DRAFT A 07/16/15

DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Hazardous Materials and Waste Management Division

RADIATION CONTROL - LICENSING REQUIREMENTS FOR URANIUM AND THORIUM PROCESSING

6 CCR 1007-1 Part 18

Adopted by the Board of Health December 16, 2015

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

PART 18: LICENSING REQUIREMENTS FOR URANIUM AND THORIUM PROCESSING

18.1 Purpose and Scope.

18.1.1 The regulations in this part establish criteria, terms and conditions upon which the Department issues licenses to receive title to, receive, possess, use, transfer, or deliver source and byproduct materials **as defined in this part**, to operate uranium and thorium processing facilities and for the disposition of the resulting byproduct material. The requirements of this part are in addition to, and not in substitution for, other applicable requirements of these regulations.

18.1.2 This part establishes performance objectives and procedural requirements applicable to any uranium or thorium material processing operation, to waste systems for byproduct material **as defined in this part**~~as in definition (2) of 1.2.2,~~ and to related activities concerning uranium-bearing and thorium-bearing materials. It establishes specific technical and financial requirements for **siting**~~sitting~~, construction, operation, and decontamination, reclamation and ultimate stabilization, as well as requirements for license transfer and termination, long-term site monitoring and surveillance, and ownership and ultimate custody of source material milling facilities and byproduct material impoundments.

18.1.3 The requirements of this part apply to byproduct material **as defined in this part,** that is located at a site where milling operations are no longer active, if such site is not covered by the remedial action program of Title I of the Uranium Mill Tailings Radiation Control Act (UMTRCA) OF 1978 (92 STAT. 3021; 42 U.S.C. 7901). The regulations in this part do not establish procedures and criteria for the issuance of licenses for materials covered under Title I of the Uranium Mill Tailings Radiation Control Act of 1978 (92 Stat. 3021) ~~unless that program fails to accomplish remedial action~~. Disposal at a uranium or thorium processing site of radioactive material which is not type 2 byproduct material must not inhibit reclamation of the tailings impoundment or the ability of the U.S. Government to take title to the impoundment as long-term custodian.

18.1.4 Nothing in this Part **applies**~~shall apply~~ to**, includes, or affects** the following naturally occurring radioactive materials (NORM) or technologically enhanced naturally occurring radioactive materials (TENORM):

18.1.4.1—Residuals or sludges from the treatment of drinking water by aluminum, ferric chloride, or similar processes; except that the material may not contain hazardous substances that otherwise would preclude receipt;

18.1.4.2 Sludges, soils, or pipe scale in or on equipment from oil and gas exploration, production, or development operations or drinking water or wastewater treatment operations; except

Comment [JJ1]: **EDITORIAL NOTE 1:** ALL COMMENTS (SUCH AS THIS ONE) SHOWN IN THE RIGHT SIDE MARGIN OF THIS DOCUMENT ARE FOR INFORMATION PURPOSES ONLY TO PROVIDE ADDITIONAL INFORMATION AND TO AID THE READER IN UNDERSTANDING THE PROPOSED RULE DURING THE DRAFT REVIEW PROCESS.

THESE COMMENTS ARE **NOT** PART OF THE RULE AND ALL COMMENTS WILL BE DELETED PRIOR TO FINAL SUBMISSION.

Comment [JJ2]: This reflects the date of anticipated approval by the Colorado Board of Health. The effective date is approximately 60 days beyond this date, pending additional review and approvals.

This date is subject to change as determined by the Board of Health. Changes to this date will be properly reflected in the rule, as applicable.

Comment [JJ3]: Due to the added definition for "byproduct material" in 18.2 appearing subsequently in the rule, the wording here is clarified.

Similar changes are made in the rule up to the definition section 18.2.

Comment [JJ4]: This and three additional occurrences of this spelling error are corrected in the rule.

Comment [JJ5]:
Proposed change deletes requirements which are no longer applicable. Based on Nuclear Regulatory Commission (NRC) comments - under the 274b Agreement, the State of Colorado does not have jurisdiction over Title I facilities.

Discussion with CDPHE remediation program staff indicated that this may have been initiated in the past due to uncertainty with UMTRCA process at the time.

Change made based on NRC letter dated 10/13/11 (# 18).

10 CFR 40.2a(b)
[Compatibility=A]
NRC Compatibility information can be found at:
https://scp.nrc.gov/regresources.html

Comment [JJ6]: Language modified for consistency with 2015 statutory changes (Colorado Radiation Control Act) via House Bill 15-1145.

that the material may not contain hazardous substances that otherwise would preclude receipt;

18.1.4.3 Materials from or activities related to construction material mining regulated under article 32.5 of title 34, CRS.

18.1.4.4 The treatment, storage, management, processing, or disposal of solid waste, which may include NORM and TENORM, either pursuant to issuance of a certificate of designation or considered approved or otherwise deemed to satisfy the requirement for a certificate of designation.

18.1.5 The regulation of uranium in situ leach mining (in situ recovery), as defined in Section 34-32-103, CRS., involves the Department of Natural Resources, Division of Reclamation, Mining and Safety or their successor. The requirements of that agency may, due to the use of terms-of-art and other technical words, phrases and definitions, be interpreted inconsistently or be held in conflict with the Department's requirements. The Department will coordinate with that agency to the maximum extent practicable to resolve any such conflicts or inconsistencies. An applicant or licensee that identifies such inconsistency or conflict shall provide that information to both agencies for resolution. **The Department of Natural Resources, Division of Reclamation, Mining and Safety or their successor, is not implementing any Atomic Energy Act regulatory authority under the Articles of Agreement, Section 274, of the Atomic Energy Act of 1954, as amended.**

18.1.6 License amendments for the receipt of ~~classified~~ **radioactive** material at a facility are subject to sections 18.3 and 18.4 except when the material is from an approved source and ~~such~~**the** amendment would not result in a change in ownership, design, or operation of the facility. License amendments not subject to 18.3 and 18.4 of this part are subject to 18.5 of this section.

18.2 As used in this regulation:

"Active maintenance" means any significant activity needed during the period of long term care including ongoing activities such as the pumping and treatment of water from a site or one-time measures such as replacement of a disposal site's cover. Active maintenance does not include custodial activities such as repair of fencing, repair or replacement of monitoring equipment, revegetation, minor additions to soil cover, minor repair of disposal site cover, and general disposal site upkeep such as mowing grass.

"Aquifer" means a geologic formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs. Any saturated zone created by uranium or thorium operations would not be considered an aquifer unless the zone is or potentially is:

(1) hydraulically interconnected to a natural aquifer;

(2) capable of discharge to surface water; or

(3) reasonably accessible because of migration beyond the vertical projection of the boundary of the land transferred for long-term government ownership and care in accordance with Criterion 9 of Appendix A to this Part 18.

"As expeditiously as practicable considering technological feasibility", for the purposes of Criterion 6A, means as quickly as possible considering: the physical characteristics of the tailings and the site; the limits of available technology; the need for consistency with mandatory requirements of other regulatory programs; and factors beyond the control of the licensee. The phrase permits consideration of the cost of compliance only to the extent specifically provided for by use of the term available technology.

Comment [JJ7]:
Statement is added to clarify that the Department of Natural Resources (DNR) does not have regulatory authority over radioactive materials under the Atomic Energy Act and the Articles of Agreement between the Atomic Energy Commission (now NRC) and the State of Colorado Radiation Program.

In a letter dated October 13, 2011 (Item 17), and as reaffirmed in a letter dated June 28, 2012 (item 17), the U.S. Nuclear Regulatory Commission (NRC) requested that the regulatory authority in relation to the Atomic Energy Act be clarified.

10 CFR 40.2
NRC Regulations can be found at:
http://www.nrc.gov/reading-rm/doc-collections/cfr/

Comment [JJ8]: Wording change consistent with 2015 statutory Radiation Control Act (RCA) changes via House Bill 15-1145.

CRS 25-11-203(1)(b)(III)

"Available ~~radon barrier~~ technology" means technologies and methods for emplacing a final radon barrier on uranium mill tailings piles or impoundments. This term shall not be construed to include extraordinary measures or techniques that would impose costs that are grossly excessive as measured by practice within the industry (or one that is reasonably analogous), (such as, by way of illustration only, unreasonable overtime, staffing, or transportation requirements, etc., considering normal practice in the industry; laser fusion of soils, etc.), provided there is reasonable progress toward emplacement of the final radon barrier. To determine grossly excessive costs, the relevant baseline against which cost shall be compared is the cost estimate for tailings impoundment closure contained in the licensee's approved reclamation plan, but costs beyond these estimates shall not automatically be considered grossly excessive.

"Byproduct Material" is the same as in definition (2) of 1.2.2 and means the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content, including discrete surface wastes resulting from uranium solution extraction processes. Underground ore bodies depleted by such solution extraction operations do not constitute "byproduct material" within this definition.

"Certificate of designation" means the approval pursuant to article 20 of title 30, CRS., or section 25-15-204 (6).

"Closure" means the activities following operations to decontaminate and decommission the buildings and site used to produce byproduct materials and reclaim the tailings and/or waste disposal area.

"Closure plan" means the Department approved plan to accomplish closure.

"Compliance period" begins when the Department sets secondary ground-water protection standards and ends when the owner or operator's license is terminated and the site is transferred to the State or Federal agency for long-term care.

"Dike" means an embankment or ridge of either natural or man-made materials used to prevent the movement of liquids, sludges, solids, or other materials.

"Disposal area" means the area containing byproduct materials to which the requirements of Criterion 6 of Appendix A to this Part 18 apply.

"Disposal site" means all land that is subject to transfer to a government agency after termination of the license.

"Existing portion" means that land surface area of an existing surface impoundment on which significant quantities of uranium or thorium byproduct materials had been placed prior to September 30, 1983.

"Facility" in this part means the physical location at one site or address and under the same administrative control at which:

(1) the possession, use, processing or storage of uranium-bearing and thorium-bearing radioactive material is or was authorized by license pursuant to this part; or

(2) uranium and thorium is milled, or otherwise processed and the resulting byproduct material is dispositioned.

"Factors beyond the control of the licensee" means factors proximately causing delay in meeting the schedule in the applicable reclamation plan for the timely emplacement of the final radon barrier notwithstanding the good faith efforts of the licensee to complete the barrier in compliance with paragraph (1) of Criterion 6A. These factors may include, but are not limited to:

Comment [JJ9]:
The words "radon barrier" is deleted from this definition to be consistent with Appendix A of 10 CFR Part 40 wording. The original full definition language (including the words "radon barrier") are not used in Part 18, so no additional changes are necessary. The revised definition is currently used in Part 18 and those uses are consistent with 10 CFR Part 40.

NRC Compatibility = A
NRC letters dated 06/28/12 (#26); 10/13/11 (#26).

Comment [JJ10]:
Consistent with the approach used in 10 CFR Part 40, the definition for byproduct material is added. This approach eliminates the need to refer back to Part 1 for the definition throughout Part 18. As a result of this added definition, some current references to the Part 1 definition will be deleted.

The specific sub-definition of byproduct material is appropriate for uranium and thorium processing facilities regulated under Part 18.

NRC Compatibility = C
NRC Letter 01/14/14

(1) physical conditions at the site;

(2) inclement weather or climatic conditions;

(3) an act of god;

(4) an act of war;

(5) a judicial or administrative order or decision, or change to the statutory, regulatory, or other legal requirements applicable to the licensee's facility that would preclude or delay the performance of activities required for compliance;

(6) labor disturbances;

(7) any modifications, cessation or delay ordered by state, federal, or local agencies;

(8) delays beyond the time reasonably required in obtaining necessary government permits, licenses, approvals, or consent for activities described in the reclamation plan proposed by the licensee that result from agency failure to take final action after the licensee has made a good faith, timely effort to submit legally sufficient applications, responses to requests (including relevant data requested by the agencies), or other information, including approval of the reclamation plan; and

(9) an act or omission of any third party over whom the licensee has no control.

"Final radon barrier" means the earthen cover (or approved alternative cover) over tailings or waste constructed to comply with Criterion 6 of this Appendix (excluding erosion protection features).

"Ground water" means water below the land surface in a zone of saturation. For purposes of Appendix A to this Part 18, ground water is the water contained within an aquifer as defined above.

"Leachate" means any liquid, including any suspended or dissolved components in the liquid that has percolated through or drained from the byproduct material.

"Licensed site" means the area contained within the boundary of a location under the control of persons generating or storing radioactive materials under a Department license.

"Liner" means a continuous layer of natural or man-made materials, beneath or on the sides of a surface impoundment, which restricts the downward or lateral escape of byproduct material, hazardous constituents, or leachate.

~~"Long term care" means the observation and maintenance of a site following the post closure period and termination of the license.~~

"Milestone" means an action or event that is required to occur by an enforceable date.

"Monitoring" means observing and making measurements to provide data to evaluate the performance and characteristics of a site.

"Operation" means that a uranium or thorium mill tailings pile or impoundment is being used for the continued placement of byproduct material or is in standby status for such placement. A pile or impoundment is in operation from the day that byproduct material is first placed in the pile or impoundment until the day final closure begins.

Comment [JJ11]:
NRC has requested this definition be deleted from Part 18. Although the term is used in 10 CFR Part 40, NRC does not define the term. Retaining the definition in Colorado rules may result in non-compatibility with NRC requirements.

This term is used in 18.2, 18.6.1.2, and Criterion 6 of Part 18.

[NOTE: Although not defined in 10 CFR Part 40, the words "long term care" are used multiple times in 10 CFR 40 in 40.1, 40.2a, 40.3, 40.20, 40.27, 40.28, and Appendix A.]

NRC letters dated 06/28/12 (#20); 10/13/11 (#20). 10 CFR 40.4

"Point of compliance" is the site specific location in the uppermost aquifer where the ground-water protection standard must be met.

~~"Post closure" means the period of time from completion of the site closure plan for decontamination, reclamation, and stabilization of the site and disposal area and prior to the termination of the license.~~

"Reclamation plan", for the purposes of Criterion 6A of Appendix A of this Part 18, means the plan detailing activities to accomplish reclamation of the tailings or waste disposal area in accordance with the technical criteria of Appendix A of this Part. The reclamation plan must include a schedule for reclamation milestones that are key to the completion of the final radon barrier including as appropriate, but not limited to, windblown tailings retrieval and placement on the pile, interim stabilization (including dewatering or the removal of freestanding liquids and recontouring), and final radon barrier construction. (Reclamation of tailings must also be addressed in the closure plan; the detailed reclamation plan may be incorporated into the closure plan.)

"Residual radioactive material" means:

(1) Waste (which the Secretary of Energy determines to be radioactive) in the form of tailings resulting from the processing of ores for the extraction of uranium and other valuable constituents of the ores; and

(2) Other waste (which the Secretary of Energy determines to be radioactive) at a processing site which relates to such processing, including any residual stock of unprocessed ores or low-grade materials.

The term residual radioactive material is used only with respect to materials at sites subject to remediation under title I of the Uranium Mill Tailings Radiation control Act of 1978, as amended.

"Surface impoundment" means a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well.

~~"Surveillance" means the observation of the site for the purposes of visual detection of the need for maintenance, custodial care, evidence of unauthorized access, and compliance with other license and regulatory requirements.~~

"Third-party contractor" or "Third-party agreement" means a legal or contractual mechanism whereby an applicant or licensee voluntarily agrees to pay for the services, solely selected and supervised by the Department, of qualified persons not Department staff nor under contract directly to the Department.

"Uppermost aquifer" means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.

"Uranium milling" means any activity that results in the production of byproduct material as defined in Part 18.

Comment [JJ12]:
NRC has requested that the definition "post closure" be deleted from Part 18 since it is not defined in NRC's equivalent part (10 CFR 40). According to NRC, retaining the definition may result in conflicts with 10 CFR Part 40.

[NOTE: The term is used in Appendix A to 10 CFR Part 40 in Criterion 6 (7), but does not define it.]

Part 18 uses this term in Criterion 6(7) in a manner equivalent to Appendix A of 10 CFR Part 40.

NRC letter dated 06/28/12 (#21); 10/13/11 (#21).

