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**Niagara Falls Storage Site FUSRAP Site
Lewiston, New York**

**Interim Deliverable: ARAR Analysis
for the Waste Containment Structure
at the Niagara Falls Storage Site**

***Prepared for:*
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ACRONYM LIST

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2		
3	ALARA	As low as reasonably achievable
4	ARAR	Applicable or Relevant and Appropriate Requirement
5	CED	Committed Effective Dose
6	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
7	CFR	Code of Federal Regulations
8	Ci	Curie
9	cm	Centimeter
10	DOE	Department of Energy
11	DOT	Department of Transportation
12	EPA	Environmental Protection Agency
13	FUSRAP	Formerly Utilized Sites Remedial Action Program
14	kg	Kilogram
15	L	Liter
16	LTP	License termination plan
17	MCL	Maximum contaminant level
18	MED	Manhattan Engineering District
19	mrem/yr	Millirem per year
20	nCi	NanoCurie
21	NCP	National Contingency Plan
22	NFSS	Niagara Falls Storage Site
23	NRC	Nuclear Regulatory Commission
24	NYSDEC	New York State Department of Environmental Conservation
25	PCB	Polychlorinated Biphenyl
26	pCi/g	PicoCuries per gram
27	pCi/m2-sec	PicoCuries/meter squared-second
28	Ra-226	Radium – 226
29	Ra-228	Radium-228
30	RfD	Reference Dose
31	Rn-222	Radon – 222
32	RCRA	Resource Conservation and Recovery Act
33	SAIC	Science Applications International Corporation
34	SVOC	Semi-volatile organic compound
35	TAGM	Technical Administrative Guidance Memorandum
36	TBC	To be considered
37	TCLP	Toxicity Characteristic Leaching Procedure
38	TEDE	Total effective dose equivalent
39	TPP	Technical Project Planning
40	U-234	Uranium-234
41	U-238	Uranium – 238
42	UMTRCA	Uranium Mining Tailings Radiation Control Act
43	USACE	United States Army Corps of Engineers
44	USDW	Underground sources of drinking water
45	USEPA	United States Environmental Protection Agency
46	WCS	Waste Containment Structure
47	VOC	Volatile organic compound
48		
49		
50		

1.0 PURPOSE

The purpose of this document is to provide a detailed analysis of various rules, regulations, and other documents issued by environmental regulatory agencies that might be applicable, relevant and appropriate (ARAR), or to-be-considered for remedial alternatives associated with the Niagara Falls Storage Site (NFSS) Waste Containment Structure (WCS). This analysis will form the basis for discussions within The United States Army Corp of Engineers (USACE), with USACE and Science Applications International Corporation (SAIC), and with the stakeholders [e.g., New York State Department of Environmental Conservation (NYSDEC), Environmental Protection Agency (EPA), etc.] in the upcoming Technical Project Planning (TPP) meeting as to the selection of the appropriate ARARs for the possible remedial alternatives associated with the NFSS WCS. The results of this detailed evaluation, upon consensus with USACE and possibly the stakeholders, will be summarized and included in the Feasibility Study and the Proposed Plan for the NFSS as the ARARs that the remedial alternatives must address. A similar review will be done for the remainder of the NFSS that is outside of the WCS. It is anticipated that much of the material presented here will be appropriate for the remainder of the site, and the associated evaluations will be tailored for the other Operable Units at the site as the constituents of concern are identified in the risk assessment.

2.0 INTRODUCTION TO ARARS

In developing ARARs, we are legally required to follow the statutory and regulatory provisions set forth in The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Contingency Plan (NCP). These statutory provisions, at CERCLA Section 121(d)(1) and (2), provide that remedial actions selected for a site must attain a degree of cleanup of hazardous substances, pollutants, and contaminants that assures protection of human health and the environment. Thus, protectiveness of an ARAR requirement is a key factor in considering and selecting a particular ARAR for a site.

In addition, when a hazardous substance, pollutant, or contaminant will remain onsite at the completion of a remedial action, then that substance must meet any limit or standard set forth in any legally applicable or relevant and appropriate standard, requirement, criteria, or limitation (ARAR) under a federal environmental law. These standards apply unless such standard, requirement, criteria, or limitation is waived in accordance with Section 121(d)(4).

Any promulgated standard, requirement, criteria, or limitation under a State environmental or facility siting law that is more stringent than any federal standard, requirement, criteria, or limitation, and that has been identified by the state in a timely manner, can be an ARAR as well.

Regulatory language interpreting and implementing the statutory directive is found at 40 Code of Federal Regulations (CFR) § 300.400(g). It provides that the lead agency (USACE) and support agencies (NYSDEC) shall identify applicable requirements based upon an objective determination of whether the requirement specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Under 40 CFR 300.430(e), the USACE has the ultimate authority to decide what requirements are ARARs for the potential remedial activities.

If it is determined that a requirement is not legally applicable to a specific release, the requirement may still be relevant and appropriate to the circumstances of the release. In evaluating relevance and appropriateness, the factors in paragraphs (i) through (viii) below are examined, where pertinent, to determine whether a requirement addresses problems or situations sufficiently similar to the

1 circumstances of the release or remedial action contemplated, and whether the requirement is well-
2 suited to the site, and therefore is both relevant and appropriate. The pertinence of each of the
3 following factors will depend, in part, on whether a requirement addresses a chemical, location, or
4 action. The following comparisons are made, where pertinent, to determine relevance and
5 appropriateness:

- 6
- 7 (i) the purpose of the requirement and the purpose of the CERCLA action;
- 8
- 9 (ii) the medium regulated or affected by the requirement and the medium contaminated or
10 affected at the CERCLA site;
- 11
- 12 (iii) the substances regulated by the requirement and the substances found at the CERCLA site;
- 13
- 14 (iv) the actions or activities regulated by the requirement and the remedial action contemplated at
15 the CERCLA site;
- 16
- 17 (v) any variances, waivers, or exemptions of the requirement and their availability for the
18 circumstances at the CERCLA site;
- 19
- 20 (vi) the type of place regulated and the type of place affected by the release or CERCLA action;
- 21
- 22 (vii) the type and size of structure or facility regulated and the type and size of structure or facility
23 affected by the release or contemplated by the CERCLA action; and
- 24
- 25 (viii) any consideration of use or potential use of affected resources in the requirement and the use
26 or potential use of the affected resource at the CERCLA site.
- 27

28 In addition to applicable or relevant and appropriate requirements, the lead and support agencies may
29 identify other advisories, criteria, or guidance to be considered for a particular release. The "to be
30 considered" (TBC) category consists of advisories, criteria, or guidance that were developed by EPA,
31 other federal agencies, or states that may be useful in developing CERCLA remedies. If no other
32 standard is available for a situation to help determine the necessary level of cleanup for protection of
33 health or the environment, or if potential ARARs are determined not to be protective, a TBC can be
34 included as guidance or justification for a standard used in the remediation.

35
36 Identifying ARARs involves determining whether a requirement is legally applicable, and if it is not
37 legally applicable, then whether a requirement is relevant and appropriate. Individual ARARs for each
38 site must be identified on a site-specific basis. Factors to assist in identifying ARARs include the
39 physical circumstances of the site, contaminants present, and characteristics of the remedial action.

40
41 Applicable requirements are those cleanup standards, standards of control, and other substantive
42 environmental protection requirements, criteria or limitations promulgated under federal or state
43 environmental or facility siting laws that specifically address a hazardous substance, pollutant,
44 contaminant, remedial action, location, or other circumstance found at a CERCLA site. A law or rule is
45 applicable if the jurisdictional prerequisites of the law or rule are satisfied. These jurisdictional
46 prerequisites are:

- 47
- 48 • Who, as specified by the statute or regulation, is subject to its authority;
- 49 • The types of substances or activities listed as falling under the authority of the statute
50 or regulation;
- 51 • The time period for which the statute or regulation is in effect; and

- The type of activities the statute or regulation requires, limits, or prohibits.

Determining whether a rule is relevant and appropriate is a two-step process which involves determining whether the rule is relevant, and, if so, whether it is appropriate. A requirement is relevant if it addresses problems or situations sufficiently similar to the circumstances of the remedial action contemplated. It is appropriate if it is well suited to the site.

In determining whether a requirement is both relevant and appropriate, the factors enumerated previously are used to evaluate the requirement.

While onsite actions must comply with both applicable and relevant and appropriate requirements, offsite actions must comply with only applicable requirements. Also, a determination of relevance and appropriateness may be applied to only portions of a requirement, so that only parts of a requirement need be complied with, whereas a determination of applicability is made for the requirement as a whole, so that the entire requirement must be complied with.

CERCLA Section 121(e), 42 USC 9621(e), provides that no permit is required for the portion of any removal or remedial action conducted entirely on-site. Although no permit is required, onsite actions must comply with substantive requirements that permits enforce, but not with related administrative and procedural requirements. That is, remedial actions conducted onsite do not require a permit but must be conducted in a manner consistent with permitted conditions as if a permit were in effect.

3.0 FACTORS THAT INFLUENCE THE CHOICE OF AN ARAR/CLEANUP LEVEL

ARARs or cleanup levels at a site are selected based on site-specific factors, or factors unique to the particular remediation. Several of these unique or site-specific factors that influence the choice of a particular ARAR or cleanup level are described in the following paragraphs.

One factor that influences the choice of an ARAR or cleanup level is the type of waste present. In the WCS there are higher-activity low-level uranium mill tailings, low-activity low-level wastes resulting from Manhattan Engineer District (MED) activities, remediation wastes from contamination resulting from MED activities, sludge waste that may be Resource Conservation and Recovery Act (RCRA) hazardous, and, potentially, soils and debris contaminated with cesium-137. A summary of all the materials placed in the WCS over a period of approximately 20 years and when they were placed there is tabulated in Table 1. Reported concentrations of selected radiological and chemical constituents particularly relevant to ARAR analysis are also given, if available.

