M-32

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 27, 1996

Mr. Daniel W. Sullivan
Project Manager
DOE - West Valley Area Office
P.O. Box 191, WV-37
West Valley, New York 14171-0191

SUBJECT: COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR COMPLETION OF THE WEST VALLEY DEMONSTRATION PROJECT AND CLOSURE OR LONG-TERM MANAGEMENT OF FACILITIES AT THE WESTERN NEW YORK NUCLEAR SERVICE CENTER

Dear Mr. Sullivan:

The U.S. Nuclear Regulatory Commission staff has reviewed the subject document. Although the draft environmental impact statement (DEIS) represents a step forward regarding the decommissioning and ultimate disposition of the West Valley Demonstration Project (WVDP) and the Western New York Nuclear Service Center, the NRC staff believes that there is additional information that could be included in the DEIS and would improve the DEIS as a decision aiding document under the National Environmental Policy Act (NEPA).

Specifically, the DEIS ought to identify viable decontamination and decommissioning criteria and waste disposal criteria; identify and evaluate feasible alternatives, including combinations of the "bounding" alternatives identified in the present draft; and designate and justify a preferred alternative based on environmental, health and safety, cost, and other considerations. In addition, the DEIS should be amended by providing or referencing an adequate performance assessment of the alternatives, including the preferred alternative. This performance assessment should clearly identify whether the preferred alternative satisfies the decontamination/ decommissioning criteria and waste disposal criteria and, if not, it should identify what mitigating measures are proposed to compensate for this deficiency.

As we discussed in our September 24, 1996, meeting, NRC is willing to consult with the Department of Energy and the New York State Energy and Research Development Authority on the establishment of decontamination and decommissioning criteria for this site. However, we look to DOE to propose alternative criteria and provide adequate support for the proposed criteria, as well as the selection and justification of the preferred alternative.

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Enclosure 1 includes the staff's comments resulting from this review. Enclosure 2 is a report developed by NRC's contractor, the Center for Nuclear Waste Regulatory Analyses (CNWRA), that also includes additional comments supported by NRC.

If you have any questions, please call me at 301-415-8106.

Sincerely,

Original signed by:

Gary C. Comfort, Jr.
Licensing Section 2
Licensing Branch
Division of Fuel Cycle Safety
and Safeguards, NMSS

Project M-32

Enclosures:
1. NRC staff comments
2. CNWRA comments

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Enclosure 1 includes the staff's comments resulting from this review. Enclosure 2 is a report developed by NRC's contractor, the Center for Nuclear Waste Regulatory Analyses (CNWRA), that also includes additional comments supported by NRC.

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1. NRC staff comments
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NRC COMMENTS ON THE WVDP DEIS

1. As provided for in Title 40 of the Code of Federal Regulations, Section 1502.14(e), (40 CFR 1502.14(e)), the staff would like to see DOE "identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement..." Because NRC anticipates considerable public interest in the selection of a preferred alternative for this site, the staff believes that the preferred alternative should be clearly stated in a DEIS and the DEIS reissued for public comment. By providing the preferred alternative in a DEIS, the public will have the opportunity to comment on the methodology and data used to determine the preferred alternative.

2. The DEIS approach is to present "site-wide" alternatives and assess all source terms (e.g., impacts and remedial options) in one shot under the same generic alternative. This approach leads to the lack of specificity regarding analysis of costs, risks, remediation technologies, and site specific conditions that may have significant impact on selection and implementation of a preferred alternative. As a result, analysis of remedial (or disposal) options based on specific risk/cost analysis of each individual source term are not present. It should be noted that an alternative which is appropriate for a certain source term may not be suitable for another source term because of significant differences in the nature and extent of radiological contaminants from one source to another or in the feasibility and effectiveness of various remedies. In addition, the cost of remediation will vary from one source to another. By focusing on aggregated alternatives, potential benefits and costs associated with the application of alternatives on a source-specific basis can be inappropriately overlooked or discounted because of the structure of the analysis. Therefore, specific alternatives associated with each source term should be developed. These alternatives should assess specific potential impacts associated with the source-term (or waste management area) and remedial options based on identified characteristics of the source-term. The staff also suggests that the DEIS use comparison tables to present direct and indirect impacts for each source (e.g., waste management area) and the benefits and costs associated with each alternative.