10 CFR 40.

Comment [JJ13]:
NRC has commented that the definition for "residual radioactive material" was omitted from Part 18 of the regulations. Continued omission of the definition may result in incompatibility with NRC regulations.

[The term is used in Part 3, 3.16.2.6 in a manner similar to use in the Conference of Radiation Control Program Directors (CRCPD) Suggested State Regulations for Radiation Control (SSRCR) Part C.32. The term is not currently used/found in Part 1 or in Part 18.]

NRC letter dated 06/28/12 (#22); 10/13/11 (#22) [Compatibility = A]

Comment [JJ14]:
At the request of NRC, the specific definition for surveillance is deleted. NRC has stated that the Colorado definition is too narrow as it implies only "visual" types of surveillance. [The word is used in 18.1.2; Appendix A-criterion 2, 9C, and 9F].

The word "surveillance" is not defined in 10 CFR Part 40, although the word is used in several areas of Part 40 in a broad sense. NRC has stated that surveillance may include other activities besides visual observation, including monitoring and sampling.

NRC letters 06/28/12 (#23); 10/13/11 (#23).

Comment [JJ15]:
As required by NRC for compatibility, a definition for "uranium milling" is added. The definition is based on that found in 10 CFR Part 40.4.

NRC letters: 01/14/14 (#3); 06/28/2012 (#24); 10/13/11 (#24)

Compatibility = A

18.3 Special Requirements for Issuance of Specific Licenses For Source Material Milling.

In addition to the requirements set forth in 3.8 and 3.9, a specific license for source material milling will be issued if the applicant submits to the Department a complete and accurate **written** application that clearly demonstrates how objectives and requirements of this Part are met. Failure to clearly so demonstrate shall be grounds for refusing to accept an application. Any person desiring to have a facility or site referred to in this Part shall apply to the Department for approval of such facility or site. The application shall contain such information as the Department requires and shall be accompanied by an application fee determined by the Board pursuant to the provisions of Part 12 of these regulations.

18.3.1 An application for a license or to amend or renew an existing license to receive, possess, and use source material for milling or byproduct material ~~as in definition (2) of 1.2.2~~ shall include all information required under these regulations and such other information as the Department may deem necessary, and shall address the following:

18.3.1.1 Description of the proposed project or action;

18.3.1.2 Area/site characteristics including geology, topography, hydrology and meteorology;

18.3.1.3 Radiological and nonradiological impacts of the proposed project or action, including waterway and groundwater impacts;

18.3.1.4 Environmental effects of accidents;

18.3.1.5 Tailings disposal and decommissioning;

18.3.1.6 Site and project alternatives.

18.3.2 The applicant shall provide procedures describing the means employed to meet the following requirements during the operational phase of any project.

18.3.2.1 Milling operations shall be conducted so that all releases are reduced to as low as is reasonably achievable below the limits of Part 4.

18.3.2.2 The mill operator shall conduct at least daily inspection of any tailings or waste retention systems. The inspection shall be performed by a person who is qualified and approved by the Department. Records of such inspections shall be maintained for review by the Department.

18.3.2.3 The mill operator shall immediately notify the Department of the following:

18.3.2.3.1 Any failure in a tailings or waste retention system which results in a release of tailings or waste into uncontrolled areas; and

18.3.2.3.2 Any unusual conditions which are not contemplated in the design of the retention system and which if not corrected could lead to failure of the system and result in a release of tailings or waste into uncontrolled areas.

18.3.3 During any one full year prior to submittal of a new application or amendment expanding the facility the applicant/licensee shall conduct a preoperational monitoring program to provide complete baseline data on a milling site and its environs. Throughout the construction and operating phases of the mill, the applicant/licensee shall conduct an operational monitoring program to measure or evaluate compliance with applicable standards and regulations, to

evaluate performance of control systems and procedures, to evaluate environmental impacts of operation, and to detect potential long-term effects.

18.3.4 The environmental ~~report~~**assessment** required by 3.8.8 shall contain all information deemed necessary by the agency to assist the agency in the evaluation of the short-term and long-range environmental impact of the project and activity so that the agency may weigh environmental, economic, technical, and other benefits against environmental costs, while considering available alternatives. The environmental ~~report~~**assessment** shall be submitted with the license application or amendment request, unless an exemption as provided by 3.8.7.1 has been obtained from the Department.

18.3.5 The following types of actions require an applicant's environmental ~~report~~**assessment**:

18.3.5.1 Issuance ~~or~~**of a new or** renewal ~~of a~~ source material milling license;

18.3.5.2 Each new, renewal or amendment application pertaining to the facility's receipt of material;

18.3.5.~~3~~2 Issuance of an amendment that would authorize or result in:

(1) A significant expansion of a site;

(2) A significant change in the types of releases;

(3) A significant increase in the amounts of releases;

(4) A significant increase in individual or cumulative occupational radiation exposure; or

(5) A significant increase in the potential for or consequences from radiological accidents.

18.3.5.~~4~~3. ~~t~~The environmental ~~assessment~~ **report** shall contain all information deemed necessary by the department, and shall include, at a minimum:

(1) The identification of the types of ~~classified~~ material to be received, stored, processed, or disposed of;

(2) A representative presentation of the physical, chemical, and radiological properties of the type of ~~classified~~ material to be received, stored, processed, or disposed of;

(3) An evaluation of the short-term and long-range environmental impacts of such receipt, storage, processing, or disposal;

(4) An assessment of the radiological and nonradiological impacts to the public health from the proposed activities;

(5) Any facility-related impact on any waterway and ground water from the proposed activities;

(6) An analysis of the environmental, economic, social, technical, and other benefits of the proposed activities against environmental costs and social effects while considering available alternatives;

Comment [JJ16]: Wording is modified, consistent with the language used in the Colorado Radiation Control Act for the document(s) submitted by the applicant which pertains to environmental concerns.

Comment [JJ17]: Language modified for clarity.

Comment [JJ18]: This requirement has been relocated from 18.3.9, and 18.3.9.2 and language merged.

Comment [JJ19]: For consistency within this subsection, the term environmental assessment is changed to environmental report. The environmental report is the document submitted by the applicant or licensee.

(7) Aa list of all material violations of local, state, or federal law at the facility since the submittal date of the previous license application or license renewal application;

(8) Ffor an application for a license or license amendment pertaining to the facility's receipt of classified material for storage, processing, or disposal at the facility, a demonstration that:

(a) Tthere are no outstanding material violations of any state or federal statutes, compliance orders, or court orders applicable to the facility, and any releases giving rise to any such violation have been remediated;

(b) tThe operator, after a good faith review of the facility and its operations, is not aware of any current license violation at the facility;

(c) tThere are no current releases to the air, ground, surface water, or groundwater that exceed permitted limits; and

(d) nNo conditions exist at the facility that would prevent the Department of Energy's receipt of title to the facility pursuant to the federal "Atomic Energy Act of 1954",42U.S.C. sec. 2113;

(9) Aa list of all necessary permits and any changes to local land use ordinances that are needed to construct or operate the facility; and

(10) Ffor sites or facilities placed on the National Priority List pursuant to the federal "Comprehensive Environmental Response, Compensation, and Liability Act", 42 U.S.C. sec. 9605, a copy of the most recent five-year review and any associated updates that have been issued by the United States Environmental Protection Agency.

18.3.6 An application for a license to receive, possess and use source material for milling or byproduct material as in definition (2) of 1.2.2 shall contain proposed specifications relating to the milling operations and the disposition of tailings or wastes resulting from such milling activities to achieve the requirements and objectives set forth in the criteria listed in Appendix A to this Part 18. Each application for a new license or for license renewal must clearly demonstrate how the requirements and objectives set forth in Appendix A to this Part 18 have been addressed. Failure to clearly demonstrate how the requirements and objectives in Appendix A to this Part 18 have been addressed shall be grounds for refusing to accept an application.

A facility shall not dispose of or receive for storage incident to disposal or processing at the facility radioactive material, except for nonprocessing operational purposes such as radioactive standards, samples for analysis, or materials contained in fixed or portable gauges, unless the facility has received a license, a five-year license renewal, or license amendment pertaining to the facilities receipt of radioactive material, in accordance with the Administrative Procedures Act, for such receipt, storage, processing, or disposal of radioactive material and the license, license renewal, or license amendment approves the type of activity.

18.3.7 Nothing in **section** 18.3 shall apply**applies** to a contract for the storage, processing, or disposal of less than the sum of one hundred ten (**110**) tons of classified **radioactive** material per source or to a contract for a bench-scale or a pilot-scale testing project or a contract for less than a de minimis amount of classified **radioactive** material as determined by the department for storage, processing, or disposal.

Comment [JJ20]: Paragraph added consistent with the 2015 changes to the RCA. The provision allows for a facility to receive nonprocessing related radioactive materials provided the license authorizes the material and activity.

RCA: 25-11-203(1)(b)(I)

Comment [JJ21]: Wording change consistent with 2015 statutory (RCA) changes via House Bill 15-1145.

C.R.S. 25-11(1)(b)(II)

Comment [JJ22]: Editorial adjustment - number is added for clarity/consistency with other formatting in Part 18.

Comment [JJ23]: Wording change to "radioactive" consistent with 2015 statutory (RCA) changes via House Bill 15-1145.

18.3.8 Upon receipt of an application or notice as provided in ~~this~~ section **18.3**, the Department shall notify the public and forward a copy of the application or notice to the Governor and the General Assembly, as appropriate. **The Department will take no further formal action on notices that are not accompanied by the proper application and application fee.**

18.3.8.1 ~~the Department shall publish a determination as to whether an application submitted pursuant to paragraph (b) of subsection (2) of this section is substantially complete within forty-five days after receipt of the application.~~**Within forty-five (45) days after receipt of an application, the Department shall publish a determination as to whether the application submitted is substantially complete.**

18.3.8.2 ~~an initial public meeting or hearing shall be convened within forty-five days after publication of the determination that the application is substantially complete. A second such public meeting shall be convened within thirty days after the first public meeting.~~ **Within forty-five (45) days after publication its determination that the application required by 18.3.8.1 is substantially complete, an initial public meeting shall be convened. The meeting shall, at a minimum require:**

(1) At least two weeks' written notice before the meeting;

(2) The meeting to be hosted and presided over by a person selected upon agreement by the Department, the local Board of County Commissioners and the applicant;

(3) The licensee or applicant to provide a summary of the facility's application to receive, store, process, or dispose of material and the nature of the material;

(4) An opportunity for the public to comment and be heard;

(5) The licensee or applicant to provide transcripts of the meeting, which:

(a) Allows the public to make copies of a transcript of the meeting; and

(b) Shall be provided to the Department in an electronic format in a manner that allows posting on the Department's website within ten (10) days after receipt from the transcription service.

~~18.3.8.3 the Department shall approve, approve with conditions, or deny the application within three hundred sixty days after the second public meeting.~~

18.3.8.3 Within ninety (90) days of the initial public meeting required by 18.3.8.2, a response, if any, written by the local Board of County Commissioners to the applicant's environmental assessment is to be provided to the applicant.

Upon request of and documentation of the expenditure by such Board, the applicant shall provide the Board with up to fifty thousand dollars, as adjusted for inflation since 2003, which is available to assist the Board in responding to the application, including an independent environmental analysis and identification of any substantial adverse impact upon the safety or maintenance of transportation infrastructure or transportation facilities within the county.

18.3.8.4 Upon completion of the Department's review of the application, the Department shall provide notice to the public of issuance of an initial draft decision where the license application is approved, approved with conditions, or is denied.

Comment [JJ24]: Throughout section 18.3.8 and subsections, language is reworded with the intent of improving the clarity, understanding and flow of the rule.

Comment [JJ25]: The original language of 18.3.8.1 (shown in strikeout) makes reference to "paragraph (b) of subsection (2)". Paragraph (b) of subsection (2) does not currently exist within Part 18. During a prior revision to Part 18, this reference was incorporated in Part 18 in error. The "paragraph (b)" phrase refers to a section in the Colorado Radiation Control Act (2010) (rather than Part 18).

Comment [JJ26]: This paragraph incorporates the requirements of 18.3.9.1 relating to the application being substantially complete prior to holding an initial meeting.

Comment [JJ27]: Relocated from 18.3.9.1(1).

Comment [JJ28]: Relocated from 18.3.9.1.

Comment [JJ29]: Relocated from 18.3.9.1(2).

Comment [JJ30]: Relocated from 18.3.9.1(2).

Comment [JJ31]: Relocated from 18.3.9.1(3).

Comment [JJ32]: This paragraph is removed/deleted as it is replaced by 18.3.8.4.

Comment [JJ33]: The requirements of 18.3.9.3 have been incorporated here.

Comment [JJ34]: The phrase "as adjusted for inflation…" is included, consistent with the 2014 RCA changes.

Senate Bill 14-192

Comment [JJ35]: Language is added consistent with the 2014 RCA changes

NOTE: The 360 day time period specified in the current rule (in 18.3.8.3) is deleted, consistent with the 2014 RCA changes (via SB 14-192).

RCA: 25-11-203 (3)(c)(V)(C).
Senate Bill (SB) 14-192

(1) The initial draft decision shall be posted on the Department's website at the time of notice and shall include:

(a) A decision analysis;

(b) The final technical and environmental impact analysis conducted by the Department as specified in 18.4;

(c) All requests from the Department seeking information from the applicant and all of the applicant's responses;

(d) All public comments;

(e) Any additional information that may assist the public review of the Department's draft decision; and

(f) A draft license for any proposed approval.

(2) Upon issuance of the initial draft decision in 18.3.8.4, the Department shall initiate a final public comment process which shall include:

(a) A public comment period that shall be noticed at the time the initial draft decision is published; and

(b) A public meeting, held within thirty (30) days after giving public notice of the initial draft decision. Such meeting shall, at a minimum require:

(i) At least two weeks' written notice before the meeting;

(ii) The meeting to be hosted and presided over by a person selected upon agreement by the Department, the local Board of County Commissioners and the applicant;

(iii) The summary of the facilities' license to receive, store, process, or dispose of radioactive material and the nature of the radioactive material;

(iv) The opportunity for cross-examination;

(v) An opportunity for the public to comment and be heard;

(vi) The licensee or applicant to provide transcripts of the meeting, which:

(a) Allows the public access to make copies of a transcript of the meeting; and

(b) Shall be provided to the Department in an electronic format in a manner that allows posting on the Department's website within ten (10) days after receipt from the transcription service.

(3) For applications which are denied, the Department shall issue a decision document summarizing the basis for denial.

Comment [JJ36]:
The requirement for a public meeting to be held within 30 days of providing notice of the initial draft decision, is specified by the RCA.

Comment [JJ37]: The opportunity for cross-examination was requested by NRC in correspondence dated January 14, 2014 and is necessary for compatibility with federal rule in 10 CFR 150.31.

NRC Compatibility = C

18.3.8.5 The expense of public notice, public comment periods, or public meetings required by Section 18.3 shall be at the expense of the applicant or licensee.

18.3.8.6 Following the public comment period specified in 18.3.8.4(2), the Department shall:

(1) After review of all final public comments, issue a final draft decision; and

(2) Provide affected parties, including the applicant in the case of approval with conditions or denial, an opportunity to request an adjudicatory hearing in accordance with 24-4-105, C.R.S.

18.3.8.7 If none of the parties specified in 18.3.8.6(2) seeks an adjudicatory hearing, the final draft decision becomes final agency action.

Comment [JJ38]: Provisions 18.3.8.7, 18.3.8.8, 18.3.8.9 and 18.3.8.10 originate from RCA provision (3)(c)(I)(V)(D)

18.3.8.8 If any party specified in 18.3.8.6(2) seeks an adjudicatory hearing, resolution of all material issues of fact, law, or discretion presented by the record and the appropriate order, sanction, relief, or denial of the material issues must be through an initial decision of a hearing officer or administrative law judge.

18.3.8.9 Upon issuance of the initial decision of the hearing officer or administrative law judge, and after any allowable appeal to the executive director of the Department, the Department shall issue within a reasonable time a final decision to approve, approve with conditions, or deny the application.

