the maximum contaminant levels listed in §141.66, averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.	§141.25 (d)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
SUBPART C - MONITORING AND ANALYTICAL REQUIREMENTS			
§141.26 MONITORING FREQUENCY AND COMPLIANCE REQUIREMENTS FOR RADIONUCLIDES IN COMMUNITY WATER SYSTEMS			
Monitoring and compliance requirements for gross alpha particle activity, radium-226, radium-228, and uranium.	§141.26 (a)		
Community water systems (CWSs) must conduct initial monitoring to determine compliance with § 141.66 (b), (c) and (e) by December 31, 2007. For the purposes of monitoring for gross alpha particle activity, radium-226, radium-228, uranium, and beta particle and photon radioactivity in drinking water, "detection limit" is defined as in §141.25(c).	§141.26 (a)(1)		
Applicability and sampling location for existing community water systems or sources. All existing CWSs using ground water, surface water or systems using both ground and surface water ("systems") must sample at every entry point to the distribution system that is representative of all sources being used ("sampling point") under normal operating conditions. The system must take each sample at the same sampling point unless conditions make another sampling point more representative of each source or the State has designated a distribution system location, in accordance with §141.26(a)(2)(ii)(C).	§141.26 (a)(1)(i)		
Applicability and sampling location for new community water systems or sources. All new CWSs or CWSs that use a new source of water must begin to conduct initial monitoring for the new source within the first quarter after initiating use of the source. CWSs must conduct more frequent monitoring when ordered by the State in the event of possible contamination or when changes in the distribution system or treatment processes occur which may increase the concentration of radioactivity in finished water.	§141.26 (a)(1)(ii)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Initial monitoring: Systems must conduct initial monitoring for gross alpha particle activity, radium-226, radium-228, and uranium as follows:	§141.26 (a)(2)		
Systems without acceptable historical data (defined below) must collect four consecutive quarterly samples at all sampling points before December 31, 2007.	§141.26 (a)(2)(i)		
Grandfathering of data: States may allow historical monitoring data collected at a sampling point to satisfy the initial monitoring requirements, for that sampling point, for the following situations:	§141.26 (a)(2)(ii)		
To satisfy initial monitoring requirements, a community water system having only one entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and December 7, 2003.	§141.26 (a)(2)(ii)(A)		
To satisfy initial monitoring requirements, a community water system with multiple entry points and having appropriate historical monitoring data for each entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and December 7, 2003.	§141.26 (a)(2)(ii)(B)		
To satisfy initial monitoring requirements, a community water system with appropriate historical data for a representative point in the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and December 7, 2003, provided that the State finds that the historical data satisfactorily demonstrate that each entry point to the distribution system is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between entry points. The State must make a written finding indicating how the data conforms to the these requirements.	§141.26 (a)(2)(ii)(C)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
For gross alpha particle activity, uranium, radium-226 and radium-228 monitoring, the State may waive the final two quarters of initial monitoring for a sampling point if the results of the samples from the previous two quarters are below the detection limit.	§141.26 (a)(2)(iii)		
If the average of the initial monitoring results for a sampling point is above the MCL, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the State.	§141.26 (a)(2)(iv)		
Reduced monitoring: States may allow community water systems to reduce the future frequency of monitoring from once every three years to once every six or nine years at each sampling point, based on the following criteria:	§141.26 (a)(3)		
If the average of the initial monitoring results for each contaminant is below the detection limit specified in §141.25 (c)(1) (Table B), the system must collect and analyze for that contaminant using at least one sample at that sampling point every nine years.	§141.26 (a)(3)(i)		
For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below ½ the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below ½ the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years.	§141.26 (a)(3)(ii)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above ½ the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above ½ the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years.	§141.26 (a)(3)(iii)		
Systems must use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods (e.g., if a system's sampling point is on a nine year monitoring period, and the sample result is above ½ MCL, then the next monitoring period for that sampling point is three years).	§141.26 (a)(3)(iv)		
If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the State.	§141.26 (a)(3)(v)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Compositing: To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. States will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than ½ MCL, the State may direct the system to take additional quarterly samples before allowing the system to sample under a reduced monitoring schedule.	§141.26 (a)(4)		
A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed 5 pCi/l. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed 15 pCi/l. The gross alpha measurement shall have a confidence interval of 95% (1.65σ, where σ is the standard deviation of the net counting rate of the sample) for radium-226 and uranium. When a system uses a gross alpha particle activity measurement in lieu of a radium-226 and/or uranium measurement, the gross alpha particle activity analytical result will be used to determine the future monitoring frequency for radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, ½ the detection limit will be used to determine compliance and the future monitoring frequency.	§141.26 (a)(5)		
Monitoring and compliance requirements for beta particle and photon radioactivity. To determine compliance with the maximum contaminant levels in §141.66(d) for beta particle and photon radioactivity, a system must monitor at a frequency as follows:	§141.26 (b)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Community water systems (both surface and ground water) designated by the State as vulnerable must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the State. Systems already designated by the State must continue to sample until the State reviews and either reaffirms or removes the designation.	§141.26 (b)(1)		
If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 50 pCi/L (screening level), the State may reduce the frequency of monitoring at that sampling point to once every 3 years. Systems must collect all samples required in paragraph (b)(1) of this section during the reduced monitoring period.	§141.26 (b)(1)(i)		
For systems in the vicinity of a nuclear facility, the State may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the State determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(1).	§141.26 (b)(1)(ii)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Community water systems (both surface and ground water) designated by the State as utilizing waters contaminated by effluents from nuclear facilities must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the State. Systems already designated by the State as systems using waters contaminated by effluents from nuclear facilities must continue to sample until the State reviews and either reaffirms or removes the designation.	§141.26 (b)(2)		
Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended.	§141.26 (b)(2)(i)		
For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the State, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.	§141.26 (b)(2)(ii)		
Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.	§141.26 (b)(2)(iii)		
If the gross beta particle activity beta minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 15 pCi/L, the State may reduce the frequency of monitoring at that sampling point to every 3 years. Systems must collect all samples required in paragraph (b)(2) of this section during the reduced monitoring period.	§141.26 (b)(2)(iv)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
For systems in the vicinity of a nuclear facility, the State may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the State determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(2).	§141.26 (b)(2)(v)		
Community water systems designated by the State to monitor for beta particle and photon radioactivity can not apply to the State for a waiver from the monitoring frequencies specified in paragraphs (b)(1) or (b)(2) of this section.	§141.26 (b)(3)		
Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Systems are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the screening level is exceeded. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.	§141.26 (b)(4)		
If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the screening level, an analysis of the sample must be performed to identify the major radioactive constituents present in the sample and the appropriate doses must be calculated and summed to determine compliance with §141.66(d)(1), using (d)(2). Doses must also be calculated and combined for measured levels of tritium and strontium to determine compliance.	§141.26 (b)(5)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Systems must monitor monthly at the sampling point(s) which exceed the maximum contaminant level in § 141.66(d) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the system has established, by a rolling average of 3 monthly samples, that the MCL is being met. Systems who establish that the MCL is being met must return to quarterly monitoring until they meet the requirements set forth in paragraphs (b)(1)(ii) or (b)(2)(i) of this section.	§141.26 (b)(6)		
General monitoring and compliance requirements for radionuclides.	§141.26 (c)		
The State may require more frequent monitoring than specified in paragraphs (a) and (b) of this section, or may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.	§141.26 (c)(1)		
Each public water system shall monitor at the time designated by the State during each compliance period.	§141.26 (c)(2)		
Compliance: Compliance with 141.66 (b) through (e) will be determined based on the analytical result(s) obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL.	§141.26 (c)(3)		
For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, then the system is out of compliance with the MCL.	§141.26 (c)(3)(i)		
For systems monitoring more than once a year, if any sample result will cause the running average to exceed the MCL at any sample point, the system is out of compliance with the MCL immediately.	§141.26 (c)(3)(ii)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Systems must include all samples taken and analyzed under the provisions of this section in determining compliance, even if that number is greater than the minimum required.	§141.26 (c)(3)(iii)		
If a system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance will be based on the running average of the samples collected.	§141.26 (c)(3)(iv)		
If a sample result is less than the detection limit, zero will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, ½ the detection limit will be used to calculate the annual average.	§141.26 (c)(3)(v)		
States have the discretion to delete results of obvious sampling or analytic errors.	§141.26 (c)(4)		
If the MCL for radioactivity set forth in § 141.66(b) through (e) is exceeded, the operator of a community water system must give notice to the State pursuant to § 141.31 and to the public as required by subpart Q of this part.	§141.26 (c)(5)		
SUBPART F - MAXIMUM CONTAMINANT LEVEL GOALS AND MAXIMUM RESIDUAL DISINFECTANT LEVEL GOALS			
§ 141.55 MAXIMUM CONTAMINANT LEVEL GOALS FOR RADIONUCLIDES			

FEDERAL REQUIREMENT		FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Contaminant	MCLG	§ 141.55		
1. Combined radium-226 and radium -228	Zero			
2. Gross alpha particle activity (excluding radon and uranium)	Zero			
3. Beta particle and photon radioactivity	Zero			
4. Uranium	Zero			

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
SUBPART G - NRPDWR: MAXIMUM CONTAMINANT LEVELS AND MAXIMUM RESIDUAL DISINFECTANT LEVELS			
§ 141.66 MAXIMUM CONTAMINANT LEVELS FOR RADIONUCLIDES			
[reserved]	§ 141.66 (a)		
MCL for combined radium-226 and 228. The maximum contaminant level for combined radium-226 and radium-228 is 5 pCi/L. The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.	§ 141.66 (b)		
MCL for gross alpha particle activity (excluding radon and uranium). The maximum contaminant level for gross alpha particle activity (including radium-226 but excluding radon and uranium) is 15 pCi/L.	§ 141.66 (c)		
MCL for beta particle and photon radioactivity.	§ 141.66 (d)		
The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year).	§ 141.66 (d)(1)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in *" Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure,"* NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of this document are available from the National Technical Information Service, NTIS ADA 280 282, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street, SW., Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.	§ 141.66 (d)(2)		
Table A - Average Annual Concentrations Assumed to Produce A Total Body or Organ Dose of 4 mrem/yr Radionuclide — Critical Organ — pCi per Liter Tritium — Total body — 20,000 Strontium-90 — Bone marrow — 8	§ 141.66 (d)(2) Table A		
MCL for uranium. The maximum contaminant level for uranium is 30 μg/L.	§ 141.66 (e)		
Compliance dates	§ 141.66 (f)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Compliance dates for combined radium 226 and 228, gross alpha particle activity, gross beta particle and photon radioactivity, and uranium: Community water systems must comply with the MCLs listed in paragraphs (b), (c), (d) and (e) of this section beginning December 7, 2003 and compliance shall be determined in accordance with the requirements of § 141.25 and § 141.26. Compliance with reporting requirements for the radionuclides under Appendix A to Subpart O and Appendix A and B to Subpart Q is required on December 7, 2003.	§ 141.66 (f)(1)		
Best Available Technologies (BATs) for Radionuclides. The Administrator, pursuant to section 1412 of the Act, hereby identifies as indicated in the following table the best technology available for achieving compliance with the maximum contaminant levels for combined radium-226 and and radium-228, uranium, gross alpha particle activity, and beta particle and photon radioactivity.	§ 141.66 (g)		

FEDERAL REQUIREMENT			FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Contaminant	**BAT**		§ 141.66 (g) Table B		
1. Combined Radium-226 and Radium-228	Ion Exchange, Reverse Osmosis, Lime Softening				
2. Uranium	Ion Exchange, Reverse Osmosis, Lime Softening, Coagulation/Filtration				
3. Gross alpha particle activity (Excluding Radon and Uranium)	Reverse Osmosis				
4. Beta Particle and Photon Radioactivity	Ion Exchange, Reverse Osmosis				
List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use			§ 141.66 (h) Table C		
Limitations (see footnotes)	Operator Skill Level Required	Raw Water Quality Range and Considerations			
1. Ion Exchange (IE)					
(a)	Intermediate	All ground waters			
2. Point of Use (POU[2]) IE					
(b)	Basic	All ground waters			
3. Reverse Osmosis (RO)					
(c)	Advanced	Surface waters usually require pre-filtration			
			§ 141.66 (h)		

FEDERAL REQUIREMENT			FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Limitations (see footnotes)	Operator Skill Level Required	Raw Water Quality Range and Considerations	Table C continued		
4. POU[2] RO					
(b)	Basic	Surface waters usually require pre-filtration			
5. Lime Softening					
(d)	Advanced	All waters			
6. Green Sand Filtration					
(e)	Basic				
7. Co-precipitation with Barium Sulfate					
(f)	Intermediate to Advanced	Ground waters with suitable water quality			
8. Electrodialysis/Electrodialysis Reversal					
	Basic to Intermediate	All ground waters			
9. Pre-formed Hydrous Manganese Oxide Filtration					
(g)	Intermediate	All ground waters			

FEDERAL REQUIREMENT			FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
10. Activated alumina					
(a), (h)	Advanced	All ground waters, competing anion concentrations may affect regeneration frequency			
Limitations (see footnotes)	Operator Skill Level Required	Raw Water Quality Range and Considerations			
11. Enhanced coagulation/filtration					
(i)	Advanced	Can treat a wide range of water qualities			
See § 141.66 (h) Table C for footnotes.			§ 141.66 (h) Table C, Footnotes		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Compliance Technologies by System Size Category for Radionuclide NPDWRs 1. Combined radium-226 and radium-228 25-500: 1,2,3,4,5,6,7,8,9 501-3,300: 1,2,3,4,5,6,7,8,9 3,300-10,000: 1,2,3,4,5,6,7,8,9 2. Gross alpha particle activity 25-500: 3,4 501-3,300: 3,4 3,300-10,000: 3,4 3. Beta particle activity and photon activity 25-500: 1,2,3,4 501-3,300: 1,2,3,4 3,300-10,000: 1,2,3,4 4. Uranium 25-500: 1,2,4,10,11 501-3,300: 1,2,3,4,5,10,11 3,300-10,000: 1,2,3,4,5,10,11	§ 141.66 (h) Table D		
Note: (1) Numbers correspond to those technologies found listed in the table C of 141.66(h).	§ 141.66 (h) Table D		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
SUBPART O - CONSUMER CONFIDENCE REPORTS			
APPENDIX A TO SUBPART O OF PART 141			
Regulated Contaminants Table	Appendix A to Subpart O		
Beta/photon emitters (mrem/yr) MCL in mg/L: 4 mrem/yr MCL in CCR units: 4 MCLG: 0 Major sources in drinking water: Decay of natural and man-made deposits Health effects: Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta particle and photon radioactivity in excess of the MCL over many years may have an increased risk of getting cancer.			
Alpha emitters (pCi/L) MCL in mg/L: 15 pCi/L MCL in CCR units: 15 MCLG: 0 Major sources in drinking water: Erosion of natural deposits Health effects: Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.			