The higher activity low-level waste contained in the WCS derives from ore extraction activities carried out before 1978, when the Uranium Mill Tailings Radiation Control Act (UMTRCA) was passed. The waste consists of residuals from ore extraction activities, which are also known as uranium mill tailings, or byproduct materials, as defined in Section 11(e)(2) of the Atomic Energy Act, as amended by UMTRCA. Under the Formerly Utilized Sites Remedial Action Program (FUSRAP), such material is called 11(e)(2) [pre-1978] material.

The radioactive material in some uranium mill tailings present in the WCS is different from uranium mill tailings at other sites in that some of the WCS waste exhibits a high activity level, although the activity level is not sufficiently high to fall within any high-level waste classification as defined under USEPA rules, Nuclear Regulatory Commission (NRC) rules, or Department of Transportation (DOT) rules. Therefore, even though some of the uranium mill tailings at the WCS are higher-activity than 'typical' mill tailings, they are still low-level radioactive wastes.

1 Another factor that will influence the choice of an ARAR or cleanup level is the regulatory authority
2 followed. Under CERCLA, the USACE has flexibility to select protective cleanup standards that are
3 the most relevant and appropriate for the site. Different regulatory authorities that have promulgated
4 potential ARARs include the NRC and the USEPA, under different programs. Also, in any CERCLA
5 remedial action, the State may propose ARARs to consider for potential cleanup levels.
6

7 These two factors, waste classification and the regulatory program followed, both have a bearing on
8 how the material is managed and where the waste can be disposed. Regulatory requirements for low-
9 level radioactive material allow the material to be blended for safe management purposes. In contrast,
10 RCRA hazardous materials cannot be diluted for management purposes beyond accumulation of waste
11 in sufficient quantities to treat. In addition, RCRA hazardous materials must be disposed in RCRA
12 Subtitle C facilities. Waste management and disposal options therefore have an influence on the choice
13 of an ARAR or cleanup level.
14

15 A third factor that will influence the choice of an ARAR or cleanup level is how the land will be used
16 after the remedial activity is completed. Possible assumptions for future land use for the NFSS WCS
17 site include: unrestricted use, uncontrolled industrial use, recreational use, controlled industrial use, and
18 restricted use, with waste disposal at the site. Potential future ownership of the WCS site ranges from
19 releasing the land for unrestricted use by anyone to complete ownership in perpetuity by the federal
20 government.
21

22 A fourth factor that will influence the choice of an ARAR or cleanup level is the remedial alternative
23 selected for the site. Several potential remedial alternatives are being developed for the WCS at the
24 NFSS, ranging from a no action alternative to complete removal of waste materials from the WCS. At
25 this stage of ARAR development, potential ARARs will be considered for either an
26 excavation/removal alternative or a containment alternative. As the potential remedial alternatives are
27 developed, the potential ARARs will be refined per alternative.
28

29 Each of the potential remedial alternatives involves either leaving waste in place (containment) or
30 excavating and removing waste. Containment of the waste could involve no disruption of the waste,
31 partial disruption of the waste for treatment or excavation, or treatment of all the materials. If the
32 higher-activity low-level waste is contained, in all likelihood it will not be disrupted for treatment.
33 Excavating and removing waste could involve treatment of any of the various waste types. Treatment
34 could be either ex-situ or in-situ. Removal of the waste could be conducted for some discrete waste
35 types, while leaving others in place.
36
37

Table 1. Summary of Wastes and Other Materials in the WCS

			Reported Inventory		Concentrations of Selected Radiological Constituents (pCi/g)				Concentrations of Selected Chemical Constituents (mg/kg) ⁵				
			Volume ⁴ (yd ³)	U ₃ O ₈ ³ (Pounds)	Ra-226 ¹	U-238 ¹	U-238 ²	Th-230 ¹	Uranium (Total)	Barium (Total)	Chromium (Total)	Lead (Total)	Selenium (Total)
Original NFSS Location Source													
Residue													
K-65	Building 434	Afrimet	3,200	11,006	520,000		650	54,000	3,800	30,000	100	5,600	100
L-30	Building 411	Afrimet	7,960	55,021	12,000		5,000		5,000	6,100	244	1,300	50
L-50	Buildings 413, 414	Afrimet	2,150	6,331	3,300		700		790	20,000	140	4,900	39
R-10	Water Treatment Area	DOE	9,400	36,194	95	1.7		50	14	230	24	51	0.77
F-32	Recarbonation Pit	Afrimet	440	917	300		2,200		6,500 ²				
Middlesex Sands	Building 410	DOE	230	176									
Subtotal Residue			23,380										
Contaminated Soils													
1972 - Remedial Action			15,000										
1982 - Remedial Action			15,700										
1983 - Remedial Action													
On-Site Cleanup			39,850										
Off-Site Cleanup			14,150										
1984 - Remedial Action													
On-Site Cleanup			4,640										
Off-Site Cleanup			23,260										
1985 - Remedial Action ⁶													
On-Site Cleanup			8,300										
Vicinity Properties			1,000										
Hot Spot			3,000										
1991 - Remedial Action ⁷													
Misc. Soils			3,200										
Subtotal Soils			128,100		16	4.8		16	14	500	45	17	0.55
Contaminated Rubble													
Building 410 & grouted piping			4,210										
Building 415			100										
Building 434			1,400										

Original NFSS Location Source	Reported Inventory		Concentrations of Selected Radiological Constituents (pCi/g)				Concentrations of Selected Chemical Constituents (mg/kg) ⁵				
	Volume ⁴ (yd ³)	U ₃ O ₈ ³ (Pounds)	Ra-226 ¹	U-238 ¹	U-238 ²	Th-230 ¹	Uranium (Total)	Barium (Total)	Chromium (Total)	Lead (Total)	Selenium (Total)
Thaw House Foundation	220										
K-65 Slurry transfer piping	170										
1991 - Hittman tanks, misc debris ⁷ 64 barrels waste/sludge	300										
Subtotal Rubble	6,400										
Miscellaneous											
Existing Structures prior to WCS	15,000										
Misc. materials added to upgrade Bldgs. 411, 413, 414	25,000										
Cap Material	60,000										
Contaminated below grade material ⁸	48,000										
Dike material (assume only a 2 ft width is contaminated)	14,000										
Total Waste Volume	309,880										

1. Average concentrations as reported in previous studies.
2. Maximum reported concentration.
3. Aerospace Corporation, 1982. Background and Resurvey Recommendations for the Atomic Energy Commission Portion of the Lake Ontario Ordnance Works, November, 1982. Prepared for U.S. Department of Energy by Environment and Conservation Directorate, Eastern Technical Division, The Aerospace Corporation, Washington, D.C. Contract No. DE-AC01-82-EP15100.
4. Bechtel National, Inc., 1986. Close/Post-Closure Plan for the Interim Waste Containment Facility at the Niagara Falls Storage Site. Prepared for the U.S. Department of Energy. DOE/OR/20722-85. May 1986.
5. Average concentration, except as otherwise noted.
6. Includes 3600 yd³ excavated from Central Drainage Ditch and placed on bank in 1984, but not transported to Waste Containment Area until 1985.
7. Bechtel National, Inc., 1991. Geotechnical Post-Construction Report for NFSS Contaminated Waste Pile Consolidation, July-October, 1991.
8. Based on core samples in 1980 (Final Env. Impact Statement, DOE/EIS-0109f, April 1986).

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4.0 BACKGROUND FOR POTENTIAL STANDARDS AT THE WCS

The major radiation hazard from uranium mill tailings arises from inhalation of alpha radiation from radon decay products, which can cause lung cancer. Radon comes from decay of radium constituents in uranium mill tailings. Radium/radon pose both a present hazard to human health, and a long-term hazard if the mill tailings are vulnerable to human mismanagement and to dispersal by natural forces.

The primary consideration for any potential ARAR that may be used as a cleanup level is whether the requirement will ensure protectiveness of human health and the environment when the remedial action is completed. Under CERCLA, the USEPA employs a risk-based approach for determining protectiveness to human health and the environment. Under CERCLA, a remedy is protective if it is within the risk range of 3:10,000 to 1:1,000,000 (3×10^{-4} to 10^{-6}) excess lifetime risk of getting cancer.

Each agency that has issued radiation management standards would argue that its standards are protective of human health (dose-based standards) and/or the environment (risk-based standards). USEPA and NRC have chosen different approaches to protect human health and the environment in the various radiation management standards they have promulgated.

While the USEPA CERCLA program establishes a risk-based standard for measuring protectiveness, the USEPA uranium mill tailings program sets forth numerical standards for radium in soil and for radioactive constituents in groundwater that are not strictly either risk-based or dose-based standards. The USEPA uranium mill tailings program does establish a radon dose standard.

In UMTRCA, NRC was directed to adopt standards established by the USEPA for management of uranium mill tailings at active uranium and thorium processing facilities. NRC standards for uranium mill tailings therefore parallel the USEPA standards for uranium mill tailings. While NRC has established numerical standards that are identical to the USEPA uranium mill tailings standards, other NRC standards and criteria for management of uranium mill tailings are more detailed than those of the USEPA.

In its rule for decommissioning and terminating NRC licenses, NRC has established a dose-based standard for unrestricted or restricted use of property. USEPA has argued in an agency memorandum that the standard in the NRC rule is not sufficiently protective of human health, and is therefore not to be used as an ARAR. NRC argues that its standard of 25 millirem per year (mrem/yr) plus ALARA (as low as reasonably achievable) will always result in a site cleanup that is well within the CERCLA risk guidelines of 3×10^{-4} to 10^{-6} and that the NRC standard therefore meets the CERCLA protectiveness criteria. In order for USEPA's determination to be mandatory for the regulated community, USEPA must promulgate its determination as a rule.¹ USEPA has not promulgated its determination as a rule, so the judgment by USEPA that the NRC standards are not sufficiently protective of human health is not binding for any regulated entity. The USACE is therefore under no restraints to consider the NRC license termination criteria as a potential ARAR at the WCS.

