



To: Members of the State Board of Health

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Subject: Request for a Rulemaking Hearing concerning new 6 CCR 1007-1, Part 20, titled "Registration and licensing of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)", and amendments to 6 CCR 1007-1, Part 12, titled "Fees for radiation control services".

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The Colorado Department of Public Health and Environment (the Department) has developed a proposed residual management rule titled Part 20, "Registration and licensing of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)", as required by Senate Bill 18-245. TENORM is naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices. TENORM may be found in the residuals created by drinking and waste water treatment, oil and gas exploration and production, and other processes that have the potential to concentrate metals or other constituents. This rulemaking effort is crucial as it advances Colorado's health and establishes protections for the places we live, learn, work and play by ensuring that the handling, transportation, beneficial use, and disposal of TENORM is conducted in a safe and consistent manner that protects workers, members of the public, and the environment.

In 2018, the Colorado State Legislature passed the Senate Bill 18-245 which amended the Colorado Revised Statutes, 25-11-104(1)(b), provided the Department the authority to promulgate a rule for safe management of TENORM and requires that the state Board of Health adopt those rules by December 31, 2020. Since the bill was passed, the Department has worked together with stakeholders to develop a proposed regulatory structure that addresses TENORM and is in tandem with our vision of a healthy and sustainable Colorado where current and future generations thrive. The Department has made considerable efforts to engage stakeholders in this TENORM regulatory development process as outlined in the rule package. In addition to the proposed Part 20 rule, the Division is proposing parallel amendments to the Part 12 fee rules to incorporate a fee structure for registration and licensing of these facilities.

The proposed Part 20 rule provides a graded, tiered approach to regulation of TENORM materials, including allowing exemption of certain materials of low risk. Other materials presenting moderate risk will be regulated through a registration process. It is expected that most facilities subject to regulation will fall into this mid-level category. A specific radioactive materials licensing process consistent with current licensing activities, will be reserved for facilities concentrating or processing the highest risk materials and which would require more extensive safety controls.

As with other radiation regulations, statute requires rules to be consistent with federal rule or model regulations promulgated by the Conference of Radiation Control Program Directors, Inc. (CRCPD). While such a rule exists in the model Part N rule, this rule was last amended in 2004 and does not specifically address the needs, concerns or industries that are specific to Colorado or the statutory requirements of Senate Bill 18-245. As such, the Division chose to develop a rule based upon sound data as well as feedback and information from stakeholders specific to Colorado. Aspects of the proposed Part 20 rule do however parallel some limits and concepts of the Part N model rule.

Since this is a new rule, all text is as proposed and incorporates to the extent possible, the comments, recommendations, and concerns of stakeholders.

At the September 16, 2020 request for rulemaking, the Division requests that the Board of Health set a rulemaking hearing for November 18, 2020 for the proposed Part 20 and Part 12 rules.

DRAFT STATEMENT OF BASIS AND PURPOSE  
AND SPECIFIC STATUTORY AUTHORITY  
for Amendments to

6 CCR 1007-1, Part 20, "Registration and licensing of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)"  
6 CCR 1007-1, Part 12, "Fees for radiation control services"

Basis and Purpose.

In 2018, the Colorado State Legislature passed the Senate Bill 18-245 that amended the Colorado Revised Statutes in 25-11-104(1)(b), which provided the Colorado Department of Public Health and Environment (the Department) the authority to promulgate a rule for safe management of TENORM, and requires the state Board of Health to adopt a rule by December, 31 2020. The bill required a number of other interim steps to be conducted during the development process. It required the Department to convene a stakeholder group including representatives from the industries that produce TENORM and invite stakeholder participation in the TENORM rule development. It required the Department to prepare a TENORM report that considered background radiation levels in the state, waste stream identification and quantification, use and disposal practices, current engineering practices, appropriate test methods, economic impacts, and data gaps. It also required that the Department provide the TENORM report and a summary of stakeholder activity to the legislature by December 31, 2019.

Since the bill was passed, the Department has worked together with stakeholders to develop a proposed regulatory structure that addresses TENORM and is in tandem with our vision of a healthy and sustainable Colorado where current and future generations thrive. A description of these activities may be found in the stakeholder engagement section of this rule package.

Regarding the preparation of the report required by the bill, in September 2018, the Department hired Rule Engineering LLC, a third-party environmental consulting firm, to research and prepare the report. In preparing the TENORM report, Rule Engineering engaged stakeholders through meetings, interviews, conference calls, and site tours of the facilities that may be impacted by TENORM. These activities allowed Rule Engineering to collect stakeholder input on the topics required by the bill, as well as TENORM data and comments or concerns on TENORM regulatory development. Rule Engineering also employed the use of industry specific questionnaires to further the understanding of how TENORM may be generated and handled by various industries, typical radionuclide concentrations in the wastes, and the characterization methods used by industry. The questionnaires were sent to oil and gas operators, public water treatment facilities, wastewater treatment facilities, solid waste disposal facilities, and other stakeholders.

On March 1, 2019, Rule Engineering submitted the draft report to the Department. Department staff reviewed the draft report and provided 141 comments on April 9, 2019. A 60-day public comment period was then opened for the draft report between April and June 2019, and received over one hundred comments from 18 groups of stakeholders, including a number of wastewater or drinking water treatment facilities, the Colorado Mining Association, the Colorado Oil and Gas Association, the Colorado Water Utility Council, a land application service company, environmental advocacy groups, environmental consulting service companies, and other members of the public. After incorporating all of the applicable comments, Rule Engineering completed the final report in June 2019.

“Senate Bill 18-245: TENORM Report and Summary of Regulatory Development and Stakeholder Process” was provided to the Senate Committee on Health and Human Services and the House of Representatives Committee on Health, Insurance, and Environment by the Department on December 27, 2019. No comments were received from the legislature following submission of the report.

In regard to the development of the rule, the statute requires that the rule be based on the TENORM report, include regulatory limits for at least landfill disposal, beneficial reuse, and exemption levels and allows for the beneficial reuse of water treatment residuals and by-products of the wastewater treatment process. The bill also requires that the development of concentration limits contained within the rule for each of these management options be based on the contribution to public dose and account for different activities specific to each management option.

Technologically enhanced naturally occurring radioactive material or TENORM is defined in Colorado statute as naturally occurring radioactive material (NORM) whose radionuclide concentrations are increased by or as a result of past or present human practices. Additionally, background radiation or the natural radioactivity of rocks or soils; “byproduct material” or “source material”, as defined by Colorado statute or rule; and enriched or depleted uranium as defined by Colorado or federal statute or rule are specifically excluded from that definition.

TENORM materials typically result from the processing of our natural resources to provide clean water and energy to our Colorado residents and are generated by a wide range of human activities and at varying concentrations depending on a number of factors including natural composition of materials and processes used. The proposed new Part 20 rule sets forth a formal regulatory structure for TENORM materials that parallels the regulatory processes used for regulation of other radioactive materials, and which was partially based on existing TENORM guidance information that Colorado has had in place for many years. Prior to the current rulemaking effort, the radiation program relied upon this 2007 guidance along with facility specific letters and documents to promote safe handling, control, and disposal of TENORM materials. The proposed Part 20 rule serves to provide a clear and equitable regulatory structure under which these materials may be managed and dispositioned or disposed of in a safe and sustainable manner while meeting the requirements of Senate Bill 18-245.

The rule proposes a graded and prudent three tiered approach to regulation and control of certain TENORM materials, based upon current state statute, regulation, state and national guidance, industrial practices, and stakeholder feedback. At the lowest level, certain TENORM materials may be considered exempt from regulatory requirements due to the low risk they present to workers, members of the public, and the environment. Other facilities producing materials of higher concentrations will be regulated through a registration process, with some, but minimal levels of control and requirements that must be followed. Facilities generating or handling TENORM materials of greater risk will be regulated as specific licensees, similar to other users of radioactive materials such as hospitals, research, and industrial licensees. Like other specific licensees, TENORM facilities will need to develop procedures and establish a formal radiation safety program to train and monitor workers, evaluate radiological systems and areas, and provide for proper control and disposal of materials.

Changes to the existing Part 12 rule are necessary to provide the fee structure for the TENORM registration and licensing process.

**The Part 12 changes include:**

- Adding a new section 12.8 to address the TENORM facility registration process parallel to the Part 20 requirements;
- Incorporating TENORM specific licensees to the current 3.Q fee category of Appendix 12A.
- Adding a new Category 27 fee to Appendix 12A applicable to TENORM registrants.

**The following provides details on the requirements and topics addressed in select sections of the proposed Part 20 rule.**

**Section 20.1**

This section contains the standardized language regarding scope, etc. and includes the current standardized language pertaining to documents incorporated by reference.

Section 20.1.3 provides the scope of the rule and also allows an eighteen month period after the effective date of the rule during which enforcement will be suspended. This period will allow for entities to perform a characterization to determine the applicability of the rule to their materials and operations, understand better how the rules will apply to those operations and materials and to develop programs to bring the operations into compliance. TENORM identification at generator sites, guidance development at the Department, and programmatic and operational development by all affected parties will be the main focus during the eighteen month period.

While the Department has done its best to identify TENORM materials generation over the years, there has never been a comprehensive inventory of materials generated in the state. A statutory prohibition on TENORM rule promulgation was in place until the passage of Senate Bill 18-245 and made it difficult for the Department to compel entities to properly characterize their materials. As a result there is still a significant amount of materials that need to be properly characterized.

Sample analysis can take a significant amount of time for analytical labs to complete due to the nature of the analyte. Radium-226 is most frequently analyzed using a laboratory method that requires the sample to be isolated for up to 28 days prior to the analysis. There is also a potential for delays in laboratory processing time as a result of an increased demand for radiological analysis of these materials. However, the eighteen month period after the effective date of the rule during which enforcement will be suspended will allow generators to have adequate time to identify the processes that are likely to concentrate naturally occurring radionuclides, sample the resultant materials, determine the applicability of the rule, identify the applicable requirements in the rule, and modify operations, as well as, any permits or authorizations that may be required in order to achieve compliance with the rule.

The Department is also committed to working closely with the regulated community to develop guidance for compliance with the rule. The industries that are typically generating these materials are doing so unintentionally and may have very little experience with the scientific concepts related to characterization and safe management of these radioactive materials. The expertise within the industries are typically focused on the particular

objective of the processes which create TENORM, i.e. oil and gas exploration and production or water treatment. As a result, the Department will work with the regulated community to ensure that there are various options available for compliance that can be integrated into the industry specific routine operations as much as possible. Guidance development will be an ongoing process but will be particularly important as materials are characterized and facilities begin developing programs for compliance. Achieving compliance may include updating any authorizations or permits issued by another agency for operations which involve materials that contain the TENORM. These tasks can take time and those subject to the TENORM regulation may be at the mercy of other agencies when it comes to processing time.

In addition to developing a program for compliance with this new rule, the Department acknowledges that the oil and gas industry will also be adapting to revised rules that are due to be adopted by the Colorado Oil and Gas Conservation Commission (COGCC) in November of this year.

Finally, the COVID pandemic has put a significant strain on operations for many of the stakeholders involved as well as the Department. Operational delays as a result of the pandemic have been systemic and this period will allow for a better incorporation of the new regulatory framework as the world begins to recover.

Section 20.1.4 provides detail on the applicability of the rule. This section specifically states that source material is not subject to the requirements or provisions of the rule. Source material is defined by statute as, "uranium, thorium, or any combination of uranium and thorium in any physical or chemical form, including ores that contain, by weight, one-twentieth of one percent or more of uranium, thorium, or any combination of uranium and thorium." The previously used TENORM policy and guidance included uranium and thorium as TENORM radionuclides. This was in conflict with the statutory definition of TENORM which specifically excludes source material. This change in focus was discussed with stakeholders at the very beginning of and throughout the rulemaking effort. Once the Part 20 rule becomes effective, it will help clarify that source material will be governed by the Colorado Radiation Control Regulations, 6 CCR 1007-1 Part 3. The Part 3 rule currently in place is consistent and compatible with the federal regulatory structure for the control of source material.

#### **Section 20.2**

This section provides formal definitions that are used throughout the Part 20 rule. Most definitions are derived from existing rules and statutes of the Department and other agencies.

#### **Section 20.3**

This section provides the broad general requirements that are applicable to all facilities that generate TENORM materials. The section includes requirements for initial and ongoing characterization of TENORM materials to determine applicability of the rule to a given operation or facility. The section also provides for the Department to incorporate additional criteria or requirements into any registration or license in order to protect health and safety as stated in other regulations.

Section 20.3.1 establishes the standard method and data format for quantifying TENORM concentrations. The standard data format to be used within the rule for TENORM concentration is radioactivity per mass in dry weight, typically picocuries per gram. Dry weight refers to the mass of a material excluding the mass of any water or moisture present within the material. Dry weight concentration limits are used universally in order to consistently and adequately assess the potential impact from these materials. Recognizing

that the sample results in dry weight may not represent the materials as they exist when generated, the Department has evaluated potential dose to receptors using realistic modelling scenarios to account for the dispersion of these materials in their common matrices and has accounted for the potential shielding and exposure rate reduction that is provided by the moisture content of the materials. For example, when performing dose assessments for occupational exposure scenarios involving a produced water in an oil and gas setting where these materials are typically found in a liquid form, dry weight values are converted to a radioactivity per volume format and the assessment incorporates the reduction in dose rate as a result of the materials being dispersed within a water matrix. This provides for an accurate and realistic representation of the true radiological hazard that exists in the real world as a result of the presence of these materials. Guidance will be provided on different methods of determining dry weight concentrations for characterization and compliance determination purposes.

Additionally, this section establishes that all limits and thresholds within the rule unless otherwise noted are in excess of natural background. The intention of the rule is to control the potential radiological dose to members of the public from TENORM materials. As noted above and in the proposed rule, the TENORM definition specifically excludes background radiation or the natural radioactivity of rocks or soils.

Section 20.3.2 requires that those who generate a waste, residual product, or other material by way of a process that has the potential to concentrate naturally occurring radioactive materials must make a TENORM determination to evaluate whether that material is subject to the rule. This is based on a concept used in the federal hazardous waste regulatory framework. The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. Under RCRA, hazardous waste generators are the first link in the hazardous waste management system. All generators must determine if their waste is hazardous and must oversee the ultimate fate of the waste. Furthermore, under RCRA, generators must ensure and fully document that the hazardous waste that they produce is properly identified, managed, and treated prior to recycling or disposal.

The RCRA approach is applied as the basis of the Part 20 rule and is appropriate in regard to the generation of TENORM due to the extensive universe of potential operations that use natural resources which may contain NORM as raw materials. The determination may employ process and industry knowledge in addition to radiological measurement and analysis. This determination is expected to be made based on the sum total of this knowledge and the radiological characterization of materials is expected to be based on a statistically significant data set rather than a single event or data point.

The Department's expectations are that initial determinations are made at the point at which the materials are generated, are no longer in process, and remain under the control of the generator. Additionally, the materials need to be readily accessible for sampling or measurement. The Department will be developing guidance with the input of industry and related stakeholders to establish acceptable process sampling points/locations for those who generate potential TENORM.

The ability to create waste or material profiles over time is also provided for in this section and will be encouraged for those processes that are ongoing and generate a reasonably consistent material. The stakeholders originally had concerns regarding storage of materials for extended periods of time due to laboratory turnaround times. The Department discussed

the concept of waste or materials profiling as a potential mitigating factor in the stakeholder meetings. Profiling of materials can allow for an initial full characterization and periodic confirmation sampling on materials. This would in turn allow for regularly produced materials to be characterized over time and avoid the need for extended storage. Adequate frequency of verification sampling will be developed with participation from stakeholders and included in guidance.

#### **Section 20.4**

This section provides an exemption from the requirements of Part 20 for certain facilities that meet specified requirements based on the concentrations, quantities, or categorical types of TENORM materials they produce, process, or handle. Operations that are exempted from the Part 20 requirements under the specified criteria are deemed to be of minimal risk to workers and members of the public. This section also explains that if a material or person is exempt as a result of meeting the criteria for any one exemption they are exempt from the regulation and do not need to meet the criteria of any other exemption category.

This section encompasses the first of the three tiers of hazard and control contained within the overall Exemption/Registration/Specific Licensing regulatory structure that the rule follows. The Department worked with stakeholders to establish the basic criteria for judging radiological hazard significance and appropriate level of control. A maximum radiological dose threshold of 100 millirem per year was established for exposure.

Once the radiological dose threshold was chosen, the Department performed dose assessments for a variety of activities to establish concentration and quantity thresholds that would not likely result in a member of the public, including workers involved in these activities, exceeding a radiological dose in excess of 100 millirem annually in the absence of any controls imposed by the Department. This is the radiological exemption criteria used within the rule.

The exempt concentration and quantity values are found in Tables 20-1 and 20-2.

Section 20.4.5 provides radiological exemption criteria for pipe generated by oil and gas operations. Exemption values based on a removable radioactive contamination limit criteria were adopted from two American National Standards Institute documents that considered potential radiological doses from these materials. Those documents are: ANSI N.13.12, Surface and Volume Radioactivity Standards for Clearance, 2013 Edition and N13.53, Control and Release of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), 2009 Edition.

In addition to the concentration and quantity based exemptions there are also categorical exemptions provided for household waste, consumer products, and common carriers subject to U.S. Department of Transportation regulations. Similar exemptions are found in other radiation control regulations.

Section 20.4.8 prohibits the purposeful dilution of TENORM materials to meet an exemption criteria and clarifies that dilution that occurs as a function of the routine, state of practice, and common operations within an industry are not prohibited. Comingling or combining identical or similar wastes at a facility for disposal as part of routine operations would not be considered purposeful dilution if it is a common practice. Additionally, if there is a common and necessary industry practice that may reduce the overall TENORM concentration - such as

adding alum to capture or sequester a constituent in a water treatment process - then this would be allowed and would not be considered purposeful dilution.

### Section 20.5

This section provides a process for the registration of facilities that produce, process, or handle TENORM materials and that are not otherwise exempted from the regulatory requirements of Part 20. The registration process includes requirements for providing certain information to the Department, periodic (annual) registration, and fee payment criteria. This section of the rule also provides for limitations and prohibitions on control and access to TENORM materials, labeling and signage, and recordkeeping requirements in order to maintain public health and safety. Also provided in this section are requirements for assignment of a knowledgeable individual to be responsible for compliance and minimum initial and retraining requirements for individuals employed at TENORM facilities.

The registration tier within the regulatory structure includes those facilities which manage materials that are in excess of the established exempt concentrations or quantities. The radiological criteria or limitation regarding dose to members of the public within the registration tier remains the same, it is unlikely that a member of the public will exceed 100 millirem annually as a result of these registered materials and operations. The difference is that these materials and facilities are registered with the Department and are subject to a variety of regulatory requirements and controls imposed both by this rule as well as other agencies who have authority over industry operations and the materials that contain the TENORM. The controls, prohibitions, and limitations on activities contained within the rule are established in order to provide an appropriate level of confidence that the 100 millirem threshold will not be exceeded. The Department performed extensive dose assessments and modelling in order to establish thresholds and limitations on operations, activities, and TENORM radionuclide concentrations for each of the defined registration categories. The Department utilized data and feedback provided by the stakeholders, information and data provided by the Department's TENORM report, and an understanding of the existing regulatory framework that each industry is subject to in order to develop the most realistic and likely scenarios for radiological exposure and to assess potential dose.

Section 20.5.3 establishes training requirements for individuals whose job duties may involve exposure to registered TENORM or radiation resulting from that material. The requirements are for training that is commensurate with the activities that an employee engages in as part of their work duties and provide a further level of protection and assurance that the 100 millirem threshold will not likely be exceeded as a result of registered TENORM. The Department expects to provide a significant amount of guidance related to training subject matter and the appropriate level of training for the various activities.

Section 20.5.4 contains requirements related to spills or releases of registered materials. The Department has worked closely with other regulatory agencies in order to minimize dual reporting and to partner with those agencies to establish the best path forward in terms of providing oversight in the event of a significant spill. The Department intends to work with other regulatory agencies such as the Colorado Oil and Gas Conservation Commission (COGCC) and the Water Quality Control Division through memorandums of agreement or other cooperative methods to establish the most significant threat resulting from spill events, the most appropriate response, and the most appropriate agency to take the lead on enforcement or oversight of remedial activities.

## Section 20.6

This section provides the requirements for registration as a TENORM generator, which can include oil and gas operations, drinking water treatment, domestic wastewater treatment and other water treatment facilities. Included are requirements for radiation monitoring and surveys, access controls, and acceptable disposal or disposition options specific to these generator operations.

Section 20.6.1 addresses oil and gas industry registration. This section requires that registrants managing materials generated by oil and gas exploration and production activities meet the requirements of the corresponding COGCC regulations. This, as described above, allows the requirements and limitations to be based on dose assessment scenarios limited by regulatory restrictions that are already in place.

The subsections within describe a number of defined waste streams or residual types and the specific limitations regarding the management and disposal or disposition of those materials. Materials include produced fluids, oily wastes, pigging wastes, filter socks, pipes, pipe scale, processing equipment, other non-hazardous waste, as well as RCRA hazardous waste.

The inclusion of produced fluids as a TENORM waste category was discussed extensively in stakeholder interactions and comments provided to the Department. There was some feedback that suggested that produced fluids should simply be considered naturally occurring radioactive materials or NORM rather than TENORM. The Department contends that oil and gas operations result in the concentration of radium within the produced fluids and therefore meet the definition of TENORM.

The second concern expressed by stakeholders regarding the inclusion of produced fluids was that they would likely all be exempt in terms of the TENORM exempt concentration values within the rule and as a result should be categorically exempt. This was frequently based on the claim that conclusive data demonstrating that the materials would qualify for exemption in almost every case was presented during the stakeholder process. The Department did request data from the oil and gas industry regarding TENORM content within produced fluids on a number of occasions throughout the stakeholder process that took place as a result of the SB 18-245 and on multiple occasions prior to that during meetings regarding the application of the previous policy and guidance to the oil and gas industry. The oil and gas industry provided significant sampling and analysis data to the Department to be included in the TENORM report but of the more than 230 sample results provided, none were produced fluid samples. The only significant source of produced fluid characterization data was provided in a November 2019 COGCC report titled "Sampling and analysis of naturally occurring radioactive material in oil and gas produced water." That report included 52 samples from 45 facilities across the state. The report contained the following information and conclusions regarding TENORM radionuclides and produced waters:

- "This study collected representative samples from many areas of the state and attempted to gather samples from all areas of the state with significant oil and gas operations in proportion to produced water production. That goal was not completely met as no produced water samples were collected from Rio Blanco County from which approximately 33% of the total produced water volume in Colorado (2017) was reported."
- "The project's radiochemistry data and geochemistry results demonstrate that the composition of the rocks in contact with the produced water is the dominant factor in

the overall water quality (TDS for example) and radiological content of the produced fluids.”

- “...in some cases, the level of NORM activity in E&P wastes may be equal to activities of materials governed under TENORM regulatory programs in Colorado or other states. In some instances the handling and disposal of produced water and associated E&P wastes may create situations with potential for increased radiation exposures particularly to workers who may come in close contact with produced water or sediments from produced water...”
- “The medians, means, and maximums of gross alpha and gross beta activities of produced water samples are higher than the same statistics for surface and domestic groundwater samples for which data is present in the COGCC database.”
- Regarding a sample that had high uranium and radon (which is a progeny or daughter radionuclide of radium) content but low radium content, “...high <sup>222</sup>Rn activity simultaneous with very low <sup>226</sup>Ra activity indicates the presence of Ra in the aquifer solids, even if very low in the water sample collected perhaps due to the geochemistry of the water sample itself, which has dominant anions of sulfate and bicarbonate alkalinity unlike many of the produced waters, which are more frequently dominated by chloride anions.”
- “Significant variations in the geochemistry of produced waters were observed within waters produced from the same formations in the same basin and even in formations in stratigraphic proximity to one another.”

These findings are in accord with the Department’s basis for determining that the produced fluids meet the TENORM definition and suggest that the sampling may not be comprehensive enough to suggest that the entirety of the state’s produced fluids have been adequately characterized.

A review of the COGCC data in relation to the exempt concentration values included within the rule found that approximately 7% of the 52 samples would have been in excess of the exempt concentration and subject to registration. The Department has concluded that with limited data there is not at this time a reasonable basis for a categorical exclusion.

Additionally, the COGCC draft “Statement of Basis, Specific Statutory Authority, and Purpose” for proposed amendments to their rules, 2 CCR 404-1, indicated that TENORM isotopes would be added to the list of analytes that operators must analyze in produced water in an effort to better characterize this waste stream. This requirement may be revisited at a later date based on the results of those tests. The Commission determined that, although some of their stakeholders were of the opinion that produced water contains little NORM and these tests were unnecessary, there is insufficient evidence with respect to NORM in produced water to make a conclusive determination at this time.

The Department agrees with the assertion that there is insufficient evidence to make a conclusive determination regarding TENORM content in produced fluids.

Sections 20.6.1.E and 20.6.1.H require indoor air quality radon monitoring for filter sock and RCRA wastes that are in excess of 50 picocuries per gram of radium-226 and stored in occupied workspaces. These requirements are in place to ensure that the 100 millirem per year threshold is not exceeded as a result of radon exposure. The rule requires that those areas do not exceed a radon concentration of 4 picocuries per liter. This limit is equivalent

to the EPA's radon action level for residential indoor radon. The Department chose the 4 picocuries per liter after consideration of both the EPA action level as well as an information note prepared by the United Nations Committee on Effects of Atomic Radiation (UNSCEAR) and the International Committee on Radiological Protection (ICRP) for Participants at the IAEA Technical Meeting on the Implications of the New Dose Conversion Factors for Radon in October of 2019 that would suggest that a 4 picocuries per liter threshold at 2000 hours per year would be commensurate with our 100 mrem dose constraint for registrants.

Sections 20.6.1.E, 20.6.1.F, and 20.6.1.H require dose rate surveys, restricting access to areas, and documenting access to areas where filter sock and RCRA wastes that are in excess of 50 picocuries per gram and non-exempt pipes, pipescale, and other processing equipment are stored. These requirements are in place to ensure that the 100 millirem annual threshold will not likely be exceeded as a result of external exposure resulting from higher activity materials. There is a limitation on a maximum dose rate of 2 millirem per hour which is equivalent to the maximum hourly dose limit for a member of the public as a result of operations specifically licensed to use radioactive materials in federal and state regulation. Additionally, there is a limit of 11 microrem per hour for unrestricted areas. This ensures that if any member of the public were to occupy that unrestricted space for an entire year (8760 hours) that the dose would not exceed 100 millirem. Finally, there is a limit of 50 hours for a worker in a space that exceeds 50 microrem/hour. This ensures that even if a worker were to be in close proximity to the restricted space for a 2000 hour work year that they would not exceed 100 millirem and if they were to spend time within the restricted space for 50 hours a year exposed to up to the 2 millirem per hour limit that they would not exceed the 100 millirem threshold.

Section 20.6.2 addresses water treatment registration, and provides concentration limits for these residuals as well as disposal and beneficial use options. This section also requires dose rate and radon monitoring, equivalent to those described above, for drinking water treatment residuals that have concentrations in excess of 50 picocuries per gram. The section provides a framework for drinking water treatment, domestic wastewater treatment, and other water treatment activities. The more general water treatment registration is provided to capture other treatment systems such as mine, construction, and other industrial operations that involve water treatment that may increase the concentration of TENORM radionuclides.

### **Section 20.7**

Following activities that generate or concentrate TENORM materials, some materials that contain low concentrations of TENORM may be used for alternative beneficial purposes. The facilities that handle these materials for beneficial uses may include those that distribute biosolids, those that apply the biosolid materials to land, composting facilities, and other types of beneficial use. The provisions of this section provide the limitations, and characterization needs applicable to these beneficial use operations.

Section 20.7.1 provides a framework to allow for the beneficial use of biosolids. The Department worked with stakeholders to better understand the use of biosolids as a fertilizer and/or organic soil amendment and the requirements already imposed on those activities by the Water Quality Control Commission's biosolids regulation number 64, 5 CCR 1002-64.

Registrants are required to conduct operations in accord with 5 CCR 1002-64 and are limited to applying materials with TENORM concentrations less than 25 picocuries per gram. Additionally, applications to each parcel of land are limited to no more than twenty crop cycles or individual applications. The Department based these limitations on dose assessments

conducted by both the Department staff as well as the Interagency Steering Committee on Radiation Standards (ISCORS). ISCORS is comprised of eight federal agencies, three federal observer agencies and two observer member representatives from state radiation control organizations.

ISCORS facilitates consensus on acceptable levels of radiation risk to the public and workers and promote consistent risk approaches in setting and implementing standards for protection from ionizing radiation.

Department dose assessments using realistic biosolids land application scenarios were in agreement with the assessments performed by the ISCORS organization and provided confidence that the activities permitted in the rule with the limitations as presented would not result in a dose to any member of the public in excess of the 100 millirem annual threshold.