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Combined radium (pCi/L) MCL in mg/L: 5 pCi/L MCL in CCR units: 5 MCLG: 0 Major sources in drinking water: Erosion of natural deposits Health effects: Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer.			
Uranium (pCi/L) MCL in mg/L: 30 μg/L MCL in CCR units: 30 MCLG: 0 Major sources in drinking water: Erosion of natural deposits Health effects: Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.			

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
SUBPART Q - PUBLIC NOTIFICATION OF DRINKING WATER VIOLATIONS			
APPENDIX A TO SUBPART Q OF PART 141 - NPDWR VIOLATIONS AND OTHER SITUATIONS REQUIRING PUBLIC NOTICE[1]			
I. Violations of National Primary Drinking Water Regulations(NPDWR)[3]:	I		
1. Beta/photon emitters: MCL/MRDL/TT violations[2] Tier of Public Notice Required — Citation 2 — 141.66 (d) Monitoring and testing procedure violations Tier of Public Notice Required — Citation 3 — 141.25 (a), 141.26 (b)	I.F.1.		
2. Alpha emitters: MCL/MRDL/TT violations[2] Tier of Public Notice Required — Citation 2 — 141.66 (c) Monitoring and testing procedure violations Tier of Public Notice Required — Citation 3 — 141.25 (a), 141.26 (a)	I.F.2.		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
3. Combined radium (226 & 228): MCL/MRDL/TT violations[2] Tier of Public Notice Required — Citation 2 — 141.66 (b) Monitoring and testing procedure violations Tier of Public Notice Required — Citation 3 — 141.25 (a), 141.26 (a)	I.F.3.		
4. Uranium: MCL/MRDL/TT violations[2] Tier of Public Notice Required — Citation 2[9] — 141.66 (e) Monitoring and testing procedure violations Tier of Public Notice Required — Citation 3[10] — 141.25 (a), 141.26 (a)	I.F.4.		
1. Violations and other situations not listed in this table (e.g., reporting violations and failure to prepare Consumer Confidence Reports), do not require notice, unless otherwise determined by the primary agency. Primacy agencies may, at their option, also require a more stringent public notice tier (e.g., Tier 1 instead of Tier 2 or Tier 2 instead of Tier 3) for specific violations and situations listed in this Appendix, as authorized under Sec. 141.202(a) and Sec. 141.203(a). 2. MCL--Maximum contaminant level, MRDL--Maximum residual disinfectant level, TT--Treatment technique	Appendix A, Endnotes		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
3. The term Violations of National Primary Drinking Water Regulations (NPDWR) is used here to include violations of MCL, MRDL, treatment technique, monitoring, and testing procedure requirements.	Appendix A, Endnotes		
9. The uranium MCL Tier 2 violation citations are effective December 7, 2003 for all community water systems. 10. The uranium Tier 3 violation citations are effective December 7, 2003 for all community water systems.	Appendix A, Endnotes		
APPENDIX B TO SUBPART Q OF PART 141 - STANDARD HEALTH EFFECTS LANGUAGE FOR PUBLIC NOTIFICATION			
B. Standard Health Effects Language for Surface Water Treatment Rule (SWTR), Interim Enhanced Surface Water Treatment Rule (IESWTR) and Filter Backwash Recycling Rule (FBRR) violations: Contaminant — MCLG[1] mg/L — MCL[2] mg/L — Standard Health Effects Language for PN 79. Uranium[16] — Zero — 30 μg/L — Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.	G.79.		
1. MCLG- Maximum contaminant level goal 2. MCL- Maximum contaminant level 16. The uranium MCL is effective December 7, 2003 for all community water systems.	Appendix B Endnotes		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
PART 142-NATIONAL PRIMARY DRINKING WATER REGULATIONS IMPLEMENTATION			
SUBPART B - PRIMARY ENFORCEMENT RESPONSIBILITY			
§ 142.16 SPECIAL PRIMACY REQUIREMENTS			
[reserved]	§ 142.16 (i)		
[reserved]	§ 142.16 (j)		
[reserved]	§ 142.16 (k)		
An application for approval of a State program revision for Radionuclides which adopts the requirements specified in § 141.26(a)(2)(ii)(C) of this chapter must contain the following (in addition to the general primacy requirements enumerated in this part, including that State regulations be at least as stringent as the Federal requirements):	§ 142.16 (l)		
If a State chooses to use grandfathered data in the manner described in § 141.26(a)(2)(ii)(C) of this chapter, then the State must describe the procedures and criteria which it will use to make these determinations (whether distribution system or entry point sampling points are used).	§ 142.16 (l)(1)		
The decision criteria that the State will use to determine that data collected in the distribution system are representative of the drinking water supplied from each entry point to the distribution system. These determinations must consider:	§ 142.16 (l)(1)(i)		
All previous monitoring data.	§ 142.16 (l)(1)(i)(A)		
The variation in reported activity levels.	§ 142.16 (l)(1)(i)(B)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
Other factors affecting the representativeness of the data (e.g. geology)	§ 142.16 (l)(1)(i)(C)		
A monitoring plan by which the State will assure all systems complete the required monitoring within the regulatory deadlines. States may update their existing monitoring plan or use the same monitoring plan submitted for the requirements in § 142.16(e)(5) under the National Primary Drinking Water Regulations for the inorganic and organic contaminants (i.e. the Phase II/V Rules). States may note in their application any revision to an existing monitoring plan or note that the same monitoring plan will be used. The State must demonstrate that the monitoring plan is enforceable under State law.	§ 142.16 (l)(2)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
§ 142.65 VARIANCES AND EXEMPTIONS FROM THE MAXIMUM CONTAMINANT LEVELS FOR RADIONUCLIDES (OPTIONAL - STATES THAT PLAN TO ALLOW VARIANCES AND EXEMPTIONS MUST COMPLETE THIS SECTION)			
Variances and exemptions from the maximum contaminant levels for Combined Radium-226 and Radium-228, Uranium, Gross alpha particle activity (Excluding Radon and Uranium), and Beta Particle and Photon Radioactivity. The Administrator, pursuant to section 1415(a)(1)(A) of the Act, hereby identifies the following as the best available technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in §141.66 (b), (c), (d), and (e) of this chapter, for the purposes of issuing variances and exemptions, as shown in § 141.66 (g) Table B. In addition, the Administrator hereby identifies the following as the best available technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in §141.66 (b), (c), (d), and (e) of this chapter, for the purposes of issuing variances and exemptions to small drinking water systems, defined here as those serving 10,000 persons or fewer, as shown in § 141.66 (h) Table D.	§ 142.65(a)(1)		
A State shall require community water systems to install and/or use any treatment technology identified in Table A of this section, paragraph (1), or in the case of small water systems (those serving 10,000 persons or fewer), § 141.66 (h) Tables C and D, as a condition for granting a variance except as provided in paragraph (a)(3) of this section. If, after the system's installation of the treatment technology, the system cannot meet the MCL, that system shall be eligible for a variance under the provisions of section 1415(a)(1)(A) of the Act.	§ 142.65(a)(2)		

FEDERAL REQUIREMENT	FEDERAL CITATION	STATE CITATION (DOCUMENT TITLE, PAGE NUMBER, SECTION/PARAGRAPH)	DIFFERENT FROM FED. REQUIREMENT? EXPLAIN ON SEPARATE SHEET
If a community water system can demonstrate through comprehensive engineering assessments, which may include pilot plant studies, that the treatment technologies identified in this section would only achieve a *de minimus* reduction in the contaminant level, the State may issue a schedule of compliance that requires the system being granted the variance to examine other treatment technologies as a condition of obtaining the variance.	§ 142.65(a)(3)		
If the State determines that a treatment technology identified under paragraph (a)(3) of this section is technically feasible, the Administrator or primacy State may require the system to install and/or use that treatment technology in connection with a compliance schedule issued under the provisions of section 1415(a)(1)(A) of the Act. The State's determination shall be based upon studies by the system and other relevant information.	§ 142.65(a)(4)		
The State may require a community water system to use bottled water, point-of-use devices, point-of-entry devices or other means as a condition of granting a variance or an exemption from the requirements of §141.66 of this chapter, to avoid an unreasonable risk to health.	§ 142.65(a)(5)		
Community water systems that use bottled water as a condition for receiving a variance or an exemption from the requirements of §141.66 of this chapter must meet the requirements specified in either paragraph (g)(1) or (g)(2) and (g)(3) of §142.62.	§ 142.65(a)(6)		
Community water systems that use point-of-use or point-of-entry devices as a condition for obtaining a variance or an exemption from the radionuclides NPDWRs must meet the conditions in §142.62 (h)(1) through (h)(6).	§ 142.65(a)(7)		

Appendix D

SDWIS-Fed DTF Reporting Requirements Guidance

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United States Environmental Protection Agency

Office of Water (4606)

EPA 816-D-00-005
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EPA

State Reporting Guidance for Radionuclides

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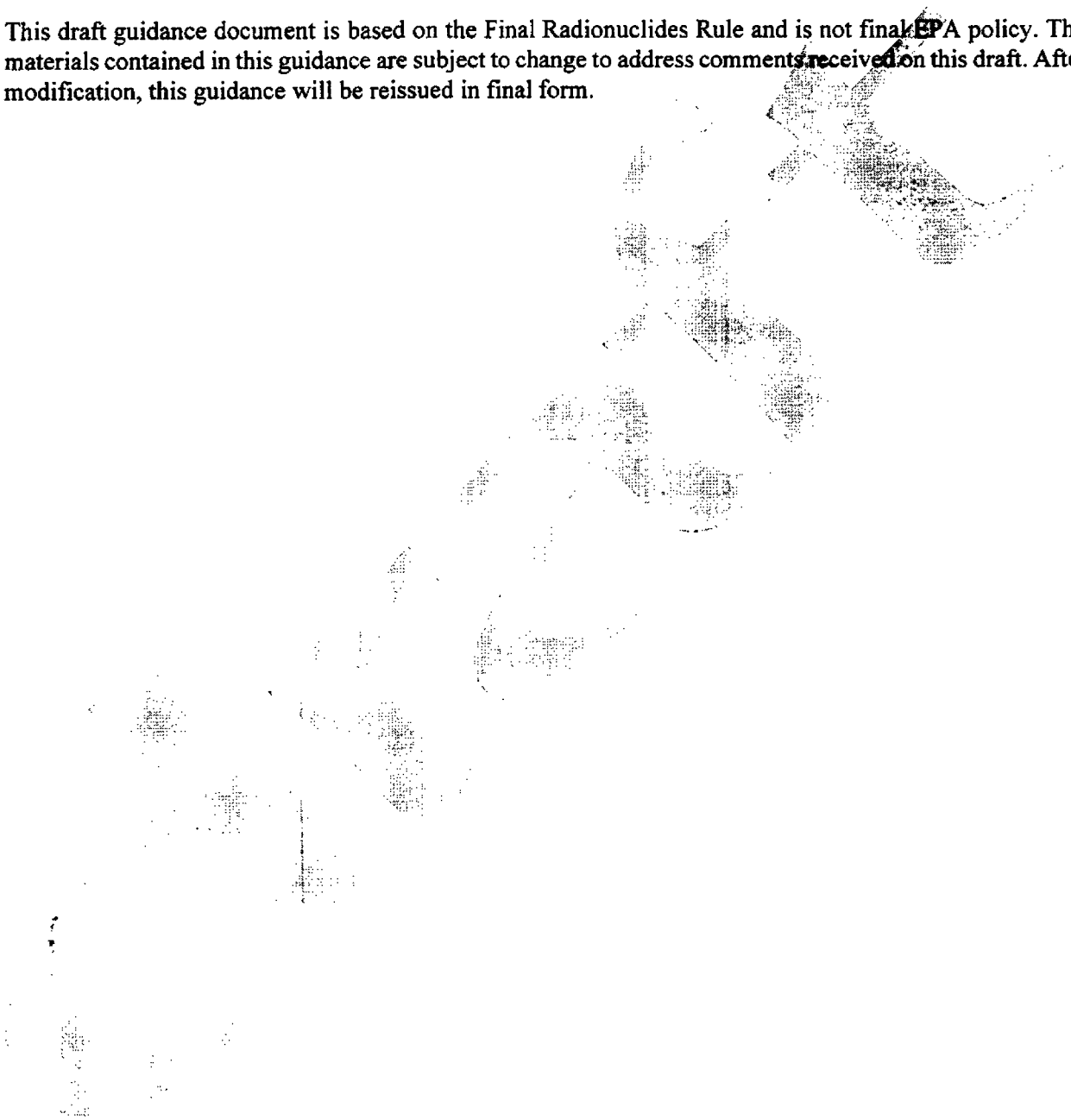
Disclaimer

This document provides guidance to EPA Regions and States exercising primary enforcement responsibility under the Safe Drinking Water Act concerning how EPA interprets the reporting requirements for radionuclides monitoring. This guidance reflects the reporting corrections to the Radionuclides Rule which was published as a final rule in the *Federal Register* on December 7, 2000.