18.3.8.10 The final decision in 18.3.8.9 is subject to judicial review pursuant to section 24-4-106, C.R.S.

18.3.8.11 The applicant shall pay all reasonable, necessary, and documented expenses of the hearing held in accordance with 18.3.8.8.

~~18.3.9 In addition to the requirements of section 18.3 and 18.4, each new, renewal or amendment application pertaining to the facility's receipt of classified material shall include a written application to the Department and information relevant to the pending application, including:~~

Comment [JJ39]: Applicable elements of this requirement exist in the "preamble" language to 18.3, and in 18.3.5.4

~~18.3.9.1 transcripts of two public meetings hosted and presided over by a person selected upon agreement by the Department, the local Board of County Commissioners, and the applicant. One or both of the meetings shall be a hearing conducted to comply with section 24-4-104 or 24-4-105, CRS. The expense of the meetings or hearing shall be paid by the facility. Such meetings shall not be held until the Department determines that the application is substantially complete. The facility shall provide the public with:~~

Comment [JJ40]: The requirements of this section have been incorporated into 18.3.8.2 and 18.3.8.4

Comment [JJ41]: The requirement relating to expenses have been incorporated into 18.3.8.5, 18.3.8.11

~~(1) at least two weeks' written notice before the first meeting and an additional two weeks' written notice before the second meeting;~~

Comment [JJ42]: The requirement of this section has been incorporated into 18.3.8.2, and 18.3.8.4

~~(2) At both meetings, summaries of the facility's license to receive, store, process, or dispose of classified material and the nature of the classified material, and an opportunity to be heard; and~~

Comment [JJ43]: The requirements of this section have been relocated to 18.3.8.2(3), and 18.3.8.4(2)(b)

~~(3) access to make copies of a transcript of the meetings, and shall provide an electronic copy to the Department in a manner that allows posting on the department's web site within ten days after receipt from the transcription service.~~

Comment [JJ44]: The requirements of this section have been relocated to 18.3.8.2(5), 18.3.8.4(2)(b)

~~18.3.9.2 an environmental assessment as defined in 18.3.5;~~

Comment [JJ45]: The requirements of this section have been relocated to (new) Section 18.3.5.2

~~18.3.9.3 a response, if any, to the environmental assessment written by the Board of County Commissioners provided to the facility within ninety days after the first public meeting. Upon request of and documentation of the expenditure by such Board, the applicant shall provide the Board with up to fifty thousand dollars, which shall be available to assist the Board in responding to the application, including an independent environmental analysis and identification of any substantial adverse impact upon the safety or maintenance of transportation infrastructure or transportation facilities within the county.~~

Comment [JJ46]: The requirements of this section have been relocated to (new) Section 18.3.8.3

18.4 Department Environmental Impact Analysis

Comment [JJ47]: The word "Department" added for clarity.

Comment [JJ48]: The wording of this section is modified for clarity and understanding.

18.4.1 **The Department shall prepare a written Environmental Impact Analysis (EIA) of the impact of the licensed activity on the environment** ~~F~~**f**or each license application or application to amend or renew an existing license to receive, possess, or use source material for uranium or thorium milling or byproduct material ~~as in definition (2) of 1.2.2~~ which will have a significant impact on the environment~~., the Department shall prepare a written analysis of the impact of the licensed activity on the environment, which~~ **The written EIA** shall be **made** available **for review**~~to~~ **by** the public and ~~for review by~~ the NRC at the time of public notice **in 18.3.8.5**~~of hearing. ,~~ **The EIA** ~~which~~ analysis shall include:

18.4.1.1 An assessment of the radiological and nonradiological impacts to the public health;

18.4.1.2 An assessment of any impact on any waterway and ground water;

18.4.1.3 Consideration of alternatives to the activities to be conducted; and

18.4.1.4 Consideration of the long-term impacts of the licensed activities.

18.4.2 In preparing the **EIA**~~environmental impact analysis~~, the Department may use and incorporate by reference the environmental ~~report~~**assessment** prepared by the applicant and environmental ~~assessments~~**analysis** prepared by Federal, State or local agencies.

18.4.3 The **EIA**~~environmental impact analysis~~, or any part thereof, shall be prepared directly by the Department or the Department shall utilize the third party method set forth in 3.13.

18.5 ~~Notices~~Requirements Pertaining to Materials Not Subject to 18.3 and 18.4 ~~and Financial Assurance~~

Comment [JJ49]: The requirements of this provision originate from RCA requirements in 25-11-203(4)(a) and updated in 2015.

The phrase "in writing" is added for clarity.

18.5.1 At least ninety **(90)** days before a facility proposes to receive, store, process, or dispose of ~~classified~~ **radioactive** material in a license application or amendment that is not subject to 18.3 and 18.4, **and for which a material acceptance report has not already been filed with the Department,** the facility shall notify the Department **in writing**, and the Department shall notify the public and the board of county commissioners of the county in which the facility is located, of the specific ~~classified~~ **radioactive** material to be received, stored, processed, or disposed of. The notice ~~shall~~ **must** include:

18.5.1.1 **A**~~a~~ representative analysis of the physical, chemical, and radiological properties of the ~~classified~~ **radioactive** material;

18.5.1.2 **T**~~t~~he material acceptance report that demonstrates that the ~~classified~~ **radioactive** material does not contain hazardous waste characteristics not found in uranium ore;

18.5.1.3 **A**~~a~~ detailed plan for transport, acceptance, storage, handling, processing, and disposal of the material;

18.5.1.4 **A**~~a~~ demonstration that the material contains technically and economically recoverable uranium, without taking into account its value as disposal material;

18.5.1.5 **T**~~t~~he existing location of the ~~classified~~ **radioactive** material;

18.5.1.6 **T**~~t~~he history of the ~~classified~~ **radioactive** material;

18.5.1.7 **A**~~a~~ written statement by the applicant describing any pre-existing regulatory classification of the ~~classified waste~~**radioactive material** in the state of origin that describes all steps taken by the applicant to identify ~~such~~ **the** classification;

18.5.1.8 **A**~~a~~ written statement from the United States Department of Energy or successor agency that the receipt, storage, processing, or disposal of the ~~classified~~ **radioactive** material at the facility will not adversely affect the Department of Energy's receipt of title to the facility pursuant to the federal "Atomic Energy Act of 1954", 42 U.S.C. Sec. 2113;

18.5.1.9 **D**~~d~~ocumentation showing any necessary approvals of the ~~u~~**U**nited ~~s~~**S**tates ~~e~~**E**nvironmental ~~p~~**P**rotection ~~a~~**A**gency; and

18.5.1.10 **A**~~a~~n environmental assessment **containing the information required by 18.3.5.4**~~as defined in section 18.4 and 18.5 of this section~~**, and** which may incorporate by reference relevant information contained in an environmental assessment previously submitted for the facility.

Comment [JJ50]: The specific reference to the contents of the environmental assessment are referenced for clarity.

18.5.2 Within thirty **(30)** days after the department's receipt of notice pursuant to 18.5.1, the Department shall determine whether the notice is complete.

18.5.3 **O**~~o~~nce the department determines that the notice pursuant to 18.5.1 is complete, the Department shall**:**

Comment [JJ51]: Sub-section 18.5.3 is revised to incorporate language similar to that found in 18.5.1. This provision is intended to improve the clarity and flow of this subsection.

18.5.3.1 Publish the notice of the specific material to be received, stored, processed, or disposed of, to:

(1) The public, through publishing on the Department's web site; and

(2) The county commissioners of the county in which the facility is located.

Comment [JJ52]: Section added consistent with the 2014 RCA changes.

25-11-203(4)(a)(II)(c)

~~publish the notice on its web site and~~

18.5.3.2 The notice required in 18.5.3.1 shall include the information contained in 18.5.1.1 through 18.5.1.10.

18.5.3.3 ~~p~~**P**rovide a sixty **(60)** ~~-~~day public comment period for the receipt of written comments concerning the notice. **A**~~a~~ ~~-~~ public hearing may be held, at the Department's discretion, at the operator's expense.

18.5.4 **W**~~w~~ithin thirty **(30)** days after the close of the written public comment period held pursuant to 18.5.3, the Department shall approve, approve with conditions, or deny the receipt, storage, processing, or disposal as described in the notice based on whether the material proposed for receipt, storage, processing, or disposal complies with the facility's license and:

18.5.4.1 Be conducted such that the exposures to workers and the public are within the dose limits of part 4 of the department's rules pertaining to radiation control for workers and the public;

18.5.4.2 Not cause releases to the air, ground, or surface or ground water that exceed permitted limits; and

18.5.4.3 Not prevent transfer of the facility to the United States in accordance with 42 U.S.C. sec. 2113 upon completion of decontamination, decommissioning, and reclamation of the facility.

18.6 Financial Assurance

18.**6.1**~~5.5~~ ~~—~~Prior to issuance of the license, the applicant shall**:**

18.6.1.1~~(1)~~ ~~e~~**E**stablish financial assurance arrangements, as provided by 3.9.5, to ensure decontamination and decommissioning of the facility**;** and

18.6.1.2~~(2)~~ ~~p~~**P**rovide a fund adequate to cover the payment of the cost for long-term care and monitoring as provided by 3.9.5.~~10~~**15**.

(1) Such fund shall be sufficient to meet the requirements of 3.9.5.~~10~~**15**.4.

(2) The Department will consider proposals to combine the two types of financial assurance.

(3) Financial assurance shall be provided prior to commencement of construction or operation.

18.6.2 Financial surety arrangements must be established by each mill operator before the commencement of operations to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the mill and site and for the reclamation of any tailings or waste disposal areas. The amount of funds to be ensured by such surety arrangements must be based on Department-approved cost estimates in a Department-approved plan, or a proposed revision to the plan submitted to the Department for approval, if the proposed revision contains a higher cost estimate for:

18.6.2.1 Decontamination and decommissioning of mill buildings and the milling site to levels which allow unrestricted use of these areas upon decommissioning, and

18.6.2.2 The reclamation of tailings and/or waste areas in accordance with technical criteria delineated in Criterion 1 through 8 of Appendix A.

18.6.3 To avoid unnecessary duplication and expense, the Department may accept financial sureties that have been consolidated with financial or surety arrangements established to meet requirements of other Federal or state agencies and/or local governing bodies for decommissioning, decontamination, reclamation, and long-term site surveillance and control, provided such arrangements are considered adequate to satisfy these requirements and that the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas, and the long-term funding charge is clearly identified and committed for use in accomplishing these activities.

~~18.6 License Hearings~~

~~18.6.1 There shall be an opportunity for public hearings to be held in accordance with the procedures in 24-4-104 and 24-4-105, CRS., and 18.6, prior to the granting, denial or renewal of a specific license permitting the receipt, possession or use of source material for milling or byproduct material as in definition (2) of 1.2.2.~~

Comment [JJ53]: The previous section (18.5) is divided into two sections (18.5, and 18.6) to enhance functionality and flow.

Comment [JJ54]: As requested by NRC, this provision is added for compatibility with 10 CFR Part 40, Appendix A, Criterion 9(a)(1), and (2).

http://www.nrc.gov/reading-rm/doc-collections/cfr/part040/part040-appa.html

Compatibility = C
NRC RATS = 2011-1
NRC Letter 11/19/14

Comment [JJ55]: As requested by NRC, this provision added for compatibility with 10 CFR Part 40, Appendix A, Criterion 9(d).

NRC Compatibility = C
NRC Letter 11/19/14

Comment [JJ56]: Sections 18.6.1 through 18.6.7 are deleted. Hearing processes will defer to the requirements of the Administrative Procedures Act and in order to avoid conflicts with administrative court rules.

~~18.6.2 Notice of Hearing~~

~~18.6.2.1 All hearings shall be preceded by written notice containing:~~

~~18.6.2.1.1 The nature of the hearing and its time and place;~~

~~18.6.2.1.2 The legal authority and jurisdiction under which the hearing is to be held;~~

~~18.6.2.1.3 The matters of fact and law asserted or to be considered;~~

~~18.6.2.1.4 A description of the proposed licensing action and a statement of the availability of its text from the Department;~~

~~18.6.2.1.5 A description of the right of any interested person to make written comments to the Department or present oral comments at the hearing;~~

~~18.6.2.1.6 The procedure for applying to become a party to the hearing; and~~

~~18.6.2.1.7 A description of the procedures to be followed at the hearing and at a prehearing conference if required.~~

~~18.6.2.2 The notice of the hearing shall be mailed by the Department to the licensee or applicant and to each person who has filed a written request to receive notice of such proceedings. The licensee or applicant shall cause the notice to be published for three (3) days in a newspaper of statewide circulation and in local newspapers designated by the Department in the area to be affected by the proposed action. The notice shall be mailed and published not less than ninety (90) days prior to the hearing.~~

~~18.6.2.3 The time and place of hearing will be fixed with due regard for the convenience of the parties or their representatives, and the public interest. The hearing will be held in the locale of the site to be licensed.~~

~~18.6.2.4 The cost of any licensing action hearing shall be at the expense of the applicant. These costs shall include, but not be limited to, the hearing officer, the meeting room, the court reporter and transcript copies, and the required notices. The costs shall not include the expenses of other parties to the hearing.~~

~~18.6.3 Party Status~~

~~18.6.3.1 A person who may be affected or aggrieved by Department action may apply for party status not less than twenty (20) days prior to the hearing. Thereafter, application to be made a party shall not be considered except upon motion for good cause shown.~~

~~18.6.3.2 Application for party status must identify the individual or group applying, including the address or phone number where they may be contacted, state the nature of their interest in the hearing and the specific ground on which they claim to be affected or aggrieved, and the specific aspects of the hearing which they wish to address.~~

~~18.6.3.3 The Department, or the hearing officer, will grant or deny party status within five (5) days after receipt of the request for party status based on the nature and extent of the person's property, financial or other interest in the hearing and the possible effect of any order which may be entered as a result of the hearing on the person's interest. Any person applying for or granted party status may, by motion to the hearing officer or Department, as appropriate, challenge the right of any other person to be a party.~~

18.6.3.4 Parties shall have the right to initiate discovery. Parties shall have the right to make motions or objections, present evidence, cross-examine witnesses, and appeal from the decision of the hearing as provided by the Colorado Administrative Procedures Act, 24-4-101 et seq., CRS.

18.6.3.5 A person who is not a party will be permitted to submit written comments to the Department and may be permitted to make an oral presentation at the hearing, but will not have the other rights of a party.

18.6.4 Prehearing Conference

18.6.4.1 The Department or hearing officer, on its own motion or at the request of any party or any person who has applied to become a party, may direct the parties to appear at a specific time and place for a conference to consider:

18.6.4.1.1 The simplification and clarification of the issues;

18.6.4.1.2 The obtaining of stipulations and admissions of fact and of the contents and authenticity of documents to avoid unnecessary proof;

18.6.4.1.3 Identification of witnesses and the limitation of the number of expert witnesses, and other steps to expedite the presentation of evidence;

18.6.4.1.4 The setting of a hearing schedule;

18.6.4.1.5 Granting or denying requests for party status, if such decisions have not previously been made;

18.6.4.1.6 Such other matters as may aid in the orderly disposition of the hearing.

18.6.4.2 At such conference each party or person who has applied to become a party shall present to every other person, party, and the Department a prehearing statement containing the following:

18.6.4.2.1 A brief summary of the nature of the claim of the party and the basis therefore;

18.6.4.2.2 A copy of all exhibits proposed to be introduced; and

18.6.4.2.3 A list of all witnesses who may be called and a brief description of their testimony.

18.6.4.3 Except for good cause shown or for evidence or testimony accepted as rebuttal, no witness may testify nor may any exhibits be introduced on behalf of a party who had notice of the prehearing conference unless such witness has been previously listed and/or his written testimony and related exhibits have been presented to opposing parties at the prehearing conference.

18.6.4.4 The Department or hearing officer shall issue a written summary of the action taken at the conference and agreements by the parties, which limits the issues or defines the matters in controversy to be determined in the hearing.