This section also requires sampling and characterization of the materials for TENORM radionuclide concentrations prior to application and uses a sampling and analysis frequency identical to the required frequency for sampling and characterization of other constituents that are required by the biosolids regulations of 5 CCR 1002-64. This allows for the TENORM requirements to integrate into the routine operations of the industry and reduces excess burden that could be a result of the rule implementation.

Records of land application are required to be submitted to the Department so that the land can be tracked to ensure that the applications do not exceed the limit provided by the rule. Compliance with this requirement can be achieved by including the TENORM radionuclides in the standard annual report required by 5 CCR 1002-64 and providing a copy to the Department. This again was designed to reduce additional regulatory burden and utilize the existing regulatory structure to accomplish the goals of TENORM regulation.

Section 20.7.2 provides a structure identical to the biosolids beneficial use section applicable to the analogous use of water treatment residuals for land application.

Section 20.7.3 addresses the acceptance or use of feedstock which contain TENORM for composting. As with other sections, these registrants are required to comply with the regulations of other agencies applicable to these operations. Registrants are required to characterize finished compost materials for their TENORM content prior to releasing them for unrestricted use. The final product must be less than the exempt concentrations defined by this rule in order to be distributed for unrestricted use.

Section 20.7.4 provides a registration structure for other beneficial uses of materials that contain TENORM. The rule requires that these registrants provide a dose assessment, demonstrating that the 100 millirem threshold will not be exceeded by the proposed operations or use, to the Department for review and approval. Additionally, the registrant must obtain a Beneficial Use Certification or Determination from the Hazardous Materials and Waste Management Division of the Department and a written approval from the radioactive materials program prior to commencing any activities.

## Section 20.8

Many TENORM materials may be disposed in a landfill or similar authorized disposal facility. These disposal facilities must register as a TENORM disposal facility and adhere to the limitations and requirements of this section.

Section 20.8.1 provides a framework for a sanitary or municipal solid waste landfill to accept TENORM materials for land disposal. Over the last decade or so, the Department has worked with landfills to extend one time approvals for the acceptance of limited amounts of TENORM. These have mostly been residuals from drinking water treatment processes. This process was extremely labor intensive for the generators, the facilities, as well as the Department. The generators would need to provide a request for disposal accompanied by TENORM characterization documentation to the radiation control program for review and approval. Once that was completed the disposal facility would have to request a one-time approval from the solid waste permitting unit of the Department for the specific waste. This process was lengthy and a source of frustration for the stakeholders involved. As a result the Department worked with a number of disposal facilities to develop dose assessments and waste acceptance criteria which would allow for an ongoing approval of those facilities to accept TENORM wastes without the need for a Department review each time the waste was accepted. This experience allowed the Department the opportunity to understand the processes and exposure scenarios that are present at sanitary and municipal solid waste landfills associated with the disposal of TENORM. With that information dose assessments were performed by the Department in order to develop a general set of design, operational, and acceptance criteria for the rule such that each disposal facility would no longer need to develop a site specific dose and risk assessment to be able to accept TENORM materials as part of their normal operations and without case by case approval from the Department. The registration requires that certain minimum design and operational requirements are in place and that their approved engineering design and operating plans are updated to include Part 20 requirements and approved in accord with the solid waste regulations, 6 CCR 1007-2 Part 1. These design, operating, and acceptance elements when implemented provide confidence that the 100 millirem annual threshold will not be exceeded for any member of the public.

Section 20.8.2 provides a structure for the registration of centralized E&P waste management facilities analogous to the sanitary and municipal solid waste landfill. These facilities are subject to the COGCC regulations for waste management of oil and gas related waste streams and registrants are required to incorporate TENORM requirements into their procedures and operational plans required by 2 CCR 404-1.

### **Section 20.9**

This section provides requirements for those materials or activities that may be subject to registration, rather than specific licensing, but do not fit into the specific generator, beneficial use, or disposal categories as provided in sections 20.6 through 20.8.

If a generator, beneficial user, or disposal facility does not meet the requirements of the predesignated registration categories and would like to perform operations as a registrant rather than a specific licensee they may provide a request to the Department to do so. The Department may grant approval in writing for an entity to register in lieu of obtaining a specific license if it determines that the operations and activities will not likely cause a member of the public to exceed the 100 millirem annual dose threshold.

The Department will provide a specific written approval detailing any limitations and restrictions on registrant activities.

**Section 20.10**

This section provides the requirements for recordkeeping associated with the activities of a TENORM registrant. This includes information pertaining to TENORM materials characterization, information on receipt, transfer and disposal, employee training and qualifications, and spills or releases of TENORM materials.

**Section 20.11**

This section provides the Department with the ability to approve of the transfer of registered material that has not been specifically detailed or authorized by other sections of the rule.

**Section 20.12**

This section provides the requirements for termination of registration due to permanent facility or area closure. Requirements provide assurance that no residual materials will be left in place and that no potential exists for an annual dose in excess of 100 millirem to be delivered to any member of the public as a result of registered activities.

**Section 20.13**

This section, in conjunction with other radiation regulations provides the requirements for the specific licensing of TENORM facilities that generate, handle, or process higher activities of TENORM materials. The section also provides for a case-by-case evaluation process for exemption from specific licensing requirements when material quantities do not explicitly meet the exemption or registration criteria in other parts of the rule, but otherwise demonstrate meeting the specified dose limits.

Section 20.13.1 requires that upon completion of a TENORM determination that concludes the materials generated are not eligible for exemption or registration in one of the pre-designated registration categories, an individual must within 90 days file an application for a specific radioactive materials license or make a request to the Department to for an exemption from the requirements for a specific license. This request shall include a dose assessment which demonstrates that no member of the public will exceed 100 millirem as a result of the activities involving the TENORM materials. The Department may then either approve the request and issue an approval for registration under Section 20.9, approve an exemption from the rule, or deny the request and require a specific license for the materials and operations.

Senate Bill 18-245 required the Department to develop a proposed residuals management rule based on the TENORM report which includes at a minimum, regulatory limits for landfill disposal, beneficial reuse, and exemption levels and would allow for the beneficial reuse of water treatment residuals and by-products of the wastewater treatment process. The bill also required that the development of concentration limits for each of these management options must be based on the contribution to public dose and consider different activities specific to each management option. The proposed new Part 20 rule meets the requirements in Senate Bill 18-245 by providing a structure for the management of these materials including exemption limits, landfill disposal limits, beneficial use pathways for drinking water and wastewater treatment residuals and in all cases includes regulatory limitations and requirements based on an industry specific scientific analysis of the potential contribution of radiological dose to members of the public.

Specific Statutory Authority.

Statutes that require or authorize rulemaking:

Sections 25-1.5-101(1)(k), 25-1.5-101(1)(l), 25-11-103, 25-11-104, and 25-1-108, C.R.S.

Other relevant statutory sections: 25-11-104(1)(b)

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Is this rulemaking due to a change in state statute?

Yes, the bill number is Senate Bill (SB) 18-245.

Rules are  authorized  required.

No

Does this rulemaking include proposed rule language that incorporate materials by reference?

Yes  URL

No

Does this rulemaking include proposed rule language to create or modify fines or fees?

Yes

No

Does the proposed rule language create (or increase) a state mandate on local government?

No.

- The proposed rule does not require a local government to perform or increase a specific activity for which the local government will not be reimbursed;
- The proposed rule requires a local government to perform or increase a specific activity because the local government has opted to perform an activity, or;
- The proposed rule reduces or eliminates a state mandate on local government.

Yes.

This rule includes a new state mandate or increases the level of service required to comply with an existing state mandate, and local government will not be reimbursed for the costs associated with the new mandate or increase in service.

The state mandate is categorized as:

Necessitated by federal law, state law, or a court order

Caused by the State's participation in an optional federal program

Imposed by the sole discretion of a Department

Has an elected official or other representatives of local governments disagreed with this categorization of the mandate?  Yes  No. If "yes," please explain why there is disagreement in the categorization.

Please elaborate as to why a rule that contains a state mandate on local government is necessary.

The requirements of Senate Bill SB 18-245 and associated proposed Part 20 rule will impact some local governments that operate landfills, drinking water treatment

facilities or wastewater treatment plants. These facilities along with privately owned facilities will be required to implement certain requirements of the rule depending upon whether sampling and analysis data indicate the presence of TENORM materials above certain limits in the wastes or residuals they dispose of or produce. These requirements include but may not be limited to initial and periodic sampling and measurements for characterization of TENORM materials, application and payment of fees associated with registration or licensing of the facility or operation if certain criteria are met, disposal of TENORM materials using authorized facilities or methods, and training and monitoring of personnel. Implementation of the requirements in the proposed rule will depend on the type of operation and the quantities of TENORM materials generated by their processes. It is expected that many facilities will be exempt from the regulations, but this cannot be known until sampling and analysis for TENORM materials is completed by each facility.

DRAFT REGULATORY ANALYSIS  
 6 CCR 1007-1, Part 20, "Registration and licensing of Technologically Enhanced Naturally  
 Occurring Radioactive Material (TENORM)"  
 6 CCR 1007-1, Part 12, "Fees for radiation control services"

1. A description of the classes of persons affected by the proposed rule, including the classes that will bear the costs and the classes that will benefit from the proposed rule.

Group of persons/entities affected by the Proposed Rule	Size of the Group	Relationship to the Proposed Rule Select category: C/CLG/S/B
Public and private drinking water treatment facilities/utilities.	Approximately 2000	C / CLG
Public and private waste water treatment facilities/utilities.	Approximately 600	C / CLG
Oil and Gas operators that may generate TENORM materials through oil and gas exploration and production activities.	Approximately 300	C
Sanitary landfills or municipal solid waste landfills.	Approximately 55	C / CLG
Centralized E&P waste management facilities	49	C
Entities that beneficially use, distribute or perform land application of TENORM materials.	Approximately 500	C / CLG
Active mine water treatment operations	10	C
Other entities performing activities that concentrate TENORM materials.	Unknown	C
Entities or individuals that provide consulting, maintenance, repair, or cleaning services to public and private drinking water or waste water treatment facilities or other prospective TENORM registrants.	Approximately 10	C / S
Environmental advocacy group(s).	10	S
Environmental consulting companies.	5	S
Analytical Laboratories	7	S
Entities or agencies that regulate non-TENORM related aspects of facilities that produce TENORM materials.	5	S
Organizations who collectively represent or advocate for providers of drinking water and/or waste water treatment systems.	5	S
Organizations who collectively represent or advocate for the oil and gas industry.	4	S
Organizations who collectively represent or advocate for the mining industry.	2	S
Residents of the state of Colorado who rely upon drinking water and waste water treatment facilities.	5,000,000 or approximately 85% of the state population	B

While all are stakeholders, groups of persons/entities connect to the rule and the problem being solved by the rule in different ways. To better understand those different relationships, please use this relationship categorization key:

- C = individuals/entities that implement or apply the rule.
- CLG = local governments that must implement the rule in order to remain in compliance with the law.
- S = individuals/entities that do not implement or apply the rule but are interested in others applying the rule.
- B = the individuals that are ultimately served, including the customers of our customers. These individuals may benefit, be harmed by or be at-risk because of the standard communicated in the rule or the manner in which the rule is implemented.

More than one category may be appropriate for some stakeholders.

2. To the extent practicable, a description of the probable quantitative and qualitative impact of the proposed rule, economic or otherwise, upon affected classes of persons.

The stakeholder engagement process allowed the Department to identify a number of economic and non-economic concerns that were considered during the regulatory development process. These included some that were mitigated or resolved as the rule matured in its development. Examples of these are the possibility of prohibition of the use of biosolids as a sustainable source of nutrients for crops, a requirement for the sampling of every individual truckload or package of TENORM materials, that there would be no exemption for facilities within an identified industry who did not generate TENORM, that entities would have to submit information to both the Department and a waste disposal facility for separate approval each time they were disposing of materials, that all naturally occurring materials would be regulated, and that thresholds for regulation would be arbitrarily selected rather than science based. As the rule was developed and stakeholder engagement continued these concerns were addressed within the rule which allows for the beneficial use of biosolids, waste profiling, the exemption of low concentration and other categories of TENORM, and transfer of waste to registered facilities without specific per load approval. It was also made clear within the rule and during stakeholder engagement that the rule is clearly focused on TENORM as it is defined, rather than all naturally occurring radioactive material, and based on a scientific review and assessment of potential radiological doses to members of the public.

In addition to those concerns that were mitigated there were also many concerns identified during the stakeholder engagement process that do present and will have ongoing economic impact. The Department worked with representatives of each of the industries that have been identified as being subject to the rule to further develop this list and estimate both the quantitative and qualitative costs and benefits within each category identified. These will be explored here, where possible with specific cost and cost range information.

#### Economic outcomes

Summarize the financial costs and benefits, include a description of costs that must be incurred, costs that may be incurred, and any Department measures taken to reduce or eliminate these costs, any financial benefits.

C and CLG: For facilities that must implement the proposed requirements due to their processing, handling, or disposal of materials there will be costs associated with the following broad categories. The costs are first discussed by category and then ranges and examples by registrant or license type are provided in table format:

- **Sampling/analysis.** Costs will be incurred for the sampling and analysis of TENORM materials in order to characterize what a given facility is handling, processing, disposing, or transferring.

Sampling costs range between \$50 and \$100 dollars per hour. When performed by the facility itself. The range reflects differences in the pay structure of the employees involved and the ease of sampling. Some materials may be readily available for sampling while others may require additional equipment or operations to access the materials that need to be sampled.

Some facilities may alternatively use a service provider to perform the sampling activities and those costs would then extend that range to a high end of approximately \$225 per hour.

The amount of time required for initial sampling will ultimately depend on the number and type of wastes or residuals that are generated by a facility. A material that is relatively homogeneous in its composition will likely require no more than 6-10 samples be taken for adequate characterization and a sampling event would likely be completed in single day.

Sample analysis costs range between \$150 and \$300 per sample. This is based on samples being sent to a commercial laboratory. The Department will be working with facilities to develop and approve alternative forms of analysis for ongoing characterization such as field screening techniques that would allow for a handheld or portable radiation detection device to be used to quantify TENORM concentrations for materials that have traditionally been sent to a commercial laboratory. Once approved and implemented it is likely that a field screening method will significantly reduce the costs for analysis compared to the cost of analysis at a commercial laboratory. In addition to approving field screening methodology, the Department intends to work with the oil and gas industry to explore options for characterizing wastes on a geologic or geographic basis, looking at materials generated as a result of activities extracting materials from the same basin or formation. Data may demonstrate that these materials share the same radiological characteristics. In the event that data shows a consistency across these formations and geographic areas there may be an opportunity to use that data as a tool to collectively profile materials by the geologic or geographic area and reduce the number of samples required for the each individual facility. This potential reduction in the number of samples required could provide a very significant reduction in costs per facility.

Finally, many of the materials that require a TENORM determination are also required to be sampled and analyzed for other constituents for non-TENORM compliance purposes. It is difficult to clearly delineate costs that are incurred when a sampling event can serve multiple purposes, i.e. a sample of produced

water may concurrently satisfy the requirements of this rule as well as those of COGCC, a sample of solid waste may satisfy the requirements of this rule for radionuclides and those of RCRA or the solid waste regulations for hazardous constituents, a sample of a finished product for land application may satisfy the requirements of this rule for radionuclides and the nutrients requirements of the water quality regulations for the land application of biosolids. Keeping this in mind there may be a portion of the costs attributed to these activities that are shared to satisfy other requirements. For the purposes of the estimates within this document no reduction has been accounted for and the costs are presented without adjustment for this fact. The Department has crafted the rule in such a way that many of the requirements for sampling and analysis mirror the requirements of other regulations to allow for sampling events to serve both purposes and to be more cost efficient.

- **Residual/Waste characterization and profiling.** There will be costs associated with waste profiling or characterization, some of which will be dependent upon acceptance criteria and other requirements of the receiving waste facility.

Data results from analysis will need to be reviewed and interpreted in order to make a TENORM determination and potentially develop a profile of the waste or residual for use over time.

In order to make an adequate TENORM determination the data must demonstrate, statistically, that the materials are appropriately characterized. This means that an adequate number of samples have been taken and that the upper limit of the confidence interval for the data set does not exceed the regulatory threshold that is being used.

The Department has created a user friendly spreadsheet that will allow for a facility to easily perform this analysis in a relatively short time. The analysis should take less than an hour once the data are available to be reviewed.

Characterization and profiling costs range between \$50 and \$100 dollars per hour based on the pay structure of the employees involved. The expectation is that each material generated is fully characterized at least once initially and that verification sampling then happens periodically over time. As a result there is a likely cost of approximately \$100 per year for this activity for the majority of generator registrants.

There is also an associated cost for the disposal and beneficial use facilities to review these characterization data sets and profiles as they accept the materials from generators. We estimate these review costs to range between \$50 and \$100 dollars per hour as well but understand that the annual costs are dependent on the number of generators and individual waste streams or material types that they accept each year.

- **Registration/licensing.** Where not exempted by regulation based on the quantity/concentration of TENORM in the materials they handle or process, facilities will incur costs associated with registration or specific licensing. These costs include registration and specific license fees, as well as the costs

for preparation of the initial registration information or a specific license application.

The proposed annual fee for registration is \$200 dollars per facility. Additionally, if multiple facilities are located in the same township only one \$200 fee will be due for those facilities. A township is a six mile by six mile geographic area designated by the United States Bureau of Land Management Public Land Survey System. This will reduce the cost of registration for oil and gas operators that have multiple wells grouped together in producing areas. This will also apply to entities which have drinking water and wastewater treatment facilities close to each other.

The proposed annual fee for a specific license is \$2,790 dollars. Additionally, persons with radioactive materials licenses authorizing permanent, multiple locations that are separated by more than one mile shall increase the annual fee by 75 percent for the second location; 50 percent for the third location; and 25 percent for each additional location of use.

It is estimated that the time required to collect, compile, and provide the required information for registration of a single facility would range from four to six hours per material type generated or accepted for disposal or beneficial use. Hourly pay ranges from \$25 to \$50 for this work. The total cost range for information preparation related to registration would be approximately \$100 to \$300 annually per facility and material generated or accepted for disposal or beneficial use.

As with registration, there is a cost to preparing the information required for a specific license application. It is estimated that the initial cost will likely fall in the range of \$5,000 to \$7,000. This considers the time to develop a radiation safety program, standard operating procedures, and a public dose estimate as well as completing the required application. This assumes that the applicant is preparing these materials in house. If a consultant is relied on for preparation the costs could range as high as \$20,000 to \$30,000 for a complete application.

Facilities that accept materials for disposal or beneficial use are required to incorporate TENORM materials into a number of documents required by other agencies. These documents include engineering design and operating plans, waste or feedstock acceptance criteria, leachate monitoring plans, surface and groundwater evaluations and monitoring plans, as well as closure plans. Modification of these plans can require a number of hours to complete. Some estimates by stakeholders suggest the costs have approached upwards of \$40,000 to modify these plans for the acceptance of TENORM in the past. These costs would have included the cost of hiring a health physics consultant to perform an acceptable site specific dose assessment as part of the process. The Part 20 rule has eliminated that cost by using generic dose assessments as a basis for authorization to accept materials as a registrant. Although no site specific assessments will be needed for well-engineered landfills there can still be a significant amount of time required to modify these documents.

- **Disposal costs.** The cost of disposal may be lower than what a facility currently pays, may remain the same, or may increase based on the characterization of their TENORM materials, the required or available disposal methods and sites.

The cost for disposal of TENORM materials at a commercial solid waste facility can range from \$40 - \$50 per ton. This can constitute up to a 300% increase in disposal costs if the materials were not considered TENORM in the past.

This would be an increase for those facilities who have not characterized or identified their materials as TENORM when disposing at a commercial solid waste facility. However, many facilities have identified their materials as TENORM and consequently been limited to disposing of their materials at a RCRA C hazardous waste landfill that is specifically licensed to accept radioactive materials. This is a result of very limited options when considering disposal at a commercial solid waste facility. A RCRA C hazardous waste facility with a specific radioactive materials license may accept TENORM at the concentrations allowed for registrants within the rule and greater. The cost for disposal of TENORM materials at this type of facility can be three times greater than the anticipated costs for disposal at a registered commercial solid waste facility and six times greater than the cost for disposal of non-tenorm materials. As a result, implementation of the rule will have different implications for those subject to the rule based on whether or not they have previously identified the TENORM materials or not and whether or not they have previously been disposing of these materials at a commercial solid waste or a RCRA C hazardous waste facility.

As discussed within the Basis and Purpose section, the rule now provides a less complex pathway to allow for commercial solid waste facilities to accept TENORM materials. The Department expects that this pathway will encourage more commercial solid waste facilities to register and accept these materials. This will reduce both the necessity to go to a RCRA C hazardous waste facility and the associated costs for many generators.

Costs for disposal vary considerably as a result of the differences between the volumes of wastes produced at different sized facilities. Because of these significant differences it is difficult to provide a true and meaningful cost range for all of the different facilities. As a result the ranges for disposal costs are presented as percentage increases or decreases based on the application of the rule. These costs, however, are not insignificant and this is demonstrated by a review of annual disposal costs at a single average operating well provided by the Colorado Oil and Gas Association and the American Petroleum Institute which estimated that, with four TENORM waste streams, the total cost would exceed \$200,000. The review estimated the following annual costs per waste stream; Produced Water: \$30,000, Filter Socks: \$120,000, Tank Bottoms: \$40,000, and Other Solid Wastes: \$10,000.

- **Transportation.** As with disposal costs, the cost of transportation may be lower than what a facility currently pays, may remain the same, or may increase based on the characterization of their TENORM materials and the distance to a required or available disposal site.

Transportation costs range from \$100 to \$150 per hour and can account for a significant portion of the cost of disposal. As described above with disposal costs the economic impacts associated with transportation can be positive or negative depending on the current practice of the generator. If the wastes are currently taken to a RCRA C hazardous waste facility 3 hours away but the rule allows for a commercial solid waste facility less than an hour away to register and accept those same wastes the result is a 66 percent decrease or savings in transportation costs. Conversely, if the materials have been going to a local landfill as solid waste and the rule would no longer allow for acceptance of TENORM, the materials will need to be transported to a new facility that is further away and would result in an increase in transportation costs. For example the increase associated with a twenty minute transport versus a three hour transport is \$400 or 800% of the original cost.

As part of the stakeholder engagement efforts related to this rulemaking, as well as during the thirteen years of implementation of the previous TENORM guidance and policy, the Department had explored the topic of the lack of available options for disposal extensively with members of both the disposal industry and other industries that generate TENORM. The conclusion drawn from those interactions was that everyone would benefit from a rule structure that allowed for more facilities to be approved to take these materials.

- **Training.** Under the proposed rule, TENORM facilities will be required to expend resources to provide varied levels of training for their employees. These trainings may be developed and presented by facility employees or contracted out. Similar to other registered or licensed facilities regulated under areas of the radiation program, a graded approach will be needed with some employees requiring only limited awareness training while others will need more extensive training depending upon the employees work activities.

Training costs are estimated to range from approximately \$100 to \$150 per hour.

The Department would expect that the vast majority of individuals that will require training would likely need one to two hours of initial training and an additional one to two hours once every three years. TENORM registrants are required to provide training that is commensurate with their job duties and the potential for exposure to the radiation that results from TENORM. The one to two hours of training will need to focus on basic concepts related to radiation and radiation safety, general awareness of the materials that they may encounter in the workplace, and the basic regulatory requirements pertaining to TENORM.

Some individuals who physically handle TENORM materials as part of routine operations, perform sampling or surveying activities, or work in areas that have the potential for an increased exposure will require a more extensive training.

The Department plans on working with industries to develop training plans based on the various job duties and activities that individuals are assigned and providing guidance related to the extent of the required training for different classes of employees. Additionally, guidance will include the basic topics that

need to be covered and potentially some training materials that may be used to satisfy the requirements of the rule.

For those who need more in depth training, costs will range between \$700 and \$3,000 dollars for initial training. These costs are based on offerings that are currently available from consulting firms in the state and typical hourly wages for the industries subject to the rule. Available trainings range in complexity from a two hour TENORM awareness course all the way to a forty hour Radiation Safety Officer (RSO) course. There is no requirement for an RSO for registrants but a specific licensee would require a trained RSO.

As with many of the other categories the overall annual cost of training can vary depending on the size of a facility, the number of employees, whether a facility requires a specific license, and the activities a registrant or licensee may have their employees performing.

- **Recordkeeping.** The implementation of the rule will result in some additional costs associated with recordkeeping and reporting, including records associated with:
  - The initial and periodic characterization of TENORM materials;
  - Routine periodic area/facility radiation surveys and occupancy or access;
  - Monitoring records;
  - Staff training records;
  - Receipt, transfer or disposal records;
  - Land application records; and
  - Records associated with the reporting of events involving spills or releases, loss or theft of materials, or other events of radiological significance.

Cost estimates for recordkeeping requirements depend on the number of waste or residual streams that may need to be characterized, which requirements apply to a specific facility, the number of employees that require training, the frequency of receipt, transfer, disposal or land application, and the likelihood of an event which needs to be recorded. This can vary significantly from one facility to the next but a reasonable cost per record should fall in the range of \$5 to \$10 dollars per record. This estimate includes staff time to enter information into an electronic system or to file a paper copy, to develop or purchase software to organize records electronically, and to maintain storage equipment.

- **Survey and monitoring costs.** Facilities that generate, process or store TENORM materials may need to perform routine or periodic monitoring of the workplace for radiation, contamination, and radon associated with TENORM to ensure the safety of employees, and members of the public is maintained and to demonstrate that the facility is operating within applicable regulatory requirements.
  - For some higher concentration materials the rule requires that radiation dose rates be limited and as a result dose rate surveys must be performed in order to demonstrate compliance. These dose rate surveys may need to

be done as often as daily if there are materials being continuously generated and incorporated into a storage area.

A trained individual should be able to complete surveys to establish that dose rates do not exceed one of three thresholds that exist within the rules in about 15 minutes. Equipment required for this type of activity runs on the order of \$3,000 to \$5,000 dollars to purchase. This equipment typically would last for at least five to ten years in the field. Costs for these surveys range from \$25 per area per day, for a trained employee to perform, to upwards of \$2,000 if a service provider was contracted to perform a half day survey.

- Radon Monitoring is also required for the indoor storage of materials in a work area that have concentrations of Radium-226 in excess of 50 pCi/g. Costs for this type of monitoring range from \$20 to \$60 for a Long Term Radon Test Kit.
- Commercial solid waste disposal facilities will incur costs associated with monitoring of leachate collected in their facilities and potentially as a part of their groundwater monitoring. The total number of analyses will depend on the quantity of leachate produced and the results of the leachate monitoring will dictate whether the groundwater monitoring will need to include TENORM radionuclides in the analysis.

Centralized E&P facilities are also required to incorporate TENORM analysis into the monitoring of groundwater, surface water, or soil monitoring that is required by COGCC.

Land Application registrants are required to analyze their finished product after final treatment. The sampling and analysis frequency is determined according to the quantity produced annually.

Composting facilities are required to analyze their finished product prior to sale or distribution. The sampling and analysis frequency is determined according to the quantity produced annually.

The costs for these analyses associated with monitoring programs will be similar to the costs associated with the sampling and analysis of TENORM materials for initial characterization as discussed above. Also, as noted above these materials are required to be sampled and analyzed for other constituents to satisfy the requirements of regulations that currently apply to them so the costs may not be a result of the application of the TENORM rule alone. Again, the Department crafted the requirements in the rule to allow for these sampling events to serve the dual purposes of TENORM monitoring and other monitoring in an effort to reduce burden to the regulated community and reduce the cost implications of sampling.

- Waste Pipe. The majority of TENORM materials will require sampling and analysis of materials to determine their TENORM concentration but the rule also requires that waste pipe from the oil and gas industry is characterized by way of dose rate surveys. During a plugging and abandonment activity

for an oil and gas well that is being taken out of service it is anticipated that up to four miles of pipe will be removed from the well and need to be surveyed. Four miles of pipe is approximately 21,000 feet of pipe and approximately 420 fifty foot sections of pipe to be surveyed. Survey of these materials would likely take approximately 40 hours for a trained field technician scanning at approximately five centimeters per second. As mentioned above, equipment required for this type of activity runs on the order of \$3000, to \$5000 dollars to purchase and typically lasts for five to ten years.

This survey activity would result in a cost of between \$2200 and \$13,000 per closed well depending on whether or not a service provider would be contracted for the work or a trained employee of the facility would perform the survey. Considering that the average cost of plugging a well is approximately \$82,500, survey costs may represent an approximately 2.5 to 15 percent increase per well.

- Surveys may also be required for termination of registration or specific license.

The Department will be working with industry to develop guidelines for appropriate surveys for termination. The expected costs for termination or closure can range from \$0 (if there is no expectation of residual TENORM based on the type of activities or operations registered) to \$9,000 per day in the case that a service provider were performing an EPA Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) type survey.

