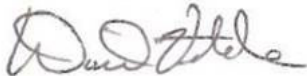


DMM-5 / Management of Soils Contaminated with Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM)

New York State Department of Environmental Conservation

DEC Program Policy

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Date Issued: 10/27/2023

Latest Date Revised: NEW POLICY

I. Summary:

This policy explains the process and requirements for obtaining a variance under 6 NYCRR 380-3.5 for the management of processed and concentrated naturally occurring radioactive material, also commonly referred to as technologically enhanced naturally occurring radioactive material (TENORM). Additionally, this policy identifies the process and criteria to be used to evaluate TENORM and provides guidelines to Department of Environmental Conservation ("Department") program staff, and property owners, project sponsors, and the public who may be seeking variances, on how to appropriately handle TENORM encountered during construction or earthwork projects, such as clearing, grading, excavation, filling, demolition, or stockpiling. This policy also applies to any project site where the intrusive work conducted has or will likely disturb identified or suspected TENORM. This policy does not apply to activities that disturb naturally occurring radioactive materials.

Part 380 applies to any person who disposes of or releases TENORM. This policy is applicable where a variance application has been submitted pursuant to 6 NYCRR 380-3.5 for on-site management of TENORM fill that was generated, disposed of, or released prior to the implementation of 6 NYCRR Part 380, which was March 24, 1994, and which has been excavated for a project. Once TENORM has been excavated, it is considered radioactive material and may be subject to DEC's regulatory authority as noted in 6 NYCRR 380-1.2(e) and as defined in 6 NYCRR 380-2.1(a)(20). Placing the TENORM back into the area in which it was excavated constitutes deposition or injection into the environment and thus disposal. This policy provides guidance on the variance application that may be submitted pursuant to 6 NYCRR 380-3.5 to allow on-site management of excavated TENORM.

Implementation

This policy is to be implemented at any site, location, or work area where anthropogenic (i.e., “man-made” or “man-modified”) material or fill (frequently observed to be “slag”) has been noted or discovered and is suspected or known to have a potential or definitive TENORM characteristic, (see definition below).

Definitions

As Low As Reasonably Achievable (ALARA) – Means every reasonable effort is made to maintain exposures to radiation as far below the dose limits (or for purposes of this Policy concentration values) in Part 380 as is practical consistent, with the purpose for which the action is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of radioactive materials in the public interest.

Area of Contamination (AOC) – Means a discrete area of generally dispersed contamination.

Excavation – Means any man-made cut, cavity, trench, or depression in the earth surface formed by the removal of soil and rock, or any activity that causes or contributes to the creation of any such cut, cavity, trench, or depression.

Disposal – Means the act of discarding regulated radioactive material. Depositing or injecting radioactive material in the environment is disposal unless the radioactive material is being used in the environment, as authorized by a permit issued under 6 NYCRR 380-3.1.

TENORM Fill – Means slag or other material containing TENORM used as fill, without regard to its radiological content, placed on its present site before March 24, 1994, when 6 NYCRR Part 380 became effective. Such historically placed fill is not a regulated waste if it remains as it was placed at that time.

Licensed Decontamination & Decommissioning (D&D) Contractor – Means a person or company who possesses a radioactive materials license that authorizes them to perform decontamination and decommissioning of radiologically contaminated sites. D&D Contractors must possess a license issued by the New York State Department of Health (DOH). Companies licensed by the US Nuclear Regulatory Commission (NRC), or another state may work under reciprocity with the DOH.

Naturally-Occurring Radioactive Material (NORM) – Means any of the primordial radionuclides (those present since the formation of the earth – Uranium, Thorium, Potassium) or radioactive elements as they occur in nature, and their radioactive decay products, such as radium and radon, that are not concentrated as a result of human activity. (*Note:* NORM produced through interaction of cosmic rays with certain gasses in the upper atmosphere (cosmogenic NORM) such as tritium or carbon-14 are not addressed in this policy.)

Person – Means:

- (i) any individual; public, private, or government corporation; joint stock company; industry; partnership; co-partnership; firm; association; trust; estate; public or private institution; agency, department, or bureau of the State, or group, political subdivision of the State, any other State or political subdivision thereof; Federal government agencies other than the U.S. Nuclear Regulatory Commission or Department of Energy; any foreign government or nation or any political subdivision of any such government or nation; and
- (ii) any legal subsidiary, successor, representative, agent, or agency of the foregoing, or any other legal entity whatsoever.