Different standards under consideration as potential ARARs for potential remedial alternatives (i.e., cleanup for various radionuclides or containment) at the WCS are summarized in the following Table 2 and evaluated as relevant and appropriate requirements for the WCS in the paragraphs that follow. Standards considered in Table 2 are relevant and appropriate because there are no applicable requirements for radionuclide contamination at the WCS; that is, there is not an absolute mandatory standard.

Table 2. Standards for Cleanup Levels

Agency/Regulation	Standard/Numerical Limit
USEPA, uranium mill tailings (40 CFR 192)	Ra-226, Ra-228: 5 pCi/g (surface)
NRC, uranium mill tailings (10 CFR Part 40 App A)	15 pCi/g (subsurface)
	Rn-222: 20 pCi/m ² -s
NRC, decommissioning (10 CFR Part 20 Subpart E)	Unrestricted use: 25 mrem/yr TEDE plus ALARA
	Restricted use: up to 100 mrem/yr or 500 mrem/yr if Institutional controls fail
	Alternate criteria: 100 mrem/yr plus ALARA
NRC, land disposal of low-level radioactive waste (10 CFR Part 61)	Annual effective dose to any member of the public: 25 mrems to the whole body, 75 mrems to the thyroid, and 25 mrems to any other organ
NRC, dose limits for individual members of the public (10 CFR § 20.1301)	Total Effective Dose Equivalent (TEDE) of 100 mrem/yr

Groundwater standards are not included in the potential ARARs because groundwater is not a targeted media for cleanup in the WCS Operable Unit. Contamination in groundwater at the NFSS will be addressed as a separate operable unit. Groundwater considerations arise in the WCS remedial action, however. As the WCS remediation is performed, depending on the remedial alternative selected, any remedial action must be implemented in a manner that does not contaminate the groundwater. In addition, groundwater involvement will be thoroughly explored before any potential remedial alternative is selected that allows waste to remain onsite. Accordingly, groundwater standards are included in Table 3 for groundwater protection purposes.

5.0 ARAR DISCUSSION

As stated in Section 2, a rule is applicable as an ARAR if it specifically addresses the entity to be subjected to its requirements, the types of substances or activities to be subjected to its requirements, and the types of activities that will be implemented, and if the rule is in effect for the appropriate time period.

There are no applicable ARARs for the radionuclide contaminants at the WCS. That is to say, none of the rules under consideration as potential ARARs for radionuclide contaminants in the WCS is applicable to the site. The USEPA rules and NRC rules for uranium mill tailings are only applicable to Title I UMTRCA sites and Title II UMTRCA sites, respectively. The NRC rules for decommissioning and license termination are only applicable to NRC licensees. Likewise, the NRC rules for disposal of low-level radioactive waste are only applicable to NRC licensees. However, any of these rule could be relevant and appropriate for remedial actions at the WCS. An analysis of whether each rule is relevant and appropriate is presented in the next few subsections.

The relevant and appropriate analysis is conducted in accordance with comparisons set forth in the National Contingency Plan (NCP), as explained in Section 1 of this memorandum and repeated here for clarity:

- (i) the purpose of the requirement and the purpose of the CERCLA action;
- (ii) the medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;
- (iii) the substances regulated by the requirement and the substances found at the CERCLA site;

- (iv) the actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site;
- (v) any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site;
- (vi) the type of place regulated and the type of place affected by the release or CERCLA action;
- (vii) the type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action; and
- (viii) any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

6.0 REGULATIONS OR REQUIREMENTS EVALUATED AS POTENTIAL ARARS FOR THE NFSS WCS REMEDIAL ACTION

The following subsections discuss the potential ARARs evaluated for the WCS. Tables 3 and 4 contain a summary of the potential radiological and hazardous waste ARARs, respectively.

6.1 10 CFR PART 40 APPENDIX A, CRITERIA RELATING TO THE OPERATION OF URANIUM MILLS AND THE DISPOSITION OF TAILINGS OR WASTE PRODUCED BY THE EXTRACTION OR CONCENTRATION OF SOURCE MATERIAL FROM ORES PROCESSED PRIMARILY FOR THEIR SOURCE MATERIAL CONTENT.

6.1.1 General Discussion

The NRC regulatory program at 10 CFR Part 40 Appendix A addresses situations sufficiently similar to the circumstances of the remedial action contemplated at the WCS that it could be relevant to the situation. The only two reservations to this statement are that the requirement does not expressly address low-level material of such high activity as some of the material in the WCS, and that the requirement is for management of mill tailings at an active uranium mill processing facility operated under an NRC license, rather than for an inactive storage facility (i.e., the type of place regulated is not the same). Years of monitoring have demonstrated the capability for the low-level higher-activity waste in the WCS to be safely addressed under the requirements of this rule, in a manner that is protective of human health and the environment. [Therefore, 10 CFR Part 40 Appendix A is well-suited to the site so that it is appropriate for use at the site.] For the low-level, low-activity waste present in the WCS, the requirement is well-suited to the site. Seeing that 10 CFR Part 40 Appendix A addresses situations similar to the circumstances at the WCS and is well-suited to the site, it is both relevant and appropriate for use as an ARAR at the WCS site.

6.1.2 Relevant and Appropriate Analysis

- (i) Purpose – The purpose of the rule is to provide standards for long-term management and disposal of 11(e)(2) byproduct material, consisting of mill tailings and other wastes, from active mill processing facilities.

(ii) Media regulated under the rule are soil, water, and air: Media regulated at the site are the same.

(iii) Substances regulated by the requirement are 11(e)(2) byproduct materials. These are the same as the substances found at the WCS: higher-activity low-level uranium mill tailings, low-activity low-level wastes resulting from MED activities, and remediation wastes from contamination resulting from MED activities. Two wastes at the WCS may not be included in the scope of this rule: sludge waste in barrels that may be RCRA hazardous, and soil and debris remediation waste contaminated with cesium-137, if present within the WCS. The cesium-137 material is a low-level radioactive waste that most likely derives from 11(e)(1) byproduct materials.

The radioactive material in some uranium mill tailings present in the WCS is different from uranium mill tailings at other sites in that some of the WCS waste exhibits a higher activity level. Although some of the uranium mill tailings at the WCS are higher-activity than "typical" mill tailings, they are still uranium mill tailings. The residues do not fall within any high-level waste classification as defined under USEPA rules, NRC rules, or DOT rules.

Substances regulated by 10 CFR Part 40 Appendix A include thorium radionuclides as well as uranium and radon radionuclides. Thorium (Th-230) exists as a daughter product whenever uranium is present, which can result in thorium "hot spots" at a contaminated site. A regulation that includes provisions for establishing a standard for thorium contamination therefore may be more protective of human health than a regulation that does not address thorium contamination (such as 40 CFR Part 192).

(iv) Actions regulated by the rule – long-term management and containment or disposal – are the same actions as contemplated at the WCS. 10 CFR Part 40 Appendix A establishes siting and other criteria for safe disposal of radioactive materials.

10 CFR Part 40 Appendix A does not expressly establish cleanup standards for unrestricted use, as does 40 CFR Part 192. However, cleanup standards can be extrapolated from the language of the rule, which provides that the rule does not apply to sites that have less than 5 pCi/g of radium-226 (Ra-226) and radium-228 (Ra-228) in the first 15 centimeters (6 inches) and 15 pCi/g of Ra-226 and Ra-228 in the next 15 centimeters (6 inches).

(v) No variances are discussed for this requirement.

(vi) The type of place regulated by 10 CFR Part 40 Appendix A is an active uranium or thorium mill processing facility. These facilities are generally located in dry, arid climates away from populated areas. The WCS is a contained waste storage facility located in an area that is not dry or arid, and where no active milling or processing has occurred. Therefore, the type of place envisioned under the rule is not the same as the type of place regulated at the WCS.

(vii) The type and size of structure or facility to be regulated under the rule is a milling facility with wastes typically contained onsite in some manner. At closed or inactive sites, the wastes are typically contained in large waste piles. Active facilities may contain the waste in some type of closed structure. The type and size of the WCS structure at NFSS may be similar to that found at a milling facility for tailings.

- (viii) Under 10 CFR Part 40 Appendix A, Criterion 11, when a site undergoes long-term stabilization (containment of uranium mill tailings on-site), ownership and control of the land will transfer to either the federal or agreement state government. After transfer, the government may allow another use of the land that is compatible with remedy integrity. Ownership and control of the WCS is currently with the federal government and will remain so for any alternative requiring control of future land use.

6.1.3 10 CFR Part 40 Appendix A – Standards

Rule applies to: residual radioactive materials (pre-1978 11(e)(2)) and 11(e)(2) materials at closed, inactive, or active uranium or thorium processing facilities, as listed in UMTRCA, added by the DOE, or under an NRC license for mill tailings management.

Long-term stabilization standard:

*Design standard:

1. To be effective for up to 1000 years to the extent reasonably achievable, and in any case for at least 200 years, and
2. Limit average radon-222 (Rn-222) release rate to 20 picoCuries per meter squared-second (pCi/m²-sec) or increase average concentration of Rn-222 outside disposal site by more than 0.5 pCi/liter (L).
(*no monitoring required)

Cleanup criteria for unrestricted use of property:

... not expressly specified in rule; extrapolated from the 5/15 pCi/g exclusion [i.e., property that does not contain levels of radium above 5 pCi/g in the first 15 centimeters (cm) or 15 pCi/g in the next 15 cm are excluded from the requirements of this rule]. Uranium/thorium soil standards are calculated in reference to a benchmark dose using levels of radium after cleanup to the 40 CFR Part 192 standards (5/15 pCi/g).