18.6.5 Discovery

18.6.5.1 Any party may initiate discovery in the form of interrogatories to another party, requests for admission to another party, requests for production of documents to another party, or

depositions of any persons, or any combination thereof. The Colorado Rules of Civil Procedure, to the extent not inconsistent with the Colorado Administrative Procedure Act, shall apply. Such discovery may be modified by a motion for protective order filed with the Department or hearing officer within seven (7) days of receipt of the notice or request for discovery. Motions for protective order shall set forth the grounds in support thereof and shall be ruled upon immediately. Discovery shall be completed no later than ten (10) days preceding the hearing date, except as otherwise ordered by the Department or hearing officer.

18.6.6 Conduct of Hearings

18.6.6.1 Hearing presentations will proceed in the following order unless otherwise directed by the Department or hearing officer.

18.6.6.1.1 Call to order, introductory remarks, and action on applications for party status, if not already decided.

18.6.6.1.2 Presentation of any stipulations or agreements of the parties, and any other matters which were required to be dealt with at the prehearing conference, if held.

18.6.6.1.3 Opening statement by the party upon whom the burden of proof rests.

18.6.6.1.4 Opening statements by all other parties.

18.6.6.1.5 Presentation of case by party upon whom burden of proof rests.

18.6.6.1.6 Presentation by all other persons wishing to offer evidence in the order to be determined by the Department or hearing officer.

18.6.6.1.7 Rebuttal by the party upon whom the burden of proof rests, followed by rebuttal of other parties.

18.6.6.1.8 Closing statements by party upon whom the burden of proof rests, followed by closing statements of all other parties.

18.6.6.2 Public participation as provided for in these rules shall be allowed at that time or times during the hearing as determined by the Department or hearing officer in their discretion to be appropriate.

18.6.6.3 At the conclusion of any witness's testimony, or at the conclusion of the party's entire presentation, as may be determined by the Department or hearing officer, all parties may then cross-examine such witness or witnesses. The Department or hearing officer may examine and cross-examine any witness. A person who is not a party shall not have the right to cross-examine.

18.6.6.4 Any person, not a party to the proceeding, wishing to present testimony may do so by indicating his desire in writing. A form will be available prior to and during the hearing. This form will request the person's name, address, whom he represents, the general nature of his testimony, and the time required for his presentation. This form is to be presented to a representative of the Department during the hearing. Voluntary testimony not specifically requested on or by the written form may also be allowed. Any person presenting testimony shall be under oath and be subject to cross examination.

18.6.6.5 The proponent of any motion, order, or license issuance bears the burden of proof.

~~18.6.6.6 No interested person, party, or applicant for party status outside the Department will have any oral or written communication with any Department personnel or hearing officer relevant to the merits of a hearing pending before the Department unless reasonable prior notice is given to all participants in the hearing. This prohibition shall apply after the hearing is noticed. Any Department employee or hearing officer who is involved in such a prohibited communication shall make a written record of it and transmit it to all the parties to the hearing.~~

~~18.6.7 Department Decision~~

~~18.6.7.1 Any party to a hearing may, or if so directed by the Department or the hearing officer shall, file proposed findings of fact and conclusions of law and a proposed form of order or decision within twenty (20) days after the record is closed. A party who has the burden of proof may reply within ten (10) days after service of proposed findings of fact and conclusions of law.~~

~~18.6.7.2 After due consideration of the hearing record, the Department or hearing officer shall issue its findings of fact, conclusions of law, and decision and order.~~

18.~~7~~8 Operational Requirements.

Each licensee authorized to receive, possess or use source material for milling or byproduct material ~~as in definition (2) of 1.2.2~~ shall:

18.~~7~~8.1 Operate in accordance with the requirements of this Part 18, in particular the procedures required by 18.3.2, monitoring required by 18.3.3, and the requirements and objectives of Appendix A to this Part 18.

18.~~7~~8.2 Submit a report to the Department within **sixty (**60**)** days after January 1 and July 1 of each year, specifying the quantity of each of the radioactive materials released to unrestricted areas in liquid and in gaseous effluents during the previous six months of operation, and such other information as the Department may require to estimate maximum potential annual radiation doses to the public resulting from effluent releases. If quantities of radioactive materials released during the reporting period are significantly above the licensee's design objectives previously reviewed as part of the licensing action, the report shall cover this specifically. On the basis of such reports and any additional information the Department may obtain from the licensee or others, the Department may from time to time require the licensee to take such action as the Department deems appropriate.

18.~~7~~8.3 For any licensed site or facility determined by the Department to have caused a release to the groundwater that exceeds the basic standards for groundwater as established by the water quality control commission, until remediation has been completed, the licensee shall provide annual written notice of the status of the release and any remediation activities associated with the release, by certified or registered mail, return receipt requested, to the current address for each registered groundwater well within one mile of the release as identified in the corrective action monitoring program~~, unless the licensee demonstrates that a distance less than one mile is warranted~~. Documentation of this activity will be retained and made available to the Department upon request.

18.8.3.1 Under no circumstances shall remediation be deemed complete until all groundwater wells affected by any release associated with the site or facility are

Comment [JJ57]: Phrase removed, consistent with 2014 RCA changes.

Comment [JJ58]: This provision is added consistent with the 2014 changes to the Colorado Radiation Control Act.

SENATE BILL 14-192
RCA: 25-11-107(5)(j)

restored to at least the numeric groundwater standards as established by the water quality control commission that apply to the historic uses of the wells. The licensee shall remediate any release affecting groundwater wells in the most expedited manner reasonably possible using best available active restoration and groundwater monitoring technologies.

18.8.3.2 Prior to the application of any numeric groundwater standard different from the baseline standard contained in 10 CFR Part 40, the standard must have been approved by the United States Nuclear Regulatory Commission in accordance with section 274o of the federal "Atomic Energy Act of 1954", 42 U.S.C. sec 2021(o).

Comment [JJ59]: This provision is added consistent with the 2015 changes to the Colorado Radiation Control Act.

HOUSE BILL 15-1145
RCA: 25-11-107(5)(j)

18.8.4 For any facility licensed under Part 18, in addition to any reporting requirements provided in the license or rules, the license shall provide notice to the Department as soon as practicable upon discovery of any spill or release involving toxic or radioactive materials and shall provide an initial written report within seven (7) days after any discovery. The department shall post all such written reports on the Department's web site as soon as practicable, and in no case later than seven (7) days after receipt by the Department.

Comment [JJ60]: This provision is added consistent with the 2014 changes to the Colorado Radiation Control Act.

SENATE BILL 14-192
RCA: 25-11-107(5)(k)

18.~~8~~9 Decommissioning Requirements.

18.~~8~~9.1 In addition to the information required under 3.16, each licensee authorized to receive, possess or use source material for milling or byproduct material ~~as in definition (2) of 1.2.2~~ shall submit a plan for completion of decommissioning if the procedures necessary to carry out decommissioning:

18.~~8~~9.1.1 Have not been previously approved by the Department; and

18.~~8~~9.1.2 Could increase potential health and safety impacts to workers or to the public, such as in any of the following cases:

18.~~8~~9.1.2.1 Procedures would involve techniques not applied routinely during cleanup or maintenance operations; or

18.~~8~~9.1.2.2 Workers would be entering areas not normally occupied where surface contamination and radiation levels are significantly higher than routinely encountered; or

18.~~8~~9.1.2.3 Procedures could result in significantly greater airborne concentrations of radioactive materials than are present during operation; or

18.~~8~~9.1.2.4 Procedures could result in significantly greater releases of radioactive material to the environment than those associated with operation.

18.~~8~~9.2 Procedures withpotential health and safety impacts may not be carried out prior to approval of the decommissioning plan.

18.~~8~~9.3 The proposed decommissioning plan, if required by 18.~~8~~9.1 or by license condition, must include:

18.~~8~~9.3.1 Description of planned decommissioning activities;

18.~~8~~9.3.2 Description of methods used to assure protection of workers and the environment against radiation hazards during decommissioning;

18.~~8~~9.3.3 A description of the planned final radiation survey; and

18.~~8~~9.3.4 An updated detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and plan for assuring the availability of adequate funds for completion of decommissioning.

18.~~8~~9.4 The proposed decommissioning plan will be approved by the Department if the information therein demonstrates that the decommissioning will be completed as soon as is reasonable and that the health and safety of workers and the public will be adequately protected.

18.~~8~~9.5 Upon approval of the decommissioning plan by the Department, the licensee shall complete decommissioning in accordance with the approved plan. As a final step in decommissioning, the licensee shall submit the information required in 3.16.4.1.5 and shall certify the disposition of accumulated wastes from decommissioning.

18.~~8~~9.6 If the information submitted under 3.16.4.1.5 or 18.8 does not adequately demonstrate that the premises are suitable for release for unrestricted use, the Department will inform the licensee of the appropriate further actions required for termination of license.

PART 18, APPENDIX A ~~———~~CRITERIA RELATING TO THE OPERATION OF MILLS AND THE DISPOSITION OF THE TAILINGS OR WASTES FROM THESE OPERATIONS

Introduction: Every applicant for a license to possess and use radioactive material in conjunction with uranium or thorium milling, or byproduct material at sites formerly associated with such milling, is required by the provisions of 18.3 to include in a license application proposed specifications relating to milling operations and the disposition of tailings or wastes resulting from such milling activities. This appendix establishes technical, ownership, and long-term site surveillance criteria relating to the siting, operation, decontamination, decommissioning, and reclamation of mills and tailings or waste systems and sites at which such mills and systems are located.

As used in this appendix, the term "as low as is reasonably achievable" has the same meaning as in 1.2.2.

In many cases, flexibility is provided in the criteria to allow achieving an optimum tailings disposal program on a site-specific basis. However, in such cases the objectives, technical alternatives and concerns which must be taken into account in developing a tailings program are identified. As provided by the provisions of 18.3, applications for licenses must clearly demonstrate how the criteria have been addressed.

The specifications shall be developed considering the expected full capacity of tailings or waste systems and the lifetime of mill operations. Where later expansions of systems or operations may be likely (for example, where large quantities of ore now marginally uneconomical may be stockpiled), the amenability of the disposal system to accommodate increased capacities without degradation in long-term stability and other performance factors shall be evaluated.

Licensees or applicants may propose to the Department alternatives to meet the specific requirements in this Appendix. The alternative proposals may take into account local or regional conditions, including geology, topography, hydrology, and meteorology. The Department may find that the proposed alternatives meet the Department's requirements if the alternatives will achieve a level of stabilization and containment of the sites concerned and a level of protection for public health, safety, and the environment from radiological and nonradiological hazards associated with the site, which is equivalent to, to the extent practicable, or more stringent than the level which would be achieved by the requirements of this Appendix and the standards promulgated by the Environmental Protection Agency in 40 CFR Part 192, Subparts D and E. Proposed alternatives to specific regulations in this Part 18 require notice and opportunity for hearing before the NRC.

All site-specific licensing decisions based on the criteria in this Appendix or alternatives proposed by licensees or applicants will take into account the risk to the public health and safety and the environment with due consideration to the economic costs involved and any other factors the Department determines to be appropriate. In implementing this Appendix, the Department will consider "practicable" and "reasonably achievable" as equivalent terms. Decisions involving these terms will take into account the state of technology~~.~~ and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest.

Criterion 1.

Criterion 1A. The general goal or broad objective in ~~sitting~~ **siting** and design decisions is permanent isolation of tailings and associated contaminants by minimizing disturbance and dispersion by natural forces, and to do so without ongoing maintenance. For practical reasons, specific ~~sitting~~ **siting** decisions and design standards must involve finite times (e.g., the longevity design standard in Criterion 6). The following site features which will contribute to such a goal or objective must be considered in selecting among alternative tailings disposal sites or judging the adequacy of existing tailings sites:

(1) Remoteness from populated areas;

(2) Hydrologic and other natural conditions as they contribute to continued immobilization and isolation of contaminants from ground-water sources; and

(3) Potential for minimizing erosion, disturbance, and dispersion by natural forces over the long-term.

Criterion 1B. The site selection process must be an optimization to the maximum extent reasonably achievable in terms of the features in Criterion 1A.

Criterion 1C. In the selection of disposal sites, primary emphasis must be given to isolation of tailings or wastes, a matter having long-term impacts, as opposed to consideration only of short-term convenience or benefits, such as minimization of transportation or land acquisition costs. While isolation of tailings will be a function of both site and engineering design, overriding consideration must be given to ~~sitting~~ **siting** features given the long-term nature of the tailings hazards.

Criterion 1D. Tailings should be disposed of in a manner that no active maintenance is required to preserve conditions of the site.

Criterion 2.

To avoid proliferation of small waste disposal sites and thereby reduce perpetual surveillance obligations, byproduct material ~~as in definition (2) of 1.2.2~~, from in situ extraction operations, such as residues from solution evaporation or contaminated control processes, and wastes from small remote above ground extraction operations shall be disposed of at existing large mill tailings disposal sites; unless considering the nature of the wastes, such as their volume and specific activity and the costs and environmental impacts of transporting the wastes to a large disposal site, such offsite disposal is demonstrated to be impracticable or the advantages of onsite burial clearly outweigh the benefits of reducing the perpetual surveillance obligations.

Criterion 3.

The "prime option" for disposal of tailings is placement below grade, either in mines or specially excavated pits (that is, where the need for any specially constructed retention structure is eliminated). The evaluation of alternative sites and disposal methods performed by mill operators in support of their proposed tailings disposal program (provided in applicants' environmental ~~reports~~**assessment**) must reflect serious consideration of this disposal mode. In some instances, below grade disposal may not be the most environmentally sound approach, such as might be the case if a ground-water formation is relatively close to the surface or not very well isolated by overlying soils and rock. Also, geologic and topographic conditions might make full below grade burial impracticable: For example, bedrock may be sufficiently near the surface that blasting would be required to excavate a disposal pit at excessive cost, and more suitable alternative sites are not available. Where full below grade burial is not practicable, the size of retention structures, and size and steepness of slopes associated with exposed embankments must be minimized by excavation to the maximum extent reasonably achievable or appropriate given the geologic and hydrologic conditions at a site. In these cases, it must be demonstrated that an above grade disposal program will provide reasonably equivalent isolation of the tailings from natural erosional forces.

Criterion 4.

The following site and design criteria must be adhered to whether tailings or wastes are disposed of above or below grade.

Criterion 4A. Upstream rainfall catchment areas must be minimized to decrease erosion potential and the size of the floods, which could erode or wash out sections of the tailings disposal area.

Criterion 4B. Topographic features should provide good wind protection.

Criterion 4C. Embankment and cover slopes must be relatively flat after final stabilization to minimize erosion potential and to provide conservative factors of safety assuring long-term stability. The broad objective should be to contour final slopes to grades which are as close as possible to those which would be provided if tailings were disposed of below grade: this could, for example, lead to slopes of about 10 horizontal to 1 vertical (10h:1v) or less steep. In general, slopes should not be steeper than about 5h:1v. Where steeper slopes are proposed, reasons why a slope less steep than 5h:1v would be impracticable should be provided and compensating factors and conditions, which make such slopes acceptable, should be identified.

Criterion 4D. A full self-sustaining vegetative cover must be established or rock cover employed to reduce wind and water erosion to negligible levels.

(1) Where a full vegetative cover is not likely to be self-sustaining due to climatic or other conditions, such as in semi-arid and arid regions, rock cover must be employed on slopes of the impoundment system. The Department will consider relaxing this requirement for extremely gentle slopes such as those, which may exist on the top of the pile.

(2) The following factors must be considered in establishing the final rock cover design to avoid displacement of rock particles by human and animal traffic or by natural process, and to preclude undercutting and piping:

(a) Shape, size, composition, and gradation of rock particles (excepting bedding material average particles size must be at least cobble size or greater);

(b) Rock cover thickness and zoning of particles by size; and

(c) Steepness of underlying slopes.

(3) Individual rock fragments must be dense, sound, and resistant to abrasion, and must be free from cracks, seams, and other defects that would tend to unduly increase their destruction by water and frost actions. Weak, friable, or laminated aggregate may not be used.

(4) Rock covering of slopes may be unnecessary where top covers are very thick (on the order of 10m or greater); impoundment slopes are very gentle (on the order of 10h:1v or less); bulk cover materials have inherently favorable erosion resistance characteristics; and, there is negligible drainage catchment area upstream of the pile and good wind protection as described in Criteria 4A and 4B.