This draft guidance document is based on the Final Radionuclides Rule and is not final EPA policy. The materials contained in this guidance are subject to change to address comments received on this draft. After modification, this guidance will be reissued in final form.



I. Introduction

This document addresses the requirements for State reporting to EPA and the definitions of monitoring, reporting, violations and returned to compliance data under the Radionuclides rule. Such reporting is required under Section 1445 of the Safe Drinking Water Act (codified at Section 142.15 of Title 40 of the *Code of Federal Regulations*). The goal of this document is to obtain consistency in the manner in which radionuclides violation data are reported to EPA via the Safe Drinking Water Information System/Federal Version (SDWIS/FED) Data Transfer Format (DTF).

This guidance document is designed for use by State program officials; however, States may at their discretion share components of this guidance with PWSs, drinking water laboratories, and others in the drinking water community.

For the purposes of this document, "State" means each of the fifty States, the District of Columbia, Guam, the Commonwealth of Puerto Rico, the Northern Mariana Islands, the Virgin Islands, American Samoa, the Trust Territories of the Pacific Islands, and any Indian Tribe which has treatment as a State status under Section 1451 of the Safe Drinking Water Act for this program.

II. Federal Monitoring Requirements

This section of the guidance provides the monitoring requirements for Radionuclides. Radionuclides monitoring and reporting will be based on the following contaminants:

Gross Alpha, excluding Radon & Uranium
Combined Radium -226 & -228
Combined Uranium -234, -235 & -238
Man-Made Beta Particle and Photon Emitters

Initial entry point to the distribution system monitoring for radionuclides begins December 7, 2003 and ends December 31, 2007. A radionuclides violation must be reported for any system that fails to complete ANY of the following activities during the compliance period:

Using the appropriate sampling procedures in accordance with Sections 141.25 and 141.44

Collecting the required number of samples during the specified time frame, in accordance with Sections 141.25 and 141.44

Ensuring samples are analyzed properly in accordance with Sections 141.15, 141.16 and 141.25

Submitting all required monitoring information on-time in accordance with Sections 141.31 and 142.15

III. Federal Reporting Requirements

This section discusses the SDWIS/FED radionuclides rule reporting requirements for public water system (PWS) monitoring programs under the SDWA. Violation and returned to compliance reporting requirements for each violation type are defined.

The following table contains the permissible contaminant codes for SDWIS/FED radionuclides reporting.

SDWIS/FED Radionuclides Contaminant Codes	
Contaminant Name	SDWIS/FED Contaminant Code
Gross Alpha, Excl. Radon & Uranium	4000
Combined Radium -226 & -228	4010
Combined Uranium -234, -235 & -238	4006
Man-Made Beta Particles and Photon Emitters	4101

A. Compliance Period

Compliance period can have two distinct definitions, one definition when we refer to the Standardized Monitoring Framework (SMF), and a completely separate definition when we refer to SDWIS/FED.

Under the SMF, a compliance period means a three-year period of time (calendar year based) within a nine-year compliance cycle.

In SDWIS/FED, a compliance period means the period of time during which monitoring was to have been performed, such as a quarter, a year, etc. For example, assume a PWS is required to monitor for contaminant X each calendar quarter. If this PWS fails to conduct the required monitoring for contaminant X for the first calendar quarter of 2002, a M/R violation is incurred. When this M/R violation is reported to SDWIS/FED, the State must supply the beginning date of the compliance period, and the ending date of the compliance period. The beginning date of the compliance period in this example would be 0/01/0002, the ending date of the compliance period would be 03/31/2002.

In an effort to eliminate the confusion between the SMF compliance period and the SDWIS/FED compliance period in this document, the SDWIS/FED compliance period will be hereafter referred to as a monitoring period.

B. Violations

EPA views violations on a system specific basis, therefore, violations must be reported to SDWIS/FED by system only (no reporting by sampling point will be accepted). For EPA purposes, each system can be in violation only one time, for each type of violation, for each contaminant, for each compliance period -- even though the PWS may have had multiple violations of the same type and for the same contaminant and monitoring period, at multiple sampling points. In choosing which of the sampling points to report a same type violation for, always report the more severe violation.

States must report ONLY Federal maximum contaminant level (MCL) and monitoring and reporting (M/R) violations to SDWIS/FED within 45 days after the end of the quarter in which the violation occurs. Violations that are the result of more stringent State MCLs, more stringent State sampling frequencies, or for contaminants not regulated at the Federal level, etc. should NOT be reported to SDWIS/FED. Failure to comply with this requirement will translate into more PWSs being identified as violations in SDWIS/FED than are actually in violation of the Federal requirements, and, in the worst case, may result in PWSs being incorrectly classified as a Significant Non-Complier.

Violations of the Radionuclides Rule and the Public Notification Rule are required to be linked, refer to the *State Implementation Guidance for the Public Notification (PN) Rule* for detailed information on reporting violation information to the general public.

SDWIS/FED Reporting will be based on the following definitions and violation type codes (in parenthesis).

- **MCL Average Exceedance Violation (02)**

  At a sampling site, the computed running annual average exceeds the MCL or; any one sample causes the annual average to exceed the MCL (e.g. 1 sample result exceeds 4 times the MCL).

- **Monitoring and Reporting Violation (03)**

  At a sampling site, failure to: complete the initial round of sampling; conduct any repeat sampling; conduct confirmation sampling, when required; or accurately report the analytical result of a regular or confirmation sample to the State.

For each violation listed above, the State must report the following data to SDWIS/FED.

- A unique PWS-ID
- A unique violation ID
- A code identifying the contaminant for which the violation applies
- A code describing the type of violation

- Calendar date of the beginning of the monitoring period
- Calendar date of the end of the monitoring period
- Analytical Result (Running Annual Average) causing the violation (for MCL violations only).

C. Returned to Compliance and Enforcement Actions

When a MCL or M/R violation has been incurred, it must be reported to SDWIS/FED. In addition, the State must inform EPA when that violation has been appropriately resolved. Returned To Compliance (RTC) is defined for an MCL violation as subsequent monitoring shows system is below the MCL. RTC is defined for an M/R violation as system is reporting in accordance with requirements.

In addition, all formal enforcement actions taken against violations of this rule are required to be reported to SDWIS/FED. Both "returned to compliance" and formal enforcements must be linked to the specific violation(s) they address. The following describes the appropriate ways in which enforcement and follow-up actions, formal and informal (including returned to compliance), may be linked to Radionuclides rule violations:

Associated Violation IDs (Y5000) - FY & VIOLATION ID NUMBER.

Entering the specific violation ID(s) to which the enforcement action is related will establish a link between the enforcement record and each violation record matching the specific violation ID. If no links are established (reported violation IDs not found/matched on the data base) the enforcement record will be posted.

Associated Violation Contaminant Groups (Z5000) - TYPE, CONTAMINANT, Monitoring PERIOD BEGIN DATE (MO, DAY & YR)

Entering the Radionuclides violation type code, the contaminant code and the begin date of the monitoring period begin date will establish a link between the enforcement action and all Radionuclides violations which exactly match the enforcement link data. If no matches are found, the enforcement record will be posted.

Refer to the *SDWIS/FED Data Entry Instructions* for more detailed information.

D. SNC Definitions

Note: At this time, SNC definitions specific to different types of water systems have not yet been determined for radionuclide regulation. The following SNC definition, applicable to the radionuclide rule, has been adopted and modified from an EPA Memorandum dated May 22, 1990.

The SNC definition is composed of those violators which present the greatest risk to health and which, therefore, are generally primary enforcement targets for all violators of the National Primary Drinking Water Regulations (NPDWRs).

A Radiological SNC is a public water system which meets any of the following criteria:

(a) Exceeds the unreasonable risk to health level identified for that contaminant. The unreasonable health level is 2 times the MCL.

(b) Fails to monitor for or report the results of any of the currently regulated contaminants for two or more consecutive monitoring periods if they monitor more than once a year, or failure to monitor or report results once if they monitor once a year or less.

Refer to the *SDWIS/FED Data Entry Instructions* and the *SDWIS/FED Significant Non-Compliance Specifications* for more detailed information.

IV. SDWIS/FED Data Transmittal

The Data Transfer File (DTF) is the only format by which data can be entered into the SDWIS/FED data base.

Each Data Transfer File record is 80 characters in length and has the following format:

Definition	Positions	Example
Form ID	1 - 2	D1
Qualifier 1	3 - 11	PWS-ID
Qualifier 2	12 - 18	VIOLATION-ID
Qualifier 3	19 - 25	TREATMENT-ID
Action Code	26	D, I, or M*
Data Element Number	27 - 31	Cnnnn
Data Value	32 - 71	
Reserved for SDWIS/FED	72 - 74	
Batch Sequence Number	75 - 80	NNNNNN

* D = DELETE, I = INSERT, and M = MODIFY

FORM ID	DATA ADDRESS QUALIFIERS			ACT. CODE	DATA ELEM. NUM.	DATA VALUE	N/A	Batch Sequence Number
	QUAL 1	QUAL 2	QUAL 3					
1-2	3-11	12-18	19-25	26	27-31	32-71	72-74	75-80

The following table presents the SDWIS/FED violation record data elements for reporting Radionuclides rule violations.

SDWIS/FED DTF C1100 - Violation Record Data Elements			
DTF Number	Format	Description	Permissible Values
C101	Character 9	PWS ID	Must be included within SDWIS/FED inventory
C1101	Character 7	Violation ID	Characters 1 & 2 must be the Federal fiscal year in which the State became aware of the violation
C1103	Character 4	Contaminant Code	4000-Gross Alpha 4010-Combined Radium 4006-Combined Uranium 4101-Beta Particles
C1105	Character 2	Violation Type Code	02-MCL, Average 03-M/R
C1107	Date 8 (YYYYMMDD)	Monitoring Period Begin Date	Date monitoring period begins
C1109	Date 8 (YYYYMMDD)	Monitoring Period End Date	Date monitoring period ends
C1123	Decimal 6.9	Analysis Result	Required for MCL violations only; Must be >= 0; Only one significant digit should be used

V. Sources for Additional Information

Additional technical information on SDWIS/FED reporting information can be obtained by contacting Valerie Love-Smith of the Infrastructure Program, Drinking Water Protection Division, Office of Ground Water and Drinking Water at (202)-260-5596, or from the following resources:

Revised Radionuclides Final Rule, December 7, 2000

Implementation Guidance for Radionuclides, December 2000

Revised Consolidated Summary of State Reporting Requirements for the Safe Drinking Water Information System (SDWIS)

SDWIS/FED Data Entry Instructions

SDWIS/FED Online Data Dictionary

SDWIS/FED Significant Non-Compliance Specifications, March 7, 1997

Appendix A
Monitoring, Reporting, and Compliance Determination Examples

Example 1

A ground water (GW) system MD34590 serving 2,304 people in operation since 1989. The system has collected gross alpha samples for the 4 monitoring periods under the existing radionuclides rule (1988-1992, 1992-1996, 1996-2000, 2000-2004). The system only has 1 entry point to the distribution system (EPTDS). All gross alpha samples were between 5 - 9 pCi/L. The radium-226 samples were all 2 pCi/l or less and the system was in compliance with the existing rule. The system collected a gross alpha, radium-226, and radium-228 samples on June 3, 2005 at the EPTDS. Since gross alpha results were historically all below 15, the system elects to use gross alpha as a surrogate for uranium.

Results:

Gross alpha = 7 ± 2 pCi/L

Radium-226 = 2 ± 1 pCi/L

Radium-228 = 4 ± 2 pCi/L

Uranium = Not measured. The gross alpha value of 7 ± 2 is used as a surrogate for uranium.

[Although there is no significant variation in radium 226 levels historically, the combined radium results to be considered for grandfathering exceed the combined radium MCL. These results should not be acceptable for grandfathering and the system should be required to conduct 4 consecutive quarters of monitoring for radium 226 and radium 228 in the initial monitoring period.]