- **Service contracting.** A TENORM facility may be required to contract with service providers that hold (or will be required to hold) a specific license to perform certain higher-risk activities involving TENORM materials.
- Within the rule there are a limited number of restrictions on activities that would potentially provide a pathway for radiological exposure different from that found in routine operations. Certain activities or operations, when involving some of the higher concentration materials authorized to be possessed by registrants, have the potential to result in a likely exposure in excess of the 100 millirem annual threshold and as a result only those entities that possess a specific license are permitted to perform those activities. In these cases the registrants have two options, they may apply for a specific license to perform the activities or they may hire a service provider who possesses a specific radioactive materials license.

Costs for these types of services range from \$1000 to \$2000 per hour.

- These service providers may also perform activities including sampling, analysis, radiological surveys, waste handling, packaging, and disposal, as well as other general radiation safety or health physics consulting that involves the handling of the TENORM materials for those entities that do not have the available staff or would rather rely on outsourcing the work.

The costs estimates for many of these activities have been included where appropriate in other sections of this economic outcomes section.

Costs for residual or waste packaging, handling, and preparation for transfer can range from \$8,000 to \$12,000 per day.

- Local Government.** The proposed rule will impact some local governments that operate landfills, drinking water, or wastewater treatment plants. The proposed rule requirements will impact these public and privately owned facilities and operations in the same manner.

TABLE 1 - ESTIMATED COSTS FOR FACILITIES DETERMINED TO BE EXEMPT FROM PART 20

FACILITY TYPE/CATEGORY	INITIAL SAMPLING & ANALYSIS PER WASTE STREAM	REGISTRATION OR LICENSING	DISPOSAL COSTS	SERVICE CONTRACTING	TRANSPORTATION	TRAINING	RECORDKEEPING
Oil and gas facility	\$1,300-\$4,800	\$0	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO ADDITIONAL TRAINING REQUIRED	MINIMAL \$
Drinking water treatment facility	\$1,300-\$4,800	\$0	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO ADDITIONAL TRAINING REQUIRED	MINIMAL \$
Wastewater treatment facility	\$1,300-\$4,800	\$0	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO ADDITIONAL TRAINING REQUIRED	MINIMAL \$
Oil and gas facility	\$1,300-\$4,800	\$0	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO ADDITIONAL TRAINING REQUIRED	MINIMAL \$
Other	\$1,300-\$4,800	\$0	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	NO ADDITIONAL TRAINING REQUIRED	MINIMAL \$

TABLE 2 - ESTIMATED COSTS FOR FACILITIES THAT MUST BE REGISTERED UNDER PART 20 AS A GENERATOR

FACILITY TYPE AND DESCRIPTION	INITIAL SAMPLING & ANALYSIS PER TENORM TYPE	ONGOING SAMPLING & ANALYSIS	RESIDUAL/WASTE CHARACTERIZATION AND PROFILING	REGISTRATION	DISPOSAL COSTS	TRANSPORTATION PER LOAD	TRAINING	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING
OIL AND GAS GENERATORS										
Oil and gas exploration and production facility <ul style="list-style-type: none"> <li>TENORM waste streams: Four</li> <li>Employees: 20</li> <li>Currently not disposing as TENORM</li> <li>Monitor for Radon Quarterly</li> <li>Dose Rate Surveys done by trained employee for 1 waste stream each day</li> <li>One full day of service provider waste packaging per waste stream</li> </ul>	\$5,200-\$19,200	\$1,000-\$3,000	\$500	\$600-\$1,400	300% INCREASE (ESTIMATED AT \$200,000)	\$100-\$875	\$3,550-\$8,225	\$3,585 - \$6,850	\$9,205-\$9,365	\$32,000 - \$48,000
Oil and gas exploration and production facility <ul style="list-style-type: none"> <li>TENORM waste streams: Four</li> <li>Employees: 20</li> <li>Currently disposing as TENORM at a solid waste landfill</li> <li>Monitor for Radon Quarterly</li> <li>Dose Rate Surveys done by trained employee for 1 waste stream each day</li> <li>One full day of service provider waste packaging per waste stream</li> </ul>	\$5,200-\$19,200	\$1,000-\$3,000	\$500	\$600-\$1,400	NO CHANGE	NO CHANGE	\$3,550-\$8,225	\$3,585 - \$6,850	\$9,205-\$9,365	\$32,000 - \$48,000

FACILITY TYPE AND DESCRIPTION	INITIAL SAMPLING & ANALYSIS PER TENORM TYPE	ONGOING SAMPLING & ANALYSIS	RESIDUAL/WASTE CHARACTERIZATION AND PROFILING	REGISTRATION	DISPOSAL COSTS	TRANSPORTATION PER LOAD	TRAINING	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING
Oil and gas exploration and production facility <ul style="list-style-type: none"> <li>TENORM waste streams: Four</li> <li>Employees: 20</li> <li>Currently disposing as RCRA licensed facility</li> <li>Monitor for Radon Quarterly</li> <li>Dose Rate Surveys done by trained employee for 1 waste stream each day</li> <li>One full day of service provider waste packaging per waste stream</li> </ul>	\$5,200-\$19,200	\$1,000-\$3,000	\$500	\$600-\$1,400	66% POTENTIAL REDUCTION	\$100-\$875	\$3,550-\$8,225	\$3,585 - \$6,850	\$9,205-\$9,365	\$32,000 - \$48,000
Oil and gas facility performing plugging and abandoning operations <ul style="list-style-type: none"> <li>One TENORM waste streams: Pipe</li> <li>Employees: 20</li> <li>Currently not disposing as TENORM</li> </ul>	SEE SURVEYING AND MONITORING	NO CHANGE	\$100 PER WELL	\$300-\$500 PER WELL	300% INCREASE ON MATERIALS THAT ARE NOT EXEMPT	\$100-\$875	\$3,550-\$8,225	\$2,680 - \$4,880 PER WELL	\$2,200-\$13,000 PER WELL	SEE SURVEYING AND MONITORING
Oil and Gas midstream Refining operation <ul style="list-style-type: none"> <li>TENORM waste streams: Four</li> <li>Employees: 20</li> <li>Currently not disposing as TENORM</li> <li>Monitor for Radon Quarterly</li> <li>Dose Rate Surveys done by trained employee for 1 waste stream each day</li> <li>One full day of service provider waste packaging per waste stream</li> </ul>	\$5,200-\$19,200	\$1,000-\$3,000	\$500	\$600-\$1,400	300% INCREASE	\$100-\$875	\$3,550-\$8,225	\$3,585 - \$6,850	\$9,205-\$9,365	\$32,000 - \$48,000
WATER TREATMENT										

FACILITY TYPE AND DESCRIPTION	INITIAL SAMPLING & ANALYSIS PER TENORM TYPE	ONGOING SAMPLING & ANALYSIS	RESIDUAL/WASTE CHARACTERIZATION AND PROFILING	REGISTRATION	DISPOSAL COSTS	TRANSPORTATION PER LOAD	TRAINING	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING
Drinking water treatment facility - small size • One TENORM waste stream • Employees: 2 • Currently not disposing as TENORM • Monitor for Radon Quarterly • Dose Rate Surveys done by trained employee each week • One full day of service provider waste handling	\$1,300-\$4,800	\$250-\$750	\$200	\$300-\$500	ZERO TO 300% INCREASE	\$100-\$875	\$300-\$925	\$805-\$4,810	\$1,380-\$1,540	\$8,000-\$16,000
Drinking water treatment facility - medium size • One TENORM waste stream • Employees: 10 • Currently not disposing as TENORM • Monitor for Radon Quarterly • Dose Rate Surveys done by trained employee each week • One full day of service provider waste handling	\$1,300-\$4,800	\$250-\$750	\$200	\$300-\$500	ZERO TO 300% INCREASE	\$100-\$875	\$2,050-\$2,725	\$845-\$4,890	\$1,380-\$1,540	\$8,000-\$16,000
Drinking water treatment facility - large size • Three TENORM waste streams • Employees: 50 • Currently not disposing as TENORM • Monitor for Radon Quarterly • Dose Rate Surveys done by trained employee each week for each waste stream • Three full days of service provider waste handling	\$3,900-\$14,400	\$750-\$2,250	\$400	\$500-\$1,100	ZERO TO 300% INCREASE	\$100-\$875	\$8,050-\$15,925	\$1,625-\$6,530	\$4,140-\$4,620	\$8,000-\$16,000

FACILITY TYPE AND DESCRIPTION	INITIAL SAMPLING & ANALYSIS PER TENORM TYPE	ONGOING SAMPLING & ANALYSIS	RESIDUAL/WASTE CHARACTERIZATION AND PROFILING	REGISTRATION	DISPOSAL COSTS	TRANSPORTATION PER LOAD	TRAINING	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING
Wastewater treatment facility • One TENORM residual product: biosolids • Employees: 10 • Currently land applying • One full day of service provider waste handling	\$1,300-\$4,800	\$250-\$750	\$200	\$300-\$500	ZERO TO 300% INCREASE	\$100-\$875	\$1,500-\$2,250	\$565-\$730	\$0-\$2,000	\$8,000-\$16,000
Wastewater treatment facility • Two TENORM streams: biosolids and grit screenings • Employees: 40 • Currently land applying biosolids and not disposing as TENORM • One full day of service provider waste handling	\$2,600-\$9,600	\$500-\$1,500	\$300	\$400-\$800	ZERO TO 300% INCREASE	\$100-\$875	\$6,000-\$9,000	\$840-\$1,580	\$0-\$2,000	\$8,000-\$16,000
Wastewater treatment facility • Registration required due to acceptance of registered TENORM into the collections system • All materials generated are exempt • Employees: 40 • Service provider contracted for radiological oversight and surveys for maintenance on collection system	\$1,300-\$4,800	\$250-\$750	\$200	\$300-\$500	NO CHANGE FROM CURRENT	NO CHANGE FROM CURRENT	\$1,500-\$2,250	\$690-\$980	\$0-\$2,000	\$1,000-\$2,000

**TABLE 3 - ESTIMATED COSTS FOR FACILITIES THAT MUST BE REGISTERED UNDER PART 20 AS A BENEFICIAL USER**

FACILITY TYPE AND DESCRIPTION	INITIAL SAMPLING & ANALYSIS AFTER FINAL TREATMENT OF FINISHED PRODUCT	ONGOING SAMPLING & ANALYSIS PER FINISHED PRODUCT	RESIDUAL/WASTE CHARACTERIZATION AND PROFILING	REGISTRATION	UPDATING OPERATIONAL AND OTHER REQUIRED PLANS	TRANSPORTATION PER LOAD	TRAINING PER EMPLOYEE	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING
Land Applier or Composting Facility • 300 dry short tons per year (dst/y) produced	\$1,300-\$4,800	\$250-\$750	\$200	\$300-\$500	\$0-\$6,000	NO CHANGE FROM CURRENT	\$150-\$3,000	\$795-\$6,140	\$0-\$2,000	\$0-\$2,000
Land Applier or Composting Facility • 1500 dry short tons per year (dst/y) produced	\$1,300-\$4,800	\$700-\$1,650	\$500	\$300-\$500	\$0-\$6,000	NO CHANGE FROM CURRENT	\$150-\$3,000	\$810-\$6,170	\$0-\$2,000	\$0-\$2,000
Land Applier or Composting Facility • 5,000 dry short tons per year (dst/y) produced	\$1,300-\$4,800	\$1,000-\$2,250	\$700	\$300-\$500	\$0-\$6,000	NO CHANGE FROM CURRENT	\$150-\$3,000	\$820-\$6,190	\$0-\$2,000	\$0-\$2,000
Land Applier or Composting Facility • 18,000 dry short tons per year (dst/y) produced	\$1,300-\$4,800	\$1,900-\$4,050	\$1300	\$300-\$500	\$0-\$6,000	NO CHANGE FROM CURRENT	\$150-\$3,000	\$850-\$6,250	\$0-\$2,000	\$0-\$2,000

**TABLE 4 - ESTIMATED COSTS FOR FACILITIES THAT MUST BE REGISTERED UNDER PART 20 AS A DISPOSAL FACILITY**

FACILITY TYPE AND DESCRIPTION	INITIAL COST OF INCORPORATING TENORM INTO PLANS AND PROCEDURES	WASTE PROFILE REVIEW	REGISTRATION FEE AND INFORMATION PREPARATION	TRAINING	RECORDKEEPING	SURVEYING AND MONITORING	SERVICE CONTRACTING (SURVEYS AND MONITORING DONE BY CONTRACTOR)
Solid waste landfill • 20 employees • Accept TENORM from 50 registrants	\$8,000-\$10,000	\$8,000-\$12,000	\$5,200-\$15,200	\$9290	\$1,180-\$6,640	\$4,800-\$40,000	\$9,000-\$52,500
Oil and gas centralized waste facility • 20 employees • Accept TENORM from 50 registrants	\$12,000-\$14,000	\$8,000-\$12,000	\$5,200-\$15,200	\$9290	\$3,180-\$26,640	\$7,200-\$60,000	\$16,875-\$78,750

TABLE 5 - ESTIMATED COSTS FOR FACILITIES THAT MUST BE SPECIFICALLY LICENSED UNDER PART 20

FACILITY TYPE	INITIAL SAMPLING & ANALYSIS PER MATERIAL TYPE	LICENSING FEE	APPLICATION MATERIAL PREPARATION	DISPOSAL COSTS	SERVICE CONTRACTING FOR WASTE PREPARATION FOR	TRANSPORTATION	TRAINING	RECORDKEEPING	EQUIPMENT	SURVEYING AND MONITORING
Specific Licensee	\$1,300-\$4,800	\$2,790	\$28,000	300%-600% INCREASE	\$8,823-\$44,117	\$3,500-\$5,750	\$1,238-\$7,425	\$3,180-\$26,640	\$6558	\$8,000-\$16,000

Please describe any anticipated financial costs or benefits to these individuals/entities.

**S: Service providers.** Those entities that provide service to TENORM facilities may benefit from the proposed rule. Some of these entities already provide services to TENORM concentrating/processing facilities under current guidance. Other facilities may now need to contract with a service provider as the activities previously performed in-house may not sufficiently protect TENORM facility employees or meet regulatory requirements.

**Analytical Laboratories.** Laboratories will likely see a significant increase in business as a result of facilities sampling more materials in order to characterize their wastes or residuals for the purposes of making a TENORM determination and for the purposes of meeting certain monitoring requirements.

**B:** Residents of the state of Colorado may see an increase in the cost of utilities as a result of the rule as costs to water systems and wastewater treatment facilities related to compliance will likely be transferred to the consumer.

Non-economic outcomes

Summarize the anticipated favorable and non-favorable non-economic outcomes (short-term and long-term), and, if known, the likelihood of the outcomes for each affected class of persons by the relationship category.

**C and CLG:** For entities that must implement the proposed requirements under the current guidance based approach to management and control of TENORM materials, the requirements vary and are determined mostly on a case-by-case basis. A favorable non-economic benefit of the proposed rule will be having a clear and consistent set of requirements across facility types and operations, making it a more level process for all.

An additional favorable outcome is that the rule sets exemption limits at a higher concentration limit than was imposed in the current guidance. These limits still ensure the safe management of these materials but provide relief from the controls that may have been imposed on materials with much lower concentrations.

Without the rule as proposed the Department would likely need to fall back to the regulations governing all other radioactive materials and apply those rules to TENORM. Within those rules there does not exist an exempt concentration for Radium-226 or Radium-228 and as a result those in possession of these materials even in small amounts and low concentrations would be required by rule to obtain a specific radioactive

materials license. The current guidance was an attempt to provide regulatory relief in the form of a framework within which entities could both possess TENORM and avoid specific radioactive materials licensing. The guidance was not applicable to all materials or industries and was lacking an enforcement mechanism that would ensure that TENORM materials would not present an unacceptable hazard to members of the public. With the Part 20 rule in place all entities who possess TENORM can rely on the regulatory structure to manage the materials according to the hazard or risk potential and not be subject to a specific licensing requirement and controls that are not commensurate with the hazard.

The Department expects that the vast majority of those who produce TENORM will likely qualify for an exemption or be subject to registration. This framework allows for these materials to be managed in essentially the same way as they are today with some minor constraints and controls in place to ensure that no member of the public is exposed to an undue hazard. Radioactive materials that are specifically licensed have limited options for disposal. If these materials were all subject to a specific license they would be considered radioactive waste under the law and the disposal options would be very limited and very expensive. This is a non-favorable outcome for two very significant reasons. First, the industries involved would incur tremendous expenses managing these wastes and finding a home for them. The costs associated with transportation alone would not be sustainable for any of the industries that produce these wastes and the cost for disposal would likely become overwhelming very quickly. Secondly, the limited number of facilities designed to provide a safe and protective home for radioactive wastes would be over run and filled up with materials that simply do not have the hazard potential of other radioactive wastes. The unintended consequence of this is that these TENORM materials would occupy the limited space that was specifically designed and intended to accommodate radioactive wastes that can present a significant public health threat. Further limiting the space for these licensed radioactive wastes to be safely disposed of could result in the creation of a significant threat to public health and safety.

The Part 20 Rule also allows for the beneficial use of biosolids that may contain TENORM. If these materials were subject to a radioactive materials license rather than registration they would not be permitted to be land applied to agricultural land. As described above they would likely be considered radioactive waste under the law. This would result in farmers needing to purchase chemical fertilizers that are more expensive and are likely not a sustainable source of nutrients.

S: Environmental advocacy groups have been actively involved in pursuing the regulation of these materials to ensure that the wastes that are produced by large industries are being managed correctly and with attention paid to all constituents of those materials. In the past while there may have been certain hazardous components recognized as constituents that needed to be evaluated and addressed by rule there has not been a focus on the radiological component. This rule will shine a light on those aspects of waste streams that have been ignored in the past and provide assurances that the hazards presented by the radiological component are being mitigated.

B: The residents of Colorado will benefit from the safe management of TENORM as the rule will provide assurance that no members of the public will expect to receive a radiological dose in excess of 100 millirem annually as a result of TENORM once the rule is in place.

3. The probable costs to the agency and to any other agency of the implementation and enforcement of the proposed rule and any anticipated effect on state revenues.
  - A. Anticipated CDPHE personal services, operating costs or other expenditures: The Department has experienced an increase in workload to conduct a robust stakeholder process, rule development, guidance development and rulemaking hearings necessary to develop and implement the rule. This workload has and continues to be addressed within existing appropriations.

When promulgated, the radiation program will incur expenses for the implementation of the TENORM regulatory program.

For the purposes of estimating anticipated Department expenditures as well as revenue the following assumptions are made:

- Year one will require approximately 0.5 Full Time Employee (FTE) at the Environmental Protection Specialist II (EPS II) level for guidance development and this will likely shrink down to about 0.1 FTE in year two
- Year one will potentially see the introduction of up to 50 registrants and in year two this will likely approach 500 registrants
- While there are currently less than 10 TENORM specific licensees, we expect that, based on the new rule structure and the materials that are currently specifically licensed, a number of these will be able to transition to a registration and that we would expect no more than two new facilities to be identified as requiring a specific license to operate per year.
- The following table breaks down the projected workload and associated time associated with TENORM registration processing and oversight based on our current general licensing program.

Task	Hours per registrant per year
Initial entry of registrant information into database	0.25
Updates or revisions to registration information within database	0.25
Preparation for annual billing	0.5
Ensuring annual registration information is received	0.5
Registrant information review	0.5
Registrant classification determination	0.5
Verification of location	0.25
Assessing need for service provider assistance	0.25
Coordination with other regulatory authorities to verify compliance	0.5
Review of incident or spill release data*	0.1
Site visit*	0.4
<b>Total</b>	<b>4</b>

\*For the purposes of this exercise we assume that 5%, or fewer, of registrants may have a reportable spill or incident or other circumstance each year that would require a site visit. Assuming the review takes approximately two hours and the site visit takes approximately 8 hours the projected time per registrant would be 0.1 and 0.4 hours respectively.

During the first year the expenditures will be absorbed by the program but as the program moves into its enforcement stage during year two it is anticipated that the Department will likely need to hire one additional FTE to accommodate the workload that would result from the number of registrations being assumed for the purposes of this exercise. Registration processing and oversight for five hundred registrants at approximately four hours per registrant per year equates to 2000 hours or one FTE.

It is anticipated that this FTE would be an EPSII and would cost approximately \$102,148 annually. As demonstrated in the next section the revenue from the proposed \$200 dollar fee would support one FTE at an EPSII salary. If the program were to grow significantly the expectation is that one FTE would be required for every 500 additional registrants.

Type of Expenditure	Year 1	Year 2
TENORM Guidance Development	\$ 50,000	\$ 10,000
TENORM Registration processing and oversight	\$ 10,000	\$ 100,000
TENORM Specific license processing	\$ 4,000	\$ 4,000
Total	\$ 64,000	\$ 114,000

Anticipated Department Revenues:

This rulemaking modifies fees:

Entity Type	# of Entities	Current Fee	Proposed Fee*	% increase or decrease
TENORM Registrant	550	N/A	\$200 <sup>a,b</sup>	100 %
TENORM Specific Licensee	2	\$2,790	\$2,790 <sup>a,b</sup>	0 %

<sup>a</sup> Initial registration/licensing application fee as outlined in Part 12, tbd.

<sup>b</sup> Annual registration/licensing fee as outlined in Part 12, Category 27.

Please note that while Part 12 is being revised to specify a TENORM specific license fee there is no change because the fee category (3.Q) currently captures all specific license types not captured elsewhere within the rule and as a result all TENORM licensees are, at present, considered 3.Q licensees. The rule change adds language that specifically identifies TENORM licensees within the 3.Q category for clarity in the rule.

- B. Anticipated personal services, operating costs or other expenditures by another state agency:

Anticipated Revenues for another state agency: N/A

4. A comparison of the probable costs and benefits of the proposed rule to the probable costs and benefits of inaction.

Along with the costs and benefits discussed above, the proposed new rule will:

- Comply with a statutory mandate to promulgate rules.
- Comply with federal or state statutory mandates, federal or state regulations, and department funding obligations.
- Maintain alignment with other states or national standards.
- Implement a Regulatory Efficiency Review (rule review) result
- Improve public and environmental health practice.
- Implement stakeholder feedback.

Advance the following CDPHE Strategic Plan priorities (select all that apply):

<p>1. Reduce Greenhouse Gas (GHG) emissions economy-wide from 125.716 million metric tons of CO<sub>2</sub>e (carbon dioxide equivalent) per year to 119.430 million metric tons of CO<sub>2</sub>e per year by June 30, 2020 and to 113.144 million metric tons of CO<sub>2</sub>e by June 30, 2023.</p> <p><input type="checkbox"/> Contributes to the blueprint for pollution reduction</p> <p><input type="checkbox"/> Reduces carbon dioxide from transportation</p> <p><input type="checkbox"/> Reduces methane emissions from oil and gas industry</p> <p><input type="checkbox"/> Reduces carbon dioxide emissions from electricity sector</p>
<p>2. Reduce ozone from 83 parts per billion (ppb) to 80 ppb by June 30, 2020 and 75 ppb by June 30, 2023.</p> <p><input type="checkbox"/> Reduces volatile organic compounds (VOC) and oxides of nitrogen (NO<sub>x</sub>) from the oil and gas industry.</p> <p><input type="checkbox"/> Supports local agencies and COGCC in oil and gas regulations.</p> <p><input type="checkbox"/> Reduces VOC and NO<sub>x</sub> emissions from non-oil and gas contributors</p>
<p>3. Decrease the number of Colorado adults who have obesity by 2,838 by June 30, 2020 and by 12,207 by June 30, 2023.</p> <p><input type="checkbox"/> Increases the consumption of healthy food and beverages through education, policy, practice and environmental changes.</p> <p><input type="checkbox"/> Increases physical activity by promoting local and state policies to improve active transportation and access to recreation.</p> <p><input type="checkbox"/> Increases the reach of the National Diabetes Prevention Program and Diabetes Self-Management Education and Support by collaborating with the Department of Health Care Policy and Financing.</p>
<p>4. Decrease the number of Colorado children (age 2-4 years) who participate in the WIC Program and have obesity from 2120 to 2115 by June 30, 2020 and to 2100 by June 30, 2023.</p> <p><input type="checkbox"/> Ensures access to breastfeeding-friendly environments.</p>
<p>5. Reverse the downward trend and increase the percent of kindergartners protected against measles, mumps and rubella (MMR) from 87.4% to 90% (1,669 more kids) by June 30, 2020 and increase to 95% by June 30, 2023.</p> <p><input type="checkbox"/> Reverses the downward trend and increase the percent of kindergartners protected against measles, mumps and rubella (MMR) from 87.4% to 90% (1,669 more kids) by</p>

<p>June 30, 2020 and increase to 95% by June 30, 2023.</p> <ul style="list-style-type: none"> <li>___ Performs targeted programming to increase immunization rates.</li> <li>___ Supports legislation and policies that promote complete immunization and exemption data in the Colorado Immunization Information System (CIIS).</li> </ul>
<p>6. Colorado will reduce the suicide death rate by 5% by June 30, 2020 and 15% by June 30, 2023.</p> <ul style="list-style-type: none"> <li>___ Creates a roadmap to address suicide in Colorado.</li> <li>___ Improves youth connections to school, positive peers and caring adults, and promotes healthy behaviors and positive school climate.</li> <li>___ Decreases stigma associated with mental health and suicide, and increases help-seeking behaviors among working-age males, particularly within high-risk industries.</li> <li>___ Saves health care costs by reducing reliance on emergency departments and connects to responsive community-based resources.</li> </ul>
<p>7. The Office of Emergency Preparedness and Response (OEP) will identify 100% of jurisdictional gaps to inform the required work of the Operational Readiness Review by June 30, 2020.</p> <ul style="list-style-type: none"> <li>___ Conducts a gap assessment.</li> <li>___ Updates existing plans to address identified gaps.</li> <li>___ Develops and conducts various exercises to close gaps.</li> </ul>
<p>8. For each identified threat, increase the competency rating from 0% to 54% for outbreak/incident investigation steps by June 30, 2020 and increase to 92% competency rating by June 30, 2023.</p> <ul style="list-style-type: none"> <li>___ Uses an assessment tool to measure competency for CDPHE's response to an outbreak or environmental incident.</li> <li>___ Works cross-departmentally to update and draft plans to address identified gaps noted in the assessment.</li> <li>___ Conducts exercises to measure and increase performance related to identified gaps in the outbreak or incident response plan.</li> </ul>
<p>9. 100% of new technology applications will be virtually available to customers, anytime and anywhere, by June 20, 2020 and 90 of the existing applications by June 30, 2023.</p> <ul style="list-style-type: none"> <li>___ Implements the CDPHE Digital Transformation Plan.</li> <li>___ Optimizes processes prior to digitizing them.</li> <li>___ Improves data dissemination and interoperability methods and timeliness.</li> </ul>
<p>10. Reduce CDPHE's Scope 1 &amp; 2 Greenhouse Gas emissions (GHG) from 6,561 metric tons (in FY2015) to 5,249 metric tons (20% reduction) by June 30, 2020 and 4,593 tons (30% reduction) by June 30, 2023.</p> <ul style="list-style-type: none"> <li>___ Reduces emissions from employee commuting</li> <li>___ Reduces emissions from CDPHE operations</li> </ul>

11. Fully implement the roadmap to create and pilot using a budget equity assessment by June 30, 2020 and increase the percent of selected budgets using the equity assessment from 0% to 50% by June 30, 2023.

\_\_\_ Used a budget equity assessment

\_\_\_ Advance CDPHE Division-level strategic priorities.

The costs and benefits of the proposed rule will not be incurred if inaction was chosen. Costs and benefits of inaction not previously discussed include:

- One significant cost of inaction would be that the state Board of Health would not be in compliance with the state statute that requires the adoption of TENORM rules
- Other costs would relate to the current issues of a lack of clear and consistent direction to stakeholders regarding the proper management of these materials.
- There has been the suggestion that there was a real potential for litigation regarding the current TENORM policy and whether or not it was being used as a tacit regulation.
- There might be a significant cost to the regulated community if the Department were to make a decision to specifically license all radium in the state. There is currently no exemption for radium in the radioactive materials regulations that would allow for the possession, handling or disposal of these materials without a specific license. If the new rule is not adopted the Department may have no choice but to regulate within the current rule structure and that would have significant costs to the regulated community. These costs would be both economic as well as operational in that many of the normal waste management practices would likely be halted and that would significantly affect the industries who need to dispose of their materials routinely in order for their normal operations to continue.
- In the absence of the rule there is a very reasonable likelihood that TENORM materials being generated would not be managed in an appropriate fashion and members of the public including industry workers would be exposed to radiological doses that may contribute to negative health effects over time.

5. A determination of whether there are less costly methods or less intrusive methods for achieving the purpose of the proposed rule.