(5) Furthermore, all impoundment surfaces must be contoured to avoid areas of concentrated surface runoff or abrupt or sharp changes in slope gradient. In addition to rock cover on slopes, areas toward which surface runoff might be directed must be well protected with substantial rock cover (rip rap). In addition to providing for stability of the impoundment system itself, overall stability, erosion potential, and geomorphology of surrounding terrain must be evaluated to assure that there are not ongoing or potential processes, such as gully erosion, which would lead to impoundment instability.

Criterion 4E. The impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III(g) of Appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material.

Criterion 4F. The impoundment, where feasible, should be designed to incorporate features, which will promote deposition. For example, design features, which promote deposition of sediment suspended in any runoff, which flows into the impoundment area, might be utilized; the object of such a design feature would be to enhance the thickness of cover over time.

Criterion 5.

Criteria 5A-5D and Criterion 10 incorporate the basic ground-water protection standards imposed by the Environmental Protection Agency in 40 CFR Part 192, Subparts D and E (48 FR 45926; October 7, 1983) which apply during operations and prior to the end of closure. Groundwater monitoring to comply with these standards is required by Criterion 7A.

Comment [JJ61]: Cross-reference error correction – reference should be to Criterion 7 and not Criterion 7A. Criterion 7A does not exist.

NRC Compatibility = C
NRC Letter 01/14/14

Criterion 5A.

(1) The primary ground-water protection standard is a design standard for surface impoundments used to manage byproduct material. Unless exempted under paragraph 5A(3) of this criterion, surface impoundments (except for an existing portion) shall have a liner that is designed, constructed, and installed to prevent any migration of wastes out of the impoundment to the adjacent subsurface soil, ground water, or surface water at any time during the active life (including the closure period) of the impoundment. The liner may be constructed of materials that may allow wastes to migrate into the liner (but not into the adjacent subsurface soil, ground water, or surface water) during the active life of the facility, provided that impoundment closure includes removal or decontamination of all waste residues, contaminated containment system components (liners, etc.) contaminated subsoils, and structures and equipment contaminated with waste and leachate. For impoundments that will be closed with the liner material left in place, the liner must be constructed of materials that can prevent wastes from migrating into the liner during the active life of the facility.

(2) The liner required by paragraph 5A(1) above shall be:

(a) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;

(b) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift; and

(c) Installed to cover all surrounding earth likely to be in contact with the wastes or leachate.

(3) The applicant or licensee will be exempted from the requirements of paragraph 5A(1) of this criterion if the Department finds, based on a demonstration by the applicant or licensee, that alternate design and operating practices, including the closure plan, together with site characteristics will prevent the migration of any hazardous constituents into ground water or surface water at any future time.

In deciding whether to grant an exemption, the Department will consider:

(a) The nature and quantity of the wastes;

(b) The proposed alternate design and operation;

(c) The hydrogeologic setting of the facility, including the attenuative capacity and thickness of the liners and soils present between the impoundment and ground water or surface water; and

(d) All other factors which would influence the quality and mobility of the leachate produced and the potential for it to migrate to ground water or surface water.

(4) A surface impoundment must be designed, constructed, maintained, and operated to prevent overtopping resulting from normal or abnormal operations, overfilling, wind and wave actions, rainfall, or run-on; from malfunctions of level controllers, alarms, and other equipment; and from human error.

(5) When dikes are used to form the surface impoundment, the dikes must be designed, constructed, and maintained with sufficient structural integrity to prevent massive failure of the dikes. In ensuring structural integrity, it must not be presumed that the liner system will function without leakage during the active life of the impoundment.

Criterion 5B.

(1) Uranium and thorium byproduct material ~~in definition (2) of 1.2.2~~ shall be managed to conform to the following secondary ground-water protection standard: hazardous constituents entering the ground water from a licensed site must not exceed the specified concentration limits in the uppermost aquifer beyond the point of compliance during the compliance period. Hazardous constituents are those constituents identified by the Department pursuant to paragraph 5B(2) of this criterion. Specified concentration limits are those limits established by the Department as indicated in paragraph 5B(5) of this criterion. The Department will also establish the point of compliance and compliance period on a site-specific basis through license conditions and orders. The objective in selecting the point of compliance is to provide the earliest practicable warning that the impoundment is releasing hazardous constituents to the ground water. The point of compliance must be selected to provide prompt indication of ground-water contamination on the hydraulically downgradient edge of the disposal area. The Department shall identify hazardous constituents, establish concentration limits, set the compliance period, and may adjust the point of compliance if needed to accord with developed data and site information as to the flow of ground water or contaminants, when the detection monitoring established under Criterion 7~~A~~ indicates leakage of hazardous constituents from the disposal area.

Comment [JJ62]: Cross-reference error correction – reference should be to Criterion 7 and not Criterion 7A. Criterion 7A does not exist.

NRC Compatibility = C
NRC Letter 01/14/14

(2) A constituent becomes a hazardous constituent subject to paragraph 5B(5) only when the constituent meets all three of the following tests:

(a) The constituent is reasonably expected to be in or derived from the uranium and thorium byproduct material in the disposal area;

(b) The constituent has been detected in the ground water in the uppermost aquifer; and

(c) The constituent is listed in Criterion 10 of this appendix.

(3) Even when constituents meet all three tests in paragraph 5B(2) of this criterion, the Department may exclude a detected constituent from the set of hazardous constituents on a site-specific basis if it finds that the constituent is not capable of posing a substantial present or potential hazard to human health or the environment. In deciding whether to exclude constituents, the Department will consider the following:

(a) Potential adverse effects on ground-water quality, considering

(i) The physical and chemical characteristics of the waste in the licensed site, including its potential for migration;

(ii) The hydrogeological characteristics of the facility and surrounding land;

(iii) The quantity of ground water and the direction of ground water flow;

(iv) The proximity and withdrawal rates of ground-water users;

(v) The current and future uses of ground water in the area;

(vi) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground water quality;

(vii) The potential for health risks caused by human exposure to waste constituents;

(viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;

(ix) The persistence and permanence of the potential adverse effects.

(b) Potential adverse effects on hydraulically-connected surface water quality, considering

(i) The volume and physical and chemical characteristics of the waste in the licensed site;

(ii) The hydrogeological characteristics of the facility and surrounding land;

(iii) The quantity and quality of ground water and the direction of ground water flow;

(iv) The patterns of rainfall in the region;

(v) The proximity of the licensed site to surface waters;

(vi) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;

(vii) The existing quality of surface water, including other sources of contamination and the cumulative impact on surface water quality;

(viii) The potential for health risks caused by human exposure to waste constituents;

(ix) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; and

(x) The persistence and permanence of the potential adverse effects.

(4) In making any determinations under paragraphs 5B(3) and 5B(6) of this criterion about the use of ground water in the area around the facility, the Department will consider any identification of underground sources of drinking water and exempted aquifers made by the Colorado Water Quality Control Commission, as in 5 CCR 1002-8, or other agency having jurisdiction.

(5) At the point of compliance, the concentration of a hazardous constituent must not exceed:

(a) The Department-approved background concentration of that constituent in the ground water;

(b) The respective value given in the table in paragraph 5C if the constituent is listed in the table and if the background level of the constituent is below the value listed; or

(c) An alternate concentration limit established by the Department.

(6) Conceptually, background concentrations pose no incremental hazards and the drinking water limits in Criterion 5C state acceptable hazards but these two options may not be practically achievable at a specific site. Alternate concentration limits that present no significant hazard may be proposed by licensees for Department consideration. Licensees must provide the basis for any proposed limits including consideration of practicable corrective actions, that limits are as low as reasonably achievable, and information on the factors the Department must consider. The Department will establish a site specific alternate concentration limit for a hazardous constituent as provided in paragraph 5B(5) of this criterion if it finds that the proposed limit is as low as reasonably achievable after considering practicable corrective actions, and that the constituent will not pose a substantial present or potential hazard to human health or the environment as long as the alternate concentration limit is not exceeded. In making the present and potential hazard finding, the Department will consider the following factors:

(a) Potential adverse effects on ground water quality, considering:

(i) The physical and chemical characteristics of the waste in the licensed site including its potential for migration;

(ii) The hydrogeological characteristics of the facility and surrounding land;

(iii) The quantity of ground water and the direction of ground water flow;

(iv) The proximity and withdrawal rates of ground water users;

(v) The current and future uses of ground water in the area;

(vi) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground water quality;

(vii) The potential for health risks caused by human exposure to waste constituents;

(viii) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents;

(ix) The persistence and permanence of the potential adverse effects.

(b) Potential adverse effects on hydraulically-connected surface water quality, considering:

(i) The volume and physical and chemical characteristics of the waste in the licensed site;

(ii) The hydrogeological characteristics of the facility and surrounding land;

(iii) The quantity and quality of ground water, and the direction of ground water flow;

(iv) The patterns of rainfall in the region;

(v) The proximity of the licensed site to surface waters;

(vi) The current and future uses of surface waters in the area and any water quality standards established for those surface waters;

(vii) The existing quality of surface water including other sources of contamination and the cumulative impact on surface water quality;

(viii) The potential for health risks caused by human exposure to waste constituents;

(ix) The potential damage to wildlife, crops, vegetations, and physical structures caused by exposure to waste constituents; and

(x) The persistence and permanence of the potential adverse effects.

Criterion 5C.

Maximum Values for Ground Water Protection

Constituent or property	**Maximum Concentration (Milligrams per liter):**
Arsenic	0.05
Barium	1.0
Cadmium	0.01
Chromium	0.05
Lead	0.05
Mercury	0.002
Selenium	0.01
Silver	0.05
Endrin (1,2,3,4,10, 10-hexachloro-1,7-expoxy-1,4,4a,5,6,7,8, 9a-octahydro-1, 4-endo, endo-5, 8-dimethano naphthalene)	0.0002
Lindane (1,2,3,4,5,6-hexachloro-cyclohexane, gamma isomer)	0.004
Methoxychlor (1,1,1-Trichloro-2, 2-bis, p-methoxyphenylethane)	0.1
Toxaphene (C 10 H 10 Cl 6 , Technical chlorinated camphene, 67–69 percent chlorine)	0.005
2,4-D (2,4-Dichlorophenoxyacetic acid)	0.1
2,4,5-TP Silvex (2,4,5-Trichloro-phenoxypropionic acid)	0.01

.	**Becquerels per liter**	**PicoCuries per liter**
Combined radium-226 and radium-228	0.185	5
Gross alpha-particle activity (excluding radon and uranium when producing uranium byproduct material or radon and thorium when producing thorium byproduct material)	0.555	15

Criterion 5D. If the ground water protection standards established under paragraph 5B(1) of this criterion are exceeded at a licensed site, a corrective action program must be put into operation as soon as is practicable, and in no event later than eighteen (18) months after the Department finds that the standards have been exceeded. The licensee shall submit the proposed corrective action program and supporting rationale for Department approval prior to putting the program into operation, unless otherwise directed by the Department. The objective of the program is to return hazardous constituent concentration levels in ground water to the concentration limits set as standards. The licensee's proposed program shall address

removing the hazardous constituents that have entered the ground water at the point of compliance or treating then in place. The program shall also address removing or treating in place any hazardous constituents that exceed concentration limits in ground water between the point of compliance and the down gradient facility property boundary. The licensee shall continue corrective action measures to the extent necessary to achieve and maintain compliance with the ground water protection standard. The Department will determine when the licensee may terminate corrective action measures based on data from the ground water monitoring program and other information that provide reasonable assurance that the ground water protection standard will not be exceeded.

Criterion 5E. In developing and conducting ground water protection programs, applicants and licensees shall also consider the following:

(1) Installation of bottom liners (Where synthetic liners are used, a leakage detection system must be installed immediately below the liner to ensure major failures are detected if they occur. This is in addition to the ground water monitoring program conducted as provided in ~~Criterion 7~~**18.3.3**. Where clay liners are proposed or relatively thin, in situ clay soils are to be relied upon for seepage control, tests must be conducted with representative tailings solutions and clay materials to confirm that no significant deterioration of permeability or stability properties will occur with continuous exposure of clay to tailings solutions. Tests must be run for a sufficient period of time to reveal any effects if they are going to occur (in some cases deterioration has been observed to occur rather rapidly after about nine months of exposure)).

Comment [JJ63]: Cross-reference error correction – reference should be to 18.3.3 and not Criterion 7, consistent with 10 CFR 40 Appendix A, I (Technical Criteria).

NRC Compatibility = C
NRC Letter 01/14/14

(2) Mill process designs which provide the maximum practicable recycle of solutions and conservation of water to reduce the net'input of liquid to the tailings impoundment.

(3) Dewatering of tailings by process devices and/or in situ drainage systems (At new sites, tailings must be dewatered by a drainage system installed at the bottom of the impoundment to lower the phreatic surface and reduce the driving head of seepage, unless tests show tailings are not amenable to such a system. Where in situ dewatering is to be conducted, the impoundment bottom must be graded to assure that the drains are at a low point. The drains must be protected by suitable filter materials to assure that drains remain free running. The drainage system must also be adequately sized to assure good drainage).

(4) Neutralization to promote immobilization of hazardous constituents.

Criterion 5F. Where ground water impacts are occurring at an existing site due to seepage, action must be taken to alleviate conditions that lead to excessive seepage impacts and restore ground water quality. The specific seepage control and ground water protection method, or combination of methods, to be used must be worked out on a site-specific basis. Technical specifications must be prepared to control installation of seepage control systems. A quality assurance, testing, and inspection program, which includes supervision by a qualified engineer or scientist, must be established to assure the specifications are met.

Criterion 5G. In support of a tailings disposal system proposal, the applicant/operator shall supply information concerning the following:

(1) The chemical and radioactive characteristics of the waste solutions.

(2) The characteristics of the underlying soil and geologic formations particularly as they will control transport of contaminants and solutions. This includes detailed information concerning extent, thickness, uniformity, shape, and orientation of underlying strata. Hydraulic gradients and conductivities of the various formations must be determined. This information must be gathered from borings and field survey methods taken within the proposed impoundment area and in surrounding areas where contaminants might migrate to ground water. The information gathered on boreholes must include both geological and geophysical logs in sufficient number and degree

of sophistication to allow determining significant discontinuities, fractures, and channeled deposits of high hydraulic conductivity. If field survey methods are used, they should be in addition to and calibrated with borehole logging. Hydrologic parameters such as permeability may not be determined on the basis of laboratory analysis of samples alone; a sufficient amount of field testing (e.g., pump tests) must be conducted to assure actual field properties are adequately understood. Testing must be conducted to allow estimating chemi-sorption attenuation properties of underlying soil and rock.

(3) Location, extent, quality, capacity and current uses of any ground water at and near the site.

Criterion 5H. Steps must be taken during stockpiling of ore to minimize penetration of radionuclides into underlying soils; suitable methods include lining and/or compaction of ore storage areas.

Criterion 6.

(1) In disposing of waste byproduct material, licensees shall place an earthen cover (or approved alternative) over tailings or wastes at the end of milling operations and shall close the waste disposal area in accordance with a design[1] which provides reasonable assurance of control of radiological hazards to (i) be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years, and (ii) limit releases of radon-222 from uranium byproduct materials, and radon-220 from thorium byproduct materials, to the atmosphere so as not to exceed an average[2] release rate of 0.74 Becquerel per square meter per second (Bq/m^2 s), or 20 picocuries per square meter per second (pCi/m^2 s), to the extent practicable throughout the effective design life determined pursuant to (1)(i) of this criterion. In computing required tailings cover thicknesses, moisture in soils in excess of amounts found normally in similar soils in similar circumstances may not be considered. Direct gamma exposure from the tailings or wastes should be reduced to background levels. The effects of any thin synthetic layer may not be taken into account in determining the calculated radon exhalation level. If non-soil materials are proposed as cover materials, it must be demonstrated that these materials will not crack or degrade by differential settlement, weathering, or other mechanism, over long-term intervals.

1 In the case of thorium byproduct materials, the standard applies only to design. Monitoring for radon emissions from thorium byproduct materials after installation of an appropriately designed cover is not required.