²Groundwater protection standards:

1. Combined Ra-226 and Ra-228: 5 pCi/L,
2. Combined uranium-234 (U-234) and uranium-238 (U-238): 30 pCi/L; and
3. Gross alpha particle activity (excluding radon and uranium): 15 pCi/L.

Design standards in rule in addition to longevity standard:

design requirements for stormwater, wind protection and erosion factors (Criterion 4), but siting is more important because of long-term nature of isolation.

Siting standards in rule:

General goal is isolation of tailings without ongoing maintenance. Site features to consider when selecting a disposal site for uranium mill tailings include:

1. Remoteness from populated areas;
2. Hydrologic and other natural conditions as they contribute to continued immobilization and isolation of contaminants from groundwater sources; and

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

4 Siting considerations are also given for rainfall/stormwater, wind protection from topographic
5 features, and erosion potential – flat embankment and cover slopes. Vegetative cover is also
6 required to reduce wind and water erosion. Rock cover is considered. The disposal site may
7 not be located in a significant seismic zone (Criterion 4).
8

9 Other requirements of rule:

10
11 Goal is to dispose of tailings so that no active maintenance is required to preserve the
12 conditions of the site, although disposal sites remain.
13

14 **6.2 40 CFR PART 192 SUBPARTS A, B, AND C, HEALTH AND ENVIRONMENTAL**
15 **PROTECTION STANDARDS FOR URANIUM AND THORIUM MILL TAILINGS**
16

17 **6.2.1 General Discussion**
18

19 This USEPA regulatory program addresses situations sufficiently similar to the circumstances of the
20 remedial action contemplated that it could be relevant to the situation. The only two reservations to this
21 statement are that the requirement does not address low-level material of such high activity as that at
22 the WCS, and the requirement was envisioned for a different type of place than the NFSS. 40 CFR
23 Part 192 is less comprehensive than 10 CFR Part 40 Appendix A because that rule provides for
24 calculation of cleanup levels for thorium in soil, while this rule does not. In addition, for containment
25 alternatives, 10 CFR Part 40 Appendix A provides siting standards as well as design standards, while
26 this rule does not, and only cites performance standards relative to any on-site management alternatives
27 (e.g., containment). Years of monitoring have demonstrated the capability for the low-level higher-
28 activity waste in the WCS to be safely addressed by this rule in a manner that is protective of human
29 health and the environment, which renders the rule appropriate for use at the site. Moreover, the
30 requirement is well-suited to the site for the low-level, low-activity waste that is present. Overall, the
31 requirement is less well-suited than 10 CFR Part 40 Appendix A because it is less comprehensive.
32

33 **6.2.2 Relevant and Appropriate Analysis**
34

- 35 (i) Purpose – the purpose of 40 CFR Part 192 Subparts A, B, and C is to provide for the long-
36 term stabilization (containment or disposal) or cleanup of uranium/thorium mill tailings at
37 closed or inactive uranium/thorium processing or milling operations. The purpose of the
38 CERCLA action at the WCS is to provide for either long-term containment or excavation
39 and removal of mill tailings that derive from uranium milling which occurred at locations
40 other than the NFSS.
41
42 (ii) Medium – the media regulated under the rule, air (radon), soil (uranium), water (uranium),
43 and buildings, are the same as the media regulated in the CERCLA action.
44
45 (iii) Substances regulated by the rule – uranium and its decay products - are the substances found
46 at the CERCLA site. Cleanup levels for thorium, a daughter of uranium, cannot be
47 calculated under this rule.
48
49 (iv) Actions or activities regulated by the rule – either long-term containment or cleanup of soil
50 to a 5/15 pCi/g level – are similar to the remedial actions contemplated at the WCS.
51

(v) Variances are allowed if:

- it is possible that a long-term containment situation may be an interim remedial action, particularly if the health and environmental consequences of moving the waste materials are more harmful than the consequences of leaving the material in place.
- compliance with cleanup option will result in greater risk to human health and the environment than alternative options.

(vi) Type of place regulated compared with the type of place affected by the CERCLA action - Type of place regulated is inactive milling operation sites, which are typically located in isolated spots in dry climates (low exposure and migration potential). Usually the mill tailings are spread out over a large area, and consist of low activity, low-level waste. The NFSS is not isolated and it is not located in a dry climate, nor is the radioactivity in the WCS spread out over a large area.

(vii) Type and size of structure or facility regulated compared with the type and size of structure or facility contemplated by the CERCLA action. Mill tailings at inactive or closed uranium/thorium processing wastes are typically spread out over a large area, with poor access controls. These radioactive wastes are generally large volume low activity wastes. At the WCS, there are higher-activity wastes of relatively small volumes, which are contained within the waste containment structure.

(viii) Use or potential use of affected resources in the rule compared with use or potential use of the affected resource at the CERCLA site - Inactive mill tailing sites will either remain in government control or be released to the public (if a site meets the 5/15 pCi/g criteria). Assumptions for future land use for the NFSS site range from unrestricted use to remaining in government control in perpetuity.

6.2.3 40 CFR Part 192 Subparts A and B – Standards

Rule applies to: Pre-1978 11(e)(2) byproduct material, also called residual radioactive material; typical activity level of 10,000 to 20,000 pCi/g, up to 50,000 pCi/g. (Material in the WCS has an activity level of up to 500,000 pCi/g).

Cleanup standards in rule:

1. Radium concentrations in soil cannot exceed background by more than 5 pCi/g in the upper 15 cm of soil or 15 pCi/g in any 15 cm layer below the upper layer, averaged over an area of 100 m²;
2. Uranium in soil is calculated using a risk assessment approach.

Long-term containment standards in rule:

*Design performance standards:

1. To be effective for up to 1000 years to the extent reasonably achievable, and in any case for at least 200 years, and
2. Limit average Rn-222 release rate to 20 pCi/m²-sec or increase average concentration of Rn-222 outside disposal site by more than 0.5 pCi/L.
(*no monitoring required)

²Groundwater protection standards:

1. Combined Ra-226 and Ra-228: 5 pCi/L,

2. Combined U-234 and U-238: 30 pCi/L; and
3. Gross alpha particle activity (excluding radon and uranium): 15 pCi/L.

Other requirements of rule:

Long-term surveillance and maintenance of (Title I) sites are conducted under an NRC license.

No additional design standards; no siting standards in rule.

6.3 10 CFR PART 20 SUBPART E, RADIOLOGICAL CRITERIA FOR LICENSE TERMINATION

6.3.1 General Discussion

This NRC regulatory program addresses situations sufficiently similar to the circumstances of the remedial action contemplated that it is relevant to the site, except for the regulatory exclusion contained in the rule for uranium/thorium mill tailings and facilities. If it is determined that any material in the WCS is too far removed from mill tailings operations to be classified as uranium/thorium mill tailings, then this requirement would be relevant to the site. For uranium and thorium radionuclides, 10 CFR Part 20 Subpart E contains performance requirements rather than numerical standards. Use of this requirement may be more well-suited for the site and therefore more appropriate for use at the WCS than 10 CFR Part 40 Appendix A, but for the regulatory exclusion, as performance standards may be more reasonably and cost-effectively attainable than numerical standards while ensuring protectiveness for human health and the environment.

6.3.2 Relevant and Appropriate Analysis

- (i) Purpose – the purpose of 10 CFR Part 20 Subpart E is to “provide a clear and consistent regulatory basis for determining the extent to which lands and structures must be remediated before decommissioning of a site can be considered complete and the [NRC] license terminated.” The purpose of the CERCLA action at the WCS is to provide for either long-term containment or excavation and removal of uranium tailings and wastes that derive from source material milling operations which were carried out at other facilities.
- (ii) Media regulated or affected by the regulation is the cumulative dose from radioactive material in air, soil, water, groundwater, and buildings at the site. Media at the WCS involved air and soil.
- (iii) Substances regulated by 10 CFR Part 20 Subpart E – the provisions of this rule apply to source, special nuclear, and byproduct material. The material at the WCS may be byproduct material (any soil and debris containing cesium-137 would be 11(e)(1) byproduct material). Uranium/thorium mill tailings and facilities associated with them are expressly excluded from the terms and conditions of this rule because uranium/thorium mill tailings and facilities are regulated under 10 CFR Part 40 Appendix A and 40 CFR Part 192, Subparts A, B, and C.
- (iv) Actions or activities regulated by the rule – decontamination and decommissioning of NRC-licensed sites and release of land to the public. Release can be either unrestricted or

restricted. Some actions under consideration at the WCS are the same – decontamination and decommissioning (excavation and removal).

(v) No variances or waivers are considered for the requirements of this rule.

(vi) Type of place regulated and the type of place affected by the CERCLA action – The type of place regulated under the rule is any NRC-licensed facility except for uranium or thorium processing facilities. The type of place affected by the CERCLA action is a storage site for uranium processing wastes.

(vii) Type and size of structure or facility regulated and the type and size of structure or facility in the CERCLA action - The WCS, if it did not hold uranium mill tailings, would be considered to be the type and size of structure or facility regulated under 10 CFR Part 20 Subpart E.

(viii) Consideration of use or potential use of affected resources – NRC license termination proceedings in 10 CFR Part 20 Subpart E. Land can be released for unrestricted use or for restricted use, with land use controls in place. At the WCS, both options are under consideration for future land use.

6.3.3 10 CFR Part 20 Subpart E – Standards

Rule applies to: This rule applies to the decommissioning of NRC-licensed facilities: source, special nuclear, and byproduct material, except for uranium and thorium mill tailings already subject to 10 CFR Part 40 Appendix A.