Outcome:

We are reporting and calculating compliance based on what the lab reports, we are not adding or subtracting the ± values (for example, since the value reported by the lab for gross alpha is 7 ± 2 pCi/L, the result used for compliance calculations = 7 pCi/L). The combined radium 226/228 result sum equals 6 pCi/L. The system would be required to take quarterly samples until 4 consecutive quarters are less than the MCL or the State sets a different monitoring frequency as part of a formal compliance agreement. The gross alpha value of 7 is between the gross alpha detection limit (3 pCi/L) and 1/2 MCL, and therefore the system reduces monitoring for gross alpha to one sample every six years (i.e., the next sample must be collected between _____ and _____). Using gross alpha as a surrogate for uranium, the system assumes a value of 7 pCi/L. For simplicity of calculation, since the gross alpha result is less than 1/2 MCL for uranium, an activity to mass ratio of 1:1 is assumed. Therefore, a value of 7 ug/L is assumed for uranium, which is between the uranium detection limit (???) and 1/2 MCL, and the system is allowed to reduce monitoring for uranium to one sample every six years (i.e., the next sample must be collected between _____ and _____).

	Initial	Quarter 2	Quarter 3	Quarter 4
	6/03/05	9/10/05	12/12/05	3/31/06
Rad 226/228	6 pCi/L	7 pCi/L	no sample	4 pCi/L

The State will report the following violations to SDWIS/FED:

1 - M/R Violation (10/1/05 - 12/31/05)

2 - (MCL Violation) (4/1/05 - 3/31/06)

6 pCi/L + 7pCi/L + 4 pCi/L ÷ 3 = 5.66 pCi/L, which rounds to 6 pCi/L

[use one significant figure]

[Compliance is based on the running annual average as referenced in 40CFR141.26(c)(3)(iv)]

Columns 1-2	Columns 3-11	Columns 12-18	Columns 19-25	Columns 26-31	Columns 32-71
D1	MD5234590	0655111		IC1103	4006
D1	MD5234590	0655111		IC1105	03
D1	MD5234590	0655111		IC1107	20051001
D1	MD5234590	0655111		IC1109	20051231
D1	MD5234590	0655112		IC1103	4006
D1	MD5234590	0655112		IC1105	02
D1	MD5234590	0655112		IC1107	20050401
D1	MD5234590	0655112		IC1109	20060331
D1	MD5234590	0655112		IC1123	6

Example 2

GW system MD5234590 serving 1,510 people in operation since 1994. The system only has 1 entry point to the distribution system (EPTDS). The system has collected gross alpha samples for the 2 compliance periods under the existing radionuclides rule (1992-1996, 1996-2000). The average gross alpha value for these periods was 4 pCi/L, so no radium 226 or radium 228 monitoring was required under the 1976 regulations. The State has informed the system that the revised rule will not be effective until December 7, 2003. The State tells the system that if they collect EPTDS samples for gross alpha, radium-226, and radium-228, and uranium between June 2000 and December 7, 2003 then they may be able to grandfather this data and not be subject to the initial quarterly monitoring requirements. The system collects samples for gross alpha, radium-226 and radium-228 on July 17, 2002 at the EPTDS. Since all previous gross alpha results were less than 15 pCi/L, the system elects to use gross alpha as a surrogate for uranium.

Results:

Gross alpha = 4 ± 1 pCi/L

Radium-226 = 1 ± 1 pCi/L

Radium-228 = 2 ± 1 pCi/L

Uranium = Not measured. The gross alpha value of 4 ± 1 is used as a surrogate for uranium.

Outcome:

No violations to report to SDWIS/FED. The system is in compliance with the existing rule for the 2000-2004 compliance period (i.e., 1976 regulations). However, the revised radionuclides rule becomes effective December 7, 2003 and the system is grandfathering the data for the initial compliance period (2004-2007). The system would be on the following schedule for repeat monitoring:

Gross alpha - result is greater than a non-detect (ND) but less than ½ the MCL. The system must collect a sample once every 6 years (i.e., the next sample is due between 2008 and 2013).

Radium-226/228 is greater than ½ the MCL but less than the MCL. The system must collect a sample once every 3 years (i.e., the next sample is due between 2008 and 2010).

Uranium - Using gross alpha as a surrogate for uranium, the system assumes a value of 4 pCi/L. For simplicity of calculation, since the gross alpha value is less than 1/2 MCL for uranium, an activity to mass ratio of 1:1 is assumed and a value of 4ug/L is used for determining reduced monitoring for uranium. Since 4 ug/L is between the detection level (DL) and 1/2 MCL, the system is allowed to reduce monitoring for uranium to one sample every 6 years (i.e., the next sample is due between 2008 and 2013).

Example 3

GW system MD5234590 serving 1,510 people in operation since 1994. The system only has 1 entry point to the distribution system (EPTDS). The system has collected gross alpha and radium 226 samples for the 2 compliance periods under the existing radionuclides rule (1992-1996, 1996-2000). The State has informed the system that the revised rule will not be effective until December 7, 2003. The State tells the system that if they collect EPTDS samples for gross alpha, radium-226, radium-228, and uranium between June 2000 and December 7, 2003 then they may be able to grandfather this data and not be subject to the initial quarterly monitoring requirements. The system collects samples for gross alpha, radium-226,and radium-228, on July 17, 2002 at the EPTDS. Since all previous gross alpha results were less than 15 pCi/L, the system elects to use gross alpha as a surrogate for uranium.

Results:

Gross alpha = 12 ± 1 piC/L

Radium-226 = 3 ± 1 piC/L

Radium-228 = 6 ± 1 piC/L

Uranium = Not measured. The gross alpha value of 12 ± 1 is used as a surrogate for uranium.

Outcome:

The system would be on the following schedule for repeat monitoring:

Gross alpha - result is greater than ½ the MCL but less than the MCL and must collect a sample once every 3 years (next sample required between 2008 and 2010).

Radium-226/228 is greater than the MCL and must collect quarterly samples until the annual average is less than the MCL or the State specifies a different monitoring frequency as part of a formal compliance agreement.

Uranium - Using gross alpha as a surrogate for uranium, the system assumes a value of 12 pCi/L. For simplicity of calculation, since the gross alpha value is less than 1/2 MCL for uranium, an activity to mass ratio of 1:1 is assumed and a value of 12ug/L is used for determining reduced monitoring for uranium. Since 12 ug/L is between the DL and 1/2 MCL, the system is allowed to reduce monitoring for uranium to one sample every 6 years (i.e., the next sample is due between 2008 and 2013).

We are reporting and calculating compliance based on what the lab reports (e.g. the number is the number). We are not adding or subtracting the ± values (So for example gross alpha is 7 ± 2 pCi/L. We would say the result = 7 pCi/L). The combined radium 226/228 result sum equals 9 pCi/L. The system would be required to take quarterly samples until 4 consecutive quarters are less than the MCL, but compliance is based on the running annual average.

	Initial	Quarter 2	Quarter 3	Quarter 4	Quarter 5
	7/17/02	10/12/02	1/23/03	4/07/03	7/14/03
Rad 226/228	9 pCi/L	12 pCi/L	7 pCi/L	10 pCi/L	12 pCi/L

The State will report the following violations to SDWIS/FED:

1 - Combined radium-226/228 MCL Violation (7/1/02 - 6/30/03)

2 - Combined radium-226/228 MCL Violation (10/1/02 - 9/30/03)

Columns 1-2	Columns 3-11	Columns 12-18	Columns 19-25	Columns 26-31	Columns 32-71
D1	MD5234590	0255333		IC1103	4006
D1	MD5234590	0255333		IC1105	02
D1	MD5234590	0255333		IC1107	20020701
D1	MD5234590	0255333		IC1109	20030630
D1	MD5234590	0255333		IC1123	10
D1	MD5234590	0355334		IC1103	4006
D1	MD5234590	0355334		IC1105	02
D1	MD5234590	0355334		IC1107	20021001
D1	MD5234590	0355334		IC1109	20030930
D1	MD5234590	0355334		IC1123	10

Example 4

GW system MD5234590 serving 1,510 people in operation since 1994. The system only has 1 entry point to the distribution system (EPTDS). The system has collected gross alpha and radium 226 samples for the 2 compliance periods under the existing radionuclides rule (1992-1996, 1996-2000). The State has informed the system that the revised rule will not be effective until December 7, 2003. The State tells the system that if they collect EPTDS samples for gross alpha, radium-226, radium-228, and uranium between June 2000 and December 7,. 21, 2003 then they may be able to grandfather this data and not be subject to the initial quarterly monitoring requirements. The system collects samples for gross alpha, radium-226, radium-228, and uranium on July 17, 2002 at the EPTDS.

Results:

Measured Gross alpha = 41 ± 1 piC/L

Gross alpha (excluding uranium) = 41 - 29 = 12 pCi/L

Radium-226 = < 1 piC/L

Radium-228 = < 1 piC/L

Uranium = 32 µg/L and 29 ± 3 piC/L (mass spec)

[The uranium result submitted by the system for grandfathering exceeds the MCL. This result should not be acceptable for grandfathering and the system should be required to conduct 4 consecutive quarters of monitoring for uranium during the initial monitoring period.]

Outcome:

The system would be on the following schedule for repeat monitoring:

Gross alpha - For determining compliance with the gross alpha MCL Uranium should be excluded from the calculation (41 piC/L - 29 piC/L = 12 piC/L). After subtracting out uranium, gross alpha is greater than ½ the MCL but less than the MCL. Therefore, the system must collect a sample once every 3 years (i.e., the next sample must be between 2008 and 2010).

Radium-226/228 - is less than the regulatory detection limit of 1 piC/L. The system must therefore collect a sample once every 9 years (i.e., the next sample must be collected between 2008 and 2016).

Uranium - (MCL = 30 µg/L) result is greater than the MCL but the uranium MCL is not effective until December 7, 2003. Legally, the system is in compliance with the current rule. When the revised rule becomes effective they will not be in violation of the rule, but the EPA is encouraging States to ensure these systems are in compliance by the effective date of the revised rule. Since the uranium results submitted for grandfathering exceed the MCL, they cannot be grandfathered, and the system must conduct 4 consecutive quarters of monitoring for uranium during the initial compliance period.

The system is in compliance and has no violations to report to SDWIS/FED.

Example 5

SW system serving 5,332 people in operation since 1995. The system has 2 entry points to the distribution system (EPTDS). The system has collected gross alpha samples from a representative point in the distribution system for the 2 compliance periods under the existing radionuclides rule (1992-1996, 1996-2000). The gross alpha levels have exceeded the trigger of 5 pCi/L but the radium-226 levels have all been less than 3 pCi/L, so the system has been in compliance with the existing (1976) rule. The State has informed the system that the revised rule will not be effective until December 7, 2003. The State tells the system that if they collect samples at both EPTDS for gross alpha, radium-226, radium-228, and uranium between June 2000 and December 7, 2003 then they may be able to grandfather this data and not be subject to the initial quarterly monitoring requirements. The system collects samples for gross alpha, radium-226, radium-228, and uranium on May 23, 2002 at each entry point to the distribution system (identified as EP-1 and EP-2).

Results:

EP-1	EP-2
Gross alpha = 10 ± 1 pCi/L	Gross alpha = 3 ± 2 pCi/L
Radium-226 = 3 ± 1 pCi/L	Radium-226 = < 1 pCi/L
Radium-228 = 6 ± 2 pCi/L	Radium-228 = < 1 pCi/L
Uranium = ND	Uranium = ND

(The Agency will propose a detection limit for uranium in a future rule before the effective date of the revised radionuclides final rule)

Outcome:

The system would be on the following schedule for repeat monitoring:

EP-1

Gross alpha - result is greater than ½ the MCL but less than the MCL. The system must collect a sample once every 3 years (i.e., next sample must be collected between 2008 and 2010).

Radium-226/228 - result is greater than the MCL. This data cannot be grandfathered, and the system must collect 4 consecutive quarterly samples for radium 226 and radium 228 during the initial compliance period.

Uranium - is less than the regulatory detection limit defined in 141.25(c) (Table B). The system must collect a sample once every 9 years (i.e., next sample must be collected between 2008 and 2016).

EP-2

Gross alpha - result is greater than the regulatory detection limit but less than ½ the MCL. The system must collect a sample once every 6 years (i.e., next sample must be collected between 2008 and 2013).

Radium-226/228 - result is less than the regulatory detection limit (1 pCi/L). The system must collect a sample once every 9 years (i.e., next sample must be collected between 2008 and 2016).

Uranium - is less than the regulatory detection limit defined in 141.25(c) (Table B). The system must collect a sample once every 9 years (i.e., next sample must be collected between 2008 and 2016).

The system would be required to take quarterly samples at EP-1 until 4 consecutive quarters are less than the MCL (or the State has specifies a different monitoring frequency as part of a formal compliance agreement), but compliance is based on the running annual average.