2 This average applies to the entire surface of each disposal area over a period of a least one year, but a period short compared to 100 years. Radon will come from both byproduct materials and from covering materials. Radon emissions from covering materials should be estimated as part of developing a closure plan for each site. The standard, however, applies only to the emissions from byproduct materials to the atmosphere.

(2) As soon as reasonably achievable after emplacement of the final cover to limit releases of radon-222 from uranium byproduct material and prior to placement of erosion protection barriers or other features necessary for long-term control of the tailings, the licensee shall verify through appropriate testing and analysis that the design and construction of the final radon barrier is effective in limiting releases of radon-222 to a level not exceeding 0.74 Bq/m^2 s (20 pCi/m^2 s) averaged over the entire pile or impoundment using the procedures described in 40 CFR Part 61, Appendix B, Method 115, or another method of verification approved by the Department as being at least as effective in demonstrating the effectiveness of the final radon barrier.

(3) When phased emplacement of the final radon barrier is included in the applicable reclamation plan, the verification of radon-222 release rates required in paragraph (2) of this Criterion must be conducted for each portion of the pile or impoundment as the final radon barrier for that portion is emplaced.

(4) Within ninety days of the completion of all testing and analysis relevant to the required verification in paragraphs (2) and (3) of this Criterion, the uranium mill licensee shall report to the Department the results detailing the actions taken to verify that levels of release of radon-222 do not exceed

0.74 Bq/m^2 s (20 pCi/m^2 s) when averaged over the entire pile or impoundment. The licensee shall maintain records until termination of the license documenting the source of input parameters including the results of all measurements on which they are based, the calculations and/or analytical methods used to derive values for input parameters, and the procedure used to determine compliance. These records shall be kept in a form suitable for transfer to the custodial agency at the time of transfer of the site to the U.S. Department of Energy or State for long-term care if requested.

(5) Near surface cover materials, i.e., within the top three meters (10 feet), may not include waste or rock that contains elevated levels of radium; soils used for near surface cover must be essentially the same, as far as radioactivity is concerned, as that of surrounding surface soils. This is to ensure that surface radon exhalation is not significantly above background because of the cover material itself.

(6) The design requirements in this Criterion for longevity and control of radon releases apply to any portion of a licensed and/or disposal site unless such portion contains a concentration of radium in land, averaged over areas of 100 square meters, which as a result of byproduct material, does not exceed the background level by more than: (i) 0.18 Becquerels (5 picocuries) per gram of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over the first 15 centimeters (cm) below the surface, and (ii)0.56 Becquerels (15 pCi) of radium-226, or, in the case of thorium byproduct material, radium-228, averaged over 15-cm thick layers more than 15 cm below the surface.

Byproduct material containing concentrations of radionuclides other than radium in soil, and surface activity on remaining structures, must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are as low is reasonably achievable. If more than one residual radionuclide is present in the same 100 square-meter area, the sum of the ratios for each radionuclide of concentration present to the concentration limit will not exceed "1" (unity). A calculation of the potential peak annual TEDE within 1000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site must be submitted for approval. The use of decommissioning plans with benchmark doses which exceed 1 millisievert per year (100 mrem/year), before application of ALARA, requires the approval of the Department. This requirement for dose criteria does not apply to sites that have decommissioning plans for soil and structures approved before the effective date of this Criterion 6(6).

(7) The licensee shall also address the nonradiological hazards associated with the wastes in planning and implementing closure. The licensee shall ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. To the extent necessary to prevent threats to human health and the environment, the licensee shall control, minimize, or eliminate post-closure escape of nonradiological hazardous constituents, leachate, contaminated rainwater, or waste decomposition products to the ground or surface waters or to the atmosphere.

Comment [JJ64]:
Editorial change: comma added based on editorial comment made by NRC in letter dated 11/10/2004.

Criterion 6A.

(1) For impoundments containing uranium byproduct materials, the final radon barrier must be completed as expeditiously as practicable considering technological feasibility after the pile or impoundment ceases operation in accordance with a written, Department-approved reclamation plan. (The term as expeditiously as practicable considering technological feasibility as specifically

defined in **section** 18.2 includes factors beyond the control of the licensee). Deadlines for completion of the final radon barrier and, if applicable, the following interim milestones must be established as a condition of the individual license: windblown tailings retrieval and placement on the pile and interim stabilization including dewatering or the removal of freestanding liquids and recontouring. The placement of erosion protection barriers or other feature necessary for long-term control of the tailings must also be completed in a timely manner in accordance with a written, Department-approved reclamation plan.

(2) The Department may approve a licensee's request to extend the time for performance of milestones related to emplacement of the final radon barrier if, after providing an opportunity for public participation, the Department finds that the licensee has adequately demonstrated in the manner required in paragraph (2) of Criterion 6 that releases of radon-222 do not exceed an average of 0.74 Becquerel/m^2 s (20 pCi/m^2 s). If the delay is approved on the basis that the radon releases do not exceed 0.74 Becquerel/m^2 s (20 pCi/m^2 s), a verification of radon levels, as required by paragraph (2) of Criterion 6, must be made annually during the period of delay. In addition, once the Department has established the date in the reclamation plan for the milestone for completion of the final radon barrier, the Department may extend that date based on cost if after providing an opportunity for public participation, the Department finds that the licensee is making good faith efforts to emplace the final radon barrier, the delay is consistent with the definition of available technology, and the radon releases caused by the delay will not result in a significant incremental risk to the public health.

(3) The Department may authorize by license amendment, upon licensee ~~report~~**request**, a portion of the impoundment to accept uranium byproduct material or such materials that are similar in physical, chemical, and radiological characteristics to the uranium mill tailings and associated wastes already in the pile or impoundment from other sources, during the closure process. No such authorization will be made if it results in a delay or impediment to emplacement of the final radon barrier over the remainder of the impoundment in a manner that will achieve levels of radon-222 releases not exceeding 0.74 Becquerel/m^2 s (20 pCi/m^2 s) averaged over the entire impoundment. The verification required in paragraph (2) of Criterion 6 may be completed with a portion of the impoundment being used for further disposal if the Department makes a final finding that the impoundment will continue to achieve a level of radon-222 release not exceeding 0.74 Becquerel/m^2 s (20 pCi/m^2 s) averaged over the entire impoundment. In this case, after the final radon barrier is complete except for the continuing disposal area, (a) only byproduct material will be authorized for disposal, (b) the disposal will be limited to the specified existing disposal area, and (c) this authorization will only be made after providing opportunity for public participation. Reclamation of the disposal area, as appropriate, must be completed in a timely manner after disposal operations cease in accordance with paragraph (1) of Criterion 6; however, these actions are not required to be complete as part of meeting the deadline for final radon barrier construction.

Comment [JJ65]: Change in wording based on editorial comment made by NRC in letter dated 11/10/2004.

Criterion 7.

The licensee shall establish a detection monitoring program needed for the Department to set the site-specific ground water protection standards in paragraph 5B(1) of this appendix. For all monitoring under

this paragraph, the licensee or applicant will propose for Department approval as license conditions which constituents are to be monitored on a site-specific basis. A detection monitoring program has two purposes. The initial purpose of the program is to detect leakage of hazardous constituents from the disposal area so that the need to set ground water protection standards is monitored. If leakage is detected, the second purpose of the program is to generate data and information needed for the Department to establish the standards under Criterion 5B. The data and information must provide a sufficient basis to identify those hazardous constituents which require concentration limit standards and to enable the Department to set the limits for those constituents and the compliance period. They may also need to provide the basis for adjustments to the point of compliance. The detection monitoring programs must be in place when specified by the Department in orders or license conditions. Once ground water protection standards have been established pursuant to paragraph 5B(1), the licensee shall establish and implement a compliance monitoring program. The purpose of the compliance monitoring program is to determine that the hazardous constituent concentrations in ground water continue to comply with the standards set by the Department. In conjunction with a corrective action program, the licensee shall establish and implement a corrective action monitoring program. The purpose of the corrective action monitoring program is to demonstrate the effectiveness of the corrective actions. Any monitoring program required by this paragraph may be based on existing monitoring programs to the extent the existing programs can meet the stated objective for the program.

Criterion 8.

Milling operations must be conducted so that all airborne effluent releases are reduced to levels as low as is reasonably achievable. The primary means of accomplishing this must be by means of emission controls. Institutional controls, such as extending the site boundary and exclusion area, may be employed to ensure that offsite exposure limits are met, but only after all practicable measures have been taken to control emissions at the source. Notwithstanding the existence of individual dose standards, strict control of emissions is necessary to assure that population exposures are reduced to the maximum extent reasonably achievable and to avoid site contamination. The greatest potential sources of offsite radiation exposure (aside from radon exposure) are dusting from dry surfaces of the tailings disposal area not covered by tailings solution and emissions from yellowcake drying and packaging operations. During operations and prior to closure, radiation doses from radon emissions from surface impoundments of uranium or thorium byproduct materials must be kept as low as is reasonably achievable.

Checks must be made and logged hourly for all parameters (e.g., differential pressures and scrubber water flow rates) that determine the efficiency of yellowcake stack emission control equipment operation. The licensee shall retain each log as a record for three years after the last entry in the log is made. It must be determined whether or not conditions are within a range prescribed to ensure that the equipment is operating consistently near peak efficiency; corrective action must be taken when performance is outside of prescribed ranges. Effluent control devices must be operative at all times during drying and packaging operations and whenever air is exhausting from the yellowcake stack. Drying and packaging operations must terminate when controls are inoperative. When checks indicate the equipment is not operating within the range prescribed for peak efficiency, actions must be taken to restore parameters to the prescribed range. When this cannot be done without shutdown and repairs, drying and packaging operations must cease as soon as practicable. Operations may not be restarted after cessation due to off-normal performance until needed corrective actions have been identified and implemented. All these cessations, corrective actions, and restarts must be reported to the Department as indicated in Criterion 8A, in writing, within ten days of the subsequent restart.

To control dusting from tailings, that portion not covered by standing liquids must be wetted or chemically stabilized to prevent or minimize blowing and dusting to the maximum extent reasonably achievable. This requirement may be relaxed if tailings are effectively sheltered from wind, such as may be the case where they are disposed of below grade and the tailings surface is not exposed to wind. Consideration must be

given in planning tailings disposal programs to methods which would allow phased covering and reclamation of tailings impoundments because this will help in controlling particulate and radon emissions during operation. To control dusting from diffuse sources, such as tailings and ore pads where automatic controls do not apply, operators shall develop written operating procedures specifying the methods of control which will be utilized.

Milling operations producing or involving uranium and thorium byproduct materials must be conducted in such a manner as to provide reasonable assurance that the annual dose equivalent does not exceed 0.25 millisievert (25 millirem) to the whole body, 0.75 millisievert (75 millirem) to the thyroid, and 0.25 millisievert (25 millirem) to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive material, radon and its progeny excepted, to the general environment.

Uranium and thorium byproduct materials must be managed so as to conform to the applicable provisions of Title 40 of the *Code of Federal Regulations*, Part 440, "Ore Mining and Dressing Point Source Category: Effluent Limitations Guidelines and New Source Performance Standards, Subpart C, Uranium, Radium, and Vanadium Ores Subcategory", as codified on January 1, 1983.

Criterion 8A. Inspections of tailings or waste retention systems must be conducted daily during operations, or at an alternate frequency approved by the Department for other conditions. Such inspections shall be conducted by, or under the supervision of, a qualified engineer or scientist, and documented. The licensee shall retain the documentation for each inspection as a record for three years after the documentation is made. The Department must be immediately notified of any failure in a tailings or waste retention system that results in a release of tailings or waste into unrestricted areas, or any unusual conditions (conditions not contemplated in the design of the retention system) that if not corrected could indicate the potential or lead to failure of the system and result in a release of tailings or waste into unrestricted areas.

Criterion 9.

Criterion 9A. These criteria relating to ownership of tailings and their disposal sites became effective on November 8, 1981, and apply to all licenses terminated, issued, or renewed after that date.

Criterion 9B. Any uranium or thorium milling license or tailings license must contain such terms and conditions as the NRC and Department determine necessary to assure that prior to termination of the license, the licensee will comply with ownership requirements of this criterion for sites used for tailings disposal.

Criterion 9C. Title to the byproduct material licensed under this Part 18 and land, including any interests therein (other than land owned by the United States or by the State), which is used for the disposal of any such byproduct material, or is essential to ensure the long-term stability of such disposal site, must be transferred to the United States or the State in which such land is located, at the option of such State. In

view of the fact that physical isolation must be the primary means of long-term control, and Government land ownership is a desirable supplementary measure, ownership of certain severable subsurface interests (for example, mineral rights) may be determined to be unnecessary to protect the public health and safety and the environment. In any case, however, the applicant/operator must demonstrate a serious effort to obtain such subsurface rights, and must in the event that certain rights cannot be obtained, provide notification in local public land records of the fact that the land is being used for the disposal of radioactive material and is subject to ~~either~~ a**n** NRC ~~or Department~~ general or specific license prohibiting the disruption and disturbance of the tailings. In some rare cases, such as may occur with deep burial where no ongoing site surveillance will be required, surface land ownership transfer requirements may be waived with the approval of the ~~Department and~~ NRC. For licenses issued before November 8, 1981, the ~~Department and~~ NRC may take into account the status of the ownership of such land, and interests therein, and the ability of a licensee to transfer title and custody thereof to the United States or the State.

Criterion 9D. If the NRC~~, or the Department if title is held by the State,~~ subsequent to title transfer determines that use of the surface or subsurface estates, or both, of the land transferred to the United States or to a State will not endanger the public health, safety, welfare, or environment, the NRC~~, or the Department if title is held by the State, may~~ **shall** permit the use of the surface or subsurface estates, or both, of such **land** ~~and~~ in a manner consistent with the provisions provided in these criteria. If the NRC~~, or the Department if title is held by the state,~~ permits such use of such land, it will provide the person who transferred such land with the right of first refusal with respect to such use of such land.

Criterion 9E. Material and land transferred to the United States or the State in accordance with this Criterion 9 must be transferred to the United States or the State without cost other than administrative or legal costs incurred in carrying out such transfer.

Criterion 9F. The provisions of this part respecting transfer of title and custody to land and tailings and wastes do not apply in the case of lands held in trust by the United States for any Indian tribe or lands owned by such Indian tribe subject to a restriction against alienation imposed by the United States. In the case of such lands which are used for the disposal of uranium or thorium byproduct material, as defined in **this** Part ~~1~~, the licensee shall enter into arrangements with the NRC as may be appropriate to assure the long-term surveillance of such lands by the United States.

Criterion 10.

Secondary ground-water protection standards required by Criterion 5 of this Appendix are concentration limits for individual hazardous constituents. The following list of constituents identifies the constituents for which standards must be set and complied with if the specific constituent is reasonably expected to be in or derived from the radioactive material and has been detected in ground water. For purposes of this Appendix, the property of gross alpha activity will be treated as if it is a hazardous constituent. Thus, when setting standards under paragraph 5B(5) of Criterion 5, the Department will also set a limit for gross alpha activity. The Department does not consider the following list imposed by 40 CFR Part 192 to be exhaustive and may determine other constituents to be hazardous on a case-by-case basis, independent of those specified by the U.S. Environmental Protection Agency in Part 192.

Comment [JJ66]:
In order to meet the compatibility for the equivalent section in 10 CFR 40, Criterion 11, NRC requires that references to the Department (CDPHE) be deleted since NRC has regulatory jurisdiction for the matters discussed in Criterion 9C, and 9D.

NRC Ltr dated 06/28/12 (#28)

10 CFR 40.2a; 10 CFR Part 40, Appendix A. Compatibility = NRC

Comment [JJ67]:
The changes in Criterion 9C, and 9D are a result of comments from the NRC in correspondence dated March 28, 2002.

The basis for the comment is that the NRC retains regulatory jurisdiction in the matters described in Criterion 9C and 9D.

NRC Ltr dated 03/28/02

10 CFR 40.2a; 10 CFR Part 40, Appendix A.

Comment [JJ68]: Consistent with the addition of a definition for type 2 byproduct material in 18.2, the language is modified here.