The purpose of the proposed rule is to provide a consistent level of protection for workers, members of the public and the environment for the potential radiological hazards associated with TENORM. The presence of TENORM has been identified in a variety of materials generated primarily by the processing of natural resources in our state. The Department has attempted to identify and mitigate these hazards through guidance and communication with the suspected generators over time but has not been successful in identifying all sources of TENORM or in assuring that those materials were being managed in a way that provides that protection to members of the public. This rule provides a requirement for those who are generating the materials to properly characterize the materials and manage them within a structure that does provide a consistent level of protection for workers, members of the public and the environment.

6. Alternative Rules or Alternatives to Rulemaking Considered and Why Rejected.

Since the promulgation of Senate Bill 18-245, alternatives to rulemaking have not been extensively considered since the Act specifically requires a rule. Much of the current process for control and management of TENORM materials in Colorado has been very piecemeal, with case-by-case specifics and using a guidance approach. While this approach has sufficed on a limited basis, it does not encompass all of the necessary controls needed to provide a consistent level of protection for workers, members of the public or the environment, nor does it meet the intent or requirements of SB 18-245.

7. To the extent practicable, a quantification of the data used in the analysis; the analysis must take into account both short-term and long-term consequences.

The following documents were used in the development of the proposed draft rules and rule package:

[Senate Bill 18-245, August 8, 2018.](#)

[TENORM Report For The State Of Colorado, June 4, 2019.](#)

[Senate Bill 18-245: TENORM Report and Summary of Regulatory Development and Stakeholder Process, December 2019.](#)

[Dose assessment and modeling in support of the proposed 6 CCR 1007-1, Part 20 TENORM rule, May 19, 2020.](#)

[Final Report: ISCORS Assessment of Radioactivity in Sewage Sludge: Modeling to Assess Radiation Doses, November 2003.](#)

[Final Report: ISCORS Assessment of Radioactivity in Sewage Sludge: Radiological Survey Results and Analysis, February 2005.](#)

[Final Report: ISCORS Assessment of Radioactivity in Sewage Sludge: Recommendations on Management of Radioactive Materials in Sewage Sludge and Ash at Publicly Owned Treatment Works, February 2005.](#)

[Sampling and Analysis of Naturally Occurring Radioactive Material in Oil and Gas Produced Water, COGCC Special Project 10243, November 2019.](#)

[Statement of Basis, Specific Statutory Authority, and Purpose, New Rules and Amendments to Current Rules of the Colorado Oil and Gas Conservation Commission, 2 CCR 404-1, June 19, 2020.](#)

[State of Colorado Joint Budget Committee, staff Figure Setting FY 2018-2019, Department of Natural Resources, March 8, 2018.](#)

[Interim Policy and Guidance Pending Rulemaking for Control and Disposition of Technologically-Enhanced Naturally Occurring Radioactive Materials in Colorado, February 2007.](#)

[Participants at the IAEA Technical Meeting on the Implications of the New Dose Conversion Factors for Radon, October 2019.](#)

STAKEHOLDER ENGAGEMENT  
for Amendments to

6 CCR 1007-1, Part 20, "Registration and licensing of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM)"  
6 CCR 1007-1, Part 12, "Fees for radiation control services"

State law requires agencies to establish a representative group of participants when considering to adopt or modify new and existing rules. This is commonly referred to as a stakeholder group.

Early Stakeholder Engagement

Since beginning the regulatory development process in 2018 through the end of 2019, the Division made considerable efforts to engage stakeholders in this TENORM regulatory development process by:

- Hosting 12 stakeholder meetings, each scheduled for 4 hours and meeting with approximately 150 stakeholders during those stakeholder meetings.
- Directly reaching out to approximately 425 stakeholders comprised of individuals from the oil and gas industry, mining industry, waste disposal industry, public drinking water and wastewater treatment sector, radiation safety consulting sector as well as other interested members of the public.
- Communicating directly with a handful of leading members of a number of trade associations and stakeholder groups representing thousands of interested parties.
- Opening two formal 60-day public comment periods as well as requesting and accepting written comments continuously from June through November of 2019.
- Soliciting and reviewing more than a hundred written comments from stakeholders.
- Creating a TENORM rulemaking and guidance website accessible to everyone and posting all of the information on TENORM regulatory development and the stakeholder process.
- Coordinating with five sister regulatory agencies, programs, or Divisions who have authority for oversight of operations or materials potentially impacted by TENORM. Working with other regulatory entities has allowed the radiation program to better understand the potential for dual authority or competing regulations and develop a TENORM rule that acknowledges the current controls on these materials, avoids any conflicting regulatory requirements, minimizes duplicative requirements, and works in accord with the requirements of the other agencies.

The Department also met individually with or presented information to several stakeholder groups including:

- The Colorado Oil and Gas Association
- Expedition Water Solutions, a water disposal and pipeline company based in Colorado and Wyoming
- The Rocky Mountain Water Environment Association
- Colorado Wastewater Utility Council (CWWUC)
- Colorado Water Utility Council (CWUC)
- Colorado General Assembly Water Resources Review Committee

Throughout the early stakeholder engagement process up to the current rulemaking development activities, the stakeholder contact list has grown from around 425 to over 3,200 individuals as different organizations and stakeholders became more involved in the process.

In addition to the below information, Section IV of the [Senate Bill 18-245: TENORM Report and Summary of Regulatory Development and Stakeholder Process](#) contains additional information and details regarding the stakeholder outreach process.

The following individuals and/or entities were invited to provide input and included in the development of these proposed rules:

Organization	Representative Name and Title (if known)
A1 Organics	Tanner Phelps
ACZ Laboratories, Inc	Mark McNeal, QA Coordinator/CHO/HWO/RSO
AECON	Not available
AET Environmental, Inc	Frank Virginia
ALS Global	Jeff Kujawa, Project Manager
American Petroleum Institute	Michael Paules, Associate Director
Anadarko Petroleum Corporation	Not available
Arapahoe County	Not available
Aurora Water	Sean Lieske, Environmental Services Manager
Brownstein Hyatt Farber Schreck, LLP	Christine Jochim
Carollo Engineers, Inc	Not available
Castle Pines Metropolitan District	Not available
Centennial Water and Sanitation District	Ken Lykens, Director of Water & Wastewater Operations
Clean Harbors	Not available
Colorado General Assembly Water Resources Review Committee	Not available
Colorado Mining Association (CMA)	Stan Dempsey, Jr., President
Colorado Oil and Gas Association (COGA)	Christy Woodward, Senior Director of Regulatory Affairs
Colorado Petroleum Association	Not available
Colorado Springs Utilities	Patti Zietlow, Environmental Specialist
Colorado Wastewater Utility Council (CWUC)	Weston Martin, Chair
Colorado Water Utility Council (CWUC)	David Leach, Chair
ConocoPhillips	Not available
Crestone Peak Resources	Not available
Denver Water	Not available
Earthworks	Aaron Mintzes, Senior Policy Counsel
East Cherry Creek Valley Water & Sanitation District	Not available
Ensero Solutions	Stephen Cohen, Practice Lead - Geology & Radiation
Energy Council of Southwest Colorado	Not available

Expedition Water Solutions	Not available
Hazen and Sawyer	Not available
Information Network for Responsible Mining (INFORM)	Jennifer Thurston
Kleinfelder	Not available
Logan County	Not available
Metro Wastewater Reclamation District	Jennifer Robinett, Regulatory Compliance Officer
Monument Sanitation District	Not available
National Waste & Recycling Association	Not available
NGL Energy Partners	Michael Dinkel
Noble Energy, Inc	Not available
Northwest Colorado Consultants, Inc.	Not available
North Front Range Water Quality Planning Association	Mark Thomas, Manager
Occidental Petroleum Corporation (Oxy)	Not available
Pace Analytical	Not available
Pawnee Waste, LLC	Not available
PDC Energy, Inc	Not available
Petroleum Equipment & Services Association (PESA)	Tim Tarpley, Vice President Government Affairs
Petrotek Engineering Corporation	Not available
Pine Brook Water	Not available
Platte Canyon Water & Sanitation District	Cynthia Lane, Assistant Manager
Plum Creek Water Reclamation Authority	Weston Martin, Authority Manager and Chair of Colorado Wastewater Utility Council
Pueblo Water	Not available
Radiation Pros, LLC	Kurt Rhea, President & CEO
Republic Services, Allied Waste Systems of Colorado, LLC	Not available
Roxborough Water & Sanitation District	Barbara Biggs, General Manager
Rule Engineering, LLC	Michael Brown
SCS Engineers	Not available
SHB, Inc	Steven Brown
South Platte Water Renewal Partners	Dan DeLaughter, Data & Regulatory Programs Manager
S & R Environmental Consulting	Not available
Suncor Energy (U.S.A.), Inc	Eric Marler, Senior Environmental Advisor
The City of Arvada	Not available
The Town of Castle Rock	Not available
The City of Greeley	Lauren Worley, Water Quality and Regulatory Compliance Manager
The City of Northglenn	Not available
The City of Thornton	David Leach, Senior Water Quality Analyst and Chair of Colorado Water Utility Council
The City of Westminster	Tom Scribner Water Treatment Superintendent
The Rocky Mountain Water Environment Association	Not available

Tri-County Health Department	Lisa Oliveto, Solid Waste Specialist
Veris Environmental, LLC	Mike Scharp, VP Marketing
Waste Connections of Colorado, Inc	Not available
Waste Management Inc	Louis Bull
Water Remediation Technology LLC (WRT)	James Voorhies, Radiation Protection Program Manager
Western Slope Colorado Oil and Gas Association (WSCOGA)	Not available
<b>STATE AGENCIES/PROGRAMS/DIVISIONS</b>	
Colorado Oil and Gas Conservation Commission (COGCC)	John Axelson, East Environmental Supervisor
Colorado Division of Reclamation, Mining and Safety	Russ Means, Minerals Program Director
Water Quality Division, Colorado Department of Public Health and Environment	David Kurz, Lead Wastewater Engineer; Tim Larson
Hazardous Materials and Waste Management Division, Colorado Department of Public Health and Environment <ul style="list-style-type: none"> <li>• Hazardous Waste Program</li> <li>• Solid Waste Program</li> </ul>	Jerry Henderson, Unit Leader, Solid Waste Permitting Unit

#### Stakeholder Engagement for the Rulemaking in 2020

In 2020, the Division continued its efforts in engaging the stakeholders in the development of the proposed TENORM rule by:

- Maintaining the TENORM rulemaking and guidance website accessible to everyone and posting all of the information on TENORM regulatory development and the stakeholder process including the draft regulations: <https://www.colorado.gov/pacific/cdphe/rad-regs-stakeholder-processes>, <https://www.colorado.gov/pacific/cdphe/tenorm-reg-dev>, and <https://www.colorado.gov/pacific/cdphe/part-20-tenorm-guidance-development>.
- Hosting two stakeholder meetings on May 26, 2020 to discuss the Draft A of Part 20 and the proposed Part 12 and on July 27, 2020 to discuss the Draft B of Part 20 and respond to stakeholder comments on the Draft A. Each meeting was scheduled for 3 hours and participated by approximately 70 stakeholders. Meeting recording was provided to those stakeholders who were not able to participate, upon request.
- Soliciting written stakeholder comments from two public comment periods, a 45-day public comment period in May-June 2020 for the Draft A of Part 20 and the proposed Part 12 and a 30-day public comment period in July-August 2020 for the Draft B of Part 20. A total of approximately 300 stakeholder comments were received. The first public comment period was extended in response to stakeholder concerns on potential delays due to COVID-19 pandemic.
- Maintaining a TENORM stakeholder contact list and routinely emailing information related to the TENORM rulemaking and stakeholder process to the TENORM stakeholders. There are currently over 3,200 individuals in the contact list. The Division has sent out seven notification emails in 2020 to the contact list.
- Meeting with individual stakeholder organizations in June - August 2020 to discuss the proposed TENORM rule and answer stakeholder questions, including the American

Petroleum Institute, Colorado Oil and Gas Association, Colorado Mining Association, Colorado Springs Utilities, NGL Energy Partners, Radiation Pros LLC, and SHB Inc.

- Presenting the proposed TENORM rule in individual meetings hosted by the stakeholder organizations in July - August 2020, including Colorado Wastewater Utility Council Meeting, Colorado Water Utility Council Meeting, and North Front Range Water Quality Planning Association Meeting.
- Providing timely responses to other stakeholder inquiries regarding the proposed TENORM rule via phone calls and emails.

#### Stakeholder Group Notification

The stakeholder group was provided notice of the rulemaking hearing and provided a copy of the proposed rules or the internet location where the rules may be viewed. Notice was provided prior to the date the notice of rulemaking was published in the Colorado Register (typically, the 10<sup>th</sup> of the month following the Request for Rulemaking).

- Not applicable. This is a Request for Rulemaking Packet. Notification will occur if the Board of Health sets this matter for rulemaking.
- Yes.

Summarize Major Factual and Policy Issues Encountered and the Stakeholder Feedback Received. If there is a lack of consensus regarding the proposed rule, please also identify the Department's efforts to address stakeholder feedback or why the Department was unable to accommodate the request.

Throughout the stakeholder process stakeholders identified a number of concerns and provided many comments and questions. Throughout the course of the stakeholder process nearly all of the issues and concerns provided by stakeholders have been resolved through the multiple iterations and continuous refinement of the draft rule requirements and language. Additionally, because of the technical needs and lack of available guidance involved in the implementation of the rule, the radiation program is - concurrent with the final stages of the formal rulemaking process - embarking on an effort to develop technical guidance documents in partnership with stakeholders.

The following section outlines some of the major factual and policy issues encountered, broken down by topical area.

#### STATUTORY AND REGULATORY DEFINITIONS

A few stakeholders expressed concern regarding the statutory and regulatory definition of TENORM. The concern was that this definition is inconsistent with other state or regulatory agency definitions which also consider naturally occurring radioactive material which has not been concentrated but only been made more accessible to humans through technology to be TENORM. As a result, materials whose naturally occurring radionuclide concentrations have not been increased by human practices would not meet the definition of TENORM and would not be subject to the TENORM rule. These stakeholders expressed the opinion that the Department should change its statutory and regulatory definition of TENORM before developing the TENORM rule to include materials with substantial natural occurring radioactivity. Additionally, stakeholders have also expressed concerns that indicated a general misunderstanding regarding the definitions of source material, byproduct material, and NORM, as well as which radionuclides are considered TENORM and which are not. As an example there was a concern that the TENORM rule would potentially apply to everything that contained even the slightest amount of radioactive material, including soil, bananas, or other

common items that may contain naturally occurring radioactive material. The Department addressed these concerns through multiple discussions during stakeholder meetings by first clarifying that TENORM is defined in the Colorado Revised Statutes, 25-11-201 and Part 1 of Colorado Rules and Regulations Pertaining to Radiation Control, 6 CCR 1007-01 as naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices. The Department went on to further review and explore Senate Bill 18-245 and clarified the obligation to develop the TENORM rule following the prescribed schedules and requirements within the bill and adopt the rule within the current context of the statute including current definitions. Once the basic definitions and the requirements of the bill were better understood the Department was able to resolve other related concerns regarding the reach and scope of the proposed rule. This would include explaining that while there may be some naturally occurring materials that contain substantial radioactivity the rule would not apply to NORM, that there would be an exempt limit, and that TENORM does not include Uranium or Thorium but does include naturally occurring Radium and its progeny. Source Material is specifically excluded from the TENORM definition mentioned above and as a result Uranium and Thorium are not TENORM. As mentioned in the Basis and Purpose section of this document, the subject of Uranium and Thorium being included in the rule has been a topic of interest for many stakeholders throughout the process. After a number of discussions and feedback the Department chose to specifically exclude source material from the rule to avoid any confusion in the future.

#### EXEMPTIONS

Some stakeholders have expressed a desire to be categorically exempted from any rule based on operation or industry. The Department explained that while there may be examples of operations or industries that produce materials that have little or no TENORM component, the rule is intended to provide a structure and a framework for materials that do contain TENORM to be managed safely and effectively. Additionally, a particular operation or industry may use the exemption parameters within the rule in combination with characterization data to demonstrate that they do not have materials subject to regulation. This ensures that all TENORM materials are treated equally based on their contribution to public dose rather than certain material exclusions, which may contribute to public dose, based on nothing more than the pedigree or origin of the material.

#### PROHIBITIONS OR BANS ON CURRENT ACTIVITIES

The Department discovered that many stakeholders feared that TENORM rule promulgation would result in a prohibition or ban on some of the existing reuse or disposal practices, such as land application of biosolids or deep well injection of oil and gas produced water. In the stakeholder meetings, the Department clarified that this was a misconception of the Department's position and reaffirmed that not only would the proposed TENORM regulation allow for these practices but that Senate Bill 18-245 specifically required that the beneficial reuse of water treatment residuals and by-products of the wastewater treatment process be included in the rule.

#### PRESENCE OF TENORM AND MATERIALS CHARACTERIZATION

Throughout the process there were many questions and concerns related to characterization of materials. The Department has discussed these items with stakeholders and has made a commitment to further address them in guidance documents.

#### IS TENORM PRESENT?

This was a common concern and the Department explained that similar to a RCRA hazardous waste determination that is common for those subject to hazardous waste

requirements, a generator is responsible for determining whether the materials that are generated by their activities contain TENORM. The Department provided guidance in the form of initial questions that need to be asked by a generator. Does the process have the potential to concentrate any constituent contained within the materials initially being processed? Are those constituents metals? Are those metals radium or progeny of radium? If the answer is yes, then there is a likelihood that TENORM may be present. Additionally, the Department explained that for those who accept materials from others it is important to establish whether the materials being accepted contain TENORM. If they do, there is a much higher likelihood that the residuals or products of the process that they are conducting also contain TENORM.

#### WHAT RADIONUCLIDES AM I LOOKING FOR?

The Department discussed this in many of the meetings and has provided clarification to many of the different industries and generators. In general, those that concentrate metals in a process that does not involve natural gas will expect Radium-226 and/or Radium-228 in their materials and those who are dealing with the storage vessels, equipment, or transfer lines associated with natural gas will expect the progeny, Lead-210 and Polonium-210 in their materials.

#### HOW IS TENORM CONFIRMED?

The Department discussed various sampling methodologies as well as statistical methods of data analysis that would result in a statistically defensible characterization and confidence regarding the presence or absence of TENORM. These discussions generally revolved around using an EPA guidance document, SW-846, as an acceptable method. Additionally, the Department has released a user friendly spreadsheet that will perform all of the statistical analysis for a given data set and provide the user with verification of the data having the appropriate number of samples and meeting a regulatory threshold that is chosen by the user. This can be used to test material data sets against exempt concentration and other thresholds that exist within the rule. Additionally a user may print out the analysis to be used as record of exemption or waste characterization for acceptance to a disposal facility or even to provide to the Department as part of the registration process or for record retention purposes. The [spreadsheet can be found on the Department website](#) and is free to download and use by anyone.

#### WHAT LABORATORY METHODS SHOULD BE USED?

The Department discussed laboratory methods and the potential for additionally using portable or handheld radiation detection devices to screen materials in the field. There are many acceptable methods for laboratory analysis and the Department is committed to maintaining a list in our guidance regarding TENORM. Additionally, the Department recognizes the potential for new methods to be developed which would allow for materials to be adequately characterized outside of a commercial laboratory. Maintaining a list of approved methods in guidance rather than regulation will allow for the quick addition or removal of methods as modifications are made, new methods are developed, or technology advances in order to accommodate the needs of generators and avoid potential delays that can be associated with a regulatory change process.

#### LABORATORY TURNAROUND TIMES

Stakeholders pointed out that many of the current methods used for TENORM characterization take an extended period of time. The Department discussed the

methods based in progeny ingrowth and the possibility of accepting other methods that have shorter turnaround times. Discussions focused on the minimum precision and accuracy of the method to determine the radioactivity present in a sample in order to appropriately make judgements regarding regulatory applicability. With new exemption levels and thresholds for waste acceptance in rule as compared to the current guidance, the Department expects that methods with higher minimum detectable activities and shorter turnaround times will likely be acceptable for many circumstances. Additionally, some of the concern was centered on needing to store materials for extended periods of time due to laboratory turnaround times. The Department discussed the concept of waste or materials profiling as a potential mitigating factor and included this concept in rule language. Profiling of materials can allow for an initial full characterization and periodic confirmation sampling on materials. This would in turn allow for regularly produced materials to be characterized over time and avoid the need for extended storage.

#### WHAT VALUES FROM LABORATORY REPORTS SHOULD BE USED?

The Department discussed using reported values rather than laboratory uncertainty values in calculations for making determinations on TENORM presence and applicability of any rule.

#### WILL THE RULE VALUES INCLUDE BACKGROUND?

The Department provided clarification that the values in the rule will almost exclusively be in excess of or above background. One exception to this would be for exempt quantity values which are individual quantities that would not allow for the subtraction of a background.

#### WHAT IS THE BACKGROUND?

Current Department guidance references a study performed on Colorado natural background radiation and establishes background values for TENORM radionuclides. The Department explained that those values will be maintained in guidance and may be updated or revised as more studies are conducted or data is presented to the Department. The Department also discussed the concept of establishing site specific background values and clarified that this as an acceptable practice which has been included within the rule.

Guidance will be provided on the acceptable methods of determining site specific background values. The rule currently states that an adequate and acceptable background sample set will provide a mean within +/- 20% of the true average at the 95% confidence level. The Department has released a user friendly spreadsheet that will perform all of the statistical analysis for a given background data set and provide the user with verification of the data having the appropriate number of samples and will calculate the site specific background. A user may print out the analysis to be used as record to accompany any other characterization data analysis. The [spreadsheet can be found on the Department website](#) and is free to download and use by anyone.

#### WILL THE RULE REQUIRE EVERY LOAD OF TENORM WASTE TO BE SAMPLED?

Stakeholders were also concerned that the TENORM rule would require per-load sampling by TENORM generators to characterize TENORM wastes and demonstrate compliance with the regulatory limits. In the stakeholder meetings, the Department indicated that this was another misconception of the Department's position and clarified that per-load sampling is just one of the acceptable alternatives to achieve a

representative waste characterization. The Department also explored with the stakeholders how current waste or materials profiling practices could be modified to accommodate TENORM materials. As explained above waste and materials profiling is encouraged for those materials that demonstrate a static and repeatable TENORM concentration.

#### RESIDUALS VS. WASTES VS. PRODUCTS

There was some stakeholder concern regarding the terms residual, waste, and product being correctly applied to the different TENORM impacted materials. The Department acknowledged the importance of correctly using those terms in regard to how other rules may apply to those materials. For example, biosolids and compost are a product whereas a drinking water treatment residual may be a waste. For the purposes of presenting general concepts on the management of TENORM impacted materials during the stakeholder process some of these terms were used interchangeably for simplicity but the Department has made a point of using appropriate delineations within the draft proposed rule.

#### SCIENCE AND SCIENTIFIC BASIS

Stakeholders indicated that any rule should be based on science and that there was a question regarding the potential hazards TENORM presents from a scientific perspective. The Department discussed the universally accepted concept of radiation being a carcinogen, the different possibilities for exposure to TENORM, the national and international approaches to radiation protection and limiting radiation dose to members of the public, and information on the scientific modelling programs that are used to predict potential exposure to members of the public from TENORM. Additionally, the Department discussed some of the published scientific papers and guidance documents that are frequently used to establish public policy and regulation in regard to radiation protection.

#### Department DISPOSAL OR TRANSFER APPROVALS

There was stakeholder concern regarding delays in approvals for the transfer and disposal of TENORM materials as a result of the Department's case by case approval method that is employed for some transfers under the current guidance. The Department clarified that with promulgation of the regulation, transfers from one registrant to another for disposal or other purposes will no longer require Department approval for each transfer. Those transactions will happen between registrants and be subject to regulatory requirements and limitations for each registrant or licensee.

#### RADIATION CONCEPTS FOR NON-RADIATION INDUSTRIES

Stakeholders were concerned about dealing with issues related to radiation without any familiarity with the concepts. The Department spent over two hours at the July 11, 2018 meeting discussing basic radiation, radiation risk, and radiation safety concepts in order to familiarize stakeholders with the important concepts and technical language that is typically encountered when dealing with TENORM. This allowed both the stakeholders and the Department to use a common language and understanding as the process moved forward. The Department addressed any basic radiation related misunderstandings throughout the process, at each meeting and also devoted time after each meeting to make sure that anyone who had individual questions could ask them in a one on one setting to ensure that any concept discussed was well understood by all. Additionally, the Department will be providing written guidance documents to assist compliance with the new regulations and the goal of these will be to remove any misunderstandings about the radiation concepts, as well as the regulatory concepts, and assist those affected in their efforts to come into and remain in compliance. Finally, the Department also included a training requirement for all TENORM registrants

within the rule. This requirement requires radiation safety training commensurate with job duties analogous to the federal requirements for HAZMAT employees.

#### REGULATORY PHASE IN PERIOD/EFFECTIVE DATES

Stakeholders voiced concerns regarding implementing new regulations and coming into compliance when there may still be parties who need to characterize their materials for the first time, adjust their operations, or obtain different approvals or permits for modified activities relating to TENORM. The Department acknowledged this and the need for a period of time to adjust to a new set of requirements. The Department included within the rule the addition of a phase in period for compliance once the rule is promulgated. This will allow for affected parties to accomplish these types of tasks and bring themselves into compliance prior to any enforcement actions by the Department. This is discussed in more detail within the Basis and purpose section above.

#### DERIVATION OF EXEMPT CRITERIA

With regard to the development of exempt concentrations, the first criteria to be established was the acceptable radiological dose threshold for members of the public. A 100 millirem per year threshold was chosen for the development of this rule. This is consistent with the radiation dose limits for individual members of the public applicable to operations specifically licensed to use radioactive materials in federal and state regulation as well as international regulation and recommended by radiation protection organizations such as the U.S. Environmental Protection Agency, International Atomic Energy Agency, American National Research Council Committee on the Biological Effects of Ionizing Radiation, United Nations Scientific Committee on the Effects of Atomic Radiation, and the World Health Organization. That threshold was used to develop all of the TENORM concentration thresholds within the rule. This is consistent with the requirements of the statute regarding the development of concentration limits based on the contribution to public dose

#### OIL AND GAS PRODUCED WATER IS TENORM

During the stakeholder process there were multiple conversations about whether or not certain waste streams qualified as TENORM as per the definition. The question of whether or not produced water was TENORM was discussed multiple times. The Department contends that oil and gas operations result in the concentration of radium within the produced fluids and therefore meet the definition of TENORM. Well completion and stimulation activities using waters and chemical additives have an effect on the geologic formation. Concentrations of radium in waters and the mobility of radium through the environment are generally controlled by interaction with surfaces by adsorption. Radium is easily desorbed by changing solution chemistry, including changes in pH, and is strongly affected by competition from other ions. Radium is most mobile in chloride-rich reducing ground water with high total dissolved-solids content. Oil and gas operations employ chemistry to manipulate chemical conditions within the producing formation to create conditions, both physically and chemically, that will allow for the most efficient and manageable extraction of the target resources. This at times includes creating reducing environments to minimize corrosion of the well components or using chemical breakers to reduce viscosity for optimal flow rates. Acids may also be employed to clean or clear fractures. These are changes that may liberate radium in the formation. Additionally, the fractures within the formation allow for the flow of waters with high salinity through the formation and the liberation of these saline waters allows for chlorides to move through the formation in ways that were previously not available. This may solubilize, desorb, and consequently mobilize and increase the concentration of radium in the waters that are produced. Finally, the introduction of waters

from one formation into a different formation during fracking operations may induce the occurrence of chemical reactions within the formation. Naturally occurring elements, including metals such as radium, can leach out of the geologic formation into the produced fluid because of this change in the formation waters. This liberation of radium that would otherwise remain in the formation dictates that the concentrations within these produced fluids are increased and therefore they would meet the statutory definition of TENORM and be subject to this rule.

Please identify the determinants of health or other health equity and environmental justice considerations, values or outcomes related to this rulemaking.

Overall, after considering the benefits, risks and costs, the proposed rule:

Select all that apply.

	Improves behavioral health and mental health; or, reduces substance abuse or suicide risk.		Reduces or eliminates health care costs, improves access to health care or the system of care; stabilizes individual participation; or, improves the quality of care for unserved or underserved populations.
X	Improves housing, land use, neighborhoods, local infrastructure, community services, built environment, safe physical spaces or transportation.	X	Reduces occupational hazards; improves an individual's ability to secure or maintain employment; or, increases stability in an employer's workforce.
	Improves access to food and healthy food options.	X	Reduces exposure to toxins, pollutants, contaminants or hazardous substances; or ensures the safe application of radioactive material or chemicals.
	Improves access to public and environmental health information; improves the readability of the rule; or, increases the shared understanding of roles and responsibilities, or what occurs under a rule.		Supports community partnerships; community planning efforts; community needs for data to inform decisions; community needs to evaluate the effectiveness of its efforts and outcomes.
	Increases a child's ability to participate in early education and educational opportunities through prevention efforts that increase protective factors and decrease risk factors, or stabilizes individual participation in the opportunity.		Considers the value of different lived experiences and the increased opportunity to be effective when services are culturally responsive.
X	Monitors, diagnoses and investigates health problems, and health or environmental hazards in the community.	X	Ensures a competent public and environmental health workforce or health care workforce.
	Other: _____ _____		Other: _____ _____

This rulemaking implements new legislation. Due to the original document being signed and certified, the document is not incorporated directly into the rule package but can be found online at [Senate Bill 18-245](#) , or [https://leg.colorado.gov/sites/default/files/2018a\\_245\\_signed.pdf](https://leg.colorado.gov/sites/default/files/2018a_245_signed.pdf).