Slag – Means a waste product from the pyrometallurgical processing of various ore, both ferrous (e.g., steel and blast furnace Fe) and non-ferrous (e.g., P, Ag, Cu, Ni, Pb, Sn, Zn).

Technologically-enhanced naturally occurring radioactive material (TENORM) – Means naturally occurring radioactive material whose radionuclide concentrations are increased by or as a result of past or present human practices, such as manufacturing or water processing.

TENORM (Background-comparable) – Means TENORM fill that has been disturbed by excavation or other methods and is below 5 pCi/g of radium-226.

TENORM Waste – Means TENORM fill that has been disturbed by excavation or other methods and exceeds 15 pCi/g of radium-226.

TENORM Disposal Plan – Means a TENORM disposal plan must cover management and disposal of TENORM waste (>15 pCi/g of Ra-226) generated for disposal to ensure handling in a manner adequate to protect human health and the environment until such time as it is shipped for disposal.

TENORM Management Plan – Means a plan to appropriately manage in an AOC and/or dispose of TENORM fill containing a concentration of radium-226 between 5 pCi/g and 15pCi/g that must be submitted with an application for a variance to be approved by the Department. (*Note:* for TENORM (Background-comparable), the procedure(s) utilized in determining compliance with the <5 pCi/g criteria will constitute a “Management Plan” for purposes of meeting the management requirements in Section IV.B. of this policy.)

II. Policy

The Department will allow excavated TENORM to be returned to the excavation area on a project site if the concentration of radium-226 meets certain thresholds (discussed throughout) and the TENORM is handled in accordance with this policy and pursuant to a variance issued under 6 NYCRR 380-3.5. The Department’s position is that handling excavated TENORM in accordance with this policy and a Department-approved TENORM Management Plan will have no significant adverse impact on public health and safety, and the environment. (*Note:* A variance application to allow excavated TENORM below 15 pCi/g of Ra-226 to be returned to the area of excavation on a project site does not need to include the demonstrations required under 6 NYCRR 380-3.5(b)(4) and (5).) This policy utilizes the EPA Uranium Mill Tailings Radiation Control Act standards of 5 and 15 pCi/g of Ra-226, but conservatively applies them only to the excavated TENORM.

Purpose and Background

The purpose of this policy is to address intrusive work on sites containing TENORM fill. A number of industrial processes generated byproducts that contained processed and concentrated NORM, also known as TENORM. Slag and other TENORM-containing byproducts from ore refining were used as backfill beneath roadways and other construction projects. This was done due to their low cost and beneficial physical properties, but without consideration of their inherent radioactivity.

This policy applies to sites containing TENORM that was placed on its present site before March 24, 1994, when 6 NYCRR Part 380 was updated to address the radiological content of TENORM. Since that time, this type of waste is not allowed to be used as fill or disposed of at any site unless the site has regulatory approval to accept it. As of the effective date of this policy, there are no sites approved for the disposal of newly generated TENORM waste in New York. Therefore, such waste must be disposed of in an authorized disposal facility.

When the presence of TENORM at sites first came to light, the New York State Department of Health commissioned a group of outside experts to assess the potential public health risks of the sites. These experts determined that the sites did not pose significant public health or environmental concerns if the TENORM is left in place. If TENORM is disturbed, it must be appropriately handled and the potential impacts to public health and the environment must be taken into consideration.

III. Responsibility

Responsibility for the interpretation and implementation of this policy resides with the Department's assigned Environmental Radiation Specialist (ERS) in coordination with any Department project manager (or other involved Department staff), to ensure that an adequate radiological screening is performed. Additional consultation may occur as determined to be necessary with the Department's Radioactive Materials Management Section (RMMS) staff, in the Bureau of Hazardous Waste and Radiation Management in the Division of Materials Management.

Responsibility for updating of this policy resides with the RMMS in consultation with regional management and staff (e.g., ERS) responsible for implementation of this policy.