PART 18 - CRITERION 10 HAZARDOUS CONSTITUENTS

- Acetonitrile (Ethanenitrile)
- Acetophenone (Ethanone, 1-phenyl)
- 3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts (Warfarin)
- 2-Acetylaminofluorene (Acetamide, N-(9H- fluoren-2-yl)-)
- Acetyl chloride (Ethanoyl chloride)
- 1-Acetyl-2-thiourea (Acetamide, N- (aminothioxomethyl)-)
- Acrolein (2-Propenal)
- Acrylamide (2-Propenamide)
- Acrylonitrile (2-Propenenitrile)
- Aflatoxins
- Aldrin (1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a,8b-hexahydro-endo,exo-1,4:5,8-Dimethanonaphthalene)
- Allyl alcohol (2-Propen-1-ol)
- Aluminum phosphide
- 4-Aminobiphenyl ([1,1-Biphenyl])-4-amine)
- 6-Amino-1,1a,2,8,8a,8b-hexahydro-8-(hydroxymethyl)-8a-methoxy-5-methyl-carbamate azirino(2,3:3,4)pyrrolo(1,2-a]indole-4,7-dione,(ester) (Mitomycin C) (Azirino[2,3:3,4]pyrrolo(1,2-a)indole-4,7-dione,6-amino-8-[((amino-cabonyl)oxy)methyl)-1,1a,2,8,8a,8b-hexahydro-8a methoxy-5-methyl-)
- 5-(Aminomethyl)-3-isoxazolol (3(2H)-Isoxazolone, 5-(aminomethyl)-)4-Aminopyridine (4-Pyridinamine)
- Amitrole (1H-1,2,4-Triazol-3-amine)
- Aniline (Benzenamine)
- Antimony and compounds, N.O.S.[3]
- Aramite (Sulfurous acid,2-chloroethyl-,2-(4-(1,1-dimethylethyl)phenoxy)-1-methylethyl ester)
- Arsenic and compounds, N.O.S.[3]
- Arsenic acid (Orthoarsenic acid)
- Arsenic pentoxide (Arsenic (V) oxide)
- Arsenic trioxide (Arsenic (III) oxide)

1428 - Auramine (Benzenamine,4,4-carbonimidoylbis (N,N-Dimethyl-,monohydrochloride)

1429 - Azaserine (L-Serine, diazoacetate (ester))

1430 - Barium and compounds, N.O.S.[3]

1431 - Barium cyanide

1432 - Benz(c)acridine (3.4-Benzacridine)

1433 - Benz(a)anthracene (1,2-Benzanthracene)

1434 - Benzene (Cyclohexatriene)

1435 - Benzenearsonic acid (Arsonic acid, phenyl-)

1436 - Benzene, dichloromethyl-(Benzal chloride)

1437 - Benzenethiol (Thiophenol)

1438 - Benzidine ([1,1-Biphenyl]-4,4 diamine)

1439 - Benzo(b)fluoranthene (2,3-Benzofluoranthene)

1440 - Benzo(j)fluoranthene (7,8-Benzofluoranthene)

1441 - Benzo(a)pyrene (3,4-Benzopyrene)

1442 - p-Benzoquinone (1,4-Cyclohexadienedione)

1443 - Benzotrichloride (Benzene, Trichloromethyl)

1444 - Benzyl chloride (Benzene, (chloromethyl)-)

1445 - Beryllium and compounds, N.O.S.[3]

1446 - Bis(2-chloroethoxy)methane (Ethane,1,1-(methylenebis(oxy)]bis[2-chloro-])

1447 - Bis(2-chloroethyl) ether (Ethane, 1,1-oxybis (2-chloro-))

1448 - N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine)

1449 - Bis(2-Chloroisopropyl) ether (Propane, 2,2-oxybis[2-chloro-])

1450 - Bis(chloromethyl) ether (methane,oxybis[chloro-])

1451 - Bis(2-ethylhexyl) phthalate (1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester)

1452 - Bromoacetone (2-Propanone, 1-bromo-)

1453 - Bromomethane (Methyl bromide)

1454 - 4-Bromophenyl phenyl ether (Benzene, 1-bromo-4-phenoxy-)

1455 - Brucine (Strychnidin-10-one, 2,3-dimethoxy-)

1456 - 2-Butanone peroxide (Methyl ethyl ketone,peroxide)

1457 - Butyl benzyl phthalate (1,2-Benzenedicarboxylic acid, butylphenylmethyl ester)

1458 - 2-sec-Butyl-4,6-dinitrophenol (DNBP) (Phenol,2,4-dinitro-6-(1-methylpropyl)-)

1459 - Cadmium and compounds, N.O.S.[3]

1460 - Calcium chromate (Chromic acid, calcium salt)

1461 - Calcium cyanide

1462 - Carbon disulfide (Carbon bisulfide)

1463 - Carbon oxyfluoride (Carbonyl fluoride)

1464 - Chloral (Acetaldehyde, trichloro-)

1465 - Chlorambucil (Butanoic acid, 4-(bis(2-chloroethyl)amino)benzene-)

1466 - Chlordane (alpha and gamma isomers)4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3,4,7,7a-
1467 tetrahydro-) (alpha and gammaisomers)

1468 - Chlorinated benzenes, N.O.S.[3]

1469 - Chlorinated ethane, N.O.S.[3]

1470 - Chlorinated fluorocarbons, N.O.S.[3]

1471 - Chlorinated naphthalene, N.O.S.[3]

1472 - Chlorinated phenol, N.O.S.[3]

1473 - Chloroacetaldehyde (Acetaldehyde, chloro-)

1474 - Chloroalkyl ethers N.O.S.[3]

1475 - p-Chloroaniline (Benzenamine, 4-chloro-)

1476 - Chlorobenzene (Benzene, chloro-)

1477 - Chlorobenzilate (Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-,ethyl ester)

1478 - p-Chloro-m-cresol (Phenol, 4-chloro-3-methyl)

1479 - 1-Chloro-2,3-epoxypropane (Oxirane, 2-(chloromethyl)-)

1480 - 2-Chloroethyl vinyl ether (Ethene, (2-chloroethoxy)-)

1481 - Chloroform (Methane, trichloro-)

1482 - Chloromethane (Methyl chloride)

1483 - Chloromethyl methyl ether (Methane,chloromethoxy-)

- 2-Chloronaphthalene (Naphthalene,betachloro-)
- 2-Chlorophenol (Phenol, o-chloro-)
- 1-(o-Chlorophenyl) thiourea (Thiourea, (2-chlorophenyl)-)
- 3-Chloropropionitrile (Propanenitrile, 3-chloro-)
- Chromium and compounds, N.O.S.[3]
- Chrysene (1,2-Benzphenanthrene)
- Citrus red No. 2 (2-Naphthol, 1-((2,5-dimethoxyphenyl)azo)-)
- Coal tars
- Copper cyanide
- Creosote (Creosote, wood)
- Cresols (Cresylic acid) (Phenol, methyl-)
- Crotonaldehyde (2-Butenal)
- Cyanides (soluble salts and complexes),N.O.S.[3]
- Cyanogen (Ethanedinitrile)
- Cyanogen bromide (Bromine cyanide)
- Cyanogen chloride (Chlorine cyanide)
- Cycasin (beta-D-Glucopyranoside, (methyl-ONN-azoxy)methyl-)
- 2-Cyclohexyl-4,6-dinitrophenol (phenol, 2-cyclohexyl-4,6-dinitro-)
- Cyclophosphamide (2H-1,3,2-Oxazaphosphorine (bis(2-chloroethyl)amino)-tetrahydro-,2-oxide)
- Daunomycin (5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-((3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopyranosyl)oxy)7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-)
- DDD (Dichlorodiphenyldichloroethane)(Ethane, 1,1-dichloro-2,2-bis(p-chlorophenyl)-)
- DDE (Ethylene, 1,1-dichloro-2,2-bis(4-chlorophenyl)-)
- DDT (Dichlorodiphenyltrichloroethane) (Ethane, 1,1,1-trichloro-2,2-bis (p-chlorophenyl)-)
- Diallate (S-(2,3-dichloroallyl)diisopropylthiocarbamate)
- Dibenz(a,h)acridine(1,2,5,6-Dibenzacridine)
- Dibenz(a,j)acridine(1,2,7,8-Dibenzacridine)
- Dibenz(a,h)anthracene (1,2,5,6-Dibenzanthracene

1512 - 7H-Dibenzo(c,g)carbazole (3,4,5,6-Dibenzcarbazole)

1513 - Dibenzo(a,e)pyrene(1,2,4,5-Dibenzpyrene)

1514 - Dibenzo(a,h)pyrene(1,2,5,6-Dibenzpyrene)

1515 - Dibenzo(a,i)pyrene(1,2,7,8-Dibenzpyrene)

1516 - 1,2-Dibromo-3-chloropropane (Propane, 1,2-dibromo-3-chloro-)

1517 - 1,2 Dibromoethane (Ethylene dibromide)

1518 - Dibromomethane (Methylene bromide)

1519 - Di-n-butyl phthalate (1,2-Benzenedicarboxylic acid, dibutyl ester)

1520 - o-Dichlorobenzene (Benzene, 1,2-dichloro-)

1521 - m-Dichlorobenzene (Benzene, 1,3-dichloro-)

1522 - p-Dichlorobenzene (Benzene, 1,4-dichlor-)

1523 - Dichlorobenzene, N.O.S.[3] (Benzene, dichloro-N.O.S.[3])

1524 - 3,3-Dichlorobenzidine ([1,1, Biphenyl]-4,4-diamine, 3,3-dichloro-)

1525 - 1,4-Dichloro-2-butene (2-Butene, 1,4-dichloro-)

1526 - Dichlorodifluoromethane (Methane, dichlorodifluoro-)

1527 - 1,1 Dichloroethane (Ethylidene dichloride)

1528 - 1,2 Dichloroethane (Ethylene dichloride)

1529 - trans-1,2-Dichloroethene (1,2-Dichloroethylene)

1530 - Dichloroethylene, N.O.S.[3] (Ethene, dichloro-N.O.S.[3]

1531 - 1,1-Dichloroethylene (Ethene, 1,1-dichloro-)

1532 - Dichloromethane (Methylene chloride)

1533 - 2,4-Dichlorophenol (Phenol, 2,4-dichloro-)

1534 - 2,6-Dichlorophenol (Phenol, 2,6-dichloro-)

1535 - 2,4-Dichlorophenoxyacetic acid (2,4-D), saltsand esters (Acetic acid, 2,4-dichlorophenoxy-, salts
1536 and esters)

1537 - Dichlorophenylarsine (Phenyl dichloroarsine)

1538 - Dichloropropane, N.O.S.[3] (Propane, dichloro-N.O.S.[3]

1539 - 1,2-Dichloropropane (Propylene dichloride)

- Dichloropropanol, N.O.S.[3] (Propanol, dichloro-N.O.S.[3])
- Dichloropropene, N.O.S.[3] (Propene, dichloro-N.O.S.[3]
- 1,3-Dichloropropene (1-Propene, 1,3-dichloro-)
- Dieldin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octa-hydro-endo,exo-1,4:5,8-Dimethanonaphthalene)
- 1,2:3,4-Diepoxybutane (2,2,-Bioxirane)
- Diethylarsine (Arsine, diethyl-)
- N,N-Diethylhydrazine (Hydrazine, 1,2-diethyl)
- O,O-Diethyl S-methyl ester of phosphorodithioic acid (Phosphorodithioic acid, O,O-diethyl S-methyl ester)
- O,O-Diethylphosphoric acid, O-p-nitrophenyl ester (Phosphoric acid, diethyl p-nitrophenyl ester)
- Diethyl phthalate (1,2-Benzenedicarboxylic acid, diethyl ester)
- O,O-Diethyl O-2-pyrazinyl phosphorothioate (Phosphorothioic acid, O,0-diethyl O-pyrazinyl ester)
- Diethylstilbesterol (4,4-Stilbenediol,alpha,alpha-diethyl,bis(dihydrogen phosphate, (E)-)
- Dihydrosafrole (Benzene, 1,2-methylenedioxy-4-propyl-)
- 3,4-Dihydroxy-alpha-(methylamino)methylbenzyl alcohol (1,2-Benzenediol, 4-(1-hydroxy-2 (methylamino)ethyl))
- Dilsopropylfluorophosphate (DFP) (Phosphorofluoridic acid, bis(1-methylethyl) ester)
- Dimethoate (Phosphorodithioic acid, O,O-dimethyl S-(2-(methylamino)-2-oxoethyl) ester)
- 3,3,-Dimethoxybenzidine ((1,1,-Biphenyl)-4,4,-diamine, 3-3,-dimethoxy-)
- p-Dimethylaminoazobenzene (Benzenamine, N,N-dimethyl-4-(phenylazo)-)
- 7,12-Dimethylbenz(a)anthracene(1,2-Benzathracene, 7,12-dimethyl-)
- 3,3-Dimethylbenzidine (1,1-Biphenyl)-4,4,diamine, 3,3-dimethyl-)
- Dimethylcarbamoyl chloride (Carbamoyl chloride, dimethyl)
- 1,1 Dimethylhydrazine (Hydrazine, 1,1-dimethyl-)
- 1,2-Dimethylhydrazine (Hydrazine, 1,2-dimethyl-)
- 3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino) carbonyl] oxime (Thiofanox)
- alpha,alpha-Dimethylphenethylamine (Ethanamine, 1,1-dimethyl-2-phenyl-)
- 2,4-Dimethylphenol (Phenol, 2,4-dimethyl-)

- Dimethyl phthalate (1,2-Benzenedicarboxylic acid, dimethyl ester)
- Dimethyl sulfate (Sulfuric acid, dimethyl ester)
- Dinitrobenzene, N.O.S.[3] (Benzene, dinitro-N.O.S.[3])
- 4,6-Dinitro-o-cresol and salts (Phenol, 2,4-dinitro-6-methyl-, and salts)
- 2,4-Dinitrophenol (Phenol, 2,4-dinitro-)
- 2,4-Dinitrotoluene (Benzene, 1-methyl-2,4-dinitro-)
- 2,6-Dinitrotoluene (Benzene, 1-methyl 2,6-dinitro-)
- Di-n-octyl phthalate (1,2-Benzenedicarboxylic acid, dioctyl ester)
- 1,4-Dioxane (1,4-Diethylene oxide)
- Diphenylamine (Benzenamine, N-phenyl-)
- 1,2-Diphenylhydrazine (Hydrazine, 1,2-diphenyl-)
- Di-n-propylnitrosamine (N-Nitroso-di-n-propylamine)
- Disulfoton (O,O-diethyl S-(2-(ethylthio)ethyl) phosphorodithioate)
- 2,4-Dithiobiuret (Thiomidodicarbonic diamide)
- Endosulfan (5-Norbomene, 2,3-dimethanol,1,4,5,6,7,7-hexachloro-cyclic sulfite)
- Endrin and metabolites (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo, endo-1,4,5,8-dimethanonaphthalene, and metabolites)
- Ethyl carbamate (Urethan) (Carbamic acid, ethyl ester)
- Ethyl cyanide (Propanenitrile)
- Ethylenebisdithiocarbamic acid, salts, and esters (1,2-Ethanediyl-biscarbamodithioic acid, salts and esters)
- Ethyleneimine (Aziridine)
- Ethylene oxide (Oxirane)
- Ethylenethiourea (2-Imidazolidinethione)
- Ethyl methacrylate (2-Propenoic acid, 2-methyl-, ethyl ester)
- Ethyl methanesulfonate (Methanesulfonic acid, ethyl ester)
- Fluoranthene (Benzo[j,k]fluorene)
- Fluorine
- 2-Fluoroacetamide (Acetamide, 2-fluoro-)