	Initial	Quarter 2	Quarter 3	Quarter 4	Quarter 5
	5/23/02	8/12/02	11/19/03	2/07/03	5/16/03
Rad 226/228	9 pCi/L	12 pCi/L	12 pCi/L	10 pCi/L	12 pCi/L

The State will report the following violations to SDWIS/FED:

1 - Combined radium-226/228 MCL Violation reported for the system

2 - Combined radium-226/228 MCL Violation reported for the system

Columns 1-2	Columns 3-11	Columns 12-18	Columns 19-25	Columns 26-31	Columns 32-71
D1	MD5612950	0355551		IC1103	4010
D1	MD5612950	0355551		IC1105	02
D1	MD5612950	0355551		IC1107	20020401
D1	MD5612950	0355551		IC1109	20030331
D1	MD5612950	0355551		IC1123	11
D1	MD5612950	0355552		IC1103	4010
D1	MD5612950	0355552		IC1105	02
D1	MD5612950	0355552		IC1107	20020731
D1	MD5612950	0355552		IC1109	20030630
D1	MD5612950	0355552		IC1123	12

Example 6

GW system serving 3,862 people in operation since 1995. The system has 2 entry points to the distribution system (EPTDS). The system has collected gross alpha samples from a representative point in the distribution system for the 3 compliance periods under the existing (1976) radionuclides rule (1992-1996, 1996-2000, 2000-2004). The gross alpha levels have exceeded the trigger of 5 pCi/L but the radium-226 levels have all been less than 3 pCi/L, so the system has been in compliance with the existing rule. The system does not collect any radium-228 samples prior to the effective date of the revised radionuclides rule. The State has made a written finding that the samples collected from the distribution system during the 2000-2004 compliance period under the existing rule are representative of both entry points and allows the system to grandfather the gross alpha and radium-226 data. The system decides not to use gross alpha as a surrogate for uranium. The system collects quarterly samples for radium-228 and uranium on June 1, 2005 at each entry point to the distribution system (identified as EP-1 and EP-2). [Wouldn't the system be required to collect four quarters for uranium and radium 228 during initial monitoring? We should clarify this.]

Results:

Representative point in distribution system (grandfathered data from 2000-2004 period):

Gross alpha = 10 ± 1 pCi/L

Radium-226 = 3 ± 1 pCi/L

Samples collected to comply with revised radionuclides rule:

EP-1	EP-2
Radium-228 = 6 ± 2 pCi/L	Radium-228 = 4 ± 1 pCi/L
Uranium = ND	Uranium = ND

(The Agency will propose a detection limit for uranium in a future rule before the effective date of the revised radionuclides final rule)

Outcome:

The system would be on the following schedule for repeat monitoring:

EP-1

Gross alpha - result (10 pCi/L) is greater than ½ the MCL but less than the MCL. The system must collect a sample once every 3 years (i.e., the next sample must be collected between 2008 and 2010).

Radium-226/228 - is greater than the MCL. The system must collect quarterly samples. The radium-226 value of 3 pCi/L from the grandfathered data is added to the radium-228 value of 6 pCi/L (for a combined value of 9 pCi/L)

Uranium - is less than the regulatory detection limit defined in 141.25(c) (Table B). The system must collect a sample once every 9 years (i.e., the next sample must be collected between 2008 and 2016).

EP-2

Gross alpha - result (10 pCi/L) is greater than ½ the MCL but less than the MCL. The system must collect a sample once every 3 years (i.e., the next sample must be collected between 2008 and 2010).

Radium-226/228 - result is greater than the MCL. The system must collect quarterly samples. The radium-226 value of 3 pCi/L from the grandfathered data is added to the radium-228 value of 4 pCi/L (for a combined value of 7 pCi/L)

Uranium - is less than the regulatory detection limit defined in 141.25(c) (Table B). The system must collect a sample once every 9 years (i.e., the next sample must be collected between 2008 and 2016).

The system would be required to take quarterly samples at EP-1 and EP-2 until 4 consecutive quarters are less than the MCL or until the State specifies a different schedule as part of a formal compliance agreement. But compliance is based on the running annual average. The system is required to take quarterly samples at EP-1 and EP-2 for radium-226 and radium-228:

	Initial	Quarter 2	Quarter 3	Quarter 4	Quarter 5
EP-1	6/01/05	9/12/05	12/19/05	3/07/06	6/16/06
Rad 226/228	9 pCi/L	8 pCi/L	11 pCi/L	8 pCi/L	12 pCi/L

	Initial	Quarter 2	Quarter 3	Quarter 4	Quarter 5
EP-2	6/01/05	9/12/05	12/19/05	3/07/06	6/16/06
Rad 226/228	7 pCi/L	4 pCi/L	6 pCi/L	9 pCi/L	4 pCi/L

The State would report the following violations to SDWIS/FED:

1 - Combined radium-226/228 MCL Violation (4/01/05 - 3/31/06) reported for the system

2- Combined radium-226/228 MCL Violation (7/01/05 - 6/30/06) reported for the system

NOTE: Even though both entry points (EP-1 and EP-2) had MCL violations, the State only has to report that the system had a violation. The State should report the highest concentration in the concentration field for the system. In this case EP-1 had the highest MCL quarterly average of 9 pCi/L for the period 4/01/05 to 3/31/06 and the highest MCL quarterly average of 10 pCi/L for the period of 7/1/05 to 6/30/06.

Columns 1-2	Columns 3-11	Columns 12-18	Columns 19-25	Columns 26-31	Columns 32-71
D1	MD5612950	0666661		IC1103	4010
D1	MD5612950	0666661		IC1105	02
D1	MD5612950	0666661		IC1107	20050401
D1	MD5612950	0666661		IC1109	20060331
D1	MD5612950	0666661		IC1123	9
D1	MD5612950	0666661		IC1103	4010
D1	MD5612950	0666661		IC1105	02
D1	MD5612950	0666661		IC1107	20050701
D1	MD5612950	0666661		IC1109	20060630
D1	MD5612950	0666661		IC1123	10

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Appendix E

Statement of Principles—Guidance on Audit Law Issues

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 14 1997

MEMORANDUM

SUBJECT: Statement of Principles
Effect of State Audit Immunity/Privilege Laws
On Enforcement Authority for Federal Programs

TO: Regional Administrators

FROM: Steven A. Herman
Assistant Administrator, OECA

Robert Perciasepe
Assistant Administrator, OAR

Mary Nichols
Assistant Administrator, OAR

Timothy Fields
Acting Assistant Administrator, OSWER

Under federal law, states must have adequate authority to enforce the requirements of any federal programs they are authorized to administer. Some state audit immunity/privilege laws place restrictions on the ability of states to obtain penalties and injunctive relief for violations of federal program requirements, or to obtain information that may be needed to determine compliance status. This statement of principles reflects EPA's orientation to approving new state programs or program modifications in the face of state audit laws that restrict state enforcement and information gathering authority. While such state laws may raise questions about other federal program requirements, this statement is limited to the question of when enforcement and information gathering authority may be considered adequate for the purpose of approving or delegating programs in states with audit privilege or immunity laws.

I. Audit Immunity Laws

Federal law and regulation requires states to have authority to obtain injunctive relief, and civil and criminal penalties for any violation of program requirements. In determining whether to authorize or approve a program or program modification in a state with an audit immunity law, EPA must consider whether the state's enforcement authority meets federal program requirements. To maintain such authority while at the same time providing incentives for self-policing in appropriate circumstances, states should rely on policies rather than enact statutory immunities for any violations. However, in determining whether these requirements are met in states with laws pertaining to voluntary auditing, EPA will be particularly concerned, among other factors, with whether the state has the ability to:

1) Obtain immediate and complete injunctive relief;

2) Recover civil penalties for:

i) significant economic benefit;

ii) repeat violations and violations of judicial or administrative orders;

iii) serious harm;

iv) activities that may present imminent & substantial endangerment.

3) Obtain criminal fines/sanctions for wilful and knowing violations of federal law, and in addition for violations that result from gross negligence under the Clean Water Act.

The presumption is that each of these authorities must be present at a minimum before the state's enforcement authority may be considered adequate. However, other factors in the statute may eliminate or so narrow the scope of penalty immunity to the point where EPA's concerns are met. For example:

1) The immunity provided by the statute may be limited to minor violations and contain other restrictions that sharply limit its applicability to federal programs.

2) The statute may include explicit provisions that make it inapplicable to federal programs.

II. Audit Privilege Laws

Adequate civil and criminal enforcement authority means that the state must have the ability to obtain information needed to identify noncompliance and criminal conduct. In

determining whether to authorize or approve a program or program modification in a state with an audit privilege law, EPA expects the state to:

1) retain information gathering authority it is required to have under the specific requirements of regulations governing authorized or delegated programs;

2) avoid making the privilege applicable to criminal investigations, grand jury proceedings, and prosecutions, or exempt evidence of criminal conduct from the scope of privilege;

3) preserve the right of the public to obtain information about noncompliance, report violations and bring enforcement actions for violations of federal environmental law. For example, sanctions for whistleblowers or state laws that prevent citizens from obtaining information about noncompliance to which they are entitled under federal law appear to be inconsistent with this requirement.

III. Applicability of Principles

It is important for EPA to clearly communicate its position to states and to interpret the requirements for enforcement authority consistently. Accordingly, these principles will be applied in reviewing whether enforcement authority is adequate under the following programs:

1) National Pollutant Discharge Elimination System (NPDES), Pretreatment and Wetlands programs under the Clean Water Act;

2) Public Water Supply Systems and Underground Injection Control programs under the Safe Drinking Water Act;

3) Hazardous Waste (Subtitle C) and Underground Storage Tank (Subtitle I) programs under the Resource Conservation Recovery Act;

4) Title V, New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, and New Source Review Programs under the Clean Air Act.

These principles are subject to three important qualifications:

1) While these principles will be consistently applied in reviewing state enforcement authority under federal programs, state laws vary in their detail. It will be important to scrutinize the provisions of such statutes closely in determining whether enforcement authority is provided.

2) Many provisions of state law may be ambiguous, and it will generally be important to obtain an opinion from the state Attorney General regarding the meaning of the state law

and the effect of the state's law on its enforcement authority as it is outlined in these principles. Depending on its conclusions, EPA may determine that the Attorney General's opinion is sufficient to establish that the state has the required enforcement authority.

3) These principles are broadly applicable to the requirements for penalty and information gathering authority for each of the programs cited above. To the extent that different or more specific requirements for enforcement authority may be found in federal law or regulations, EPA will take these into account in conducting its review of state programs. In addition, this memorandum does not address other issues that could be raised by state audit laws, such as the scope of public participation or the availability to the public of information within the state's possession.

IV. Next Steps

Regional offices should, in consultation with OECA and national program offices, develop a state-by-state plan to work with states to remedy any problems identified pursuant to application of these principles. As a first step, regions should contact state attorneys general for an opinion regarding the effect of any audit privilege or immunity law on enforcement authority as discussed in these principles.

Appendix F

Rule Presentations

Radionuclides
Notice of Data Availability

NRWA In-Service Training

July 18, 2000

Ed Thomas

Office of Ground Water

and Drinking Water

Overview

- Purpose
- History
- Monitoring requirements
- Treatment
- Costs

Purpose of Regulating

- Health Effects (each rad targets specific organs)
  - known carcinogen - predominantly bone cancer
    - Others include ovaries, testes, breast, thyroid, liver, etc.
    - Children particularly sensitive to carcinogenic effects
  - organ and cell toxicity
    - kidney, liver, anemia

Purpose of Regulating (Cont.)

Naturally occurring Sources

- Uranium: granitic formations
- Radium: geologically predominant in upper mid-west, western mountains, piedmont, coastal plain sediments
- K-40: isotopes of naturally occurring potassium.

Man made Sources

- Uranium: Mining and nuclear weapon development
- Beta emitters: Nuclear power plants, hospitals, military

Regulatory History

1976 IPDWS - Current rule effective for 23 years

- radium-226 and radium-228
- gross alpha
- man-made beta/photon emitters

1986 SDWA Amendments

- Made 1976 IPDWS a NPDWS
- Required EPA to revise existing rule and regulate Uranium and Radon by 1989

Regulatory History (Cont.)

1991 Published PR to meet court order (no FR)

1996 SDWA Amendments - Required withdrawal of 1991 PR radon portion

1996 revised Court Order

- Regulate Uranium
- Update existing rule

4/21/2000 - NODA

11/21/2000 - Revised Rads FR

MCL's

Current Limits

- Gross alpha (including Ra-226) = 15 piC/L
- Radium 226/228 (combined) = 5 piC/L
- Beta/photon screen = 15 piC/L and 50 piC/L
- Beta/photon MCL's = 4 mrem total exposure

2000 NODA does not change MCL's or beta screening triggers

- Uranium MCL = 20, 40, or 80 (piC/L and ug/l)

Applicability

All CWS (GW and SW)

NTNCWS (Options)

- All NTCWS must comply
- Targeted NTNCWS must comply
- Targeted NTNCWS monitor (MCL not enforceable)
- Issue guidance
- Exclude NTNCWS

Alpha, Rad 226/228, and U Monitoring

- Initial Monitoring
  - 4 qtrs. (most systems GF data but...)
    - Current rule: GA >5 → Rad-226 >3 → Rad-228
    - New regulation for Uranium (GA may be used as surrogate)
    - Requires EPTDS samples

Alpha, Rad 226/228, and U Monitoring (Cont.)

Reduced Monitoring (SMF)

Average < ND ⇒	1 sample/9 years
ND< Average <50%⇒	1 sample/6 years
½ MCL< Average <MCL ⇒	1 sample/3 years
>MCL ⇒	Quarterly samples

Grandfathering of Data

Use of GF Data for initial monitoring

- Systems with 1 EPTDS may use distribution system data from last compliance period
- Systems with existing EPTDS samples from last compliance period
- Systems may use distribution system sample if State gives written approval

Others?

Beta/Photon Monitoring

State designated as vulnerable

- Quarterly samples for Gross Beta
- Annual samples for Tritium and Strontium
- If Gross Beta >30 piC/L ⇒ Speciate sample

Systems using contaminated source

- Quarterly samples for Gross Beta and Iodine
- Annual samples for Tritium and Strontium
- If Gross Beta >15 piC/L ⇒ Speciate sample

Small System Compliance Tech.