IV. Procedure

The first step is to verify whether anything exhibiting elevated radioactivity is present in the materials being handled. This includes a preliminary screening radiation survey to determine if TENORM is present. Prior to conducting the survey, a survey plan must be developed and submitted for Department approval.

Second, if the survey results demonstrate that TENORM is present, then a proper TENORM management plan must be developed and submitted for Department approval. The third step is the TENORM must be managed in accordance with the approved TENORM management plan and if necessary, a variance. Further details of each step are provided below.

A. Radiological Screening

6 NYCRR 380-1.5(c)(1) requires that a variance application include a description of the waste containing radioactive material to be disposed of, including the physical and chemical properties relevant to the risk evaluation. Radiological screening, as described below, may be used to satisfy this requirement.

At sites known or reasonably suspected of being contaminated with TENORM where any development activity or other ground-disturbing activity or excavation is planned, a licensed D&D contractor must be utilized to perform an initial radiological screening survey (the "survey") to identify the presence and concentration of radium-226, as described in Attachment A. If appropriate, the survey may be submitted with the necessary proposed TENORM Management Plan (see Section VI.C. of this policy). For sites where TENORM was not initially known or suspected, but during work the presence of slag fill or other indicators raise a concern for the possible presence of TENORM, a health physics technician or appropriately trained person (as approved by the Department) may perform a preliminary radiological screening survey. Project sponsors must submit a draft of the survey plan to the Department in advance to ensure that the survey will meet the Department's data needs. The Department will review and approve the survey plan prior to implementation.

After the survey plan is approved and an initial survey is conducted, the project sponsor, site owner, or other appropriate person must submit the initial survey results to the assigned ERS (and DEC project manager for sites in a DEC remedial program) for review. The initial radiological screening survey results will assist the ERS in determining the necessity, and scope, of a TENORM Management Plan. Additionally, the initial radiological screening survey results provide the description of the waste containing radioactive material, which includes the physical and chemical properties relevant to risk evaluation, that is a requirement for a variance application under 6 NYCRR 380-3.5(c)(1).

If any radiological screening survey conducted indicates the presence of radium-226 or other NORM isotopes, in potentially elevated concentrations, the site will be deemed to contain potential TENORM. If any material is determined to be TENORM, it must be handled in accordance with the management requirements in Section IV.B of this policy.

B. Management Requirements

This policy utilizes the EPA Uranium Mill Tailings Radiation Control Act standards of 5 and 15 pCi/g of Ra- 226, but conservatively applies them only to the management of the excavated TENORM. This standard is widely used as a remedial goal at sites across the country, and in New York, which contain Ra-226 contamination. The original purpose of these values was to minimize the radiation dose received via radon emanation from Ra-226 and, as such, represents a comparable risk and exposure scenario. The following are the management requirements for the different types of TENORM that could be discovered on a particular site:

TENORM (Background-comparable) (below 5 pCi/g of radium-226) – the Department may either grant a variance to allow the excavated TENORM (Background-comparable) to be returned to the excavation/AOC, or the assigned ERS determines, and approves, that the proposed use and handling in the AOC is acceptable. The Department will also require that appropriate and approved institutional control(s) be put in place (e.g., deed restriction, environmental easement) for each AOC.

TENORM fill (between 5 pCi/g and 15 pCi/g of radium-226) – the Department may grant a variance to allow excavated TENORM fill to be returned to the excavation/AOC if the following conditions are met:

- 1) the site where the TENORM fill is found contains undisturbed TENORM fill;
- 2) all excavated TENORM fill is handled in conformance with the submitted and approved TENORM Management plan;
- 3) an appropriate and approved institutional control(s) is put in place (e.g., deed restriction, environmental easement) for each AOC; and
- 4) the TENORM fill does not exceed 15 pCi/g of radium-226.

TENORM Waste (above 15 pCi/g of radium-226) – TENORM waste is considered a regulated waste per 6 NYCRR Part 380 and must be disposed of in accordance with appropriate regulatory requirements at an authorized disposal facility.