1 **DRAFT 1** September 2, 2020

2 **DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT**

3 **Hazardous Materials and Waste Management Division**

4 **State Board of Health**

5 **RADIATION CONTROL - FEES FOR RADIATION CONTROL SERVICES**

6 **6 CCR 1007-1 Part 12**

7 *[Editor's Notes follow the text of the rules at the end of this CCR Document.]*

8 \_\_\_\_\_  
 9 **Adopted by the Board of Health November 2018, 20192020, effective date January 14, 20202021.**

10 **PART 12: FEES FOR RADIATION CONTROL SERVICES**

11 **12.1 Purpose and Scope.**

12 12.1.1 Authority.

13 12.1.1.1 Rules and regulations set forth herein are adopted pursuant to the provisions of  
 14 Sections 25-1-108, 25-1.5-101(1)(k) and 25-1.5-101(1)(l), and 25-11-104(6),  
 15 CRS.

16 12.1.2 Basis and Purpose.

17 12.1.2.1 A statement of basis and purpose accompanies this part and changes to this  
 18 part. A copy may be obtained from the Department.

19 12.1.3 Scope

20 12.1.3.1 The regulations in this part establish fees for radiation control services rendered  
 21 by the Department as authorized by the Act.

22 **12.1.4 Applicability.**

23 12.1.4.1 The regulations in this part apply to radiation control services for a person who is  
 24 an applicant for, or holder of, a:

25 (1) Specific radioactive material license or a general radioactive material license,  
 26 issued pursuant to Part 3 or Part 20:

27 (a) Except for a person who applies for or holds a specific license exempted  
 28 in 12.3.

29 (2) Registration, issued pursuant to Part 2, Part 3, or Part 20.

30 12.1.4.2 The regulations of this part also apply to a request for:

31 (1) Evaluation of a sealed source and/or device containing radioactive material;

32 (2) A special project review that the Department completes or makes whether or not  
 33 in conjunction with a license application on file or which may be filed, and/or

**Commented [JSJ1]: Editorial note 1:** All comments (such as this one) shown in the right side margin of this draft document are for information purposes only to assist the reader in understanding the proposed rule change during the review and comment process.

**Editorial note 2:** Alignment and formatting corrections and minor typographical adjustments may be made in the rule and may not be specifically identified with a side margin comment.

**Commented [JSJ2]:** These dates reflect anticipated adoption and effective dates based on the current rulemaking schedule. Dates are subject to change pending additional review, approvals, and Department rulemaking and Board of Health schedules. (NOTE: Draft A of the proposed rule inadvertently showed incorrect dates, which have since been corrected).

**Commented [JSJ3]:** Provision 12.1 and sub-provisions are formatted for alignment.

**Commented [JSJ4]:** This provision is amended to incorporate the registration and specific licensing processes outlined in the proposed Part 20.

34 (3) Any other service as specified.

35 **12.1.5** Published Material Incorporated by Reference.

36 ~~12.1.5.1 In accordance with Section 24-4-103(12.5)(c), CRS,~~  
37 ~~<https://www.colorado.gov/cdphe/radregs> identifies where incorporated material is~~  
38 ~~available to the public on the internet at no cost. If the incorporated material is not~~  
39 ~~available on the internet at no cost to the public, copies of the incorporated material has~~  
40 ~~been provided to the State Publications Depository and Distribution Center, also known~~  
41 ~~as the State Publications Library. The State Librarian at the State Publication Library~~  
42 ~~retains a copy of the material and will make the copy available to the public.~~

43 ~~12.1.5.2 The materials incorporated by reference in this Part include only those versions~~  
44 ~~that were in effect at the time of the most recent adoption of this Part, and not later~~  
45 ~~amendments to the incorporated material, unless a prior version of the incorporated~~  
46 ~~material is otherwise specifically noted, and in such case that prior version shall apply.~~

47 ~~12.1.5.1 Throughout this Part 12, federal regulations, state regulations, and standards or~~  
48 ~~guidelines of outside organizations have been adopted and incorporated by~~  
49 ~~reference. Unless a prior version of the incorporated material is otherwise~~  
50 ~~specifically indicated, the materials incorporated by reference cited herein include~~  
51 ~~only those versions that were in effect as of the most recent effective date of this~~  
52 ~~Part 12 (November, 2020), and not later amendments or editions of the~~  
53 ~~incorporated material.~~

54 ~~12.1.5.2 Materials incorporated by reference are available for public inspection, and~~  
55 ~~copies (including certified copies) can be obtained at reasonable cost, during~~  
56 ~~normal business hours from the Colorado Department of Public Health and~~  
57 ~~Environment, Hazardous Materials and Waste Management Division, 4300~~  
58 ~~Cherry Creek Drive South, Denver, Colorado 80246. Additionally,~~  
59 ~~<https://www.colorado.gov/cdphe/radregs> identifies where the incorporated~~  
60 ~~materials are available to the public on the internet at no cost. Due to copyright~~  
61 ~~restrictions certain materials incorporated in this Part are available for public~~  
62 ~~inspection at the state publications depository and distribution center.~~

63 ~~12.1.5.3 Availability from Source Agencies or Organizations.~~

64 ~~(1) All federal agency regulations incorporated by reference herein are~~  
65 ~~available at no cost in the online edition of the Code of Federal~~  
66 ~~Regulations (CFR) hosted by the U.S. Government Printing Office, online~~  
67 ~~at [www.govinfo.gov](http://www.govinfo.gov).~~

68 ~~(2) All state regulations incorporated by reference herein are available at no~~  
69 ~~cost in the online edition of the Code of Colorado Regulations (CCR)~~  
70 ~~hosted by the Colorado Secretary of State's Office, online at~~  
71 ~~<https://www.sos.state.co.us/CCR/RegisterHome.do>.~~

72 **12.2 Definitions.**

73 12.2.1 As used in this part, these terms have the definitions set forth as follows.

74  
75 **[ \* \* \* DENOTES UNAFFECTED SECTIONS/PROVISIONS IN THE DRAFT RULE ]**  
76 \_\_\_\_\_

77 \* \* \*

**Commented [JSJ5]:** Provisions are revised and added to 12.1.5 for consistency with the Colorado Administrative Procedure Act (24-4-103(12.5)(a)(2), CRS) with regard to documents that are incorporated by reference.

78 "TENORM" means Technologically Enhanced Naturally Occurring Radioactive Material as  
79 defined in Section 1.2 of Part 1 of these regulations.

80 \* \* \*

81 **12.8 Reserved TENORM Registrants.**

82 12.8.1 Persons who are required to register pursuant to Part 20, Section 20.5 shall pay an initial  
83 registration and annual fee.

84 12.8.1.1 Registrants shall pay the initial registration fee in Appendix 12A.

85 12.8.1.2 Registrants shall pay the annual fee in Appendix 12A.

86 12.8.1.3 Initial registration and annual fees shall be paid for:

87 (1) Each individual facility or location; or

88 (2) For those registrants who have multiple facilities or locations within a single  
89 Township, as designated by the United States Bureau of Land Management  
90 Public Land Survey System, only one fee for each Township in which registered  
91 facilities or locations are located shall be paid.

92 12.8.1.4 The initial registration fee shall be paid when registration information is provided  
93 to the Department in accordance with Part 20, Section 20.5.

94 12.8.1.5 The annual fees shall be due and payable upon notification by the Department.  
95 The annual fees are not refundable except in those cases where the Department  
96 has determined that a fee is not required.

97 12.8.1.6 Annual fees shall be charged and payment required for any registration that has  
98 not been terminated or for which a written notification for termination has not  
99 been submitted to the Department, pursuant to Part 20, Section 20.12, on or  
100 before the payment due date.

101 12.8.2 Fees for inspection of registrants that are based on the full cost of the inspection are payable  
102 upon notification by the Department.

103 12.8.2.1 Inspection costs include reasonable and actual preparation time, time on site,  
104 documentation time, any associated contractual service costs, and time involved  
105 in the processing and issuance of an apparent notice of violation or  
106 administrative penalty.

107 12.8.2.2 Inspection fees will be assessed to recover the full cost for each specific  
108 inspection as specified in Appendix 12A, including registrant-specific  
109 performance reviews and assessments, evaluations, and incident investigations.

110 \* \* \*

111  
112 **PART 12, APPENDIX A: SCHEDULE OF FEES FOR RADIOACTIVE MATERIALS LICENSEES, FOR**  
113 **SERVICES RELATED TO RADIATION MACHINES, AND FOR OTHER SERVICES<sup>3,4,5,6</sup>**

114 3 Applications for new licenses, applications to reinstate expired or terminated licenses, except those subject to fees assessed at full  
115 costs, must be accompanied by the prescribed application fee for each category.

116 4 Application for amendments to licenses that would place the license in a higher fee category or add a new fee category must be  
117 accompanied by the prescribed application fee for each category.

**Commented [JSJ6]:** This provision is added, consistent with the authorization to regulate TENORM materials as provided by [Colorado Senate Bill 18-245 \(SB 18-245\)](#) enacted during the 2018 legislative session, and concurrent with the proposed Part 20 TENORM regulation.

Authorization for assessing fees for licensing, registration, and other regulatory services and activities is provided in [25-11-103, CRS](#).

118 5 Renewal fees – Fees for applications for renewal of materials licenses will not be charged, except that fees for applications for  
119 renewal of licensees subject to full cost fees are due upon notification by the Department.

120 6 Inspection Fees: (a) Fees for routine inspections at locations authorized by the license or reciprocity permit will not be charged,  
121 except that routine inspections subject to full cost fees are due upon notification by the Department. (b) Separate charges will be  
122 assessed for each non-routine inspection which is performed. The frequency of routine inspections are those established in the  
123 Hazardous Materials And Waste Management Division Radiation Program Inspection and Enforcement Manual, and will be in  
124 accord with the frequencies established by the U.S. Nuclear Regulatory Commission for similar types of licenses.

\* \* \*

126 **CATEGORY 3 - BYPRODUCT MATERIAL, NATURALLY OCCURRING AND ACCELERATOR**  
127 **PRODUCED RADIOACTIVE MATERIAL**

\* \* \*

129 3.Q TENORM and A all other specific radioactive material licensees, except those in fee categories 1,  
130 2, 3.A through 3.P, and 4.A. through 9.D.

**Commented [JSJ7]:** The proposed change incorporates TENORM relates fees for a specific license.

131 Application \$ 2,790

132 Annual Fee \$ 2,790

133 Inspection \$ 1,950

\* \* \*

135 **CATEGORY 27 – TENORM REGISTRANTS**

136 Initial Registration \$ 200

137 Annual Fee \$ 200

138 Inspection Full Cost

**Commented [JSJ8]:** The proposed additional category incorporates fees for a TENORM registrant.

139

1 **DRAFT 1.** September 4, 2020

2 **DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT**

3 **Hazardous Materials and Waste Management Division**

4 **RADIATION CONTROL - REGISTRATION AND LICENSING OF TECHNOLOGICALLY ENHANCED**  
 5 **NATURALLY OCCURRING RADIOACTIVE MATERIAL (TENORM)**

6 **6 CCR 1007-1 Part 20**

7 [Editor's Notes follow the text of the rules at the end of this CCR Document.]  
 8

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9 **Adopted by the Board of Health on November 18, 2020; effective January 14, 2021.**

10 **Persons subject to this rule shall be compliant with this Part on or before July 14, 2022.**

11 **Part 20 REGISTRATION AND LICENSING OF TECHNOLOGICALLY ENHANCED NATURALLY**  
 12 **OCCURRING RADIOACTIVE MATERIAL (TENORM)**

13 **20.1 Purpose and Scope.**

14 20.1.1 Authority.

15 A. Rules and regulations set forth herein are adopted pursuant to the provisions of sections  
 16 25-11-104, CRS.

17 20.1.2 Basis and Purpose.

18 A. A statement of basis and purpose accompanies this part and changes to this Part. A copy  
 19 may be obtained from the Department.

20 20.1.3 Scope.

21 A. This Part establishes requirements and provisions for the generation, handling,  
 22 processing, transfer, receipt, transportation, disposal, possession, distribution, and  
 23 beneficial use of technologically enhanced naturally occurring radioactive materials  
 24 (TENORM) and for the registration and issuance of licenses authorizing these activities.  
 25 These requirements and provisions provide for the protection of public health and  
 26 radiation safety of workers and the general public.

27 B. Requirements and provisions in this Part 20 become enforceable July 14, 2022.

28 C. Nothing in this part relieves any person from complying with other local, state, and federal  
 29 laws, regulations, ordinances, and other requirements governing materials that may  
 30 contain TENORM.

31 20.1.4 Applicability.

32 A. The requirements and provisions of these regulations apply to any person who  
 33 generates, handles, processes, transfers, receives, transports, disposes of, possesses,  
 34 distributes, or beneficially uses TENORM unless specifically exempted.

35 B. Source material is not subject to the requirements or provisions of this Part.

36 20.1.5 Published material incorporated by reference.

**Commented [GJ9]:** EDITORIAL NOTE:

Side margin comments as shown here are not part of the rule and are for information only, with the intent to aid the reader in understanding the proposed draft rule. All side margin comments will be removed prior to publication as a final rule and are not part of the rule.

In some areas, additional spaces have been added into the draft rule to allow longer side margin comments to be viewed. These added spaces and this comment is not part of the rule and will be removed prior to final publication

- 37 A. Throughout this Part 20, federal regulations, state regulations, and standards or  
38 guidelines of outside organizations have been adopted and incorporated by reference.  
39 Unless a prior version of the incorporated material is otherwise specifically indicated, the  
40 materials incorporated by reference cited herein include only those versions that were in  
41 effect as of the most recent effective date of this Part 20 (January 2021), and not later  
42 amendments or editions of the incorporated material.
- 43 B. Materials incorporated by reference are available for public inspection, and copies  
44 (including certified copies) can be obtained at reasonable cost, during normal business  
45 hours from the Colorado Department of Public Health and Environment, Hazardous  
46 Materials and Waste Management Division, 4300 Cherry Creek Drive South, Denver,  
47 Colorado 80246. Additionally, <https://www.colorado.gov/cdphe/radregs> identifies where  
48 the incorporated materials are available to the public on the internet at no cost. Due to  
49 copyright restrictions certain materials incorporated in this Part are available for public  
50 inspection at the state publications depository and distribution center.
- 51 C. Availability from Source Agencies or Organizations.
- 52 1. All federal agency regulations incorporated by reference herein are available at  
53 no cost in the online edition of the Code of Federal Regulations (CFR) hosted by  
54 the U.S. Government Printing Office, online at [www.govinfo.gov](http://www.govinfo.gov).
- 55 2. All state regulations incorporated by reference herein are available at no cost in  
56 the online edition of the Code of Colorado Regulations (CCR) hosted by the  
57 Colorado Secretary of State's Office, online at  
58 <https://www.sos.state.co.us/CCR/RegisterHome.do>.
- 59 3. Copies of the standards or guidelines of outside organizations are available  
60 either at no cost or for purchase from the source organizations listed below.
- 61 a. Environmental Protection Agency  
62 1200 Pennsylvania Avenue, N.W.  
63 Washington, DC 20460  
64 <https://www.epa.gov/hw-sw846/sw-846-compendium>
- 65 b. U.S. Postal Service  
66 475 L'Enfant Plaza, SW Room 4012  
67 Washington, DC 20260-2200  
68 <https://pe.usps.com/DMM300/Index>

## 69 20.2 Definitions.

70 As used in this part, these terms have the definitions set forth as follows:

71 "Agreement State" means any State with which the U.S. Nuclear Regulatory Commission or the U.S.  
72 Atomic Energy Commission has entered into an effective agreement under subsection 274b. of the  
73 Atomic Energy Act of 1954, as amended (73 Stat. 689).

74 "Background radiation" means radiation from:

- 75 A. Extraterrestrial sources;
- 76 B. Naturally occurring radioactive material (which has not been technologically enhanced),  
77 including radon (except as a decay product of source or special nuclear material); and

78 C. Global fallout as it exists in the environment from the testing of nuclear explosive devices  
79 or from past nuclear accidents such as Chernobyl that are not under the control of the  
80 licensee or registrant.

81 Background radiation does not include sources of radiation from radioactive materials regulated  
82 by NRC.

83 "Beneficial Use" means:

84 A. The use of solid waste as an ingredient in a manufacturing process, or as an effective  
85 substitute for natural or commercial products, in a manner that does not pose a threat to  
86 human health or the environment. Avoidance of processing or disposal cost alone does  
87 not constitute beneficial use; or

88 B. The use of the nutrients and/or organic matter in biosolids to act as a soil conditioner or  
89 fertilizer for the promotion of vegetative growth on land; or

90 C. The use of the nutrients and/or moisture in water treatment residuals to act as a soil  
91 conditioner or low grade fertilizer for the promotion of vegetative growth on the land.

92 "Biosolids" means the accumulated treated residual product resulting from a domestic wastewater  
93 treatment works. Biosolids does not include grit or screenings from a wastewater treatment works,  
94 commercial or industrial sludges (regardless of whether the sludges are combined with domestic  
95 sewage), sludge generated during treatment of drinking water, or domestic or industrial septage.

96 "Byproduct material" means:

97 A. Any radioactive material, except special nuclear material, yielded in or made radioactive  
98 by exposure to the radiation incident to the process of producing or using special nuclear  
99 material;

100 B. The tailings or wastes produced by the extraction or concentration of uranium or thorium  
101 from ore processed primarily for its source material content, including discrete surface  
102 wastes resulting from uranium or thorium solution extraction processes (underground ore  
103 bodies depleted by these solution extraction operations do not constitute "byproduct  
104 material" within this definition);

105 C.

106 1. Any discrete source of radium-226 that is produced, extracted, or converted after  
107 extraction, before, on, or after August 8, 2005, for use for a commercial, medical,  
108 or research activity; or

109 2. Any material that:

110 a. Has been made radioactive by use of a particle accelerator; and

111 b. Is produced, extracted, or converted after extraction, before, on, or after  
112 August 8, 2005, for use for a commercial, medical, or research activity;  
113 and

114 D. Any discrete source of naturally occurring radioactive material, other than source  
115 material, that:

116 1. The NRC, in consultation with the administrator of the Environmental Protection  
117 Agency, the Secretary of Energy, the Secretary of Homeland Security, and the  
118 head of any other appropriate federal agency, determines would pose a threat

119 similar to the threat posed by a discrete source of radium-226 to the public health  
120 and safety; and

121 2. Before, on, or after August 8, 2005, is extracted, or converted after extraction, for  
122 use for a commercial, medical, or research activity;

123 "Centralized E&P waste management facility" means a facility, other than a commercial disposal facility  
124 regulated by the Colorado Department of Public Health and Environment, that (1) is either used  
125 exclusively by one owner or operator or used by more than one operator under an operating agreement;  
126 and (2) is operated for a period greater than three (3) years; and (3) receives for collection, treatment,  
127 temporary storage, and/or disposal produced fluids, produced water, drilling fluids, completion fluids, and  
128 any other E&P wastes that are generated from two or more production units or areas or from a set of  
129 commonly owned or operated leases. This definition includes oil-field naturally occurring radioactive  
130 materials (NORM) related storage, decontamination, treatment, or disposal.

131 "Class II wells" are wells which inject fluids:

132 A. Which are brought to the surface in connection with natural gas storage operations, or oil  
133 or natural gas production and may be commingled with waste waters from gas plants  
134 which are an integral part of production operations, unless those waters are classified as  
135 a hazardous waste at the time of injection.

136 B. For enhanced recovery of oil or natural gas; and

137 C. For storage of hydrocarbons which are liquid at standard temperature and pressure.

138 "Commercial composting facility" means any solid waste composting facility that accepts a fee for solid  
139 waste composting, or any solid waste composting facility that composts solid waste to create a compost  
140 or soil amendment and distributes the finished compost or soil amendment offsite for a fee.

141 "Compost" means the material or product which is developed under controlled conditions and which  
142 results from biological degradation processes by which organic wastes decompose.

143 "Composting" means the biological process of degrading organic materials that is facilitated and  
144 controlled through intentional and active manipulation. These manipulations may include but are not  
145 limited to grinding, mixing of feed stocks and bulking materials, addition of liquids, turning of piles,  
146 vermicomposting, or mechanical manipulation.

147 "Compost facility" means a site where compost is produced.

148 "Compost feedstock" or "Feedstock" means any decomposable organic material used in the production of  
149 compost or chipped and ground material including, but not limited to, green wastes, animal material,  
150 manure, biosolids, and solid waste.

151 "Department" means the Colorado Department of Public Health and Environment.

152 "Domestic wastewater treatment plant" (wastewater treatment plant) means an arrangement of devices  
153 and structures for treating, neutralizing, stabilizing, or disposing of domestic wastewater, industrial  
154 wastes, and biosolids. A domestic wastewater treatment plant is one type (or element) of domestic  
155 wastewater treatment works. The term "domestic wastewater treatment plant" does not include industrial  
156 wastewater treatment plants or complexes whose primary function is the treatment of industrial wastes,  
157 notwithstanding the fact that human wastes generated incidentally to the industrial process are treated  
158 therein.

159 "Domestic wastewater treatment works" means a system or facility for treating, neutralizing, stabilizing, or  
160 disposing of domestic wastewater which system or facility has a designed capacity to receive more than  
161 two thousand gallons of domestic wastewater per day. The term "domestic wastewater treatment works"

162 also includes appurtenances to such system or facility, such as outfall sewers and pumping stations, and  
163 to equipment relating to such appurtenances. The term "domestic wastewater treatment works" does not  
164 include industrial wastewater treatment plants or complexes whose primary function is the treatment of  
165 industrial wastes, notwithstanding the fact that human wastes generated incidentally to the industrial  
166 processes are treated therein.

167 "Drilling fluid" means a mixture of clay and other chemicals with oil or water that is circulated around the  
168 drill bit in oil-well drilling in order to lubricate and cool the bit, flush rock cuttings to the surface, and plaster  
169 the side of the well to prevent cave-ins.

170 "Dry weight" means the mass of materials excluding the mass of any water or moisture present within the  
171 materials.

172 "Exploration and production waste (E&P waste)" means those wastes associated with operations to  
173 locate or remove oil or gas from the ground or to remove impurities from such substances and which are  
174 uniquely associated with and intrinsic to oil and gas exploration, development, or production operations  
175 that are exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act  
176 (RCRA), 42 USC Sections 6921, et seq. For natural gas, primary field operations include those  
177 production-related activities at or near the wellhead and at the gas plant (regardless of whether or not the  
178 gas plant is at or near the wellhead), but prior to transport of the natural gas from the gas plant to market.  
179 In addition, uniquely associated wastes derived from the production stream along the gas plant feeder  
180 pipelines are considered E&P wastes, even if a change of custody in the natural gas has occurred  
181 between the wellhead and the gas plant. In addition, wastes uniquely associated with the operations to  
182 recover natural gas from underground storage fields are considered to be E&P waste.

183 "Final product" or "Final product material" means a finished soil amendment, compost or fertilizer which is  
184 intended for beneficial use and which contains a biosolids component.

185 "Flowline" means a segment of pipe transferring oil, gas, or condensate between a wellhead and  
186 processing equipment to the load point or point of delivery to a U.S. Department of Transportation  
187 Pipeline and Hazardous Materials Safety Administration or Colorado Public Utilities Commission  
188 regulated gathering line or a segment of pipe transferring produced water between a wellhead and the  
189 point of disposal, discharge, or loading. This definition of flowline does not include a gathering line.

190 "Gathering line" means a gathering pipeline or system as defined by the Colorado Public Utilities  
191 Commission, Regulation No. 4, 4 C.C.R. 723-4901, Part 4, (4 C.C.R. 723-4901) or a pipeline regulated by  
192 the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration pursuant  
193 to 49 C.F.R. §§ 195.2 or 192.8. 49 C.F.R. §§ 195.2 or 192.8 and 4 C.C.R. 723-4901 in existence as of the  
194 date of this regulation and does not include later amendments.

195 "Household waste" means any solid waste generated by households, including single and multiple  
196 residences, and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and  
197 day use recreation areas.

198 "Land application" means the beneficial use method by which E&P wastes, biosolids, or other water  
199 treatment residuals are spread upon or sometimes mixed into soils.

200 "Land treatment" means the treatment method by which E&P waste is applied to soils and treated to  
201 result in a reduction of hydrocarbon concentration by biodegradation and other natural attenuation  
202 processes. Land treatment may be enhanced by tilling, disking, aerating, composting and the addition of  
203 nutrients or microbes.

204 "Municipal solid waste landfill (MSWLF)" means a sanitary landfill where one of the main waste streams  
205 accepted is municipal waste.

206 "Natural background" See Background Radiation.

207 "Naturally occurring radioactive material" (NORM) means any nuclide that is radioactive in its natural  
208 physical state and is not manufactured. "Naturally occurring radioactive material" does not include source  
209 material, special nuclear material, byproduct material, or by-products of fossil-fuel combustion, including  
210 bottom ash, fly ash, and flue-gas emission by-products.

211 "NRC". See "Nuclear Regulatory Commission".

212 "Nuclear Regulatory Commission" (NRC) means the U.S. Nuclear Regulatory Commission or a duly  
213 authorized representative.

214 "Oil and gas facility" means equipment or improvements used or installed at an oil and gas location for the  
215 exploration, production, withdrawal, treatment, or processing of crude oil, condensate, E&P waste, or gas.

216 "Oil and gas operation" means exploring for oil and gas, including conducting seismic operations and the  
217 drilling of test bores; siting, drilling, deepening, recompleting, reworking, plugging, or abandoning a well;  
218 producing operations related to any well, including installing flowlines; the generating, transporting,  
219 storing, treating, or disposing exploration and production wastes; and any constructing, site preparing, or  
220 reclaiming activities associated with such operations.

221 "Oily waste" means those materials containing crude oil, condensate or other E&P waste, such as soil,  
222 frac sand, tank bottoms, and pit sludge that contain hydrocarbons.

223 "Pipeline" means a flowline or gathering line.

224 "Pit" means any natural or man-made depression in the ground used for oil or gas exploration or  
225 production purposes. Pit does not include steel, fiberglass, concrete or other similar vessels which do not  
226 release their contents to surrounding soils.

227 "Produced fluids" mean all fluids produced during flowback, initial testing, and completion of the well  
228 including, but not limited to, produced water and fluids recovered during drilling, casing cementing,  
229 pressure testing, completion, workover, and formation stimulation of all oil and gas wells including  
230 production, exploration, injection, service and monitoring wells. Excluding crude oil and natural gas.

231 "Produced water" means the water (brine) brought up from the hydrocarbon-bearing strata during the  
232 extraction of oil and gas, and can include formation water, injection water, and any chemicals added  
233 downhole or during the oil/water separation process.

234 "RCRA" means the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery  
235 Act of 1976, as amended, 42 U.S.C. section 6901 et seq.

236 "Registered material" means TENORM materials, managed by a person registered as per Section 20.5 of  
237 this Part, that are not exempt from this Part as per Section 20.4 and are not subject to a specific  
238 radioactive materials license as per Section 20.13.

239 "Release" means any unauthorized discharge of TENORM to the environment over time.

240 "Sanitary landfill" means a discrete area of land or an excavation for which the final disposal of solid  
241 waste employs a method to obtain the most dense volume practicable of the waste and covering with  
242 earth or other suitable material. A sanitary landfill may receive household waste, community waste,  
243 municipal solid waste, commercial waste, and industrial waste.

244 "Scale" means a mineral salt deposit that may occur on wellbore tubulars or pipes and components as the  
245 saturation of produced fluid is affected by changing temperature and pressure conditions in production  
246 conduit. Typical scales are calcium carbonate, calcium sulfate, barium sulfate or barite, strontium sulfate,  
247 iron sulfide, iron oxides, iron carbonate, the various silicates and phosphates and oxides, or any of a  
248 number of compounds insoluble or slightly soluble in water.