25-500 persons - Ion exchange, POU, RO, POU RO, lime softening, green sand filtration, co-precipitation, electrodialysis reversal,

500-10,000 persons - add activated alumina and enhanced coagulation/filtration

"Small Systems Compliance Technology List"
http://www.epa.gov/OGWDW/standard/tretech.html

Water System Impacts

Total Number of Systems out of compliance

# Persons Served	Radium (#)	Alpha (#)	Uranium (#)
25-500	250	170	300 – 760
501-3300	120	120	0 - 60
3301-10000			

Annual Household Costs

Annual Total Increased Cost Per Household

# Persons Served	Radium ($)	Alpha ($)	Uranium ($)	Beta's ($)
25-500	214 - 1,465	214 – 560	172 –1,465	172 – 1,465
501-3300	49 – 831	49 – 831	38 – 831	38 – 831
3301-10000	37 – 4,696	50 - 493	24 – 4,696	24 – 493

Appendix G

Rule Language

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List of Subjects

40 CFR Part 9

Reporting and recordkeeping requirements.

40 CFR Part 141

Environmental protection, Chemicals, Indian-lands, Incorporation by reference, Intergovernmental relations, Radiation protection, Reporting and recordkeeping requirements, Water supply.

40 CFR Part 142

Environmental protection, Administrative practice and procedure, Chemicals, Indian-lands, Intergovernmental relations, Radiation protection, Reporting and recordkeeping requirements, Water supply.

Dated:

_____

Carol M. Browner,

Administrator

For reasons set out in the preamble, 40 CFR Parts 9, 141 and 142 are amended as follows:

1. The authority citation for part 9 continues to read as follows:

Authority: 7 U.S.C. 135 et seq., 136-136y; 15 U.S.C. 2001, 2003, 2005, 2006, 2601-2671; 21 U.S.C. 331j, 346a, 348; 31 U.S.C. 9701; 33 U.S.C. 1251 et seq., 1311, 1313d, 1314, 1318, 1321, 1326 1330, 1324, 1344, 1345 (d) and (e), 1361; E.O. 11735, 38 FR 21243, 3 CFR, 1971-1975 Comp. p. 973; 42 U.S.C. 241, 242b, 243, 246, 300f, 300g, 300g-1, 300g-2, 300g-3, 300g-4, 300g-5, 300g-6, 300j-1, 300j-2, 300j-3, 300j-4, 300j-9, 1857 et seq., 69016992k, 7401-7671q, 7542, 9601-9657, 11023, 11048.

2. In § 9.1 the table is amended by:

(a) removing entries "141.25-141.30" and adding new entries for 141.25(a)-(e), 141.26 (a) and (b), and 141.27-141.30

(b) removing entries 142.14(a)-(d)(7) and adding 142.14-(a)-(d)(3), 142.14(d)(4) and (5) and 142.14(d)(6)-(7)

(c) removing entries 142.15(c)(5)-(d) and adding 142.15(c)(5), 142.15(c)(6) and (7), and 142.15(d)

§ 9.1 OMB approvals under the Paperwork Reduction Act.

* * * * *

40 CFR citation	OMB control No.
* * * * *	
National Primary Drinking Water Regulations	
* * * * *	
141.25(a)-(e)	2040-0090
141.26 (a) and (b)	2040-0228
141.27-141.30	2040-0090
* * * * *	

National Primary Drinking Water Regulations Implementation

* * * * *	
142.14-(a)-(d)(3)	2040-0090
142.14(d)(4) and (5)	2040-0228
142.14(d)(6)-(7)	2040-0090
142.14(d)(8)-(11)	2040-0210
142.14(e)	2040-0090
142.14(f)	2040-0209
142.14(g)	2040-0090

142.15(a).....2040-0090, 2040-0209
142.15(b)-(c)(3).....2040-0090
142.15(c)(4).....2040-0210
142.15(c)(5).....2040-0090
142.15(c)(6) and (7).....2040-0228
142.15(d).....2040-0090

* * * * *

Part 141--National Primary Drinking Water Regulations

1. The authority citation for part 141 continues to read as follows:

Authority: 42 U.S.C. 300f, 300g-1, 300g-2, 300g-3, 300g-4, 300g-5, 300g-6, 300j-4, 300j-9, and 300j-11.

Subpart B–[Amended]

2. Sections 141.15 and 141.16 are removed.

§§ 141.15 and 141.16 [remove]

3. Section 141.25 is amended by :

a. Revising paragraph (a) introductory text (the table remains unchanged),

b. Revising paragraph (c)(1) and adding a new table in (c)(1),

c. Revising paragraph (c)(2) and redesignating the table in (c)(2).

c. Revising paragraph (d).

The revision and addition read as follows:

§141.25 Analytical methods for radioactivity.

(a) Analysis for the following contaminants shall be conducted to determine compliance with § 141.66 (radioactivity) in accordance with the methods in the following table, or their equivalent determined by EPA in accordance with § 141.27.

* * * * *

(c) * * *

(1) To determine compliance with §141.66(b)(c) and (e) the detection limit shall not exceed the concentrations in Table B.

Table B-Detection Limits for Gross alpha particle activity, Radium 226, Radium 228, and Uranium

Contaminant	Detection Limit
Gross alpha particle activity	3 pCi/L
Radium 226	1 pCi/L
Radium 228	1 pCi/L
Uranium	Reserve

(2) To determine compliance with §141.66 (d) the detection limits shall not exceed the concentrations listed in Table C.

Table C–Detection Limits for Man-Made Beta Particle and Photon Emitters

* * * * *

(d) To judge compliance with the maximum contaminant levels listed in §141.66, averages of data shall be used and shall be rounded to the same number of significant figures as the maximum contaminant level for the substance in question.

* * * * *

Subpart C–[Amended]

4. Section 141.26 is revised including the heading to read as follows:

§ 141.26 Monitoring frequency and compliance requirements for radionuclides in community water systems

(a) ***Monitoring and compliance requirements for gross alpha particle activity, radium-226, radium-228, and uranium.***

(1) Community water systems (CWSs) must conduct initial monitoring to determine compliance with § 141.66 (b), (c) and (e) by December 31, 2007. For the purposes of monitoring for gross alpha particle activity, radium-226, radium-228, uranium, and beta particle and photon radioactivity in drinking water, "detection limit" is defined as in §141.25(c).

(i) Applicability and sampling location for existing community water systems or sources. All existing CWSs using ground water, surface water or systems using both ground and surface water (for the purpose of this section hereafter referred to as systems) must sample at every entry point to the distribution system that is representative of all sources being used (hereafter called a sampling point) under normal operating conditions. The system must take each sample at the same sampling point unless conditions make another sampling point more representative of each source or the State has designated a distribution system location, in accordance with paragraph (a)(2)(ii)(C) of this section.

(ii) Applicability and sampling location for new community water systems or sources. All new CWSs or CWSs that use a new source of water must begin to conduct initial monitoring for the new source within the first quarter after initiating use of the source. CWSs must conduct more frequent monitoring when ordered by the State in the event of possible contamination or when changes in the distribution system or treatment processes occur which may increase the concentration of radioactivity in finished water.

(2) Initial monitoring: Systems must conduct initial monitoring for gross alpha particle activity, radium-226, radium-228, and uranium as follows:

(i) Systems without acceptable historical data, as defined below, must collect four consecutive quarterly samples at all sampling points before December 31, 2007.

(ii) Grandfathering of data: States may allow historical monitoring data collected at a sampling point to satisfy the initial monitoring requirements for that sampling point, for the following situations.

(A) To satisfy initial monitoring requirements, a community water system having only one entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

(B) To satisfy initial monitoring requirements, a community water system with multiple entry points and having appropriate historical monitoring data for each entry point to the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

(C) To satisfy initial monitoring requirements, a community water system with appropriate historical data for a representative point in the distribution system may use the monitoring data from the last compliance monitoring period that began between June 2000 and **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]**, provided that the State finds that the historical data satisfactorily demonstrate that each entry point to the distribution system is expected to be in compliance based upon the historical data and reasonable assumptions about the variability of contaminant levels between entry points. The State must make a written finding indicating how the data conforms to the these requirements.

(iii) For gross alpha particle activity, uranium, radium-226 and radium-228 monitoring, the State may waive the final two quarters of initial monitoring for a sampling point if the results of the samples from the previous two quarters are below the detection limit.

(iv) If the average of the initial monitoring results for a sampling point is above the MCL, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are at or below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the State.

(3) Reduced monitoring: States may allow community water systems to reduce the future frequency of monitoring from once every three years to once every six or nine years at each sampling point, based on the following criteria.

(i) If the average of the initial monitoring results for each contaminant (i.e., gross alpha particle activity, uranium, radium-226, or radium-228) is below the detection limit specified in § 141.25 (c)(1) (Table B), the system must collect and analyze for that contaminant using at least one sample at that sampling point every nine years.

(ii) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is at or above the detection limit but at or below ½ the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is at or above the detection limit but at or below ½ the MCL, the system must collect and analyze for that contaminant using at least one sample at that sampling point every six years.

(iii) For gross alpha particle activity and uranium, if the average of the initial monitoring results for each contaminant is above ½ the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years. For combined radium-226 and radium-228, the analytical results must be combined. If the average of the combined initial monitoring results for radium-226 and radium-228 is above ½ the MCL but at or below the MCL, the system must collect and analyze at least one sample at that sampling point every three years.

(iv) Systems must use the samples collected during the reduced monitoring period to determine the monitoring frequency for subsequent monitoring periods (e.g., if a system's sampling point is on a nine year monitoring period, and the sample result is above ½ MCL, then the next monitoring period for that sampling point is three years).

(v) If a system has a monitoring result that exceeds the MCL while on reduced monitoring, the system must collect and analyze quarterly samples at that sampling point until the system has results from four consecutive quarters that are below the MCL, unless the system enters into another schedule as part of a formal compliance agreement with the State.

(4) Compositing: To fulfill quarterly monitoring requirements for gross alpha particle activity, radium-226, radium-228, or uranium, a system may composite up to four consecutive quarterly samples from a single entry point if analysis is done within a year of the first sample. States will treat analytical results from the composited as the average analytical result to determine compliance with the MCLs and the future monitoring frequency. If the analytical result from the composited sample is greater than ½ MCL, the State may direct the system to take additional quarterly samples before allowing the system to sample under a reduced monitoring schedule.

(5) A gross alpha particle activity measurement may be substituted for the required radium-226 measurement provided that the measured gross alpha particle activity does not exceed 5 pCi/l. A gross alpha particle activity measurement may be substituted for the required uranium measurement provided that the measured gross alpha particle activity does not exceed 15 pCi/l. The gross alpha measurement shall have a confidence interval of 95% (1.65σ, where σ is the standard deviation of the net counting rate of the sample) for radium-226 and uranium. When a system uses a gross alpha particle activity measurement in lieu of a radium-226

and/or uranium measurement, the gross alpha particle activity analytical result will be used to determine the future monitoring frequency for radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, ½ the detection limit will be used to determine compliance and the future monitoring frequency.

(b) ***Monitoring and compliance requirements for beta particle and photon radioactivity.***

To determine compliance with the maximum contaminant levels in §141.66(d) for beta particle and photon radioactivity, a system must monitor at a frequency as follows:

(1) Community water systems (both surface and ground water) designated by the State as vulnerable must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the State. Systems already designated by the State must continue to sample until the State reviews and either reaffirms or removes the designation.

(i) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 50 pCi/L (screening level), the State may reduce the frequency of monitoring at that sampling point to once every 3 years. Systems must collect all samples required in paragraph (b)(1) of this section during the reduced monitoring period.

(ii) For systems in the vicinity of a nuclear facility, the State may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the State determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(1).

(2) Community water systems (both surface and ground water) designated by the State as utilizing waters contaminated by effluents from nuclear facilities must sample for beta particle and photon radioactivity. Systems must collect quarterly samples for beta emitters and iodine-131 and annual samples for tritium and strontium-90 at each entry point to the distribution system (hereafter called a sampling point), beginning within one quarter after being notified by the State. Systems already designated by the State as systems using waters contaminated by effluents from nuclear facilities must continue to sample until the State reviews and either reaffirms or removes the designation.

(i) Quarterly monitoring for gross beta particle activity shall be based on the analysis of monthly samples or the analysis of a composite of three monthly samples. The former is recommended.

(ii) For iodine-131, a composite of five consecutive daily samples shall be analyzed once each quarter. As ordered by the State, more frequent monitoring shall be conducted when iodine-131 is identified in the finished water.

(iii) Annual monitoring for strontium-90 and tritium shall be conducted by means of the analysis of a composite of four consecutive quarterly samples or analysis of four quarterly samples. The latter procedure is recommended.

(iv) If the gross beta particle activity beta minus the naturally occurring potassium-40 beta particle activity at a sampling point has a running annual average (computed quarterly) less than or equal to 15 pCi/L, the State may reduce the frequency of monitoring at that sampling point to every 3 years. Systems

must collect all samples required in paragraph (b)(2) of this section during the reduced monitoring period.

(v) For systems in the vicinity of a nuclear facility, the State may allow the CWS to utilize environmental surveillance data collected by the nuclear facility in lieu of monitoring at the system's entry point(s), where the State determines if such data is applicable to a particular water system. In the event that there is a release from a nuclear facility, systems which are using surveillance data must begin monitoring at the community water system's entry point(s) in accordance with paragraph (b)(2).

(3) Community water systems designated by the State to monitor for beta particle and photon radioactivity can not apply to the State for a waiver from the monitoring frequencies specified in paragraph (b)(1) or (b)(2) of this section.