C. Management Plan Requirements for TENORM fill

Once TENORM fill has been identified on a property where it is being or will be disturbed, a TENORM Management Plan must be submitted to the Department for approval. As discussed previously, the radiological screening survey plan can be incorporated into the TENORM Management Plan. The TENORM Management Plan describes the proposed manner and conditions of waste disposal and the procedures to ensure that doses are maintained ALARA, which are both requirements for a variance application under 6 NYCRR 380-3.5(c)(1), (4). The TENORM Management Plan must demonstrate the following:

- 1) the site is conducive to the implementation of long-term site controls;
- 2) a well-defined and documented consolidation location within the AOC (if proposed) will be established;
- 3) a minimum of two feet of acceptable soil cover material or the equivalent of paving with asphalt or concrete will be placed over the consolidation area;
- 4) whether substantial TENORM will remain on the site at the completion of any site work;
- 5) the size of the consolidation area will be based on the known extent of area containing undisturbed TENORM remaining on-site; and will be determined and approved on a case-by-case basis by the Department; and
- 6) that it is implemented in a manner consistent with the ALARA

concept. For more details on the TENORM Management Plan, see Attachment B of this policy.

D. Variance Application Requirements

For TENORM to remain onsite per a proposed management plan, an application for a variance must be submitted and approved. The application must comply with the requirements of 6 NYCRR 380-3.5.

However, as previously indicated, the application does not need to include the demonstrations required under 6 NYCRR 380-3.5(b)(4) and (5).

To meet the requirements of 6 NYCRR 380-3.5, the application for a variance for TENORM fill must include the following:

- 1) an explanation as to why the applicant believes the property contains TENORM;
- 2) the initial radiological survey results showing the concentration of radium-226 and other NORM isotopes found in the TENORM;
- 3) a TENORM Management Plan;
- 4) institutional controls as previously discussed, as determined by the Department to be necessary; and
- 5) any additional information deemed necessary by the Department.

The application for a variance will be reviewed by the assigned ERS, with recommendations made to appropriate Department management and programmatic areas for determination of approval or rejection (preference is for determination to be made in a regionalized program office, whenever possible).

Any denial of a variance application may result in the applicant or responsible person being required to take further action, including, but not limited to, additional characterization, site definition, and potentially removal and disposal off site of the material in question. Additionally, when a variance application is denied, the Department will issue a notice of denial and the applicant may request a hearing in accordance with the procedures in 6 NYCRR Part 621 as a variance from Part 380 qualifies as a permit.

Additional Requirements and Recommendations

This policy does not address the transportation of TENORM or other radioactive materials.

Regardless of the concentration of radium-226 and other NORM isotopes determined to exist at a site, any new structures built at said location are recommended to utilize radon resistant construction.

V. Related References

49 CFR Part 173 Subpart I Class 7 Radioactive

Materials 10 NYCRR Part 16 Ionizing Radiation

6 NYCRR Part 380 Prevention and Control of Environmental Pollution by Radioactive

Materials 6 NYCRR Part 381 Transporters of Low-Level Radioactive Material

17 NYCRR Part 154 Special Hauling Permits

Attachment A Radiological

Screening Survey Criteria

If a radiological screening survey is needed to verify the presence of TENORM, the following process must be followed:

- 1) Establish an appropriate background(s) representative for the area(s) to be surveyed, as approved by the Department. It is intended for the background area to be distinct from the area of contamination (AOC), yet representative of background conditions in the vicinity of the AOC. Natural radiological background is preferred, however, in some instances, such as urban areas, background representative of non-natural conditions not impacted by TENORM may be acceptable.
- 2) At a minimum, survey the portion of the site to be disturbed.
- 3) If survey readings exceed 1.5 x background, collect a minimum of three representative composite samples of the TENORM (to be analyzed by a DOH Environmental Laboratory Approval Program (ELAP) certified laboratory) including from the area of highest survey readings. Perform fixed one-minute meter readings at each sampling location prior to collection of a sample.
 - a) In consultation with the assigned ERS, develop a correlation between meter readings and soil concentrations to guide future survey efforts. Where feasible, the use of a meter reading-to-concentration correlation (backed-up by limited sample analyses) can reduce costs and time delays during site characterization and waste monitoring rather than relying solely on analytical results.
 - b) As long as survey results indicate radium-226 levels below 5 pCi/g, no separation of soil and TENORM is required.
- 4) If no readings in excess of 1.5 times background are noted, no further monitoring during excavation activities is necessary, except as noted below.
 - a) In most cases, no other radiological monitoring will be required.
 - b) However, certain factors may necessitate limited additional monitoring of excavated materials. Those factors can include:
 - i) Whether there are known areas of TENORM in the region or on nearby properties;
 - ii) Whether there is evidence that slag is present on-site and if so whether it contains TENORM; or
 - ii) If major changes in types of TENORM encountered occur during excavation.
 - c) If Department staff or a site consultant see possible TENORM at or from a depth greater than was evaluated by the original survey, it is strongly recommended that a plan to perform limited radiological screening of excavated materials be developed. The goal is to ensure that contaminated materials are