Cleanup standard:

- Unrestricted use: 25 mrem/y TEDE and ALARA;
- Restricted use: 25 mrem/y TEDE, ALARA, durable institutional controls, license termination plan (LTP), public input, and 100 mrem/yr or 500 mrem/yr if institutional controls fail; and
- Alternate criteria: 100 mrem/yr, ALARA, LTP, and EPA and public input.

²Groundwater standard:

Groundwater is included in the 25 mrem/yr TEDE standard; amount of radiation from all media, cumulatively, is included when calculating cleanup levels for each medium.

6.4 10 CFR PART 61, LICENSING REQUIREMENTS FOR LAND DISPOSAL OF RADIOACTIVE WASTE

6.4.1 General Discussion

At the outset, this rule is not applicable and possibly not an ARAR because: 1) 11(e)(2) materials are expressly excluded from the rule; 2) the activity level of existing low-level higher-activity wastes is greater than the 100 nanocuries /g allowed by the rule; and 3) the material is not material that falls within the definition of the rule. However, if a remedial alternative is selected that will allow the WCS material to remain on-site, then this rule may be useful for providing siting and disposal criteria to supplement standards in 10 CFR Part 40 Appendix A, for radionuclides that have a higher activity level. If that is the case, then disposal standards that are relevant and appropriate would be cited as ARARs.

6.4.2 Relevant and Appropriate Analysis

- (i) Purpose – These rules establish requirements for near-surface disposal of Class A, B, and C commercially-generated low-level radioactive wastes. The definition of wastes under 10 CFR Part 61 excludes 11(e)(2) byproduct materials (uranium or thorium tailings and waste). Near-surface disposal is disposal within 30 meters of the earth's surface. Requirements are established in the rule for disposal site, disposal design, and disposal facility operations (including equipment, facilities, and procedures), disposal site closure, and post-closure institutional control). These requirements must meet performance objectives established in the rule. The purpose of the CERCLA action at the WCS is to provide for either long-term containment or excavation and removal of mill tailings from uranium milling which occurred at locations other than the NFSS.
- (ii) Medium regulated in the rule – not relevant for the residues and associated wastes, but may be relevant for other materials handled at the site, such as waste materials from the Knolls Atomic Power Laboratory.
- (iii) Substances regulated by the requirement include low-level radioactive wastes containing source, special nuclear, or byproduct material. Low-level radioactive waste has the same meaning as in the Low-Level Radioactive Waste Policy Act; that is, radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11(e)(2) of the Atomic Energy Act (uranium or thorium tailings and waste). Substances in the WCS may be classified as 11(e)(2) material or as pre-1978 11(e)(2) material and would therefore be excluded from regulation under these rules. This exclusion is most likely based on the fact that a separate regulatory program exists for 11(e)(2) wastes, rather than on actual waste characteristics.
- (iv) Actions or activities regulated by the requirement are long-term disposal of low-level radioactive wastes. Long-term containment of the wastes is a potential remedial alternative for the WCS at NFSS.
- (v) Variances are not being considered for this requirement.
- (vi) Type of place regulated is very similar to the type of place affected by the CERCLA action: i.e., each is a near-surface disposal site for the disposal of Class C or similar to Class C radioactive material.
- (vii) Type and size of structure or facility regulated under the rule may be larger or more extensive than the type and size of structure contemplated at the WCS.
- (viii) Consideration of use or potential use of affected resources in the requirement is that the federal government will assume long-term care of the site, and that the site can be used for other purposes as long as the integrity of the disposal site is not breached. One potential use of the WCS site is that the federal government will assume long-term care of the site.

6.4.3 10 CFR Part 61 – Standards

These rules apply to NRC licensees. The FUSRAP material is not subject to NRC license authority. The Department of Energy (DOE) will be the long-term owner of the site. These rules take long-term ownership by DOE into consideration.

Rules apply to: commercially-generated low-level radioactive wastes containing source, special nuclear, and byproduct material of up to 100 pCi/g activity.

Disposal standards:

- Disposal standards emphasize stability and minimization of water access to waste.
- Class C waste containers (up to 100 nanocuries /gram of alpha-emitting transuranic radionuclides with a half-life greater than five years) should be designed to be stable for at least 300 years.
- Institutional controls can be used for up to 100 years.
- To protect against inadvertent intruders, Class C waste must either be buried with at least 5 meters below the top surface of cover or have intruder barriers installed that will be effective for 500 years.
- Other design features are described in below and performance standards are described below.

Design features required to be described under 10 CFR § 61.12 include:

- Those related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes, and covers; contact of wastes with standing water; disposal site drainage; disposal site closure and stabilization; elimination to the extent practicable of long-term disposal site maintenance; inadvertent intrusion; occupational exposures; disposal site monitoring; and adequacy of the size of the buffer zone for monitoring and potential mitigative measures.
- Wastes must be placed and covered so that the radiation dose does not exceed limits established in 10 CFR §§ 20.1301 and 20.1302 (Radiation protection standards) at the time the license is transferred to the long-term owner. Boundaries must be mapped by means of a land survey and marked in an easily defined way. A buffer zone of land must be maintained between any buried waste and the disposal site boundary. Only wastes contaminated with radioactive wastes are allowed at the facility.

Other design requirements are (10 § CFR 61.51):

- Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure;
- The disposal site must be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives are met;
- Covers must be designed to minimize to the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface geologic processes and biotic activity;
- Surface features must direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance in the future.
- The disposal site must be designed to minimize to the extent practicable the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal.

Site characteristics under 10 CFR § 61.12 include:

A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must include geologic,

1 geotechnical, hydrologic, meteorologic, climatologic, and biotic features of the disposal site
2 and vicinity.

3
4 Performance objectives for any land disposal facility under 10 CFR Part 61 Subpart C are:

- 5
6 • An annual dose standard of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem
7 to any other organ of any member of the public from any media, plus ALARA;
8 • Protection of inadvertent intruders at any time after active institutional controls over the
9 disposal site are removed;
10 • Protection of individuals during operations, in accordance with radiation protection standards
11 of 10 CFR Part 20, plus ALARA, or from effluents from the land disposal facility in
12 accordance with standards described in the first bullet above; and
13 • Long-term stability of the disposal site must be achieved in the siting, design, and closure of
14 the facility, in a manner that eliminates to the extent practicable the need for ongoing active
15 maintenance of the disposal site, so that only surveillance, monitoring, or minor custodial care
16 are required.

17
18 Other siting standards emphasize disposal site suitability for isolation of waste and for site
19 features that will meet performance objectives. Site suitability features include:

- 20
21 • The disposal site must be capable of being characterized, modeled, analyzed and monitored;
22 • Projected population growth and future developments are not likely to affect the ability of the
23 disposal facility to meet the performance objectives;
24 • Avoid areas having natural resources which, if exploited, would result in failure to meet the
25 performance objectives;
26 • Site must be generally well drained and free of areas of flooding or frequent ponding. Waste
27 disposal shall not take place in a 100-year flood plain, coastal high-hazard area or wetland;
28 • Minimize upstream drainage areas to decrease the amount of runoff which could erode or
29 inundate waste disposal units;
30 • Site must provide sufficient depth to the water table that groundwater intrusion, perennial or
31 otherwise, into the waste will not occur. Exceptions to this requirement can be granted if it can
32 be demonstrated that performance objectives can be met. In no case will waste disposal be
33 permitted in the zone of fluctuation of the water table;
34 • Hydrogeologic unit used for disposal shall not discharge groundwater to the surface within the
35 disposal site;
36 • Avoid areas where tectonic processes such as faulting, folding, seismic activity, or vulcanism
37 may occur with such frequency and extent to significantly affect the ability of the disposal site
38 to meet the performance objectives, or may preclude defensible modeling and prediction of
39 long-term impacts;
40 • Avoid areas where surface geologic processes such as mass wasting, erosion, slumping,
41 landsliding, or weathering occur with such frequency and extent to significantly affect the
42 ability of the disposal site to meet the performance objectives or may preclude defensible
43 modeling and prediction of long-term impacts;
44 • Do not locate where nearby facilities or activities could adversely impact the ability of the site
45 to meet the performance objectives or significantly mask the environmental monitoring
46 program.

Other requirements of rule:

- In choosing a disposal site, site characteristics should be evaluated for at least a 500-year timeframe.
- Ongoing maintenance should not be required during the period of institutional control, after the five year post-closure observation and maintenance period. If DOE is the long-term site manager, DOE does not need to obtain an NRC license.

6.5 40 CFR PART 261 SUBPART C: IDENTIFICATION AND LISTING OF HAZARDOUS WASTE: CHARACTERISTICS OF HAZARDOUS WASTE

6.5.1 General Discussion

Wastes in barrels placed in the WCS in 1991 are suspected to be contaminated with RCRA hazardous volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). In addition, some waste containing radioactive material may be subject to the RCRA hazardous waste rules as either applicable or relevant and appropriate requirements, for heavy metals, particularly lead. Any of these wastes would be characteristic hazardous waste rather than listed hazardous waste. Under the RCRA rules, any RCRA waste materials that fail the Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic waste must be managed as hazardous waste as well as radioactive waste.

Note that only solid wastes can be hazardous wastes subject to regulation under RCRA. Per the terms of the RCRA regulations, source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 are excluded from the definition of solid waste; that is to say, these materials are not solid wastes. Any radioactive material that is pure byproduct material, including all constituents of that byproduct material, is not subject to RCRA regulation. The 11(e)(2) [pre-78] material in the WCS is such pure byproduct material, and is therefore not subject to RCRA regulation.

In addition, or alternatively, certain solid wastes are excluded from the definition of hazardous waste, and are therefore not regulated as hazardous wastes. Under the Bevill Amendment to the RCRA requirements, solid waste from the extraction, beneficiation, and processing of ores and materials, including overburden from the mining of uranium ore, are excluded from the definition of hazardous waste. Much of the higher activity low-level waste material in the WCS derives from extraction and beneficiation of ores. Under the Bevill Amendment, this material would be exempt from regulation under RCRA.