- 249 "Spill" means any unauthorized sudden discharge of TENORM to the environment.
- 250 "Solid waste disposal site and facility" means the location and/or facility at which the deposit and final  
251 treatment of solid wastes occur.
- 252 "Source material" means uranium or thorium, or any combination of uranium or thorium, in any physical or  
253 chemical form, including ores that contain, by weight, one-twentieth of 1 percent (0.05 percent) or more,  
254 of uranium, thorium or any combination thereof. Source material does not include special nuclear  
255 material.
- 256 "Tank" means a stationary vessel constructed of non-earthen materials (e.g concrete, steel, plastic) that  
257 provides structural support and is designed and operated to store produced fluids or E&P waste.
- 258 "Tank bottom" means extraneous materials which may settle to the bottoms of tanks.
- 259 "Technologically enhanced naturally occurring radioactive material" (TENORM) means naturally occurring  
260 radioactive material whose radionuclide concentrations are increased by or as a result of past or present  
261 human practices. "TENORM" does not include:
- 262 A. Background radiation or the natural radioactivity of rocks or soils;
- 263 B. "Byproduct material" or "source material", as defined by Colorado statute or rule; or
- 264 C. Enriched or depleted uranium as defined by Colorado or federal statute or rule.
- 265 "TENORM Radionuclides" means Radium-226, Radium-228, Lead-210, and Polonium-210.

### 266 20.3 General Provisions

- 267 20.3.1 Unless otherwise specified, concentration limits within this Part shall be in dry weight and exclude  
268 natural background.
- 269 A. Acceptable Natural Background values are either:
- 270 1. Established by the Department and may be found on the Department's website;  
271 or
- 272 2. For generation, disposal, or beneficial use sites, site specific values may be  
273 established and employed. An adequate and acceptable background sample set  
274 will provide a mean within +/- 20% of the true average at the 95% confidence  
275 level.
- 276 B. Dry weight refers to the mass of a material excluding the mass of any water or moisture  
277 present within the material.
- 278 1. For the purposes of liquid TENORM sample analysis, unfiltered (total) samples  
279 which include both suspended and dissolved solids must be analyzed for activity  
280 and shall represent the total dry weight mass of the sample.
- 281 2. Dry weight concentration values shall be expressed in units of activity per mass,  
282 most commonly picocuries per gram.
- 283 20.3.2 Any person who generates a waste, residual product, or other material by way of a process that  
284 has the potential to increase the concentration of NORM and as a result may contain  
285 concentrated naturally occurring radionuclides must make a TENORM determination to evaluate  
286 whether that material is subject to the applicable requirements established in this Part, or if it can

**Commented [GJ10]:** The Department will provide specific guidance on sample number and has provided calculation worksheets on our website.

**Commented [GJ11]:** Dry weight concentration limits are used universally in order to consistently and adequately assess the potential impact from these materials. Recognizing that the sample results in dry weight may not represent the materials as they exist when generated, the Department has evaluated potential dose to receptors using realistic modelling scenarios to account for the dispersion of these materials in their common matrices and has accounted for the potential shielding and exposure rate reduction that is provided by the moisture content of the materials. Guidance will be provided on different methods of determining Dry Weight Concentrations for characterization and compliance determination purposes.

**Commented [GJ12]:** Please note that the presence of NORM alone does not constitute TENORM. The purpose of this section is to make a determination regarding the extent to which NORM is concentrated within a material and which regulatory requirements will apply to the material. The first step is to establish that a process has the potential to increase concentrations of the radioactive constituents. If an exempt determination is made no further action is required unless there is reason to suspect that the NORM concentrations within the materials have changed, such as a result of a process change or a change to the raw materials involved in the process.

287 be exempted from the requirements according to Section 20.4 of this Part. The TENORM  
288 determination shall be made as follows:

- 289 A. The TENORM determination for each material must be made at the point of generation,  
290 and at any time in the course of its management that it has, or may have, changed its  
291 properties or naturally occurring radionuclide concentration as a result of the processes  
292 that generated the materials or other factors that may change the properties of the  
293 materials such that the TENORM classification of the material may change.
- 294
- 295 B. A person shall use knowledge of the material when making this determination.  
296 Acceptable knowledge may include material origin, composition, process knowledge  
297 (e.g., radiological, chemical, or physical characterization of feedstocks and other inputs to  
298 the production process, including the exclusion of one or more TENORM radionuclides  
299 from consideration based on that knowledge); knowledge of products, by-products, and  
300 intermediates produced by the process; information on the radiological, chemical, and  
301 physical properties of the materials used or produced by the process or otherwise  
302 contained in the generated materials; proper characterization of the materials that  
303 illustrates the radiological concentrations of TENORM radionuclides within the generated  
304 materials; or other reliable and relevant information about the radiological properties of  
305 the generated materials (all of which may be used to develop a waste or material profile).
- 306 C. Characterization of TENORM materials shall be performed using appropriate and  
307 standard methods such as EPA Test Methods for Evaluating Solid Waste:  
308 Physical/Chemical Methods Compendium (SW-846) or equivalent alternative methods  
309 recognized by the Department. Alternative characterization methods may be submitted to  
310 the Department for review and approval. Approved alternatives will be maintained within  
311 Department guidance and available on the Department website.

312 20.3.3 Any person who shall make, or cause to be made, surveys of areas or materials, or other  
313 measurements which are necessary to comply with or to evaluate or determine applicability of  
314 any section of this Part shall ensure that instruments and equipment used for quantitative  
315 radiation measurements, for example, radiation dose rate or levels of non-fixed contamination,  
316 are:

- 317 A. Calibrated at intervals not to exceed 12 months for the radiation measured unless  
318 otherwise approved by the Department;
- 319 B. Are appropriate for the radiation being measured; and
- 320 C. Have minimum detection capabilities adequate to demonstrate compliance or make a  
321 regulatory determination.

322 20.3.4 The Department may incorporate into any registration or license at the time of issuance, or  
323 thereafter by appropriate rule, regulation, or order, such additional requirements and conditions  
324 with respect to the licensee or registrant's receipt, possession, use, transfer, or disposal of  
325 radioactive material subject to this Part, as it deems appropriate or necessary in order to:

- 326 A. Minimize danger to public health and safety, workers, or property; and
- 327 B. Prevent loss or theft of material subject to this Part.

328 **20.4 Exemptions.**

**Commented [GJ13]:** The Department's expectations are that determinations are made at the point at which the materials are generated, are no longer in process, and are under the control of the generator. Additionally, the materials need to be reasonably readily accessible. The Department will be developing guidance with the input of industry and related stakeholders to establish acceptable process sampling points/locations for those who generate potential TENORM. Additionally, the ability to create waste or material profiles over time is acceptable and will be encouraged for those processes that are ongoing and generate a reasonably consistent material. Adequate frequency of verification sampling will be included in guidance.

**Commented [GJ14]:** This section will specifically allow for the use of industry knowledge as well as data other than just radiological sample data to make a determination. The Department will work with industry to provide guidance on acceptable considerations and determinations. This will include establishing which radionuclides are to be considered for each material type, e.g. Pb and Po are important for natural gas waste but may be excluded from analyses of drinking water or waste water treatment residuals.

**Commented [GJ15]:** The Department will be providing specific guidance on acceptable lab analysis and data evaluation methods in the form of a spreadsheet for statistically verifying adequate characterization that is consistent with SW-846 methods. This will include an evaluation for the appropriate number of samples and TENORM concentration values versus regulatory thresholds, including exempt concentrations or upper limits of registration. Additionally, acceptable alternative methods of radiological characterization will be provided in guidance.

329 TENORM materials that qualify for exemption in accordance with any one of the following  
 330 exemption categories are exempt from this rule and do not need to meet the requirements of any  
 331 other exemption category.

332 20.4.1 Exempt Concentrations.

333 A. Persons who generate, handle, process, transfer, receive, transport, dispose of, possess,  
 334 distribute, or beneficially use TENORM are exempt from the requirements of this part if  
 335 the materials contain or are contaminated at concentrations in dry weight not in excess of  
 336 those listed in Table 20 – 1 excluding natural background. The radioactive progeny of  
 337 the isotopes present in exempt TENORM are also exempt.

338 **Table 20 – 1**  
 339 **Exempt TENORM Concentrations**  
 340

Isotope	Picocuries/gram (pCi/g)
Radium-226	5
Radium-228	5
Lead-210	5
Polonium-210	5

341 20.4.2 Exempt Quantities.

342 A. Persons who generate, handle, process, transfer, receive, transport, dispose of, possess,  
 343 distribute, or beneficially use TENORM are exempt from the requirements of this part if  
 344 the materials are in individual quantities each of which does not exceed the applicable  
 345 quantity set forth in Table 20 – 2. The radioactive progeny of the isotopes present in  
 346 exempt TENORM are also exempt.

347 **Table 20 – 2**  
 348 **Exempt TENORM Quantities**  
 349

Isotope	Microcuries (μCi)
Radium-226	0.1
Radium-228	0.1
Lead-210	0.1
Polonium-210	0.1

350 20.4.3 Household waste containing TENORM is exempt from the requirements of this Part.

351 20.4.4 Consumer goods or products such as tobacco products or building materials are exempt from the  
 352 requirements of this Part.

353 20.4.5 Waste pipe generated by oil and gas exploration and production, midstream, or downstream  
 354 related activities or by other industrial activities that may contain TENORM as scale shall be  
 355 exempt from this Part if:

356 A. The pipe is no longer than 50 feet in length, or the pipe is cut to individual sections no  
 357 longer than 50 feet in length; and

358 B. Each pipe section exhibits no measured radiation dose rate distinguishable from natural  
 359 background when measured on contact with both the exterior surface and each  
 360 accessible surface of the interior of the pipe section with a portable radiation detector;  
 361 and

362 C. For each pipe section used for transfer or processing of natural gas, the level of non-fixed  
 363 alpha contamination of each accessible interior surface does not exceed 600  
 364 disintegrations per minute per 100 square centimeters (600 dpm/100 cm<sup>2</sup>).

365

366

367

368 20.4.6 Transportation: Common and contract carriers, freight forwarders, and warehouse workers which  
 369 are subject to the requirements of the DOT in 49 CFR 170 through 189, or the U.S. Postal  
 370 Service in the Postal Service Manual (Domestic Mail Manual), are exempt from the requirements  
 371 of this Part to the extent that they transport or store radioactive material in the regular course of  
 372 their carriage for others or storage incident thereto.

373 20.4.7 The Department may, upon application or upon its own initiative, grant an exemption or exception  
 374 from any requirement in this Part as it determines is authorized by law and will not result in undue  
 375 hazard to public health and safety, workers, or property.

376

377

378 20.4.8 No person may, for purposes of rendering materials exempt under the requirements of Section  
 379 20.4, purposefully dilute TENORM to reduce the concentration of radionuclides contained within  
 380 the materials or subdivide TENORM material to reduce the quantity of radionuclides contained  
 381 within the materials below the exempt limits. Operations which are routine, state of practice, and  
 382 common within an industry or are required for purposes of the activity being conducted which  
 383 may inadvertently reduce the concentration of TENORM but are not performed for the express  
 384 purpose of rendering a material exempt are not prohibited.

## 385 Registration

386 **20.5 Persons who generate, handle, process, transfer, receive, transport, dispose of, possess,**  
 387 **distribute, or beneficially use TENORM not exempt from this Part as per Section 20.4 and**  
 388 **not subject to a specific radioactive materials license as per Section 20.13 shall register**  
 389 **with the Department. TENORM materials that are included within a specific radioactive**  
 390 **materials license authorization do not require registration under this section. A registrant**  
 391 **may capture multiple activities (generation, beneficial use, acceptance for disposal, etc.)**  
 392 **and types of Non-Exempt TENORM materials under one registration.**

393 20.5.1 All persons subject to registration shall register annually with the Department and shall pay the  
 394 fee required by 6 CCR 1007-1 Part 12.

395 A. Initial registration shall take place within 90 days of any activity which requires  
 396 registration per Section 20.5.

397 B. The registrant shall furnish the following information and any other information specifically  
 398 requested by the Department:

399 1. Name and mailing address;

400 2. Name, title, telephone number, and email address of the responsible person  
 401 designated as a representative of the registrant;

**Commented [GJ16]:** The Department will be issuing specific guidance on methods to obtain a wipe of the accessible interior surface. The individual in possession may be able to make this determination themselves using Department approved survey and analysis techniques, or may choose only to swipe the potential TENORM material and send the sample to a lab for analysis. Alternatively, the facility may hire a service provider or consultant to make the determination or perform the swipe for analysis at a laboratory. Finally, if there are alternative methods suggested to establish that the removable alpha contamination does not exceed the standard, those may be approved and included in Department guidance.

Exemption values based on a removable radioactive contamination limit criteria were adopted from two American National Standards Institute documents that considered potential radiological doses from these materials. Those documents are: ANSI N.13.12, Surface and Volume Radioactivity Standards for Clearance, 2013 Edition and N13.53, Control and Release of Technologically Enhanced Naturally Occurring Radioactive Material (TENORM), 2009 Edition.

**Commented [GJ17]:** This may apply to an entity who is subject to registration. Additionally, if the Department grants a general case exemption, that will be included in guidance until such time as it can be incorporated into the rule.

**Commented [GJ18]:** Comingling or combining identical or similar wastes at a facility for disposal as part of routine operations would not be considered purposeful dilution if it is a common practice. Additionally, if there is a common and necessary industry practice that may reduce the overall TENORM concentration – such as adding alum to capture or sequester a constituent - then this would be allowed and would not be considered purposeful dilution.

**Commented [GJ19]:** Please Note: The intention of registration is to capture information on those entities who generate or are in possession of TENORM, provide a framework within which they may operate, and ensure that the materials are disposed of properly, while allowing for routine operations to continue and providing a high level of confidence that no members of the public including workers exceed the 100 mrem annual dose standard. Additionally, the Department will be developing concise registration forms to minimize the burden on registrants when providing registration information.

**Commented [GJ20]:** For example: One entity may both generate materials and beneficially use materials, i.e. generate biosolids and then apply those biosolids to land, under one registration. One entity may also generate materials in more than one method, i.e. drinking water treatment and wastewater treatment, under one registration.

- 402 3. Address or location information (Public Land Survey System (PLSS)  
403 Township/Range, Section, and Quarter-Quarter Section (Lot/Tract)) at which the  
404 TENORM is located;
- 405 4. Registrant type or a description of the process or activity that generates the  
406 TENORM. A registrant may include multiple types of activities within one  
407 registration;
- 408 5. A description of the TENORM including the amount or volume and the  
409 concentrations of TENORM radionuclides present within the material;
- 410 6. A description of any routine or non-routine maintenance that involves the  
411 manipulation or handling of the TENORM;
- 412 7. Certification by the responsible representative of the registrant that they are  
413 aware of the requirements of this Part and will meet all of the applicable  
414 requirements.

**Commented [GJ21]:** A registrant may be a generator, a beneficial user, a disposal facility, or another type of registrant at the same time or any combination of types.

415 20.5.2 General Requirements - Any person subject to registration per Section 20.5:

- 416 A. Shall not abandon such TENORM.
- 417 B. Shall secure registered materials from unauthorized removal or access, with the  
418 exception of those materials land applied for beneficial use in accordance with this Part.
- 419 C. Shall transfer TENORM in accordance with this Part.
- 420 D. Shall maintain records in accordance with Section 20.10 of this Part.
- 421 E. Shall ensure that registered materials that have been packaged or containerized for  
422 transfer or disposal as per this Part shall bear a durable, clearly visible label bearing the  
423 radiation symbol prescribed in 6 CCR 1007-1 Part 4, Section 4.27 and the words  
424 "CAUTION, RADIOACTIVE MATERIAL" when in storage awaiting transfer or disposal.
- 425 F. Is subject to the provisions in Sections 4.51 of 6 CCR 1007-1 Part 4 for reporting theft or  
426 loss of registered material but shall be exempt from the other requirements of 6 CCR  
427 1007-1 Part 4 unless otherwise required by this Part. This exemption does not apply to  
428 any person who also holds a specific radioactive materials license issued by the  
429 Department.
- 430 G. Is subject to the provisions in Section 10.5.1 of 6 CCR 1007-1 Part 10 but shall be  
431 exempt from the other requirements in 6 CCR 1007-1 Part 10. This exemption does not  
432 apply to any person who also holds a specific radioactive materials license issued by the  
433 Department.
- 434 H. Shall only allow employees or contractors under the control and supervision of a  
435 registrant to perform routine maintenance on equipment, facilities, and land owned or  
436 controlled by the registrant. Maintenance that provides a pathway for exposure different  
437 from that found in routine periodic maintenance operations or that increases the potential  
438 for additional exposure is not considered routine maintenance and shall not be conducted  
439 without a specific radioactive materials license or specific written approval from the  
440 Department.
- 441 I. Shall conduct activities so as to minimize contamination of the facility and the  
442 environment. When activities involving such TENORM are permanently ceased at any  
443 site, if evidence of residual TENORM is identified, the registrant shall notify the  
444 Department about such material and may consult with the Department as to the

**Commented [GJ22]:** Items such as drums, roll off containers, dumpsters and other packages or containers that wastes are placed in prior to transfer should be labeled as required by this item.

445 appropriateness of sampling and restoration activities to ensure that any contamination or  
 446 residual TENORM remaining at the site where registered TENORM was used does not  
 447 exceed the limits in Table 20-1 or is not likely to result in exposures that exceed the limits  
 448 in Section 4.61.2 of 6 CCR 1007-1 Part 4. Institutional controls may be required if  
 449 compliance with Table 20-1 or the limits in Section 4.61.2 of 6 CCR 1007-1 Part 4 is not  
 450 feasible.

451 J. Is prohibited from administering TENORM, or the radiation therefrom, either externally or  
 452 internally, to human beings except as may be authorized in a specific radioactive  
 453 materials license.

454 K. Shall respond to written requests from the Department to provide information relating to  
 455 the registration within 30 calendar days of the date of the request, or other time specified  
 456 in the request.

457 1. If the registrant cannot provide the requested information within the allotted time,  
 458 it shall, within that same time period, request a longer period to supply the  
 459 information by providing the Radiation Control Program Manager a written  
 460 justification for the request.

461 L. Shall appoint an individual responsible for having knowledge of the appropriate  
 462 regulations and requirements and the authority for taking required actions to comply with  
 463 appropriate regulations and requirements.

464 1. The registrant, through this individual, shall ensure the day-to-day compliance  
 465 with appropriate regulations and requirements; this appointment does not relieve  
 466 the registrant of any of its responsibility in this regard.

467 M. Is subject to all other applicable portions of this Part and any limitations of the  
 468 registration.

469 N. Is subject to the provisions of 49 CFR Subtitle B. Chapter I. Subchapter C. when  
 470 transporting registered material outside the registered site or where transport is on public  
 471 highways, or who delivers licensed material to a carrier for transport.

472 O. Shall not introduce registered material into a consumer good or product except as  
 473 specifically allowed by this Part.

474 P. Shall, when operating as a solid waste disposal site and facility, incorporate each  
 475 TENORM radionuclide present within the registered materials into monitoring and closure  
 476 plans required by 6 CCR 1007-2 Part 1.

477 Q. Use, to the extent practical, procedures and engineering controls to reduce and maintain  
 478 doses to members of the public as low as is reasonably achievable (ALARA).

479 **20.5.3** Training requirements. All persons subject to registration shall meet the following requirements.

480 A. All employed individuals whose assigned activities during normal and abnormal situations  
 481 may involve exposure to registered TENORM or radiation resulting from that material  
 482 which can reasonably be expected to occur during the life of a registered facility shall be  
 483 instructed in the following topics:

484 1. The storage, transfer, or use of sources of radiation;

485 2. General awareness in the health protection problems associated with exposure  
 486 to radiation and/or radioactive material to the individual and the potential

**Commented [GJ23]:** The concept of administering radioactive material or radiation to a human being is found in and commonly used in multiple portions of the Colorado radiation control regulations and Federal regulations and is referring to applications to the human body with the intention to illicit an effect on the body, such as medical applications. This language is not intended to prohibit the transfer of materials in accord with the rule.

**Commented [GJ24]:** The registrant is required to identify an individual who will be responsible to act as a representative of the registrant to the Department and will be familiar with the requirements applicable to the registrant. This individual may be a permanent employee or a consultant, and is not required to be certified or approved by the Department.

**Commented [GJ25]:** The Department will be issuing guidance to assist with transportation regulations. A significant portion of registered TENORM may be exempt from the DOT regulations based on the [49 CFR 173.403](#) definition of radioactive material.

**Commented [GJ26]:** This applies to those solid waste facilities that have a Section 9 impoundment or perform any other activities that require monitoring or closure plans as per the solid waste regulations.

**Commented [GJ27]:** The Department will be issuing guidance regarding training. The guidance will be developed with industry in order to best communicate expectations regarding the level of training commensurate with activities and the training content.

- 487 offspring, designed to enable the employee to recognize and identify exposure to  
488 radiation and/or radioactive material;
- 489 3. Requirements of this Part that are specifically applicable to the functions or  
490 activities the employee performs;
- 491 4. The employee's responsibility to observe, to the extent within the worker's  
492 control, the applicable provisions of the Radiation Control Act, 6 CCR 1007-1,  
493 this Part and specific measures the employer has implemented for the protection  
494 of personnel from exposures to radiation or radioactive material;
- 495 5. The employee's responsibility to report promptly to the registrant any condition  
496 which may constitute, lead to, or cause a violation of this Part and registrations,  
497 or unnecessary exposure to radiation and/or radioactive material;
- 498 6. Methods and procedures for avoiding incidents; and
- 499 7. Emergency response information, including the appropriate response to warnings  
500 made in the event of any unusual occurrence or malfunction that may involve  
501 exposure to radiation and/or radioactive material, and the procedures for  
502 mitigating any spill or release.
- 503 B. The extent of these instructions shall be commensurate with potential radiological health  
504 effects associated with assigned work and present in the work place.
- 505 C. Training frequency:
- 506 1. Initial training. A new employee, or an employee who changes job functions  
507 involving exposure to radiation or radioactive material may perform those  
508 functions prior to the completion of training provided:
- 509 a. The employee performs those functions under the direct supervision of a  
510 properly trained and knowledgeable employee; and
- 511 b. The training is completed within 90 days after employment or a change  
512 in job function.
- 513 2. Refresher training. An employee must receive the training required by this Part at  
514 least once every three years.
- 515 D. Trainings received from a previous employer or other source may be used to satisfy the  
516 requirements of this Part provided a current record of training is obtained from the  
517 employees' previous employer or other source and the training is pertinent and applicable  
518 to the employees current job function.
- 519 E. Each registrant is responsible for compliance with the requirements of this Part  
520 regardless of whether the training required by this subpart has been completed.
- 521 F. Each registrant must create and maintain employee training record in accordance with  
522 Section 20.10.4.
- 523 20.5.4 Spill and release requirements.
- 524 A. Registrants shall, immediately upon discovery, control and contain all spills/releases of  
525 Non-Exempt TENORM.

- 526 B. Registrants shall investigate and remediate impacts resulting from spills/releases as soon  
527 as practicable.
- 528 C. Reporting.
- 529 1. Oil and Gas exploration and production registrants that are subject to the spill  
530 and release reporting requirements of 2 CCR 404-1 shall provide copies of all  
531 reports required by 2 CCR 404-1 Rule 906 regarding a spill/release of registered  
532 TENORM. These shall be provided to the Department no later than 24 hours  
533 after they are submitted to the Oil and Gas Conservation Commission of the  
534 State of Colorado (COGCC).
- 535 a. The report required by 2 CCR 404-1 Rule 906 shall include information  
536 available to the registrant about the type, isotopes, concentration, and  
537 volume of TENORM involved, including whether it is controlled or  
538 uncontrolled at the time of submitting the initial report.
- 539 2. All other registrants shall make an initial notification to the Department as soon  
540 as practicable upon discovery of a spill or release in which Non-Exempt  
541 TENORM containing 10  $\mu\text{Ci}$  or more of either Radium-226, Radium-228, Lead-  
542 210, or Polonium-210 is spilled or released, and shall provide an initial written  
543 report no more than seven days after such a discovery.
- 544 a. The initial written report of a spill/release shall include, at a minimum, the  
545 location of spill/release, the type and volume of TENORM involved in the  
546 spill/release, the actions that have been taken to control or contain such  
547 spill/release, the disposal of spill/release impacted material, and the plan  
548 and schedule to prevent any future spill/release.
- 549 D. Upon receipt of the initial notification or the initial written report, the Department may  
550 require a site investigation and remediation work plan for review and approval when a  
551 spill/release results in any of the following conditions:
- 552 1. Soil contamination in excess of 5 pCi/g above natural background for any  
553 individual TENORM radionuclide
- 554 2. Groundwater or surface water impacts in excess of WQCC standards
- 555 3. The potential for any individual to exceed an annual dose of 100 millirem (1  
556 millisievert)
- 557 E. Site investigation and remediation work plans shall, at minimum, address the following:
- 558 1. Sampling and analysis to determine the extent of contamination in soil, surface  
559 water, and groundwater
- 560 2. Remedial activities including either a radiological dose estimate demonstrating  
561 that no individual will exceed an annual dose of 100 millirem (1 millisievert) or  
562 information on the individuals authorized to perform such operations under terms  
563 of a specific radioactive materials license or equivalent licensing document,  
564 issued by the Department, NRC or any Agreement State.
- 565 3. Access control to the impacted area
- 566 4. Schedule for remedial activities to be conducted and complete
- 567 5. Waste management

568 **Registrant Types and Restrictions**569 **20.6 Registration as a TENORM Generator.**

## 570 20.6.1 Oil and Gas Registrants.

571 Non-Exempt TENORM generated by Oil and Gas exploration and production, as well as  
 572 midstream and downstream activities, including those materials generated at a centralized E&P  
 573 waste management facility shall be registered and are subject to the requirements and limitations  
 574 as follows:  
 575

576 A. All activities involving Non-Exempt TENORM generated by Oil and Gas exploration and  
 577 production activities shall meet the applicable requirements of 2 CCR 404-1 in addition to  
 578 the requirements of this part.

579 B. Produced Fluids.

580 1. Registrants may possess produced fluids that contain or are contaminated at  
 581 concentrations, excluding natural background, greater than 5 pCi/g but not in  
 582 excess of 250 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210,  
 583 and Polonium-210.

584 2. Disposal. Registered produced fluids may only be disposed of as follows:

585 a. Injection into a Class II well permitted in accordance with 2 CCR 404-1,  
 586 Rule 325 and registered with the Department in accordance with this  
 587 Part;

588 b. Disposal at commercial solid waste disposal facility registered with the  
 589 Department in accordance with this Part;

590 c. Discharging into state waters, in accordance with the Water Quality  
 591 Control Act, the rules and regulations promulgated thereunder and 2  
 592 CCR 404-1, Rule 907.

593 d. Evaporation in a properly lined pit at a centralized E&P waste  
 594 management facility permitted in accordance with 2 CCR 404-1, Rules  
 595 907 and 908 and registered with the Department in accordance with this  
 596 Part.

597 e. Disposal at a facility authorized to receive such material under terms of a  
 598 specific radioactive materials license, a Part 20 TENORM registration, or  
 599 equivalent licensing document, issued by the Department, NRC or any  
 600 Agreement State, or to any person otherwise authorized to receive such  
 601 material by the Federal Government or any agency thereof, the  
 602 Department, or an Agreement State.

603 3. Registrants in possession of produced fluids that contain or are contaminated at  
 604 concentrations, excluding natural background, in dry weight in excess of 50 pCi/g  
 605 of any TENORM Radionuclide and contain greater than 10% solids (or are less  
 606 than 90% moisture content):

607 a. Shall confine these produced fluids to closed tanks, pipes, transfer lines  
 608 or any other containment that prevents physical access to the materials.

609 b. Shall prohibit any physical access to or handling of these produced fluids  
 610 outside of containment by unauthorized persons. These activities shall

**Commented [GJ28]:** Please note that the concentration limitations specific to different waste types and activities were determined by employing models and calculations to establish potential radiological dose. These scenarios took into account the different types of activities, physical conditions, and the likely physical form of the materials, i.e. produced fluids are typically in liquid form containing significant dissolved and suspended solids whereas a drinking water treatment residual may be a liquid with very little dissolved and suspended solids or more of a sludge and have significantly more solids content. Models assessed exposure rates from these materials as they would exist in operations typical to the industry in which they are produced.