(4) Community water systems may analyze for naturally occurring potassium-40 beta particle activity from the same or equivalent sample used for the gross beta particle activity analysis. Systems are allowed to subtract the potassium-40 beta particle activity value from the total gross beta particle activity value to determine if the screening level is exceeded. The potassium-40 beta particle activity must be calculated by multiplying elemental potassium concentrations (in mg/L) by a factor of 0.82.

(5) If the gross beta particle activity minus the naturally occurring potassium-40 beta particle activity exceeds the screening level, an analysis of the sample must be performed to identify the major radioactive constituents present in the sample and the appropriate doses must be calculated and summed to determine compliance with §141.66(d)(1), using (d)(2). Doses must also be calculated and combined for measured levels of tritium and strontium to determine compliance.

(6) Systems must monitor monthly at the sampling point(s) which exceed the maximum contaminant level in § 141.66(d) beginning the month after the exceedance occurs. Systems must continue monthly monitoring until the system has established, by a rolling average of 3 monthly samples, that the MCL is being met. Systems who establish that the MCL is being met must return to quarterly monitoring until they meet the requirements set forth in paragraph (b)(1)(ii) or (b)(2)(i) of this section.

(c) ***General monitoring and compliance requirements for radionuclides***.

(1) The State may require more frequent monitoring than specified in paragraphs (a) and (b) of this section, or may require confirmation samples at its discretion. The results of the initial and confirmation samples will be averaged for use in compliance determinations.

(2) Each public water systems shall monitor at the time designated by the State during each compliance period.

(3) Compliance. Compliance with §141.66 (b) through (e) will be determined based on the analytical result(s) obtained at each sampling point. If one sampling point is in violation of an MCL, the system is in violation of the MCL.

(i) For systems monitoring more than once per year, compliance with the MCL is determined by a running annual average at each sampling point. If the average of any sampling point is greater than the MCL, then the system is out of compliance with the MCL.

(ii) For systems monitoring more than once per year, if any sample result will cause the running average to exceed the MCL at any sample point, the system is out of compliance with the MCL immediately.

(iii) Systems must include all samples taken and analyzed under the provisions of this section in determining compliance, even if that number is greater than the minimum required.

(iv) If a system does not collect all required samples when compliance is based on a running annual average of quarterly samples, compliance will be based on the running average of the samples collected.

(v) If a sample result is less than the detection limit, zero will be used to calculate the annual average, unless a gross alpha particle activity is being used in lieu of radium-226 and/or uranium. If the gross alpha particle activity result is less than detection, ½ the detection limit will be used to calculate the annual average.

(4) States have the discretion to delete results of obvious sampling or analytic errors.

(5) If the MCL for radioactivity set forth in §141.66 (b) through (e) is exceeded, the operator of a community water system must give notice to the State pursuant to §141.31 and to the public as required by Subpart Q of this part.

Subpart F–[Amended]

5. A new § 141.55 is added to Subpart F to read as follows:

§ 141.55 Maximum contaminant level goals for radionuclides.

MCLGs for radionuclides are as indicated in the following table:

Contaminant	MCLG
1. Combined radium-226 and radium -228	Zero
2. Gross alpha particle activity (excluding radon and uranium)	Zero
3. Beta particle and photon radioactivity	Zero
4. Uranium	Zero

Subpart G–National Primary Drinking Water Regulations: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels

6. The title of Subpart G is revised as set out above.

7. A new § 141.66 is added to Subpart G to read as follows:

§ 141.66 Maximum Contaminant Levels for Radionuclides.

(a) [reserved]

(b) *MCL for combined radium-226 and 228.* The maximum contaminant level for combined radium-226 and radium-228 is 5 pCi/L. The combined radium-226 and radium-228 value is determined by the addition of the results of the analysis for radium-226 and the analysis for radium-228.

(c) *MCL for gross alpha particle activity (excluding radon and uranium).* The maximum contaminant level for gross alpha particle activity (including radium-226 but excluding radon and uranium) is 15 pCi/L.

(d) *MCL for beta particle and photon radioactivity.* (1) The average annual concentration of beta particle and photon radioactivity from man-made radionuclides in drinking water must not produce an annual dose equivalent to the total body or any internal organ greater than 4 millirem/year (mrem/year).

(2) Except for the radionuclides listed in Table A, the concentration of man-made radionuclides causing 4 mrem total body or organ dose equivalents must be calculated on the basis of 2 liter per day drinking water intake using the 168 hour data list in " *Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure,* " NBS (National Bureau of Standards) Handbook 69 as amended August 1963, U.S. Department of Commerce. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies of this document are available from the National Technical Information Service, NTIS ADA 280 282, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161. The toll-free number is 800-553-6847. Copies may be inspected at EPA's Drinking Water Docket, 401 M Street, SW., Washington, DC 20460; or at the Office of the Federal Register, 800 North Capitol Street, NW., Suite 700, Washington, DC. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.

Table A - Average Annual Concentrations Assumed to Produce A Total Body or Organ Dose of 4 mrem/yr		
1. Radionuclide	Critical Organ	pCi per Liter
2. Tritium.....	Total body	20,000
3. Strontium-90.....	Bone Marrow	8

(e) *MCL for uranium.* The maximum contaminant level for uranium is 30 μg/L.

(f) *Compliance dates.* (1) Compliance dates for combined radium 226 and 228, gross alpha particle activity, gross beta particle and photon radioactivity, and uranium: Community water systems must comply with the MCLs listed in paragraphs (b), (c), (d) and (e) of this section beginning **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]** and compliance shall be determined in accordance with the requirements of § 141.25 and § 141.26. Compliance with reporting requirements for the radionuclides under Appendix A to Subpart O and Appendix A and B to Subpart Q is required on **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER].**

(g) *Best Available Technologies (BATs) for Radionuclides.* The Administrator, pursuant to section 1412 of the Act, hereby identifies as indicated in the following table the best technology available for achieving compliance with the maximum contaminant levels for combined radium-226 and 228, uranium, gross alpha particle activity, and beta particle and photon radioactivity.

Table B - BAT for combined radium-226 and radium-228, uranium, gross alpha particle activity, and beta particle and photon radioactivity:

Contaminant	BAT
1. Combined Radium-226 and Radium-228	Ion Exchange, Reverse Osmosis, Lime Softening
2. Uranium	Ion Exchange, Reverse Osmosis, Lime Softening, Coagulation/Filtration
3. Gross alpha particle activity (Excluding Radon and Uranium)	Reverse Osmosis
4. Beta Particle and Photon Radioactivity	Ion Exchange, Reverse Osmosis

(h) *Small systems compliance technologies list for radionuclides.*

Table C - List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use			
Unit Technologies	Limitations (see footnotes)	Operator Skill Level Required[1]	Raw Water Quality Range & Considerations[1]
1. Ion Exchange (IE)	(a)	Intermediate	All ground waters
2. Point of Use (POU[2]) IE	(b)	Basic	All ground waters
3. Reverse Osmosis (RO)	(c)	Advanced	Surface waters usually require pre-filtration
4. POU[2] RO	(b)	Basic	Surface waters usually require pre-filtration
5. Lime Softening	(d)	Advanced	All waters
6. Green Sand Filtration	(e)	Basic	
7. Co-precipitation with Barium Sulfate	(f)	Intermediate to Advanced	Ground waters with suitable water quality
8. Electrodialysis/ Electrodialysis Reversal		Basic to Intermediate	All ground waters
9. Pre-formed Hydrous Manganese Oxide Filtration	(g)	Intermediate	All ground waters
10. Activated alumina	(a), (h)	Advanced	All ground waters; competing anion concentrations may affect regeneration frequency
11. Enhanced coagulation/filtration	(i)	Advanced	Can treat a wide range of water qualities

[1] National Research Council (NRC). *Safe Water from Every Tap: Improving Water Service to Small Communities*. National Academy Press. Washington, D.C. 1997.

[2] A POU, or "point-of-use" technology, is a treatment device installed at a single tap used for the purpose of reducing contaminants in drinking water at that one tap. POU devices are typically installed at the kitchen tap. See the April 21, 2000 NODA for more details.

Limitations Footnotes: Technologies for Radionuclides

[a] The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

[b] When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

[c] Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

[d] The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

[e] Removal efficiencies can vary depending on water quality.

[f] This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place

[g] This technology is most applicable to small systems that already have filtration in place.

[h] Handling of chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.

[i] Assumes modification to a coagulation/filtration process already in place.

Table D- Compliance Technologies by System Size Category for Radionuclide NPDWRs			
	Compliance Technologies[1] for System Size Categories (Population Served)		
Contaminant	25 - 500	501 - 3,300	3,300 - 10,000
1. Combined radium-226 and radium-228	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9
2. Gross alpha particle activity	3, 4	3, 4	3, 4
3. Beta particle activity and photon activity	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
4. Uranium	1, 2, 4, 10, 11	1, 2, 3, 4, 5, 10, 11	1, 2, 3, 4, 5, 10, 11
Note: (1) Numbers correspond to those technologies found listed in the table C of 141.66(h).			

Subpart O -- [Amended]

Appendix A to Subpart O

8. The table in Appendix A to Subpart O is amended under the heading " Radioactive Contaminants" by revising the entries for "Beta/photon emitters", "Alpha emitters", and "Combined radium" and adding the entry for "Uranium (pCi/L)" to read as follows:

APPENDIX A TO SUBPART O – REGULATED CONTAMINANTS

Contaminant (units)	Traditional MCL in mg/L	To convert for CCR, multiply by	MCL in CCR units	MCLG	Major sources in drinking water	Health effects language
* * * * * * *						
Radioactive Contaminants:						
Beta/photon emitters (mrem/yr)	4 mrem/yr	-	4	0	Decay of natural and man-made deposits	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta particle and photon radioactivity in excess of the MCL over many years may have an increased risk of getting cancer.
Alpha emitters (pCi/l)	15 pCi/l	-	15	0	Erosion of natural deposits	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Combined radium (pCi/l)	5 pCi/l	-	5	0	Erosion of natural deposits	Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer.
Uranium (pCi/L)	30 μg/L	-	30	0	Erosion of natural deposits	Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.
* * * * * * *						

Subpart Q – [Amended]

9. Appendix A to Subpart Q under I. "F. Radioactive Contaminant" is amended by revising the entries 1,2, and 3, adding entry 4 and redesignating endnotes 9 through 17 as endnotes 11 through 19 and adding new endnotes number 9 and 10.

Appendix A to Subpart Q of Part 141--NPDWR Violations and Other Situations Requiring Public Notice[1]

Contaminant	MCL/MRDL/TT Violations[2]		Monitoring & Testing Procedure Violations	
	Tier of Public Notice Required	Citation	Tier of Public Notice Required	Citation
I. Violations of National Primary Drinking Water Regulations (NPDWR)[3]:				
* * * * * * *				
F. Radioactive Contaminants				
1. Beta/photon emitters	2	141.66(d)	3	141.25(a) 141.26(b)
2. Alpha emitters	2	141.66(c)	3	141.25(a) 141.26(a)
3. Combined radium (226 & 228)	2	141.66(b)	3	141.25(a) 141.26(a)
4. Uranium	2[9]	141.66(e)	3[10]	141.25(a) 141.26(a)
* * * * * * *				

Appendix A -Endnotes

* * * * *

1. Violations and other situations not listed in this table (e.g., reporting violations and failure to prepare Consumer Confidence Reports), do not require notice, unless otherwise determined by the primary agency. Primacy agencies may, at their option, also require a more stringent public notice tier (e.g., Tier 1 instead of Tier 2 or Tier 2 instead of Tier 3) for specific violations and situations listed in this Appendix, as authorized under Sec. 141.202(a) and Sec. 141.203(a).

2. MCL--Maximum contaminant level, MRDL--Maximum residual disinfectant level, TT--Treatment technique

3. The term Violations of National Primary Drinking Water Regulations (NPDWR) is used here to include violations of MCL, MRDL, treatment technique, monitoring, and testing procedure requirements.

* * * * *

9. The uranium MCL Tier 2 violation citations are effective **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]** for all community water systems.

10. The uranium Tier 3 violation citations are effective **December 7, 2003** for all community water systems.

* * * * *

Appendix B to Subpart Q [Amend]

10. Appendix B to Subpart Q is amended by redesignating entries 79 through 88 as 80 through 89, adding entry 79 for **uranium under** "G. Radioactive Contaminants", redesignating endnote entries 16 through 21 as 17 through 22 and adding endnote 16.

Appendix B to Subpart Q of -- Standard Health Effects Language for Public Notification

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
National Primary Drinking Water Regulations (NPDWR):			
* * * * * * *			
G. Radioactive Contaminants:			
79. Uranium[16]	Zero	30 μg/L	Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.
* * * * * * *			

Appendix B Endnotes

1. MCLG– Maximum contaminant level goal
2. MCL– Maximaum contaminant level

* * * * *

16. The uranium MCL is effective **[INSERT DATE 3 YEARS AFTER PUBLICATION IN THE FEDERAL REGISTER]** for all community water systems.

* * * * *

PART 142-- NATIONAL PRIMARY DRINKING WATER REGULATIONS IMPLEMENTATION

1. The authority citation for part 142 continues to read as follows:

Authority: 42 U.S.C. 300f, 300g-1, 300g-2, 300g-3, 300g-4, 300g-5, 300g-6, 300j-4, 300j-9, and 300j-11.