6.5.2 Applicable or Relevant and Appropriate Analysis

RCRA hazardous waste rules would be applicable to any VOC or SVOC RCRA hazardous components in the sludge barrels at the WCS.

RCRA hazardous waste rules would also be applicable to any heavy metals that are a component of a mixed waste or a radioactive waste material if the radioactive waste material is not a byproduct material (either 11(e)(1) and 11(e)(2)) or if the radioactive waste material is not otherwise excluded from regulation as a hazardous waste (such as Bevill Amendment waste).

For byproduct material or Bevill Amendment waste, the RCRA hazardous waste rules may be relevant and appropriate to the hazardous constituent of the waste for purposes of calculating for the materials in the WCS a cleanup level that is protective of human health and the environment.

1
2 **6.5.3 40 CFR Part 261 Subpart C – Standard**
3

4 A solid waste exhibits the characteristic of toxicity if, using TCLP, the extract from a
5 representative sample of the waste contains any of the contaminants listed in 40 CFR 261.24 at a
6 concentration equal to or greater than the concentration listed in the rule.
7

8 **7.0 REQUIREMENTS EVALUATED AND THEN DISCARDED FOR**
9 **CONSIDERATION AS POTENTIAL ARARS**
10

11 The following subsections discuss the potential requirements evaluated and then discarded for
12 consideration as potential ARARs. Table 5 contains a summary of these requirements.
13

14 **7.1 40 CFR PART 191, ENVIRONMENTAL RADIATION PROTECTION STANDARDS FOR**
15 **MANAGEMENT AND DISPOSAL OF SPENT NUCLEAR FUEL, HIGH-LEVEL AND**
16 **TRANSURANIC RADIOACTIVE WASTES**
17

18 **7.1.1 General Discussion**
19

20 This rule addresses high-level radioactive wastes that are, by definition and by physical composition,
21 not the same as the substances found at the WCS. That is to say, the substances regulated by the rule
22 are not the same as the substances in the WCS. The requirements of this rule provide for the maximum
23 isolation of radioactive wastes of all the rules being considered as ARARs for the WCS. One major
24 protection afforded by this rule is that design of a containment structure for high-level waste,
25 transuranic waste, or spent nuclear fuel, must ensure protection for at least 10,000 years. This
26 requirement does not address situations sufficiently similar to the circumstances of the remedial action
27 contemplated so that it should be considered relevant. Other standards can fully ensure protectiveness.
28

29 As noted previously in this document, the major radiation hazard from uranium mill tailings arises from
30 inhalation of alpha radiation from radon decay products, which can cause lung cancer. Radon comes
31 from decay of radium constituents in uranium mill tailings. Radium/radon pose both a present hazard
32 to human health, and a long-term hazard if the mill tailings are vulnerable to human mismanagement
33 and to dispersal by natural forces. Design and numerical standards for radon flux as set forth in other
34 requirements considered as ARARs for the radionuclide material in the WCS are protective of human
35 health and the environment. Years of monitoring at the WCS facility demonstrate that the containment
36 structure is capable of meeting these standards as established in, for example, 10 CFR Part 40
37 Appendix A.
38

39 Siting standards contained in 10 CFR Part 40 Appendix A, supplemented with siting standards from 10
40 CFR Part 61 as necessitated by protectiveness concerns, supplement the protectiveness afforded by the
41 design standards of 10 CFR Part 40 Appendix A and the numerical standard for radon flux.
42

43 In brief, the additional storage and management standards or design longevity standards of 40 CFR Part
44 191 do not confer additional protectiveness, and would give rise to a much more burdensome
45 regulatory scheme.
46
47

7.1.2 Relevant and Appropriate Analysis

- (i) Purpose – These rules establish standards for management, storage, and disposal of spent nuclear fuel, high-level radioactive waste, and transuranic radioactive waste. Transuranic radioactive waste is:

... waste containing more than 100 nanocuries (100,000 pCi) per gram of waste of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, except for:

- high-level radioactive wastes;
- wastes that the Department (of Energy) has determined, with the concurrence of the Administrator (of the USEPA) do not need the degree of isolation required by this part; or
- wastes that the Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

A portion of the waste present in the WCS, approximately 3,200 cubic yards of K-65 residues with specific activities in excess of 500,000 pCi/g, is present in the WCS. This level of activity amounts to 500 nanocuries (nCi) of alpha-emitting radionuclides, which are not transuranic, but do have a half-life greater than 20 years. The remaining wastes (over 300,000 cubic yards) all have specific activities less than 100 nCi/g.

- (ii) Medium is the same for the rule and for the WCS.

- (iii) Substances regulated by the rule are different by definition from those found at the WCS. Substances regulated by the rule are high-level waste, transuranic waste, and spent nuclear fuel. Spent nuclear fuel is usually nuclear fuel from nuclear reactors. Transuranic wastes are usually items that have become contaminated as a result of activities associated with the production of nuclear weapons (e.g., rags, equipment, tools, and contaminated organic and inorganic sludges). High-level wastes are traditionally solid and liquid wastes from reprocessing spent nuclear fuel.

- (iv) Actions or activities regulated by the rule are similar to some potential remedial alternatives at the WCS.

- (v) Reasons for obtaining a waiver of these requirements under CERCLA could include:

- compliance with the requirement at the facility will result in greater risk to human health and the environment than alternative options if the waste is removed; and
- the remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria, or limitation, through use of another method or approach.

- (vi) Type of place regulated is nuclear reactors, facilities that produce nuclear weapons, and spent nuclear fuel reprocessing facilities. None of these types of places are similar to the ones that generated the WCS waste, e.g., mill processing facilities or residue from cleanup of milling operations.

- (vii) Type and size of structure or facility regulated under this rule may be similar to the (WCS).

(viii) Use or potential use of affected resources – in the rule it is contemplated that the facility will remain under federal control. This is an alternative that is under consideration at the WCS as well.

7.1.3 40 CFR Part 191 – Standards

Rule applies to: transuranic wastes, which are materials containing concentrations >100 nanocuries per gram of waste of alpha-emitting transuranic isotopes, with half-lives > 20 years; high-level waste; and spent nuclear fuel.

Subpart A of the rule sets forth management and storage standards; Subpart B of the rule sets forth disposal standards; and Subpart C of the rule sets forth groundwater standards.

Cleanup standards:

The rule does not provide for cleanup standards. However, the rule provides NRC management and storage standards of:

- 25 mrem whole body;
- 75 mrem to the thyroid; and
- 25 mrem to any other critical organ.

DOE standards are:

- 25 mrem whole body and
- 75 mrem to any critical organ.

Design standards:

1. Design standard to limit cumulative releases of radionuclides to the accessible environment for 10,000 years.
2. Six qualitative assurance requirements.
For facilities not regulated under 10 CFR Part 60 (NRC requirements), disposal of spent nuclear fuel, high level, or transuranic waste, must be conducted in accordance with the following provisions:
 - a. Reliance on active institutional controls for a period of up to 100 years only;
 - b. Monitoring of the disposal system until there are no significant concerns to be addressed by further monitoring;
 - c. Designation of disposal sites by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location;
 - d. Use of both engineered and natural barriers to isolate the wastes from the accessible environment at a single facility;
 - e. Sites selected for disposal should not be where mining has occurred, may occur, or where a mineral or other resource is located; and
 - f. Sites should be selected that allow wastes to be removed for a period of time after emplacement.
3. Exposure limits to individuals for 10,000 years after disposal, of 15 mrem/yr of annual committed effective dose (CED).

Alternative provisions for disposal may be substituted for any of the above disposal provisions by way of a public notice and comment rulemaking procedure undertaken by the USEPA (40 CFR 191.16).

²Groundwater standards:

- Disposal systems must be designed so that, for each pollutant, the level of contamination in offsite underground sources of drinking water (USDWs) will not, for 10,000 years, exceed the applicable maximum contaminant level (MCL).
- Alternative provisions for groundwater protection may be substituted for any of the above groundwater standards by way of a public notice and comment rulemaking procedure undertaken by the USEPA (40 CFR 191.26).

Siting standards:

Some of the six qualitative assurance requirements involve siting considerations.

Other requirements of rule:

This rule is for disposal in geologic repositories. Disposal of high-level, transuranic, or spent nuclear fuel wastes is not allowed in anyplace but a geologic repository.

These standards do not apply to wastes disposed of before November 18, 1985.

7.2 NYSDEC TAGM #4003: CLEANUP GUIDELINES FOR SOILS CONTAMINATED WITH RADIOACTIVE MATERIALS, SEPTEMBER 14, 1993

7.2.1 General Discussion

This State guidance is not a promulgated regulation, so if it were to be considered in determining a cleanup level for radionuclides at the WCS, it would be considered as a (TBC) requirement. TBCs are considered only when ARARs are not available or when ARARs are not sufficiently protective at the site. ARARs are available for the WCS that are protective of human health and the environment. Therefore, guidance set forth in the ARARs will be followed, rather than guidance set forth in the Technical Administrative Guidance Memorandum (TAGM).

7.2.2 TAGM #4003 – Standard

10 mrem/yr TEDE above that received from background levels of radiation in any one year, to the maximally exposed individual of the general public, plus ALARA.

7.3 NYSDEC TAGM #4046: DETERMINATION OF SOIL CLEANUP OBJECTIVES AND CLEANUP LEVELS (VOCs, SVOCs, HEAVY METALS), JANUARY 24, 1994

7.3.1 General Discussion

This State guidance is not a promulgated regulation, so if it were to be considered in determining a cleanup level for hazardous constituent contaminants at the WCS, it would be considered as a TBC requirement. TBCs are considered only when ARARs are not available or when ARARs are not sufficiently protective at the site. ARARs are available for the WCS that are protective of human health and the environment. Therefore, guidance set forth in the ARARs will be followed, rather than guidance set forth in the TAGM.