- 611 only be performed by individuals authorized to perform such operations  
 612 under terms of a specific radioactive materials license or equivalent  
 613 licensing document, issued by the Department, NRC or any Agreement  
 614 State. The registrant may seek to obtain a specific radioactive materials  
 615 license to perform these activities or may use a specifically licensed  
 616 service provider authorized for these activities.
- 617 c. Shall not reuse these produced fluids for enhanced recovery, drilling, or  
 618 any other use.
- 619 d. Shall only transfer these materials for disposal.
- 620 4. Reuse and Recycling.
- 621 a. Produced water may be reused for enhanced recovery, drilling, and other  
 622 approved uses in a manner consistent with existing water rights and in  
 623 consideration of water quality standards and classifications established  
 624 by the Water Quality Control Commission (WQCC) for waters of the  
 625 state, or any point of compliance established by the Director pursuant to  
 626 2 CCR 404-1, Rule 324D.
- 627 C. **Oily Waste.**
- 628 Registrants may possess oily waste that contain or are contaminated at concentrations,  
 629 excluding natural background, not in excess of 50 pCi/g each in dry weight of Radium-  
 630 226, Radium-228, Lead-210, and Polonium-210.
- 632 1. Disposal. Oily wastes may only be disposed of as follows:
- 633 a. Disposal at commercial solid waste disposal facility registered with the  
 634 Department in accordance with this Part;
- 635 b. Land treatment or land application at a centralized E&P waste  
 636 management facility permitted in accordance with 2 CCR 404-1, Rules  
 637 908 and registered with the Department in accordance with this Part.
- 638 c. Disposal at a facility authorized to receive such material under terms of a  
 639 specific radioactive materials license, a Part 20 TENORM registration, or  
 640 equivalent licensing document, issued by the Department, NRC or any  
 641 Agreement State, or to any person otherwise authorized to receive such  
 642 material by the Federal Government or any agency thereof, the  
 643 Department, or an Agreement State.
- 644 D. **Pigging Waste.**
- 645 Registrants may possess pigging waste from natural gas pipelines that contain or are  
 646 contaminated at concentrations, excluding natural background, not in excess of 500 pCi/g  
 647 each in dry weight of Lead-210, and Polonium-210.
- 649 1. Wastes from natural gas pipelines shall be:
- 650 a. Characterized at minimum for their Lead-210 content.
- 651 b. Maintained moist to prevent creation or dispersion of particulate  
 652 materials

**Commented [GJ29]:** Please note that while oily waste may refer to a number of different waste types the rule only applies to those oily wastes which can reasonably be expected to be a result of processes that have the potential to concentrate NORM and therefore be TENORM. The intent of this section is not to imply that all oily wastes are TENORM but rather to provide a framework for handling and disposing of those oily wastes that have specifically been determined to be TENORM.

- 653 c. Subject to Section 20.6.1.H. of this Part if they are determined to be a  
654 Hazardous Waste.
- 655 2. Limitations:
- 656 a. Pigging Operations: If pigging wastes contain or are contaminated at  
657 concentrations, excluding natural background, in excess of 50 pCi/g in  
658 dry weight of either Lead-210, or Polonium-210, all pigging operations  
659 involving those wastes outside of the pipeline shall be performed by  
660 individuals authorized to perform such operations under terms of a  
661 specific radioactive materials license or equivalent licensing document,  
662 issued by the Department, NRC or any Agreement State. The registrant  
663 may seek to obtain a specific radioactive materials license to perform  
664 these activities or may use a specifically licensed service provider  
665 authorized for these activities;
- 666 3. Disposal.
- 667 Pigging wastes may only be disposed of as follows, except for Hazardous  
668 Wastes which shall meet Section 20.6.1.H:
- 669
- 670 a. Disposal at commercial solid waste disposal facility registered with the  
671 Department in accordance with this Part;
- 672 b. Injection into a Class II well permitted in accordance with 2 CCR 404-1,  
673 Rule 325 and registered with the Department in accordance with this  
674 Part.
- 675 c. Disposal at a facility authorized to receive such material under terms of a  
676 specific radioactive materials license, a Part 20 TENORM registration, or  
677 equivalent licensing document, issued by the Department, NRC or any  
678 Agreement State, or to any person otherwise authorized to receive such  
679 material by the Federal Government or any agency thereof, the  
680 Department, or an Agreement State.
- 681 E. Filter Socks.
- 682 Registrants may possess filter socks that contain or are contaminated at concentrations,  
683 excluding natural background, not in excess of 500 pCi/g each in dry weight of Radium-  
684 226, Radium-228, Lead-210, and Polonium-210.
- 685
- 686 1. Disposal.
- 687 Filter socks may only be disposed of as follows:
- 688
- 689 a. Disposal at commercial solid waste disposal facility registered with the  
690 Department in accordance with this Part;
- 691 b. Disposal at a facility authorized to receive such material under terms of a  
692 specific radioactive materials license, a Part 20 TENORM registration, or  
693 equivalent licensing document, issued by the Department, NRC or any  
694 Agreement State, or to any person otherwise authorized to receive such  
695 material by the Federal Government or any agency thereof, the  
696 Department, or an Agreement State.
- 697 2. Handling.
- 698 Registrants shall limit direct handling of filter socks to removal from filter housing,  
699

700 placement on gravity separation equipment, and placement in waste containers.  
701 All other direct handling, manipulation, or any other activities that would provide  
702 an exposure pathway different from that found in routine handling operations  
703 shall be performed by individuals authorized to perform such operations under  
704 terms of a specific radioactive materials license or equivalent licensing  
705 document, issued by the Department, NRC or any Agreement State. The  
706 registrant may seek to obtain a specific radioactive materials license to perform  
707 these activities or may use a specifically licensed service provider authorized for  
708 these activities.

709 3. Registrants in possession of materials that contain or are contaminated at  
710 concentrations, excluding natural background, in dry weight in excess of 50 pCi/g  
711 of any TENORM Radionuclide shall additionally:

712 a. Maintain such materials in containment such that no individual may  
713 directly handle (with the exception of removal from filter housing,  
714 placement on gravity separation equipment, or placement in waste  
715 containers), physically interact with, or become contaminated with those  
716 materials and to prevent dispersion outside of the containment during  
717 operations or storage;

718 b. Conduct indoor air radon monitoring if materials contain or are  
719 contaminated at concentrations, excluding natural background, in dry  
720 weight in excess of 50 pCi/g of Radium-226 and are located in an  
721 occupied indoor workspace.

722 (1) Monitoring shall be performed during periods of normal operation  
723 and repeated if there is a significant increase in the quantity or  
724 concentration of registered materials contained within the  
725 workspace.

726 (2) Documentation of monitoring shall be maintained by the  
727 registrant and shall demonstrate that average indoor radon  
728 levels are not in excess of the U.S. Environmental Protection  
729 Agency's 4 pCi/L radon action level.

730 (3) If monitoring results indicate levels in excess of the 4 pCi/L  
731 action level, the work area shall be restricted from regular  
732 occupancy until mitigation action is taken and monitoring  
733 demonstrates that average indoor radon levels are below 4  
734 pCi/L.

735 c. Conduct radiation dose rate surveys.

736 (1) Radiation dose rates shall not exceed 2 millirem/hour (0.02  
737 millisievert/hour) at 30 centimeters from the source of radiation  
738 or from any surface that the radiation penetrates in any space  
739 that can be accessed or occupied by facility personnel

740 (2) Registered material shall be stored only in an area controlled by  
741 the registrant and shall not cause radiation dose rates at or  
742 beyond the boundary of that controlled area greater than 11  
743 microrem/hour excluding natural background.

744 (3) Registered material that exhibits a measured radiation dose rate  
745 which exceeds 50 microrem/hour at 30 centimeters excluding  
746 natural background shall be:

- 747 (a) Cordoned off with a physical barrier at a distance that  
748 ensures that radiation dose rates at or beyond the  
749 boundary of that barrier shall not exceed 50  
750 microrem/hour excluding natural background.
- 751 (b) Posted at the barrier with a conspicuous sign or signs  
752 bearing the radiation symbol prescribed in 6 CCR 1007-  
753 1 Part 4, Section 4.27 and the words "CAUTION,  
754 RADIOACTIVE MATERIAL".
- 755 (c) Managed such that no individual handles these materials  
756 or accesses the cordoned off area for a period of time in  
757 excess of 50 hours in a year.
- 758 (d) The registrant shall keep a record of all individuals  
759 accessing or handling these materials which shall  
760 contain at a minimum; the name of the individual; the  
761 date; the length of time in hours; and a year to date total  
762 number of hours for the individual.
- 763 (e) This record shall be maintained by the registrant for  
764 inspection by the Department.

765 F. Pipes, Pipescale, and other Processing Equipment.

766 1. Scale.

767 Registrants may possess waste pipe with scale deposition which contains or is  
768 contaminated with Radium-226, Radium-228, Lead-210, and Polonium-210 and  
769 meet the following criteria:  
770

- 771 a. Pipes shall be characterized by measuring the highest radiation dose  
772 rate on contact with and at 30 centimeters from both the exterior surface  
773 and each accessible surface of the interior of the pipe with a portable  
774 radiation detector.
- 775 b. Individual or collections of pipe sections shall not exhibit a measured  
776 radiation dose rate which exceeds 2 millirem/hour (0.02 millisievert/hour)  
777 at 30 centimeters from the source of radiation or from any surface that  
778 the radiation penetrates.
- 779 c. Individual or collections of pipe sections shall be stored only in an area  
780 controlled by the registrant and shall not cause radiation dose rates at or  
781 beyond the boundary of that controlled area greater than 11  
782 microrem/hour excluding natural background.
- 783 d. Individual or collections of pipe sections that exhibit a measured radiation  
784 dose rate which exceeds 50 microrem/hour at 30 centimeters excluding  
785 natural background shall be:
- 786 (1) Cordoned off with a physical barrier at a distance that ensures  
787 that radiation dose rates at or beyond the boundary of that  
788 barrier shall not exceed 50 microrem/hour excluding natural  
789 background.

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- (2) Posted at the barrier with a conspicuous sign or signs bearing the radiation symbol prescribed in 6 CCR 1007-1 Part 4, Section 4.27 and the words "CAUTION, RADIOACTIVE MATERIAL".
- 793  
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795
- (3) Managed such that no individual handles these materials or accesses the cordoned off area for a period of time in excess of 50 hours in a year.
- 796  
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800
- (a) The registrant shall keep a record of all individuals accessing or handling these materials which shall contain at a minimum; the name of the individual; the date; the length of time in hours; and a year to date total number of hours for the individual.
- 801  
802
- (b) This record shall be maintained by the registrant for inspection by the Department.
- 803  
804  
805
- e. Disposal.
- These waste pipes may only be disposed of as follows:
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- (1) Disposal at commercial solid waste disposal facility registered with the Department in accordance with this Part;
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- (2) Disposal at a facility authorized to receive such material under terms of a specific radioactive materials license, a Part 20 TENORM registration, or equivalent licensing document, issued by the Department, NRC or any Agreement State, or to any person otherwise authorized to receive such material by the Federal Government or any agency thereof, the Department, or an Agreement State.
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- f. Reuse and Recycling.
- These waste pipes may only be recycled and reused by persons who are authorized for such activities under a specific radioactive materials license, a Part 20 TENORM registration, or equivalent licensing document, issued by the Department, NRC or any Agreement State.
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827
- g. Any removal of scales by physical or chemical methods for disposal shall be performed by individuals authorized to perform such operations under terms of a specific radioactive materials license or equivalent licensing document, issued by the Department, NRC or any Agreement State. The registrant may seek to obtain a specific radioactive materials license to perform these activities or may use a specifically licensed service provider authorized for these activities.
- 828  
829
2. Radon Progeny Deposits.
- 830  
831  
832
- Registrants may possess waste pipe and other processing equipment from natural gas operations with radon progeny deposits which contain or is contaminated with Lead-210, and Polonium-210 and meet the following criteria:
- 833
- a. Pipes and other processing equipment shall be characterized by:
- 834  
835
- (1) Measuring the highest radiation dose rates on contact with and at 30 centimeters from both the exterior surface and each

- 836 accessible surface of the interior with a portable radiation  
837 detector; and
- 838 (2) Measuring the level of non-fixed alpha contamination of each  
839 accessible interior surface in disintegrations per minute per 100  
840 square centimeters.
- 841 b. Individual or collections of pipes or other processing equipment shall not  
842 exhibit a measured radiation dose rate which exceeds 2 millirem/hour  
843 (0.02 millisievert/hour) at 30 centimeters from the source of radiation or  
844 from any surface that the radiation penetrates.
- 845 c. Individual or collections of pipe sections shall be stored only in an area  
846 controlled by the registrant and shall not cause radiation dose rates at or  
847 beyond the boundary of that controlled area greater than 11  
848 microrem/hour excluding natural background.
- 849 d. Individual or collections of pipe sections that exhibit a measured radiation  
850 dose rate which exceeds 50 microrem/hour at 30 centimeters excluding  
851 natural background shall be:
- 852 (1) Cordoned off with a physical barrier at a distance that ensures  
853 that radiation dose rates at or beyond the boundary of that  
854 barrier shall not exceed 50 microrem/hour excluding natural  
855 background.
- 856 (2) Posted at the barrier with a conspicuous sign or signs bearing  
857 the radiation symbol prescribed in 6 CCR 1007-1 Part 4, Section  
858 4.27 and the words "CAUTION, RADIOACTIVE MATERIAL".
- 859 (3) Managed such that no individual handles these materials or  
860 accesses the cordoned off area for a period of time in excess of  
861 50 hours in a year.
- 862 (a) The registrant shall keep a record of all individuals  
863 accessing or handling these materials which shall  
864 contain at a minimum; the name of the individual; the  
865 date; the length of time in hours; and a year to date total  
866 number of hours for the individual.
- 867 (b) This record shall be maintained by the registrant for  
868 inspection by the Department.
- 869 e. Disposal.  
870  
871 These materials may only be disposed of as follows:
- 872 (1) Disposal at commercial solid waste disposal facility registered  
873 with the Department in accordance with this Part;
- 874 (2) Disposal at a facility authorized to receive such material under  
875 terms of a specific radioactive materials license, a Part 20  
876 TENORM registration, or equivalent licensing document, issued  
877 by the Department, NRC or any Agreement State, or to any  
878 person otherwise authorized to receive such material by the  
879 Federal Government or any agency thereof, the Department, or  
880 an Agreement State.

- 881 f. Reuse and Recycling.  
882  
883 These waste pipes may only be recycled and reused by persons who are  
884 authorized for such activities under a specific radioactive materials  
885 license or equivalent licensing document, issued by the Department,  
886 NRC or any Agreement State.
- 887 g. All operations that would likely disturb the radon progeny deposits and  
888 make particulates available for ingestion or inhalation including, but not  
889 limited to, grinding, cutting, or other abrasive processes involving items  
890 in which the level of non-fixed alpha contamination exceeds 600  
891 disintegrations per minute per 100 square centimeters shall only be  
892 performed by individuals authorized to perform such operations under  
893 terms of a specific radioactive materials license or equivalent licensing  
894 document, issued by the Department, NRC or any Agreement State. The  
895 registrant may seek to obtain a specific radioactive materials license to  
896 perform these activities or may use a specifically licensed service  
897 provider authorized for these activities.
- 898 h. Any removal of scale by physical or chemical methods for disposal other  
899 than those pigging operations addressed in Section 20.6.1.D shall be  
900 performed by individuals authorized to perform such operations under  
901 terms of a specific radioactive materials license or equivalent licensing  
902 document, issued by the Department, NRC or any Agreement State. The  
903 registrant may seek to obtain a specific radioactive materials license to  
904 perform these activities or may use a specifically licensed service  
905 provider authorized for these activities.
- 906 G. Other waste.  
907  
908 Registrants may possess other E&P waste as well as other solid wastes generated by oil  
909 and gas exploration and production, midstream, or downstream related activities  
910 including, but not limited to, tank bottoms, filter solids or cake, condensate sludges,  
911 molecular sieve residuals, amine filters, water treatment residuals, and other processing  
912 and storage wastes that contain or are contaminated at concentrations, excluding natural  
913 background, not in excess of 50 pCi/g each in dry weight of Radium-226, Radium-228,  
914 Lead-210, and Polonium-210.
- 915 1. Subject to Section 20.6.1.H of this Part if they are determined to be a Hazardous  
916 Waste.
- 917 2. Disposal.  
918  
919 These wastes may only be disposed of as follows, except for Hazardous Wastes  
920 which shall meet Section 20.6.1.H:
- 921 a. Disposal at commercial solid waste disposal facility registered with the  
922 Department in accordance with this Part;
- 923 b. Injection into a Class II well permitted in accordance with 2 CCR 404-1,  
924 Rule 325 and registered with the Department in accordance with this  
925 Part.
- 926 c. Treatment at a Class II well permitted in accordance with 2 CCR 404-1  
927 and registered with the Department in accordance with this Part.
- 928 d. Disposal at a facility authorized to receive such material under terms of a  
929 specific radioactive materials license, a Part 20 TENORM registration, or

- 930 equivalent licensing document, issued by the Department, NRC or any  
931 Agreement State, or to any person otherwise authorized to receive such  
932 material by the Federal Government or any agency thereof, the  
933 Department, or an Agreement State.
- 934 H. RCRA Hazardous Waste.  
935  
936 Any hazardous waste as defined in 6 CCR 1007-3 Part 261 generated by oil and gas  
937 exploration and production, midstream, or downstream related activities which contain  
938 Non-Exempt TENORM shall be registered and are subject to the requirements and  
939 limitations as follows:
- 940 1. Registrants may possess materials that contain or are contaminated at  
941 concentrations, excluding natural background, greater than 5 pCi/g but not in  
942 excess of 100 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210,  
943 and Polonium-210.
- 944 2. Registrants in possession of materials that contain or are contaminated at  
945 concentrations, excluding natural background, in dry weight in excess of 50 pCi/g  
946 of any TENORM Radionuclide and contain greater than 10% solids (or are less  
947 than 90% moisture content) shall additionally:
- 948 a. Maintain such materials in containment such that no individual may  
949 physically interact with, directly handle, or become contaminated with  
950 those materials and to prevent dispersion outside of the containment  
951 during operations or storage;
- 952 b. Require that all direct handling, manipulation, and any other activities  
953 that would provide an exposure pathway different from that found in  
954 routine hazardous waste handling operations be performed by  
955 individuals authorized to perform such operations under terms of a  
956 specific radioactive materials license or equivalent licensing document,  
957 issued by the Department, NRC or any Agreement State. The registrant  
958 may seek to obtain a specific radioactive materials license to perform  
959 these activities or may use a specifically licensed service provider  
960 authorized for these activities;
- 961 c. Conduct indoor air radon monitoring if materials contain or are  
962 contaminated at concentrations, excluding natural background, in dry  
963 weight in excess of 50 pCi/g of Radium-226 and are located in an  
964 occupied indoor workspace.
- 965 (1) Monitoring shall be performed during periods of normal operation  
966 and repeated if there is a significant increase in the quantity or  
967 concentration of registered materials contained within the  
968 workspace.
- 969 (2) Documentation of monitoring shall be maintained by the  
970 registrant and shall demonstrate that average indoor radon  
971 levels are not in excess of the U.S. Environmental Protection  
972 Agency's 4 pCi/L radon action level.
- 973 (3) If monitoring results indicate levels in excess of the 4 pCi/L  
974 action level, the work area shall be restricted from regular  
975 occupancy until mitigation action is taken and monitoring  
976 demonstrates that average indoor radon levels are below 4  
977 pCi/L.

- 978 d. Conduct radiation dose rate surveys.
- 979 (1) Radiation dose rates shall not exceed 2 millirem/hour (0.02  
980 millisievert/hour) at 30 centimeters from the source of radiation  
981 or from any surface that the radiation penetrates in any space  
982 that can be accessed or occupied by facility personnel
- 983 (2) Registered material shall be stored only in an area controlled by  
984 the registrant and shall not cause radiation dose rates at or  
985 beyond the boundary of that controlled area greater than 11  
986 microrem/hour excluding natural background.
- 987 (3) Registered material that exhibits a measured radiation dose rate  
988 which exceeds 50 microrem/hour at 30 centimeters excluding  
989 natural background shall be:
- 990 (a) Cordoned off with a physical barrier at a distance that  
991 ensures that radiation dose rates at or beyond the  
992 boundary of that barrier shall not exceed 50  
993 microrem/hour excluding natural background.
- 994 (b) Posted at the barrier with a conspicuous sign or signs  
995 bearing the radiation symbol prescribed in 6 CCR 1007-  
996 1 Part 4, Section 4.27 and the words "CAUTION,  
997 RADIOACTIVE MATERIAL".
- 998 (c) Managed such that no individual handles these materials  
999 or accesses the cordoned off area for a period of time in  
1000 excess of 50 hours in a year.
- 1001 (d) The registrant shall keep a record of all individuals  
1002 accessing or handling these materials which shall  
1003 contain at a minimum; the name of the individual; the  
1004 date; the length of time in hours; and a year to date total  
1005 number of hours for the individual.
- 1006 (e) This record shall be maintained by the registrant for  
1007 inspection by the Department.
- 1008 3. Registrants shall only transfer materials for disposal, treatment, or storage to a  
1009 RCRA Subtitle C hazardous waste permitted treatment, storage and disposal  
1010 facility or interim status facility which is:
- 1011 a. Within Colorado, a facility authorized to receive such material under  
1012 terms of a registration as per this part or a specific radioactive materials  
1013 license issued by the Department; or
- 1014 b. Outside of Colorado, a facility authorized to receive such material under  
1015 terms of a specific radioactive materials license or equivalent licensing  
1016 document, issued by the NRC or any Agreement State, or to any person  
1017 otherwise authorized to receive or not prohibited from receiving such  
1018 material by the Federal Government or any agency thereof, the  
1019 Department, or an Agreement State;
- 1020 4. Registrants shall, prior to transfer of any materials, provide a written statement to  
1021 the receiving facility as part of the description of the hazardous waste which  
1022 clearly indicates the presence of naturally occurring radioactive materials as a

1023 constituent and provides characterization data regarding the radiological content  
1024 of the materials to include the concentrations, in dry weight and excluding natural  
1025 background, of Radium-226, Radium-228, Lead-210, and Polonium-210 as  
1026 applicable.

1027 20.6.2 Water Treatment Registrants.

1028 A. Drinking Water.

1029  
1030 Non-Exempt TENORM generated by drinking water treatment activities shall be  
1031 registered and are subject to the requirements and limitations as follows:

- 1032 1. Registrants may possess materials that contain or are contaminated at  
1033 concentrations, excluding natural background, greater than 5 pCi/g but not in  
1034 excess of 500 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210,  
1035 and Polonium-210.
- 1036 2. TENORM shall be disposed as follows:
- 1037 a. Disposal at commercial solid waste disposal facility registered with the  
1038 Department in accordance with this Part;
- 1039 b. Disposal at a facility authorized to receive such material under terms of a  
1040 specific radioactive materials license, a Part 20 TENORM registration, or  
1041 equivalent licensing document, issued by the Department, NRC or any  
1042 Agreement State, or to any person otherwise authorized to receive such  
1043 material by the Federal Government or any agency thereof, the  
1044 Department, or an Agreement State;
- 1045 c. Discharge into sanitary sewerage for treatment at a domestic wastewater  
1046 treatment facility registered with the Department in accordance with this  
1047 Part;
- 1048 (1) Prior to any discharge written acknowledgement and approval  
1049 shall be obtained from the wastewater treatment facility;
- 1050 (2) This record shall be maintained by the registrant for inspection  
1051 by the Department;
- 1052 d. Discharge into state waters, in accordance with the Water Quality  
1053 Control Act;
- 1054 3. Beneficial Use.
- 1055 Registered drinking water treatment residuals may be beneficially used or  
1056 transferred to an individual registered with the Department for beneficial use in  
1057 accordance with this Part.
- 1058
- 1059 4. Registrants in possession of materials that contain or are contaminated at  
1060 concentrations, excluding natural background, in dry weight in excess of 50 pCi/g  
1061 of any TENORM Radionuclide and contain greater than 10% solids (or are less  
1062 than 90% moisture content) shall additionally:
- 1063 a. Maintain such materials in containment such that no individual may  
1064 physically interact with, directly handle, or become contaminated with  
1065 those materials and to prevent dispersion outside of the containment  
1066 during operations or storage;

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- b. Require that all direct handling, manipulation, and any other activities that would provide an exposure pathway different from that found in routine water treatment operations be performed by individuals authorized to perform such operations under terms of a specific radioactive materials license or equivalent licensing document, issued by the Department, NRC or any Agreement State. The registrant may seek to obtain a specific radioactive materials license to perform these activities or may use a specifically licensed service provider authorized for these activities;
- 1076  
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1079
- c. Conduct indoor air radon monitoring if materials contain or are contaminated at concentrations, excluding natural background, in dry weight in excess of 50 pCi/g of Radium-226 and are located in an occupied indoor workspace.
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1081  
1082  
1083
- (1) Monitoring shall be performed during periods of normal operation and repeated if there is a significant increase in the quantity or concentration of registered materials contained within the workspace.
- 1084  
1085  
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1087
- (2) Documentation of monitoring shall be maintained by the registrant and shall demonstrate that average indoor radon levels are not in excess of the U.S. Environmental Protection Agency's 4 pCi/L radon action level.
- 1088  
1089  
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1092
- (a) If monitoring results indicate levels in excess of the 4 pCi/L action level, the work area shall be restricted from regular occupancy until mitigation action is taken and monitoring demonstrates that average indoor radon levels are below 4 pCi/L.
- 1093
- d. Conduct radiation dose rate surveys.
- 1094  
1095  
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1097
- (1) Radiation dose rates shall not exceed 2 millirem/hour (0.02 millisievert/hour) at 30 centimeters from the source of radiation or from any surface that the radiation penetrates in any space that can be accessed or occupied by facility personnel
- 1098  
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1101
- (2) Registered material shall be stored only in an area controlled by the registrant and shall not cause radiation dose rates at or beyond the boundary of that controlled area greater than 11 microrem/hour excluding natural background.
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1103  
1104
- (3) Registered material that exhibits a measured radiation dose rate which exceeds 50 microrem/hour at 30 centimeters excluding natural background shall be:
- 1105  
1106  
1107  
1108
- (a) Cordoned off with a physical barrier at a distance that ensures that radiation dose rates at or beyond the boundary of that barrier shall not exceed 50 microrem/hour excluding natural background.
- 1109  
1110  
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1112
- (b) Posted at the barrier with a conspicuous sign or signs bearing the radiation symbol prescribed in 6 CCR 1007-1 Part 4, Section 4.27 and the words "CAUTION, RADIOACTIVE MATERIAL".

- 1113 (c) Managed such that no individual handles these materials  
1114 or accesses the cordoned off area for a period of time in  
1115 excess of 50 hours in a year.
- 1116 (d) The registrant shall keep a record of all individuals  
1117 accessing or handling these materials which shall  
1118 contain at a minimum; the name of the individual; the  
1119 date; the length of time in hours; and a year to date total  
1120 number of hours for the individual.
- 1121 (e) This record shall be maintained by the registrant for  
1122 inspection by the Department.
- 1123 B. Domestic Wastewater Treatment.  
1124  
1125 Non-Exempt TENORM generated, accepted for treatment, or possessed by wastewater  
1126 treatment facilities shall be registered and are subject to the requirements and limitations  
1127 as follows:
- 1128 1. Registrants may accept by way of their collection system or at their headworks  
1129 TENORM materials discharged from a water treatment facility registered with the  
1130 Department in accordance with this Part that:
- 1131 a. Contain less than 10% solids; and
- 1132 b. Contain or are contaminated at concentrations, excluding natural  
1133 background, greater than 5 pCi/g but not in excess of 500 pCi/g each in  
1134 dry weight of Radium-226, Radium-228, Lead-210, and Polonium-210;  
1135 and
- 1136 c. Constitute less than 10% of the total volume of non-TENORM materials  
1137 received by the system in the period in which it is received.
- 1138 2. TENORM materials which contain or are contaminated at concentrations,  
1139 excluding natural background, in dry weight greater than 50 pCi/g shall be  
1140 directly handled only by individuals authorized to perform such operations under  
1141 terms of a specific radioactive materials license or equivalent licensing  
1142 document, issued by the Department, NRC or any Agreement State. The  
1143 registrant may seek to obtain a specific radioactive materials license to perform  
1144 these activities or may use a specifically licensed service provider authorized for  
1145 these activities.
- 1146 3. Registrants may also possess materials in the form of residuals generated during  
1147 primary, secondary or advanced wastewater treatment processes, any materials  
1148 in process that are precursors to an accumulated treated residual product,  
1149 biosolids, or any other materials that are part of the wastewater treatment  
1150 process that contain or are contaminated at concentrations, excluding natural  
1151 background, greater than 5 pCi/g but not in excess of 50 pCi/g each in dry weight  
1152 of Radium-226, Radium-228, Lead-210, and Polonium-210.
- 1153 4. TENORM shall be disposed as follows:
- 1154 a. Disposal at commercial solid waste disposal facility registered with the  
1155 Department in accordance with this Part;
- 1156 b. Disposal at a facility authorized to receive such material under terms of a  
1157 specific radioactive materials license, a Part 20 TENORM registration, or

- 1158 equivalent licensing document, issued by the Department, NRC or any  
 1159 Agreement State, or to any person otherwise authorized to receive such  
 1160 material by the Federal Government or any agency thereof, the  
 1161 Department, or an Agreement State;
- 1162 c. Discharge into state waters, in accordance with the Water Quality  
 1163 Control Act;
- 1164 5. Biosolids containing TENORM may be beneficially used or transferred to an  
 1165 individual registered with the Department for beneficial use in accordance with  
 1166 this Part.
- 1167 C. **Other water treatment.**  
 1168  
 1169 Non-Exempt TENORM generated by any other water treatment activity shall be  
 1170 registered and are subject to the requirements and limitations as follows:
- 1171 1. Registrants may possess materials that contain or are contaminated at  
 1172 concentrations, excluding natural background, greater than 5 pCi/g but not in  
 1173 excess of 50 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210,  
 1174 and Polonium-210.
- 1175 2. TENORM shall be disposed as follows:
- 1176 a. Disposal at commercial solid waste disposal facility registered with the  
 1177 Department in accordance with this Part;
- 1178 b. Disposal at a facility authorized to receive such material under terms of a  
 1179 specific radioactive materials license, a Part 20 TENORM registration, or  
 1180 equivalent licensing document, issued by the Department, NRC or any  
 1181 Agreement State, or to any person otherwise authorized to receive such  
 1182 material by the Federal Government or any agency thereof, the  
 1183 Department, or an Agreement State;
- 1184 c. Discharge into sanitary sewerage for treatment at a domestic wastewater  
 1185 treatment facility registered with the Department in accordance with this  
 1186 Part;
- 1187 (1) Prior to any discharge written acknowledgement and approval  
 1188 shall be obtained from the wastewater treatment facility;
- 1189 (2) This record shall be maintained by the registrant for inspection  
 1190 by the Department;
- 1191 d. Discharge into state waters, in accordance with the Water Quality  
 1192 Control Act;

1193 **20.7 Registration as a user of TENORM for Beneficial Purposes.**

1194 20.7.1 Use and Distribution of Biosolids.