Subpart B Primary Enforcement Responsibility

2. Section 142.16 is amended by adding and reserving paragraphs (i), (j) and (k) and adding paragraph (l) to read as follows:

§ 142.16 Special primacy requirements.

* * * * *

(i) [reserved]

(j) [reserved]

(k) [reserved]

(l) An application for approval of a State program revision for Radionuclides which adopts the requirements specified in § 141.26(a)(2)(ii)(C) of this chapter must contain the following (in addition to the general primacy requirements enumerated in this part, including that State regulations be at least as stringent as the Federal requirements):

(1) If a State chooses to use grandfathered data in the manner described in § 141.26(a)(2)(ii)(C) of this chapter, then the State must describe the procedures and criteria which it will use to make these determinations (whether distribution system or entry point sampling points are used).

(i) The decision criteria that the State will use to determine that data collected in the distribution system are representative of the drinking water supplied from each entry point to the distribution system. These determinations must consider:

(A) All previous monitoring data.

(B) The variation in reported activity levels.

(C) Other factors affecting the representativeness of the data (e.g. geology)

(2) A monitoring plan by which the State will assure all systems complete the required monitoring within the regulatory deadlines. States may update their existing monitoring plan or use the same monitoring plan submitted for the requirements in §142.16(e)(5) under the National Primary Drinking Water Regulations for the inorganic and

organic contaminants (i.e. the Phase II/V Rules). States may note in their application any revision to an existing monitoring plan or note that the same monitoring plan will be used. The State must demonstrate that the monitoring plan is enforceable under State law.

3. Section 142.65 is added to read as follows.

§ 142.65 Variances and exemptions from the maximum contaminant levels for radionuclides.

(a)(1) *Variances and exemptions from the maximum contaminant levels for Combined Radium-226 and Radium-228, Uranium, Gross alpha particle activity (Excluding Radon and Uranium), and Beta Particle and Photon Radioactivity.* The Administrator, pursuant to section 1415(a)(1)(A) of the Act, hereby identifies the following as the best available technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in §141.66 (b), (c), (d), and (e) of this chapter, for the purposes of issuing variances and exemptions, as shown in Table A of this paragraph.

Table A. BAT for Radionuclides Listed in § 141.66

Contaminant	BAT
Combined Radium-226 and Radium-228	Ion Exchange, Reverse Osmosis, Lime Softening
Uranium	Ion Exchange, Reverse Osmosis, Lime Softening, Coagulation/Filtration
Gross alpha particle activity (Excluding Radon and Uranium)	Reverse Osmosis
Beta Particle and Photon Radioactivity	Ion Exchange, Reverse Osmosis

In addition, the Administrator hereby identifies the following as the best available technology, treatment techniques, or other means available for achieving compliance with the maximum contaminant levels for the radionuclides listed in §141.66 (b), (c), (d), and (e) of this chapter, for the purposes of issuing variances and exemptions to small drinking water systems, defined here as those serving 10,000 persons or fewer, as shown in Table C on this section.

Table B. List of Small Systems Compliance Technologies for Radionuclides and Limitations to Use			
Unit Technologies	Limitations (see footnotes)	Operator Skill Level Required[1]	Raw Water Quality Range & Considerations[1]
1. Ion Exchange (IE)	(a)	Intermediate	All ground waters
2.. Point of Use (POU[2]) IE	(b)	Basic	All ground waters
3. Reverse Osmosis (RO)	(c)	Advanced	Surface waters usually require pre-filtration
4. POU[2] RO	(b)	Basic	Surface waters usually require pre-filtration
5. Lime Softening	(d)	Advanced	All waters
6. Green Sand Filtration	(e)	Basic	
7. Co-precipitation with Barium Sulfate	(f)	Intermediate to Advanced	Ground waters with suitable water quality
8. Electrodialysis/ Electrodialysis Reversal		Basic to Intermediate	All ground waters
9. Pre-formed Hydrous Manganese Oxide Filtration	(g)	Intermediate	All ground waters
10. Activated alumina	(a), (h)	Advanced	All ground waters; competing anion concentrations may affect regeneration frequency
11. Enhanced coagulation/filtration	(i)	Advanced	Can treat a wide range of water qualities

[1] National Research Council (NRC). *Safe Water from Every Tap: Improving Water Service to Small Communities*. National Academy Press. Washington, D.C. 1997.

[2] A POU, or "point-of-use" technology is a treatment device installed at a single tap used for the purpose of reducing contaminants in drinking water at that one tap. POU devices are typically installed at the kitchen tap. See the April 21, 2000 NODA for more details.

Limitations Footnotes: Technologies for Radionuclides

[a] The regeneration solution contains high concentrations of the contaminant ions. Disposal options should be carefully considered before choosing this technology.

[b] When POU devices are used for compliance, programs for long-term operation, maintenance, and monitoring must be provided by water utility to ensure proper performance.

[c] Reject water disposal options should be carefully considered before choosing this technology. See other RO limitations described in the SWTR Compliance Technologies Table.

[d] The combination of variable source water quality and the complexity of the water chemistry involved may make this technology too complex for small surface water systems.

[e] Removal efficiencies can vary depending on water quality.

[f] This technology may be very limited in application to small systems. Since the process requires static mixing, detention basins, and filtration, it is most applicable to systems with sufficiently high sulfate levels that already have a suitable filtration treatment train in place

[g] This technology is most applicable to small systems that already have filtration in place.

[h] Handling of chemicals required during regeneration and pH adjustment may be too difficult for small systems without an adequately trained operator.

[i] Assumes modification to a coagulation/filtration process already in place.

Table C. BAT for Small Community Water Systems for the Radionuclides Listed in § 141.66			
	Compliance Technologies[1] for System Size Categories (Population Served)		
Contaminant	25 - 500	501 - 3,300	3,300 - 10,000
Combined radium-226 and radium-228	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 3, 4, 5, 6, 7, 8, 9
Gross alpha particle activity	3, 4	3, 4	3, 4
Beta particle activity and photon activity	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
Uranium	1, 2, 4, 10, 11	1, 2, 3, 4, 5, 10, 11	1, 2, 3, 4, 5, 10, 11
Note: (1) Numbers correspond to those technologies found listed in the table B of this paragraph.			

(2) A State shall require community water systems to install and/or use any treatment technology identified in Table A of this section, paragraph (1), or in the case of small water systems (those serving 10,000 persons or fewer), Table B and Table C of this section, as a condition for granting a variance except as provided in paragraph (a)(3) of this section. If, after the system's installation of the treatment technology, the system cannot meet the MCL, that system shall be eligible for a variance under the provisions of section 1415(a)(1)(A) of the Act.

(3) If a community water system can demonstrate through comprehensive engineering assessments, which may include pilot plant studies, that the treatment technologies identified in this section would only achieve a *de minimus* reduction in the contaminant level, the State may issue a schedule of compliance that requires the system being granted the variance to examine other treatment technologies as a condition of obtaining the variance.

(4) If the State determines that a treatment technology identified under paragraph (a)(3) of this section is technically feasible, the Administrator or primacy State may require the system to install and/or use that treatment technology in connection with a compliance schedule issued under the provisions of section 1415(a)(1)(A) of the Act. The State's determination shall be based upon studies by the system and other relevant information.

(5) The State may require a community water system to use bottled water, point-of-use devices, point-of-entry devices or other means as a condition of granting a variance or an exemption from the requirements of §141.66 of this chapter, to avoid an unreasonable risk to health.

(6) Community water systems that use bottled water as a condition for receiving a variance or an exemption from the requirements of §141.66 of this chapter must meet the requirements specified in either paragraph (g)(1) or (g)(2) and (g)(3) of §142.62.

(7) Community water systems that use point-of-use or point-of-entry devices as a condition for obtaining a variance or an exemption from the radionuclides NPDWRs must meet the conditions in §142.62 (h)(1) through (h)(6).

Appendix H

Comparison of Derived Values of Beta and Photon Emitters

Derived Concentrations of Individual Beta Particle and Photon Radioactivity Emitters (in pCi/L)

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
H-3 (HTO)	20,000
Be-7	6,000
C-11	NC
N-13	
C-14	2,000
C-15	
O-15	
F-18 *	2,000
Na-22	400
Na-24	
Si-31 *	3,000
P-33	
P-32	30
S-35 (Inorg)	500
Cl-36	700
Cl-38 *	1,000
K-42 *	900
Ca-45	10
Ca-47	80
Sc-46	100
Sc-47	300
Sc-48	80
V-48	90
Cr-51	6,000
Mn-52	90
Mn-54	300
Mn-56 *	300
Fe-55	2,000
Fe-59	200
Co-57	1,000
Co-58	300
Co-58m	9,000
Co-60	100

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
Ni-59	300
Ni-63	50
Ni-65 *	300
Cu-64 *	900
Zn-65	300
Zn-69 *	6,000
Zn-69m *	200
Ga-67	NC
Ga-72 *	100
Ge-71	6,000
As-73	1,000
As-74	100
As-76	60
As-77	200
Se-75	300
Br-82	100
Rb-82	
Rb-86	600
Rb-87	300
Rb-88	NC
Rb-89	NC
Sr-82	NC
Sr-85	900
Sr-85m	21,000
Sr-89	20
Sr-90	8
Sr-91 *	200
Sr-92	200
Y-90	60
Y-91	90
Y-91m *	9,000
Y-92 *	200
Y-93	90
Zr-93	2,000
Zr-95	200
Zr-97 *	60
Nb-93m	1,000
Nb-94	NC

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
Nb-95	300
Nb-95m	NC
Nb-97 *	3,000
Nb-97m	
Mo-99	600
Tc-95	NC
Tc-95m	NC
Tc-96	300
Tc-96m *	30,000
Tc-97	6,000
Tc-97m	1,000
Tc-99	900
Tc-99m	20,000
Ru-97	1,000
Ru-103	200
Ru-105 *	NC
Rh-105m	
Ru-106	30
Rh-103m *	30,000
Rh-105 *	300
Rh-106	NC
Pd-100	NC
Pd-101	NC
Pd-103	900
Pd-107	NC
Pd-109	300
Ag-105	300
Ag-108	
Ag-108m	NC
Ag-109m	
Ag-110	
Ag-110m	90
Ag-111	100
Cd-109	600
Cd-115	90
Cd-115m	90
In-113m *	3,000
In-114	

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
In-114m *	60
In-115	300
In-115m *	1,000
Sn-113	300
Sn-121	NC
Sn-121m	NC
Sn-125	60
Sn-126	NC
Sb-122	90
Sb-124	60
Sb-125	300
Sb-126	NC
Sb-126m	NC
Sb-127	NC
Sb-129	NC
Te-125m	600
Te-127	900
Te-127m	200
Te-129	2,000
Te-129m	90
Te-131m	NC
Te-131	200
Te-132	90
I-122	
I-123	NC
I-125	
I-126	3
I-129	1
I-130	NC
I-131	3
I-132 *	90
I-133 *	10
I-134 *	100
I-135 *	30
Cs-131	20,000
Cs-134	80
Cs-134m *	20,000
Cs-135	900

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
Cs-136	800
Cs-137	200
Cs-138	NC
Ba-131	600
Ba-133	
Ba-133m	
Ba-137m	
Ba-139	NC
Ba-140	90
La-140	60
Ce-141	300
Ce-143	100
Ce-144	NC
Pr-142 *	90
Pr-143	100
Pr-144	NC
Pr-144m	
Nd-147 *	NC
Nd-149 *	900
Pm-147	NC
Pm-148	NC
Pm-148m	NC
Pm-149	100
Sm-151	1,000
Sm-153	200
Eu-152 *	200
Eu-154	60
Eu-155	600
Eu-156	NC
Gd-153	600
Gd-159 *	200
Tb-158	NC
Tb-160	100
Dy-165 *	1,000
Dy-166	100
Ho-166	90
Er-169	300
Er-171 *	300

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
Tm-170	100
Tm-171	1,000
Yb-169	NC
Yb-175	300
Lu-177	300
Hf-181	200
Ta-182	100
W-181	1,000
W-185	300
W-187 *	200
Re-183	2,000
Re-186	300
Re-187	9,000
Re-188 *	200
Os-185	200
Os-191	600
Os-191m *	9,000
Os-193	200
Ir-190	600
Ir-192	100
Ir-194 *	90
Pt-191	300
Pt-193	3,000
Pt-193m	3,000
Pt-197	300
Pt-197m *	3,000
Au-196	600
Au-198	100
Au-199	NC
Hg-197	NC
Hg-197m	NC
Hg-198	
Hg-203	NC
Tl-200	NC
Tl-201	NC
Tl-202	300
Tl-204	300
Tl-207	

Nuclide (*half-life of 24 hours or less)	1976 limits (based on critical organ at 4 mrem/yr)
Tl-208	
Tl-209	
Pb-203	1,000
Pb-209	NC
Pb-210	NC
Pb-211	NC
Pb-212	NC
Pb-214	NC
Bi-206	100
Bi-207	200
Bi-212	
Bi-213	NC
Bi-214	NC
Fr-223	NC
Ra-225	NC
Ra-228	
Ac-227	NC
Ac-228	NC
Th-231	NC
Th-234	NC
Pa-233	300
Pa-234	NC
Pa-234m	
U-237	NC
U-240	NC
Np-236	
Np-238	NC
Np-239	NC
Np-240	NC
Np-240m	
Pu-241	NC
Pu-243	NC
Am-242m	NC
Bk-249	

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