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2 **7.3.2 TAGM #4046 – Standard**
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4 Soil cleanup objectives are established in this TAGM as follows:

- 5 (i) Human health based levels that correspond to excess lifetime cancer risks of one in a million
6 for proved human carcinogens and probable human carcinogens, or one in one thousand for
7 possible human carcinogens.
8
9 (ii) Human health based levels for systemic toxicants, calculated from Reference Doses (RfDs).
10 RfDs are an estimate of the daily exposure an individual (including sensitive individuals) can
11 experience without appreciable risk of health effects during a lifetime. An average scenario
12 of exposure in which children ages one to six (who exhibit the greatest tendency to ingest
13 soil) is assumed. An intake rate of 0.2 gram/day for a five-year exposure period for a 16-
14 kilogram child is assumed.
15
16 (iii) Environmental concentrations which are protective of groundwater/drinking water quality;
17 based on promulgated or proposed New York State Standards;
18
19 (iv) Background values for contaminants; and
20
21 (v) Detection limits.
22

23 Recommended soil cleanup objectives are given for: VOCs, SVOCs, Organic Pesticides/Herbicides
24 and PCBs, and Heavy Metals.
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ENDNOTES

¹ All federal agencies are required to promulgate mandatory requirements by the notice and comment rulemaking procedures specified in the Administrative Procedures Act. Notice and comment rulemaking procedures ensure that the (potential) regulated community receives adequate notice of the (potential) mandatory requirement, that the (potential) regulated community has adequate opportunity to comment on the requirement, and that the regulatory agency then considers those comments before promulgating the regulation.

The determination or judgment made by USEPA with respect to the NRC standards has not undergone the level of scrutiny required to make such a determination legally binding on other parties. Therefore, the determination or judgment of the USEPA is not a mandatory requirement for any other federal agency.

² As stated in the text, groundwater is not targeted for cleanup in the WCS Operable Unit, so groundwater standards are not being considered within the ARARs discussion. However, groundwater standards are relevant when comparing the protectiveness of potential remedial alternatives and when considering siting requirements for any wastes left onsite, so they have been included within the sections of ARARs reciting the standards.

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Table 3. Summary of Potential ARARs

	Name of Requirement	Type of Waste Regulated – Level of Activity	Cleanup or Disposal	Cleanup Standards	Disposal Standards	Groundwater Provisions/ Standards	Siting Standards	Comments
10 CFR Part 40 Appendix A (NRC)	Criteria for Disposition of 11(e)(2) Tailings and Wastes	Residual radioactive materials (pre-1978 11(e)(2)) and 11(e)(2) materials	Same as for 40 CFR Part 192 Subparts D and E: after closure, standards do not apply to sites that have less than 5/15 pCi/g.	Not expressly specified in rule; extrapolated from the 5/15 pCi/g exclusion. Uranium/thorium soil standards are calculated in reference to a benchmark dose using levels of radium after cleanup to the 40 CFR Part 192 standards.	Design requirements for stormwater, wind protection and erosion factors (Criterion 4), but siting is more important because of long-term nature of isolation. Same numerical standard for radon flux as in 40 CFR Part 192.	Same requirements as for 40 CFR Part 192 Subparts A, B, and C: Combined Ra-226 and Ra-228: 5 pCi/L, combined U-234 and U-238: 30 pCi/L; and gross alpha particle activity (excluding radon and uranium): 15 pCi/L.s	General goal is isolation of tailings without ongoing maintenance. Siting considerations are listed in footnote 2.	Goal is to dispose of tailings so that no active maintenance is required to preserve conditions of the site.
40 CFR 192, Subparts A, B, and C (USEPA)	Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings – Control or Cleanup of Residual Radioactive Materials from Inactive Uranium Processing Sites	Pre-1978 11(e)(2) byproduct material, also called residual radioactive material; typical activity level of 10,000 to 20,000 pCi/g, up to 50,000 pCi/g	Provides standards for both cleanup (unrestricted use) and long-term stabilization (disposal)	Radium concentrations in soil cannot exceed background by more than 5 pCi/g in the upper 15 cm of soil or 15 pCi/g in any 15 cm layer below the upper layer, averaged over an area of 100 m ² ; uranium concentration in soil is calculated using a risk assessment approach	*Design standard: 1) to be effective for up to 1000 years to the extent reasonably achievable, and in any case for at least 200 years, and 2) limit average m-222 release rate to 20 pCi/m ² -sec or increase average concentration of m-222 outside disposal site by more than 0.5 pCi/L. (*no monitoring required)	Combined Ra-226 and Ra-228: 5 pCi/L, combined U-234 and U-238: 30 pCi/L; and gross alpha particle activity (excluding radon and uranium): 15 pCi/L.	none	Material at NFSS exists at 550,000 pCi/g. Long-term surveillance and maintenance of (Title I) sites are conducted under an NRC license by the Federal government who takes over site for LTSM.
10 CFR Part 20 Subpart E (NRC)	Radiological Criteria for [NRC] License Termination	This rule applies to the decommissioning of NRC-licensed facilities: source, special nuclear, and byproduct material, except for uranium and thorium mill tailings.	This rule provides for unrestricted use of site (cleanup) or for release of site under restricted use conditions (which allows material to remain on-site.)	Unrestricted use: 25 mrem/y TEDE and ALARA;	Restricted use: 25 mrem/y TEDE, ALARA, durable institutional controls, license termination plan (LTP), public input, and 100 mrem/y or 500 mrem/y if institutional controls fail; and alternate criteria: 100 mrem/y, ALARA, LTP, and EPA and public input.	Groundwater is included in the 25 mrem/y TEDE standard; amount of radiation from all media, cumulatively, is included when calculating cleanup levels for each medium.	none	The criteria in this rule do not apply to uranium and thorium recovery facilities already subject to 10 CFR Part 40 Appendix A; however, it may be relevant and appropriate for radiological materials associated with Knolls Atomic Power Laboratory materials handled at the site.

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Table 3. Summary of Potential ARARs (continued)

	Name of Requirement	Type of Waste Regulated – Level of Activity	Cleanup or Disposal	Cleanup Standards	Disposal Standards	Groundwater Provisions/ Standards	Siting Standards	Comments
10 CFR Part 61 (NRC)	Licensing Requirements for Land Disposal of Radioactive Waste	Commercially-generated low-level radioactive wastes containing source, special nuclear, and byproduct material of up to 100 pCi/g activity.	This rule provides performance objectives and technical requirements for near-surface disposal of waste.	none	<p>Disposal standards emphasize stability and minimization of water access to waste. Class C waste containers (up to 100 pCi/g) should be designed to be stable for at least 300 years.</p> <p>Institutional controls can be used for up to 100 years.</p> <p>Class C waste must either be buried with at least 5 meters below the top surface of cover or install intruder barriers that will be effective for 500 years.</p> <p>Other design features are described in footnote 4, and performance standards are described in footnote 6.</p>	See disposal design requirements and site characteristics in footnotes 4 and 5.	<p>In choosing a disposal site, site characteristics should be evaluated for at least a 500-year timeframe.</p> <p>Site characteristics are described in footnote 5.</p> <p>Other siting requirements are described in footnote 7.</p>	Ongoing maintenance should not be required during the period of institutional control, after the 5 year post-closure observation and maintenance period. If DOE is the long-term site manager, it does not get an NRC license.

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Table 3. Summary of Potential ARARs (continued)

	Name of Requirement	Type of Waste Regulated – Level of Activity	Cleanup or Disposal	Cleanup Standards	Disposal Standards	Groundwater Provisions/ Standards	Siting Standards	Comments
40 CFR Part 191 (USEPA) Subpart A (Management and Storage), Subpart B (Disposal), and Subpart C (Groundwater)	Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes	transuranic waste – materials containing concentrations >100 nanocuries per gram of waste of alpha-emitting transuranic isotopes, with half-lives > 20 years; high-level waste; spent nuclear fuel	This rule is for disposal only – preferably in geologic repositories, but not restricted to such.	No cleanup standards. However, the rule provides NRC management and storage standards of: 25 mrem whole body; 75 mrem to the thyroid; and 25 mrem to any other critical organ. DOE standards are: 25 mrem whole body and 75 mrem to any critical organ. (Subpart A)	(Subpart B) (1) Design standard to limit cumulative releases of radionuclides to the accessible environment for 10,000 years. (2) Six qualitative assurance requirements. ³ (3) Exposure limits to individuals for 10,000 years after disposal, of 15 mrem/yr of annual committed effective dose (CED). Alternative provisions are allowed after public notice and comment. These standards do not apply to wastes disposed of before November 18, 1985.	Disposal systems must be designed so that, for each pollutant, the level of contamination in offsite underground sources of drinking water (USDWs) will not, for 10,000 years, exceed the applicable MCL. (Subpart C) Alternative provisions are allowed after public notice and comment.	³ Some of the six qualitative assurance requirements involve siting considerations.	NFSS waste is not transuranic; under the transportation rules (49 CFR 173 Subpart I), the K-65 is a higher-activity low-level waste. Although not transuranic, EPA “Compliance with Other Laws Manual” (EPA/540/G-89/009, OSWER Directive 9234.1-02, dated August 1989), states “that where radium concentrations are high, it may be appropriate to treat the wastes as though they were transuranic; therefore, the requirements of 40 CFR Part 191 for the storage and disposal of these wastes may be relevant and appropriate.” It does account for an acceptable control period (10,000 years) for radionuclides that will present significant risks for periods much greater than 10,000 years.