1598	-	Fluoroacetic acid, sodium salt (Acetic acid, fluoro-sodium salt)
1599	-	Formaldehyde (Methylene oxide)
1600	-	Formic acid (Methanoic acid)
1601	-	Glycidylaldehyde (1-Propanol-2,3 epoxy)
1602	-	Halomethane, N.O.S. [3]
1603	-	Heptachlor (4,7-Methano-1H-indene.1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-)
1604 1605	-	Heptachlor epoxide (alpha, beta, and gamma isomers) (4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-2,3-epoxy-3a,4,7,7-tetrahydro-,alpha, beta, and gamma isomers)
1606	-	Hexachlorobenzene (Benzene, hexachloro-)
1607	-	Hexachlorobutadiene (1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)
1608	-	Hexachlorocyclohexane (all isomers) (Lindane and isomers)
1609	-	Hexachlorocyclopentadiene (1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-)
1610	-	Hexachloroethane (Ethane, 1,1,1,2,2,2-hexachloro-)
1611 1612	-	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,endo-dimethanonaphthalene (Hexachlorohexa-hydro-endo,endo-dimethanonaphthalene)
1613	-	Hexachlorophene (2,2,-Methylenebis(3,4,6-trichlorophenol)
1614	-	Hexachloropropene (1-Propene, 1,1,2,3,3,3-hexachloro-)
1615	-	Hexaethyl tetraphosphate (Tetraphosphoric acid, hexaethyl ester)
1616	-	Hydrazine (Diamine)
1617	-	Hydrocyanic acid (Hydrogen cyanide)
1618	-	Hydrofluoric acid (Hydrogen fluoride)
1619	-	Hydrogen sulfide (Sulfur hydride)
1620	-	Hydroxydimethylarsine oxide (Cacodylic acid)
1621	-	Indeno (1,2,3-cd)pyrene(1,10-(1,2-phenylene)pyrene)
1622	-	Iodomethane (Methyl iodide)
1623	-	Iron dextran (Ferric dextran)
1624	-	Isocyanic acid, methyl ester (Methyl isocyanate)
1625	-	Isobutyl alcohol (1-Propanol, 2-methyl-)
1626	-	Isosafrole (Benzene, 1,2-methylenedioxy-4-allyl-)

- Kepone (decachlorooctahydro-1,3,4-Methano-2H-cyclobuta[cd]pentalen-2-one)
- Lasiocarpine (2-Butenoic acid, 2-methyl-,7-[(2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy) methyl]2,3,5,7a-tetrahydro-1H-pyrrolizin-1-yl-ester)
- Lead and compounds, N.O.S.[3]
- Lead acetate (Acetic acid, lead salt)
- Lead phosphate (Phosphoric acid, lead salt)
- Lead subacetate (Lead, bis(acetato-O)tetrahydroxytri-)
- Maleic anhydride (2,5-Furandione)
- Maleic hydrazide (1,2-Dihydro-3,6-pyridazinedione)
- Malononitrile (Propanedinitrile)
- Melphalan (Alanine, 3-(p-bis(2-chloroethyl)amino)phenyl-L-)- Mercury fulminate (Fulminic acid, mercury salt)
- Mercury and compounds, N.O.S.[3]
- Methacrylonitrile (2-Propenenitrile,2-methyl-)
- Methanethiol (Thiomethanol)
- Methapyrilene (Pyridine, 2-[(2-dimethylamino)ethyl)]-2-thenylamino-)
- Metholmyl (Acetimidic acid, N-[(methylcarbamoyl)oxy] thio-,methyl ester)
- Methoxychlor (Ethane, 1,1,1-trichloro-2,2'-bis(p-methoxyphenyl)-)
- 2-Methylaziridine (1,2-Propylenimine)
- 3-Methlycholanthrene (Benz[j]aceanthrylene,1,2-dihydro-3-methyl-)
- Methyl chlorcarbonate (Carbonochloridicacid, methyl ester)
- 4,4'-Methylenebis (2-chloroaniline) Benzenamine, 4,4'-methylenebis-(2-chloro-)
- Methyl ethyl ketone (MEK) (2-Butanone)
- Methyl hydrazine (Hydrazine methyl-)
- 2-Methyllactonitrile (Propanenitrile 2-hydroxy-2-methyl-)
- Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)
- Methyl methanesulfonate Methanesulfonicacid, methyl ester)
- 2-Methyl-2-(methylthio)propionaldehyde-o-(methylcarbonyl) oxime (Propanal,2-methyl-2(methylthio-0-[(methylamino)carbonyl]oxime)

Comment [JJ69]: Technical formula correction are made in this list, consistent with comments made by NRC to the Conference of Radiation Control Program Directors, Inc. (CRCPD) regarding the Part U regulation.

The correction adds a "prime" (') symbol to the formula.

NRC Letter to CRCPD dated 12/23/13. http://www.crcpd.org/SSRCRs/nrc_Part-U_letter_12-23-2013.pdf

Comment [JJ70]: Technical formula correction similar to that above.

- N-Methyl-N',-nitro-N-nitrosoguanidine (Guanidine, N-nitroso-N-methyl-N',-nitro-)
- Methyl parathion (0,0-dimethyl 0-(40 nitrophenyl) phosphorothioate)
- Methylthiouracil (4-IH-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)
- Molybdenum and compounds, N.O.S.[3]
- Mustard gas (Sulfide, bis(2-chloroethyl)-)
- Naphthalene
- 1,4-Naphthoquinone (1,4-Naphthalenedione)
- 1-Naphthylamine (alpha-Naphthylamine)
- 2-Naphthylamine (beta-Naphthylamine)
- 1-Naphthyl-2-thiourea (Thiourea, 1-naphthalenyl-)
- Nickel and compounds, N.O.S.[3]
- Nickel carbonyl (Nickel tetracarbonyl)
- Nickel cyanide (Nickel (II) cyanide)
- Nicotine and salts (Pyridine, (S)-3-(1-methyl-2-pyrrolidinyl)-, and salts)
- Nitric oxide (Nitrogen (II) oxide)
- p-Nitroaniline (Benzenamine, 4-nitro-)
- Nitrobenzine (Benzene, nitro-)
- Nitrogen dioxide (Nitrogen (IV) oxide)
- Nitrogen mustard and hydrochloride salt (Ethanamine, 2-chloro-,N-(2-chloroethyl)-N-methyl-, and hydrochloride salt)
- Nitrogen mustard N-Oxide and hydrochloride salt (Ethanamine, 2-chloro,N-(2-chloroethyl)-N-methyl-and hydrochloride salt)
- Nitroglycerine (1,2,3-Propanetriol, trinitrate)
- 4-Nitrophenol (Phenol, 4-nitro)
- 4-Nitroquinoline-1-oxide (Quinoline,4-nitro-1-oxide-)
- Nitrosamine, N.O.S.[3]
- N-Nitrosodi-n-butylamine (1-Butanamine,N-butyl-N-nitroso-)
- N-Nitrosodiethanolamine (Ethanol, 2,2'-(nitrosoimino)bis-)
- N-Nitrosodiethylamine (Ethanamine, N-ethyl-N-nitroso-)

Comment [JJ71]: Technical formula correction similar to that above.

Comment [JJ72]: Technical formula correction similar to that above.

1685 - N-Nitrosodimethylamine (Dimethylnitrosamine)

1686 - N-Nitroso-N-ethylurea (Carbamide, N-ethyl-N-nitroso-)

1687 - N-Nitrosomethylethylamine (Ethanamine, N-methyl-N-nitroso-)

1688 - N-Nitroso-N-methylurea (Carbamide, N-methyl-N-nitroso-)

1689 - N-Nitroso-N-methylurethane (Carbamic acid, methylnitroso-, ethyl ester)

1690 - N-Nitrosomethylvinylamine (Ethenamine,N-methyl-N-nitroso-)

1691 - N-Nitrosomorpholine (Morpholine,-N-nitroso-)

1692 - N-Nitrosonomicotine (Nornicotine,-N-nitroso-)

1693 - N-Nitrosopiperidine (Pyridine, hexahydro-,N-nitroso-)

1694 - Nitrosopyrrolidine (Pyrrole, tetrahydro-N-nitroso-)

1695 - N-Nitrososarcosine (Sarcosine,-N-nitroso-)

1696 - 5-Nitro-o-toluidine (Benzenamine, 2-methyl-5-nitro-)

1697 - Octamethylpyrophosphoramide (Diphosphoramide, octamethyl-)

1698 - Osmium tetroxide (Osmium(VIII)oxide)

1699 - 7-Oxabicyclo(2,2,1)heptane-2,3-dicarboxylic acid (Endothal)

1700 - Paraldehyde (1,3,5-Trioxane, 2,4,6-trimethyl-)

1701 - Parathion (Phosphorothioic acid O,O-diethylO-(p-nitrophenyl) ester)

1702 - Pentachlorobenzene (Benzene, pentachloro-)

1703 - Pentachloroethane (Ethane, pentachloro-)

1704 - Pentachloronitrobenzene (PCNB) (Benzene, Pentachloronitro-)

1705 - Pentachlorophenol (Phenol, pentachloro-)

1706 - Phenacetin (Acetamide, N-(4-ethoxyphenyl)-)

1707 - Phenol (Benzene, hydroxy-)

1708 - Phenylenediamine (Benzenediamine)

1709 - Phenylmercury acetate (Mercury acetatophenyl-)

1710 - N-Phenylthiourea (Thiourea, phenyl-)

1711 - Phosgene (Carbonyl chloride)

1712 - Phosphine (Hydrogen phosphide)

1713	-	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl]ester (Phorate)
1714	-	Phosphorothioic acid, O,O-dimethyl O-(p-[(dimethylamino)sulfonyl)phenyl]ester (Famphur)
1715	-	Phthalic acid esters, N.O.S.[3] (Benzene, 1,2-dicarboxylic acid, esters, N.O.S.[3])
1716	-	Phthalic anhydride (1,2-Benzenedicarboxylic acid anhydride)
1717	-	2-Picoline (Pyridine, 2-methyl-)
1718	-	Polychlorinated biphenyl, N.O.S.[3]
1719	-	Potassium cynanide
1720	-	Potassium silver cyanide (Argentate(1-),dicyano-,potassium)
1721	-	Pronamide (3,5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide)
1722	-	1,3 Propane sultone (1,2-Oxathiolane, 2,2-dioxide)
1723	-	n-Propylamine (1-Propanamine)
1724	-	Propylthiouracil (Undecamethylenediamine,N,N-bis(2-chlorobenzyl-),dihydrochloride)
1725	-	2-Propyn-1-ol (Propargyl alcohol)
1726	-	Pyridine
1727	-	Radium-226 and -228
1728 1729	-	Reserpine (Yohimban-16-carboxylic acid,11,17-dimethoxy-18-[3,4,5-trimethoxybenzoyl)oxy]-, methyl ester)
1730	-	Resorcinol (1,3-Benzenediol)
1731	-	Saccharin and salts (1,2-Benzoisothiazolin-3-one, 1,1-dioxide, and salts)
1732	-	Safrele (Benzene, 1,2-methylenedioxy-4-allyl-)
1733	-	Selenious acid (Selenium dioxide)
1734	-	Selenium and compounds, N.O.S.[3]
1735	-	Selenium sulfide (Sulfur selenide)
1736	-	Selenourea (Carbamimidoselenoic acid)
1737	-	Silver and compounds, N.O.S.[3]
1738	-	Silver cyanide
1739	-	Sodium cyanide
1740	-	Streptozotocin (D-Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-)

1741	-	Strontium sulfide
1742	-	Strychnine and salts (Strychnidin-10-one, and salts)
1743	-	1,2,4,5-Tetrachlorobenzene (Benzene,1,2,4,5-tetrachloro-)
1744	-	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (Dibenzo-p-dioxin, 2,3,7,8-tetrachloro-)
1745	-	Tetrachloroethane, N.O.S.[3] (Ethane, tetrachloro-N.O.S.[3]
1746	-	1,1,1,2-Tetrachlorethane (Ethane, 1,1,1,2-tetrachloro-)
1747	-	1,1,2,2-Tetrachlorethane (Ethane 1,1,2,2-tetrachloro-)
1748	-	Tetrachlorethane (Ethene, 1,1,2,2-tetrachloro-)
1749	-	Tetrachloromethane (Carbon tetrachloride)
1750	-	2,3,4,6-Tetrachlorophenol (Phenol 2,3,4,6-tetrachloro-)
1751	-	Tetraethyldithiopyrophosphate (Dithiopyrophosphoric acid, tetraethyl-ester)
1752	-	Tetraethyl lead (Plumbane, tetraethyl-)
1753	-	Tetraethylpyrophosphate (Pyrophosphoricacide, tetraethyl ester)
1754	-	Tetranitromethane (Methane, tetranitro-)
1755	-	Thallium and compounds, N.O.S.[3]
1756	-	Thallic oxide (Thallium (III) oxide)
1757	-	Thallium (I) acetate (Acetic acid, thallium (I) salt)
1758	-	Thallium (I) carbonate (Carbonic acid dithallium (I) salt)
1759	-	Thallium (I) chloride
1760	-	Thallium (I) nitrate (Nitric acid, thallium (I) salt)
1761	-	Thallium selenite
1762	-	Thallium (I) sulfate (Sulfuric acid, thallium (I) salt)
1763	-	Thioacetamide (Ethanethioamide)
1764	-	Thiosemicarbazide (Hydrazinecarbothioamide)
1765	-	Thiourea (Carbamide thio-)
1766	-	Thiuram (Bis(dimethylthiocarbamoyl) disulfide)
1767	-	Thorium and compounds, N.O.S.[3] when producing thorium byproduct material
1768	-	Toluene (Benzene, methyl-)

1769 - Toluenediamine (Diaminotoluene)

1770 - o-Toluidine hydrochloride (Benzenamine, 2-methyl-,hydrochloride)

1771 - Tolylene diisocyanate (Benzene, 1,3-diisocyanatomethyl-)

1772 - Toxaphene (Camphene, octachloro-)

1773 - Tribromomethane (Bromoform)

1774 - 1,2,4-Trichlorobenzene (Benzene, 1,2,4-trichloro-)

1775 - 1,1,1-Trichloroethane (Methyl chloroform)

1776 - 1,1,2-Trichloroethane (Ethane, 1,1,2-trichloro-)

1777 - Trichloroethene (Trichloroethylene)

1778 - Trichloromethanethiol (Methanethiol, trichloro-)

1779 - Trichloromonofluoromethane (Methane, trichlorofluoro-)

1780 - 2,4,5-Trichlorophenol (Phenol, 2,4,5-trichloro-)

1781 - 2,4,6-Trichlorophenol (Phenol, 2,4,6-trichloro-)

1782 - 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) (Acetic acid, 2,4,5-trichlorophenoxy-)

1783 - 2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex) (Propionoic acid, 2-(2,4,5-
1784 trichlorophenoxy)-)

1785 - Trichloropropane, N.O.S.[3] (Propane, trichloro-, N.O.S.[3])

1786 - 1,2,3-Trichloropropane (Propane, 1,2,3-trichloro-)

1787 - O,O,O-Triethyl phosphorothioate (Phosphorothioic acid, O,O,O-triethyl ester)

1788 - sym-Trinitrobenzene (Benzene, 1,3,5-trinitro-)

1789 - Tris(1-azridinyl) phosphine sulfide (Phosphine sulfide, tris(1-aziridinyl-)

1790 - Tris(2,3-dibromopropyl) phosphate (1-Propanol, 2,3-dibromo-, phosphate)

1791 - Trypan blue (2,7-Naphthalenedisulfonic acid, 3,3,-((3,3,-dimethyl (1,1,-biphenyl)-
1792 4,4,diyl)bis(azo))bis(5-amino-4-hydroxy-tetrasodium salt)

1793 - Uracil mustard (Uracil-5-[bis(2-chloroethyl]amino)-)

1794 - Uranium and compounds, N.O.S.[3]

1795 - Vanadic acid, ammonium salt (ammonium vanadate)

1796 - Vanadium pentoxide (Vanadium (V) oxide)

1797 - Vinyl chloride (Ethene, chloro-)

- Zinc cyanide

- Zinc phosphide

3 The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by name in this list.

EDITOR'S NOTES

6 CCR 1007-1 has been divided into separate parts for ease of use. Versions prior to 04/01/2007 are located in the first section, 6 CCR 1007-1. Prior versions can be accessed from the All Versions list on the rule's current version page. To view versions effective on or after 04/01/2007, select the desired part of the rule, for example 6 CCR 1007-1 Part 01 or 6 CCR 1007-1 Part 10.

History

Part 18, Rules 8.1 – Appendix A, Criterion 9 eff. 04/30/2011.