1195 Non-Exempt TENORM in the form of biosolids for use and distribution shall be registered and are  
 1196 subject to the requirements and limitations as follows:  
 1197

- 1198 A. Registrants may possess materials that contain or are contaminated at concentrations,  
 1199 excluding natural background, greater than 5 pCi/g but not in excess of 50 pCi/g each in  
 1200 dry weight of Radium-226, Radium-228, Lead-210, and Polonium-210.

**Commented [GJ30]:** Other water treatment may include industrial operations that treat water to remove impurities for certain processes or those that seek to remove contaminants to meet regulatory standards such as mine water treatment prior to discharge.

- 1201 B. Activities shall be in accord with a Notice of Authorization for the Use and Distribution of  
1202 Biosolids issued by the Water Quality and Control Division of the Department and 5 CCR  
1203 1002-64.
- 1204 C. Application to land for beneficial use.
- 1205 1. Concentrations of radionuclides in biosolids or final product material applied to  
1206 land shall not exceed 25 pCi/g each of Radium-226, Radium-228, Lead-210, and  
1207 Polonium-210.
- 1208 2. Biosolids or final product material containing Non-Exempt TENORM shall not be  
1209 applied to an authorized application site for more than 20 years or 20 cropping  
1210 cycles without written Department approval.
- 1211 D. Characterization.
- 1212 Characterization of TENORM materials including sampling and analysis shall be  
1213 performed using appropriate and standard methods such as EPA SW-846 or equivalent  
1214 alternative methods recognized by the Department.  
1215
- 1216 1. Biosolids or final product material shall be characterized for concentrations of  
1217 TENORM radionuclides after final treatment.
- 1218 2. Characterization shall be done initially after final treatment and thereafter at the  
1219 following frequencies based on dry short tons per year (dst/y) produced  
1220 consistent with 5 CCR 1002-64 Section 64.16 a.(1):
- 1221 a. Once per year for less than 319 dst/y.
- 1222 b. Once per quarter for greater than 319 but less than 1,650 dst/y.
- 1223 c. Once per two months for greater than 1,650 but less than 16,500 dst/y.
- 1224 d. Once per month for greater than 16,500 dst/y.
- 1225 3. Records of characterization shall be maintained for inspection by the Department  
1226 until such time as the authorized application site is closed or deactivated in  
1227 accordance with 5 CCR 1002-64 Sections 64.10 H. and I.
- 1228 4. Registrants shall provide notice to the Department sixty days prior to requesting  
1229 closure, deactivation, or a transfer of an authorized application site in accordance  
1230 with 5 CCR 1002-64 Sections 64.10 H., I. and J.
- 1231 E. Records of land application shall be provided to the Department annually. Records shall  
1232 include:
- 1233 1. Each application site location; and
- 1234 2. Number of applications at each site.
- 1235 F. Distribution.
- 1236 Biosolids or final product material containing Non-Exempt TENORM shall be distributed  
1237 only to a recipient registered with the Department in accord with this part or to an  
1238 individual authorized to receive such material under terms of a specific radioactive  
1239 materials license or equivalent licensing document, issued by the Department, NRC or  
1240

- 1241 any Agreement State, or to any person otherwise authorized to receive such material by  
1242 the Federal Government or any agency thereof, the Department, or an Agreement State.
- 1243 20.7.2 Land application of water treatment residuals.  
1244  
1245 Non-Exempt TENORM in the form of water treatment residuals to be used for land application  
1246 shall be registered and are subject to the requirements and limitations as follows:
- 1247 A. Registrants may possess materials that contain or are contaminated at concentrations,  
1248 excluding natural background, greater than 5 pCi/g but not in excess of 50 pCi/g each in  
1249 dry weight of Radium-226, Radium-228, Lead-210, and Polonium-210.
- 1250 B. Activities shall be in accord with a Beneficial Use Certification or Beneficial Use  
1251 Determination issued by the Hazardous Materials and Waste Management Division of the  
1252 Department.
- 1253 C. Application to land for beneficial use.
- 1254 1. Concentrations of radionuclides in water treatment residuals applied to land shall  
1255 not exceed 25 pCi/g each of Radium-226, Radium-228, Lead-210, and Polonium-  
1256 210.
- 1257 2. Water treatment residuals containing Non-Exempt TENORM shall not be applied  
1258 to an authorized application site for more than 20 years or 20 cropping cycles  
1259 without written Department approval.
- 1260 D. Characterization.  
1261  
1262 Characterization of TENORM materials including sampling and analysis shall be  
1263 performed using appropriate and standard methods such as EPA SW-846 or equivalent  
1264 alternative methods recognized by the Department.
- 1265 1. Water treatment residuals shall be characterized for concentrations of TENORM  
1266 radionuclides prior to application.
- 1267 2. Characterization shall be done initially on residuals to be applied to land and  
1268 thereafter at the following frequencies based on dry short tons per year (dst/y)  
1269 produced:
- 1270 a. Once per year for less than 319 dst/y.  
1271 b. Once per quarter for greater than 319 but less than 1,650 dst/y.  
1272 c. Once per two months for greater than 1,650 but less than 16,500 dst/y.  
1273 d. Once per month for greater than 16,500 dst/y.
- 1274 3. Records of characterization shall be maintained for inspection by the Department  
1275 until such time as the application activities cease at the site.
- 1276 4. Registrants shall provide notice to the Department sixty days prior to ceasing  
1277 application activities at the site.
- 1278 E. Records of land application shall be provided to the Department annually. Records shall  
1279 include:
- 1280 1. Each application site location; and

- 1281                    2.        Number of applications at each site.
- 1282        20.7.3 Composting Facility Registrant.  
1283  
1284                    Facilities that compost Non-Exempt TENORM shall be registered and are subject to the  
1285                    requirements and limitations as follows:
- 1286                    A.        Registrants may accept and/or process feedstock materials that contain or are  
1287                    contaminated at concentrations, excluding natural background, greater than 5 pCi/g but  
1288                    not in excess of 50 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210, and  
1289                    Polonium-210.
- 1290                    B.        Commercial composting facility activities shall be in accord with 6 CCR 1007-2 Part 1  
1291                    Section 14.
- 1292                    1.        Registrants shall initially include or revise their Engineering Design and  
1293                    Operations Plan to include TENORM constituents in:
- 1294                                a.        The description of feedstocks;
- 1295                                b.        The waste characterization plan;
- 1296                                c.        The evaluation of potential impacts to existing surface water and  
1297                                groundwater quality;
- 1298                                d.        The groundwater monitoring plan; and
- 1299                                e.        The compost sampling and testing description.
- 1300                    C.        Composting activities performed as part of further processing of biosolids at a domestic  
1301                    wastewater treatment works as shall be in accord with 5 CCR 1002-64 and a Notice of  
1302                    Authorization for the Use and Distribution of Biosolids issued by the Water Quality and  
1303                    Control Division of the Department.
- 1304                    D.        Sale or Distribution.
- 1305                                1.        Finished compost shall be characterized for concentrations of TENORM  
1306                                radionuclides prior to sale or distribution.
- 1307                                2.        Characterization, including sampling and analysis, shall be performed using  
1308                                appropriate and standard methods such as EPA SW-846 or equivalent  
1309                                alternative methods recognized by the Department.
- 1310                                3.        Characterization shall be done initially on finished compost and thereafter at the  
1311                                following frequencies based on dry short tons per year (dst/y) produced:
- 1312                                        a.        Once per year for less than 319 dst/y.
- 1313                                        b.        Once per quarter for greater than 319 but less than 1,650 dst/y.
- 1314                                        c.        Once per two months for greater than 1,650 but less than 16,500 dst/y.
- 1315                                        d.        Once per month for greater than 16,500 dst/y.
- 1316                                        e.        If feedstocks change the initial characterization shall be repeated.

- 1317 4. Registrants must ensure that concentrations of TENORM radionuclides in  
1318 finished compost to be sold or distributed for off-site use shall not exceed 5 pCi/g  
1319 each of Radium-226, Radium-228, Lead-210, and Polonium-210.
- 1320 5. Records of characterization data demonstrating compliance with the 5 pCi/g  
1321 standard shall be maintained for inspection by the Department for no less than 5  
1322 years after the materials have been distributed.
- 1323 6. Compost that meets the 5 pCi/g standard is acceptable for unrestricted use and  
1324 is no longer subject to this Part.
- 1325 E. Finished Compost containing Non-Exempt TENORM shall be:
- 1326 1. Transferred only to a recipient registered with the Department in accord with this  
1327 Part for use or disposal;
- 1328 2. Reintroduced into the compost process; or
- 1329 3. Transferred to an individual authorized to receive such material under terms of a  
1330 specific radioactive materials license or equivalent licensing document, issued by  
1331 the Department, NRC or any Agreement State, or to any person otherwise  
1332 authorized to receive such material by the Federal Government or any agency  
1333 thereof, the Department, or an Agreement State.
- 1334 F. Final closure.  
1335  
1336 The compost facility shall not be closed and released for unrestricted use until:
- 1337 1. All registered TENORM materials are disposed or transferred in accordance with  
1338 Sections 20.7.3.E.1 or 20.7.3.E.3; and
- 1339 2. Radiological characterization of the facility shall be conducted to ensure that:
- 1340 a. Any radionuclide concentration in soil, adjacent to or within the facility  
1341 boundary, does not exceed the limitation specified in Table 20-1 of this  
1342 Part. If any exceedance is found, the facility shall be remediated until the  
1343 limits in Table 20-1 are met.
- 1344 b. Radionuclide concentrations in groundwater do not exceed 5 pCi/L for  
1345 Radium-226 plus Radium-228 and 5 pCi/L for Lead-210 plus Polonium-  
1346 210; or the statewide standards for radioactive materials established by  
1347 the Water Quality Control Commission in accordance with the Water  
1348 Quality Control Act, whichever is more restrictive. If any exceedance is  
1349 found, the facility shall conduct groundwater remediation until the above  
1350 limits are met.
- 1351 20.7.4 Other Beneficial Uses.  
1352  
1353 Persons requesting the beneficial use of solid waste that contain or are contaminated at  
1354 concentrations, excluding natural background, greater than 5 pCi/g in dry weight of Radium-226,  
1355 Radium-228, Lead-210, or Polonium-210 shall:
- 1356 A. File a proposal with the Hazardous Materials and Waste Management Division of the  
1357 Department in accord with 6 CCR 1007-2 Part 1 Section 8.6.
- 1358 B. Provide to the Department a comprehensive dose assessment demonstrating that the  
1359 beneficial use activity would not result in a total effective dose equivalent to any individual

- 1360 member of the public in excess of 100 millirem/year (1 millisievert/year) and that the  
1361 doses to members of the public as a result of the proposed activities are as low as is  
1362 reasonably achievable (ALARA).
- 1363 C. Commence activities only after:
- 1364 1. A Beneficial Use Certification or Beneficial Use Determination is issued by the  
1365 Hazardous Materials and Waste Management Division of the Department; and
- 1366 2. The Radiation Control Program grants written authorization to engage in the  
1367 activities as approved within the Beneficial Use Certification or Beneficial Use  
1368 Determination.
- 1369 D. Limit beneficial use activities to those specifically approved and authorized within and by  
1370 the A Beneficial Use Certification or Beneficial Use Determination and written  
1371 authorization by the Radiation Control Program.
- 1372 **20.8 Registration as a TENORM Disposal Facility.**
- 1373 20.8.1 Sanitary landfill or municipal solid waste landfill (MSWLF) disposal.  
1374  
1375 Landfills that accept Non-Exempt TENORM for disposal shall be registered and are subject to the  
1376 requirements and limitations as follows:
- 1377 A. Registrants may accept materials that contain or are contaminated at concentrations,  
1378 excluding natural background, greater than 5 pCi/g but not in excess of 50 pCi/g each in  
1379 dry weight of Radium-226, Radium-228, Lead-210, and Polonium-210.
- 1380 B. Registrants shall meet all associated and applicable requirements of 6 CCR 1007-2 Part  
1381 1 for solid waste disposal.
- 1382 C. Registered facilities shall have an engineered liner or barrier layer with a hydraulic  
1383 conductivity less than or equal to  $1 \times 10^{-7}$  cm/sec in accord with 6 CCR 1007-2 Part 1  
1384 Section 3.2.5 (3)
- 1385 D. Registered facilities shall have a leachate collection and monitoring system which meets  
1386 6 CCR 1007-2 Part 1 Section 3.2.5 (d)
- 1387 E. Registered facilities shall have a groundwater monitoring system which meets the  
1388 applicable requirements of 6 CCR 1007-2 Part 1 Section 2.1.15 and 2.2
- 1389 F. Registered facilities shall incorporate the following operational practices into their  
1390 Engineering Design and Operations Plan:
- 1391 1. Each registered facility shall have a waste characterization and disposal plan  
1392 which includes waste acceptance procedures for TENORM materials
- 1393 2. Each registered facility shall have a minimum of 4 meters of materials not subject  
1394 to this part, in addition to the engineered liner or barrier layer, between the lowest  
1395 placement of Non-Exempt TENORM and groundwater
- 1396 3. Each registered facility shall place 6 inches of cover materials not subject to this  
1397 part on all TENORM at the end of each operating day
- 1398 4. Each registered facility shall have a minimum of 3 meters of materials not subject  
1399 to this part above Non-Exempt TENORM prior to the closure of any area. This  
1400 may include the final cover system

- 1401 5. Leachate must be sampled and characterized for each TENORM isotope  
1402 received by the facility
- 1403 a. If concentrations of TENORM isotopes are detected in the leachate in  
1404 excess of the groundwater standards these isotopes must be included in  
1405 the groundwater monitoring plan
- 1406 b. Leachate containing concentrations of TENORM isotopes less than 100  
1407 pCi/L may be applied to the working face of the landfill.
- 1408 c. Registrants shall not perform any other method of recirculation or  
1409 application of leachate containing concentrations of TENORM isotopes in  
1410 excess of groundwater standards within the facility without prior written  
1411 approval from the Department.
- 1412 6. Any drill cuttings from methane gas collection system installation shall be placed  
1413 within the facility on the working face and treated as TENORM waste.
- 1414 7. If solidification activities are approved within the Engineering Design and  
1415 Operations Plan for the facility Non-exempt TENORM materials received by the  
1416 facility for solidification shall be placed within the solidification basins and the  
1417 solidification process should commence within 24 hours of receipt.
- 1418 G. Following closure of the landfill, an environmental covenant must be placed on the facility  
1419 property and shall include a specific provision which requires that any future buildings,  
1420 residential or commercial, constructed on the permitted site post closure, require radon  
1421 resistant construction, post construction assessment and testing, and radon mitigation in  
1422 order to meet any federal, local, or Colorado standards or guidance on indoor radon  
1423 concentrations.
- 1424 1. Alternatively, if the environmental covenant is more restrictive, i.e. no buildings,  
1425 residential or commercial, are permitted to be constructed on the site, than that  
1426 may suffice.
- 1427 20.8.2 Centralized E&P waste management facilities that accept Non-Exempt TENORM for disposal  
1428 shall be registered and are subject to the requirements and limitations as follows:
- 1429 A. Registrants shall comply with all applicable sections of 2 CCR 404-1.
- 1430 1. Radium-226, Radium-228, Lead-210, and Polonium-210 shall, when operations  
1431 involve Non-Exempt TENORM, be included as a Contaminant of Concern in all  
1432 instances in which Table 910-1 Concentration Levels are required to be sampled,  
1433 analyzed, or adhered to for the purposes of determining the nature and extent of  
1434 any impact from the materials, groundwater, surface water or soil monitoring,  
1435 remediation, confirming compliance, or closure.
- 1436 a. For soils, a concentration, excluding natural background, not in excess of  
1437 5 pCi/g of each applicable radionuclide in dry weight shall be used as the  
1438 concentration level for the purposes of determining compliance with this  
1439 section. Concentration level values for groundwater and surface water  
1440 shall be equal to 5 pCi/L for Radium-226 plus Radium-228; 5 pCi/L for  
1441 Lead-210 plus Polonium-210; or equal to statewide standards for  
1442 radioactive materials established by the Water Quality Control  
1443 Commission in accordance with the Water Quality Control Act, whichever  
1444 is more restrictive.

- 1445 B. Registrants shall notify the Department of any exceedance of these radionuclide  
1446 concentration levels and submit a plan for the investigation and remediation of the areas.
- 1447 C. Registrants shall, as part of the initial permit application process or as a facility  
1448 modification proposal as required by 2 CCR 404-1 Rule 908, incorporate and include  
1449 TENORM as a waste stream into all appropriate or applicable portions of the application  
1450 or proposal including but not limited to waste profile, facility design, operating plan,  
1451 ground water monitoring plan, or preliminary closure plan. The application or proposal for  
1452 permit modification shall also be submitted to the Department for approval prior to  
1453 accepting any TENORM materials for treatment or disposal.
- 1454 D. Registrants shall provide to the Department a copy of the facility's annual report as  
1455 required by 2 CCR 404-1 Rule 908. TENORM materials shall be included within the  
1456 report's summary of operations.
- 1457 E. Registrants may accept produced fluids that contain or are contaminated at  
1458 concentrations, excluding natural background, greater than 5 pCi/g but not in excess of  
1459 250 pCi/g each in dry weight of Radium-226, Radium-228, Lead-210, and Polonium-210  
1460 for injection into a Class II well permitted in accordance with 2 CCR 404-1, Rule 325.
- 1461 1. Shall provide demonstration, at the time of initial registration, that those activities  
1462 will not result in the presence in an underground source of drinking water, as  
1463 defined in 2 CCR 404-1 Rule 324a, of any TENORM radionuclide which may  
1464 cause a violation of any primary drinking water regulation in effect as of July 12,  
1465 1982 and found at 40 C.F.R. Part 141, or may otherwise adversely affect the  
1466 health of persons.
- 1467 F. Registrants may accept, for the purposes of dewatering or hydrocarbon recovery,  
1468 materials that contain or are contaminated at concentrations, excluding natural  
1469 background, greater than 5 pCi/g but not in excess of 50 pCi/g each in dry weight of  
1470 Radium-226, Radium-228, Lead-210, and Polonium-210.
- 1471 G. Any Non-Exempt TENORM materials generated during treatment or disposal activities  
1472 shall be subject to all applicable requirements of Section 20.6.1.
- 1473 H. Closure.  
1474  
1475 A detailed site investigation, remediation, and closure work plan shall be submitted to the  
1476 Department for review and approval at least sixty (60) days prior to closure. The work  
1477 plan shall address, but not be limited to:
- 1478 1. Sampling and analysis to determine the extent of contamination in or compliance  
1479 with standards for soil, surface water, and groundwater
- 1480 2. Activities required to decommission and remove all equipment contaminated with  
1481 TENORM materials
- 1482 3. Disposal of residual TENORM
- 1483 4. Facility access control
- 1484 5. Potential exposures to TENORM during remedial activities including either a  
1485 radiological dose estimate demonstrating that no individual will exceed an annual  
1486 dose of 100 millirem (1 millisievert) or information on the individuals authorized to  
1487 perform such operations under terms of a specific radioactive materials license or  
1488 equivalent licensing document, issued by the Department, NRC or any  
1489 Agreement State.

- 1490 6. Schedule for remedial and closure activities to be conducted and completed
- 1491 7. Post-closure monitoring
- 1492 **20.9 Registration of other TENORM and TENORM Related Activities.**
- 1493 20.9.1 Any Non-Exempt TENORM material generated, used beneficially, or accepted for disposal which  
 1494 is not captured by Sections 20.6, 20.7, or 20.8 of this part may be registered with the Department  
 1495 when the Department makes a determination, upon request or application for such determination,  
 1496 that the reasonably maximally exposed individual will not receive a dose with a total effective  
 1497 dose equivalent (TEDE) of more than 100 millirem (1 millisievert) in one year from all licensed or  
 1498 registered sources of radiation including TENORM. This registration would be in lieu of a specific  
 1499 radioactive materials license as per Section 20.13
- 1500 A. The registrant will be subject to the general registration provisions of this part and to any  
 1501 additional requirements and conditions with respect to the registrant's receipt,  
 1502 possession, use, disposal, and transfer of TENORM subject to this part, as it deems  
 1503 appropriate or necessary in order to:
- 1504 1. Minimize danger to public health and safety, workers, or property; and
- 1505 2. Prevent loss or theft of material subject to this part.
- 1506 20.9.2 The Department may grant an approval to persons registered per Sections 20.6, 20.7, or 20.8 to  
 1507 conduct activities not specifically identified within Sections 20.6, 20.7, or 20.8, such as alternative  
 1508 disposal or handling practices, when the Department makes a determination, upon request or  
 1509 application for such determination, that as a result of the activities the reasonably maximally  
 1510 exposed individual will not receive a dose with a total effective dose effective dose equivalent  
 1511 (TEDE) of more than 100 millirem (1 millisievert) in one year from all licensed or registered  
 1512 sources of radiation including TENORM.
- 1513 A. Approval for these alternate activities shall be approved in writing and records of the  
 1514 approval must be maintained until the registration is terminated pursuant to Section 20.12  
 1515 of this Part.
- 1516 **20.10 Records.**
- 1517 20.10.1 Each registrant shall retain all records that are required by the regulations in this Part or by  
 1518 registration condition for the period specified by the appropriate regulation or registration  
 1519 condition. If a retention period is not otherwise specified by regulation or registration condition,  
 1520 each record must be maintained until the registration is terminated pursuant to Section 20.12 of  
 1521 this Part.
- 1522 20.10.2 Each registrant shall make records available to the Department for inspection during normal  
 1523 business hours, and copies thereof shall be furnished to the Department upon request.
- 1524 20.10.3 Each registrant shall retain records of receipt, transfer, and disposal of TENORM as long as the  
 1525 material is possessed and for three years following transfer or disposition, including at a  
 1526 minimum:
- 1527 A. The date of the transport;
- 1528 B. The identity of the TENORM generator or registrant;
- 1529 C. The identity of the TENORM transporter;
- 1530 D. The location of the TENORM pickup site;

**Commented [GJ31]:** This section was added to better account for those persons, activities, or materials that do not fit into one of the predesignated TENORM registrant categories and allow for registration rather than a specific radioactive materials license.

- 1531 E. The type and volume of wastes, including radiological characterization data; and
- 1532 F. The name and location of the recipient or disposal site.
- 1533 20.10.4 Each registrant must create and retain a record of current training of each employee, inclusive of  
1534 the preceding three years, in accordance with Section 20.5.3 for as long as that employee is  
1535 employed by that registrant and for 90 days thereafter. A registrant must make an employee's  
1536 record of current training available upon request by the Department. The record must include:
- 1537 A. The employee's name;
- 1538 B. The most recent training completion date of the employee's training;
- 1539 C. A description, copy, or the location of the training materials used to meet the  
1540 requirements in this section; and
- 1541 D. Certification that the employee has been trained as required by this Part.
- 1542 20.10.5 Each registrant shall retain the radiological characterization information or other information that  
1543 demonstrates compliance with the applicable requirements of this Part, including but not limited  
1544 to, the analytical data and laboratory reports, volumes of the materials, waste or material profiles,  
1545 surveys, and indoor radon monitoring.
- 1546 **20.11 Transfers.**  
1547  
1548 The Department may, upon application or upon its own initiative, approve transfers of Non-  
1549 Exempt TENORM not specifically authorized within this part as it determines is authorized by law  
1550 and will not result in undue hazard to public health and safety or property.
- 1551 **20.12 Registration Termination.**
- 1552 20.12.1 Each registrant shall provide a written notification to the Department when the registration is  
1553 ready for termination. The notification shall include documentation demonstrating that Sections  
1554 20.12.2.A through E have been met.
- 1555 20.12.2 Registrations will be terminated by written notice to the registrant when the Department  
1556 determines the following:
- 1557 A. TENORM has been properly transferred, dispositioned, or disposed of in accord with this  
1558 part;
- 1559 B. Reasonable effort has been made to eliminate residual radioactive contamination, if  
1560 present;
- 1561 C. The registrant has demonstrated, by radiation survey results and/or other appropriate  
1562 methods, that the registration termination will be in compliance with Section 20.5.2.1;
- 1563 D. Department approved institutional controls have been implemented to limit public doses,  
1564 if required; and
- 1565 E. For disposal facilities, all closure requirements have been implemented.
- 1566 **20.13 Specific Licensing.**
- 1567 20.13.1 Unlicensed persons who generate, handle, process, transfer, receive, transport, dispose of,  
1568 possess, distribute, or beneficially use TENORM not exempt from this Part as per Section 20.4  
1569 and not meeting the requirements of both TENORM concentration limitation or permitted activity

**Commented [GJ32]:** Facilities that cannot meet the exempt requirements (20.4) or the registration requirements (20.6-20.8), must obtain a specific license which is the highest level of regulation for TENORM materials. Specific licensing of TENORM facilities will follow the existing structure/process used for other types of radioactive materials. Currently, there are less than 10 facilities that are specifically licensed for TENORM. Licenses issued by the Department include authorizations for drinking water treatment residuals, mine water treatment residuals, and land disposal. Alternatively, a facility may demonstrate that no one will receive a dose in excess of 100 millirem and may be considered for registration as per Section 20.9.

- 1570 specified in Sections 20.6, 20.7, and 20.8 shall, within 90 days of making a TENORM  
1571 determination:
- 1572 A. Submit an application for a specific radioactive materials license to the Department in  
1573 accordance with 6 CCR 1007-1 Part 03, Section 3.8 or
- 1574 B. Submit a written request to the Department for an exemption or exception from specific  
1575 licensing requirements. The request shall contain:
- 1576 1. A comprehensive description of TENORM materials;
- 1577 2. A comprehensive description of all operations involving TENORM materials;
- 1578 3. A detailed dose assessment demonstrating that the reasonably maximally  
1579 exposed individual will not receive a dose with a total effective dose equivalent  
1580 (TEDE) of more than 100 millirem (1 millisievert) in one year from all licensed or  
1581 registered sources of radiation including TENORM.
- 1582 20.13.2 The Department may grant an exemption or exception to any person from specific licensing  
1583 requirements but require registration of the TENORM materials when the Department makes a  
1584 determination, upon request or application for such determination, that the reasonably maximally  
1585 exposed individual will not receive a dose with a total effective dose equivalent (TEDE) of more  
1586 than 100 millirem (1 millisievert) in one year from all licensed or registered sources of radiation  
1587 including TENORM.
- 1588 20.13.3 Persons authorized by a specific radioactive materials license for TENORM materials are not  
1589 subject to registration requirements in Sections 20.5 through 20.12.
- 1590 20.13.4 The Department may, by written notice, require any person subject to registration to apply for and  
1591 obtain a specific license if the Department determines that specific licensure is necessary to  
1592 minimize danger to public health and safety or property. The notice shall state the reason or  
1593 reasons for requiring a specific license.
- 1594 20.13.5 A specific license is required to decontaminate equipment, facilities, or land not exempted under  
1595 the provisions of Section 20.3. For purposes of this subsection, the term "decontaminate" shall  
1596 not include routine maintenance which may result in the incidental removal of contamination.
- 1597 20.13.6 A specific license is required to provide services to TENORM registrants for direct handling,  
1598 manipulation, or any other activities that would provide an exposure pathway different from that  
1599 found in routine handling operations authorized in Sections 20.6, 20.7, and 20.8.