¹11(e)(2) byproduct material is also known as uranium mill tailings and associated wastes

³Site features to consider when selecting a disposal site for uranium mill tailings include:

- remoteness from populated areas;
- hydrologic and other natural conditions as they contribute to continued immobilization and isolation of contaminants from groundwater sources; and

1 > potential for minimizing erosion, disturbance, and dispersion by natural forces over the long term.

2 Siting considerations are also given for rainfall/stormwater, wind protection from topographic features, and erosion potential – flat embankment and cover slopes. Vegetative cover is also required to
3 reduce wind and water erosion. Rock cover is considered. The disposal site may not be located in an earthquake zone. (Criterion 4).
4

5 ³For facilities not regulated under 10 CFR Part 60 (NRC requirements), disposal of spent nuclear fuel, high level, or transuranic waste must be conducted in accordance with the following provisions:

- 6 (ii) reliance on active institutional controls for a period of up to 100 years only;
7 (iii) monitoring of the disposal system until there are no significant concerns to be addressed by further monitoring;
8 (iv) designation of disposal sites by the most permanent markers, records, and other passive institutional controls practicable to indicate the dangers of the wastes and their location;
9 (v) use both engineered and natural barriers to isolate the wastes from the accessible environment at a single facility;
10 (vi) sites selected for disposal should not be where mining has occurred, may occur, or where a mineral or other resource is located; and
11 (vii) sites where wastes can be removed for a period of time after emplacement should be selected.
12

13 ⁴Design features required to be described under 10 CFR 61.12 include:

14 those related to infiltration of water; integrity of covers for disposal units; structural stability of backfill, wastes, and covers; contact of wastes with standing water; disposal site drainage;
15 disposal site closure and stabilization; elimination to the extent practicable of long-term disposal site maintenance; inadvertent intrusion; occupational exposures; disposal site monitoring; and
16 adequacy of the size of the buffer zone for monitoring and potential mitigative measures.
17

18 Wastes must be placed and covered so that the radiation dose does not exceed limits established in 10 CFR §§ 20.1301 and 20.1302 (Radiation protection standards) at the time the license is transferred
19 to the long-term owner. Boundaries must be mapped by means of a land survey and marked in an easily defined way. A buffer zone of land must be maintained between any buried waste and the
20 disposal site boundary. Only wastes contaminated with radioactive wastes are allowed at the facility.
21

22 Other design requirements are (10 CFR 61.51):
23

- 24 > Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure;
25 > The disposal site must be designed to complement and improve, where appropriate, the ability of the disposal site's natural characteristics to assure that the performance objectives are met;
26 > Covers must be designed to minimize to the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste, and to resist degradation by surface
27 geologic processes and biotic activity;
28 > Surface features must direct surface water drainage away from disposal units at velocities and gradients which will not result in erosion that will require ongoing active maintenance in the
29 future.
30 > The disposal site must be designed to minimize to the extent practicable the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes
31 after disposal.
32

33 ⁵Site characteristics under 10 CFR 61.12 include:
34

35 A description of the natural and demographic disposal site characteristics as determined by disposal site selection and characterization activities. The description must include geologic, geotechnical,
36 hydrologic, meteorologic, climatologic, and biotic features of the disposal site and vicinity.
37

38 ⁶Performance objectives for any land disposal facility under 10 CFR Part 61 Subpart C include:
39

- 40 1. Land disposal facilities must be sited, designed, operated, closed, and controlled after closure so that reasonable assurance exists that exposures to humans are within the limits established in the
41 performance objectives stated herein.
42 2. Concentrations of radioactive material which may be released to the general environment in ground water surface water, air, soil, plants, or animals must not result in an annual dose exceeding an
43 equivalent of 25 millirems to the whole body, 75 millirems to the thyroid, and 25 millirems to any other organ of any member of the public. Reasonable effort should be made to maintain releases of
44 radioactivity in effluents to the general environment as low as is reasonably achievable.
45 3. Design, operation, and closure of the land disposal facility must ensure protection of any individual inadvertently intruding into the disposal site and occupying the site or contacting the waste at any
46 time after active institutional controls over the disposal site are removed.
47 4. Operations at the land disposal facility must be conducted in compliance with the standards for radiation protection set out in part 20 of this chapter, except for releases of radioactivity in effluents
48 from the land disposal facility, which shall be governed by § 61.41 of this part. Every reasonable effort shall be made to maintain radiation exposures as low as is reasonably achievable.
49 5. The disposal facility must be sited, designed, used, operated, and closed to achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active
50 maintenance of the disposal site following closure so that only surveillance, monitoring, or minor custodial care are required.
51 (copied from 10 CFR Part 20 Subpart C – Performance Objectives. 10 CFR §§ 61.40 through 61.44)
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⁷Other siting standards emphasize disposal site suitability for isolation of waste and for site features that will meet performance objectives. Site suitability features include:

1. the disposal site must be capable of being characterized, modeled, analyzed and monitored;
2. projected population growth and future developments are not likely to affect the ability of the disposal facility to meet the performance objectives;
3. avoid areas having natural resources which, if exploited, would result in failure to meet the performance objectives;
4. site must be generally well drained and free of areas of flooding or frequent ponding. Waste disposal shall not take place in a 100-year flood plain, coastal high-hazard area or wetland;
5. minimize upstream drainage areas to decrease the amount of runoff which could erode or inundate waste disposal units;
6. site must provide sufficient depth to the water table that groundwater intrusion, perennial or otherwise, into the waste will not occur. Exceptions to this requirement can be granted if it can be demonstrated that performance objectives can be met. In no case will waste disposal be permitted in the zone of fluctuation of the water table;
7. hydrogeologic unit used for disposal shall not discharge groundwater to the surface within the disposal site;
8. avoid areas where tectonic processes such as faulting, folding, seismic activity, or vulcanism may occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives, or may preclude defensible modeling and prediction of long-term impacts;
9. avoid areas where surface geologic processes such as mass wasting, erosion, slumping, landsliding, or weathering occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives or may preclude defensible modeling and prediction of long-term impacts;
10. do not locate where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives or significantly mask the environmental monitoring program.

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Table 4 – Potential RCRA ARARs

Statute, Rule, Criteria or Limitation	Citation	Description of Requirement	Potential ARAR Status	Comments
Identification and Listing of Hazardous Wastes: Characteristics of Hazardous Waste	40 CFR Part 261 Subpart C	This rule provides that a solid waste is a hazardous waste if it fails the Toxicity Characteristic Leaching Procedure (TCLP); that is, if an extract from a representative sample of the waste contains any of the contaminants listed in the rule at a concentration greater than or equal to the concentration listed in the rule.	Potentially applicable to VOCs and SVOCs; potentially applicable to hazardous component of mixed non-11(e)(2) or non-Bevill Amendment waste.	Byproduct material (11(e)(1) or 11(e)(2) material regulated under the Atomic Energy Act is not a solid waste and is therefore not a hazardous waste. Extraction and beneficiation wastes from ores is not a hazardous waste (Bevill Amendment). RCRA requirements would not be applicable to such waste.

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Table 5 – Requirements Evaluated and then Discarded for Consideration as Potential ARARs

Statute, Rule, Criteria, or Limitation	Citation	Description of Requirements	Potential ARAR Status	Comment
Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes	40 CFR Part 191, Subparts A, B, and C	This rule, described more completely in Table 3, provides management and storage, disposal, and groundwater protection requirements for transuranic waste, high-level radioactive waste, and spent nuclear fuel.	Not a potential ARAR	None of the wastes in the WCS are transuranic, high-level, or spent nuclear fuel wastes. Other ARARs for radionuclide materials can fully ensure protectiveness of the waste material and are more relevant and appropriate to the site.
State Cleanup Guidelines for Soils Contaminated with Radioactive Materials	Technical Administrative Guidance Memorandum (TAGM) 4003	This TAGM sets the standard of 10 mrem/year TEDE above that received from background levels of radiation in any one year, to the maximally exposed individual of the general public, plus ALARA.	Not a potential ARAR.	If this TAGM were a potential ARAR, it would be a to-be-considered (TBC). TBCs are considered only when ARARs are not available or when ARARs are not sufficiently protective at the site. ARARs are available for the WCS that are protective of human health and the environment. Therefore, guidance set forth in the ARARs will be followed, rather than guidance set forth in the TAGM.
State Determination of Soil Cleanup Objectives and Cleanup Levels (VOCs, SVOCs, and Heavy Metals)	TAGM 4046	<p>Soil cleanup objectives are established in this TAGM as follows:</p> <ol style="list-style-type: none"> 1. Human health based levels that correspond to excess lifetime cancer risks of one in a million for proved human carcinogens and probable human carcinogens, or one in one thousand for possible human carcinogens. 2. Human health based levels for systemic toxicants, calculated from Reference Doses (RfDs). RfDs are an estimate of the daily exposure an individual (including sensitive individuals) can experience without appreciable risk of health effects during a lifetime. An average scenario of exposure in which children ages one to six (who exhibit the greatest tendency to ingest soil) is assumed. An intake rate of 0.2 gram/day for a five-year exposure period for a 16-kg child is assumed. 3. Environmental concentrations which are protective of groundwater/drinking water quality; based on promulgated or proposed New York State Standards; 4. Background values for contaminants; and 5. Detection limits. <p>Recommended soil cleanup objectives are given for: VOCs, SVOCs, Organic Pesticides/Herbicides and PCBs, and Heavy Metals.</p>	Not a potential ARAR.	If this TAGM were a potential ARAR, it would be a to-be-considered (TBC). TBCs are considered only when ARARs are not available or when ARARs are not sufficiently protective at the site. ARARs are available for the WCS that are protective of human health and the environment. Therefore, requirements set forth in the ARARs will be followed, rather than guidance set forth in the TAGM.