not inadvertently redistributed on the site or moved off site. If such a circumstance arises, ERS staff will work with the consultant to establish an appropriate limited screening plan.

Attachment B

TENORM Management Plan

The TENORM Management Plan must include the following:

1) TENORM Sorting Process:

a) Unless an alternate plan is approved by the Department as part of previously discussed process regarding granting a Part 380 variance, material removed from the excavation area must be sorted as part of the excavation process and placed into stockpiles using average soil concentrations, based upon waste management needs. Stockpiles should be managed to minimize erosion and the generation of dust.

b) These stockpiles may include:

i) A pile for TENORM (Background-comparable) clearly below 5 pCi/g of radium- 226

ii) A pile for TENORM Waste clearly exceeding 15 pCi/g of radium- 226 for off-site disposal.

iii) An optional intermediate pile for TENORM fill that cannot readily be identified during excavation as fitting into one of the above categories based on meter readings alone. (below 5 pCi/g or above 15pCi/g for Ra-226.)

1) If an intermediate concentration pile is proposed by the TENORM Management Plan, the TENORM Management Plan must describe how the fate of this TENORM fill will be resolved, or

2) If an intermediate concentration pile is not proposed by the TENORM Management Plan, all TENORM fill exceeding 5 pCi/g of radium-226 must be placed in the pile for off-site disposal.

c) If a correlation between meter readings and soil concentrations to guide future survey efforts has not already been completed and approved by the assigned Department ERS, it must be included as part of this TENORM Management Plan.

2) Survey Process for Soil/TENORM Sorting

a) In larger excavations, the preferred method is to excavate in six-inch (6") lifts and perform walkover surveys using the established meter reading-to-concentration correlation to separate out contaminated material. If site characteristics or other restrictions do not allow for this, surveying bucket by bucket, visual screening, or another process may be submitted for consideration as part of the TENORM Management Plan.

b) In tight areas such as trenches where normal surveying is impractical or dangerous, bucket loads of excavated material should be surveyed as they are removed from the excavation. Due to the change in geometry from a flat plane to a bucket of soil, a separate meter reading-to-concentration ratio would be required

for this survey option. Alternatives to surveying buckets of excavated material during excavation may be submitted to the Department for consideration as part of the TENORM Management Plan.

3) TENORM Management

The following contains information on the management requirements for the different types of TENORM:

a) TENORM Waste (i.e., material with survey levels exceeding 15 pCi/g of radium-226) must be disposed of off-site at facilities permitted to accept such wastes. Representative sampling must be performed following the waste acceptance criteria of the selected disposal site.

b) TENORM (Background-comparable) (i.e., material with survey levels below 5 pCi/g of radium-226) are generally not restricted for radiological purposes and may be reused on-site, dependent upon development of a variance and/or approval by the assigned ERS, and a commitment to utilize radon-resistant construction for any structures built on the property in the future, along with an appropriate land use control.

c) TENORM fill less than 15 pCi/g of radium-226 may be able to be placed back into the excavation area consistent with the criteria in this policy. Reuse of TENORM fill concentrations between 5 pCi/g and 15 pCi/g:

i) TENORM fill must be placed a minimum of two feet below grade.

ii) Appropriate land use controls, as previously discussed, must record the presence of TENORM fill and the known, or suspected, extent of its existence at the site.

4) Undisturbed TENORM

a) TENORM that does not have to be disturbed for site development or for remediation of other contaminants is not required to be remediated as long as the undisturbed TENORM poses no significant risk to public health or the environment in its present state.

b) Radon-resistant construction is strongly encouraged to be utilized for any future buildings.