3. The nature of actions for Alternatives I & II requires off-site disposal of large volume of radioactive waste. The DEIS does not address the nature and categories (e.g., waste classification) of the waste to be disposed of off-site. Licensed disposal facilities accepting high-level waste may not be available at the time of decommissioning. In addition, any licensed low-level waste disposal should comply with 10 CFR Part 61 performance objectives. Therefore, the proposed alternatives should address the issue of availability of waste disposal possibilities and their viabilities.

4. Alternatives II and III rely on institutional controls (through prevention of intrusion) for protection of the public health and safety and, to some extent, containment of radiological waste at the site. These alternatives briefly analyzed short-term (e.g., 100 years) impact issues. The analyses assumed that institutional controls would be effective only for the short-term. However, for long-term potential impacts, there are no health and safety and environmental impacts assessment to evaluate potential long-term releases of radiological contaminants. Therefore, the staff believes impacts due to the potential failure of institutional controls and long-term environmental and health/safety impacts should be addressed. In addition, future remedial actions and waste disposal options, after removal of institutional controls, should be considered. Alternatively, State or Federal control may be appropriate with adequate transfer criteria.

5. The staff would like to see the DEIS consider, among other radiological criteria, NRC's radiological criteria for unrestricted use. NRC has previously identified suitable radiological criteria for release for unrestricted use of soil and structures in the "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites," (April 16, 1992; 57 FR 13389). The staff recognizes that the West Valley Demonstration Project is not included in the SDMP. However, the NRC has applied these interim criteria for decommissioning other nuclear facilities since the establishment of the Action Plan. Another option to be considered in the DEIS is decommissioning criteria to ensure that the average dose to the critical population group that may inhabit the site at some point in the future would not exceed a specified dose level from all sources of residual contamination that remain on site. In addition, where DOE and New York State plan to consider disposal and isolation of radioactive waste on site, NRC's land disposal requirements for low-level waste (10 CFR Part 61) should be considered along with other alternative criteria (e.g., National Contingency Plan criteria in 40 CFR Part 300).

6. The DEIS should address regulatory strategy and responsibilities for implementation of the proposed actions under each alternative. In addition, the DEIS should clarify and define ownership and responsibilities associated with each action.

7. The DEIS makes it clear that the dose estimates for the alternatives are biased high. Although being conservative on the high side is generally considered to be preferable because it should bound the exposure's upper limit, the DEIS decision-makers should be careful to not exclude alternatives based on these higher estimates alone. Some of the estimates appear preposterously high (e.g., doses on the order of one million rem to the Maximum Exposed Individual). The decision-makers need to be aware of how conservative estimates may impact each alternative. The staff is concerned that the comparison of alternatives not be skewed by dose exposures that are a result of extremely unlikely

scenarios or conservative estimates that impact one alternative significantly more than another. The staff believes that conservative estimates of impacts could unreasonably affect the comparison of alternatives, if the estimates preclude selection of specific alternatives that may, in reality, fall within more acceptable ranges, and if the degree of conservatism is variable among the alternatives.

REVIEW OF DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR COMPLETION OF THE WEST VALLEY DEMONSTRATION PROJECT AND CLOSURE OR LONG-TERM MANAGEMENT OF FACILITIES AT THE WESTERN NEW YORK NUCLEAR SERVICE CENTER

Prepared for

Nuclear Regulatory Commission
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ENCLOSURE 2

ABSTRACT

This review and evaluation of the Draft Environmental Impact Statement (DEIS) for Completion of the West Valley Demonstration Project (WVDP) and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (WNYNSC or Center) has been conducted to evaluate consistency of proposed alternatives with the draft Nuclear Regulatory Commission (NRC) decontamination and decommissioning (D&D) rule and NRC regulations in Licensing Requirements for Land Disposal of Radioactive Waste 10 CFR Part 61. To assist in understanding the results of this examination, the relevant regulatory requirements are presented along with clarifying background and applicability information from statements of consideration, NUREGs, and other reference material, where appropriate.

The DEIS alternatives are compared with requirements of the draft rule on D&D to determine if an appropriate decommissioning plan can be derived for the site. Only Alternative I meets all requirements of the draft rule for either restricted or unrestricted release. Alternatives II and IV would meet the dose limits for restricted release, but would require institutional control beyond 100 yr to meet the 100 mrem total effective dose equivalent (TEDE) limit for the average member of the critical group, which is inconsistent with NRC regulatory policy. Alternatives IIIA and IIIB would not meet dose limits for unrestricted release, even with institutional controls in place. Alternative V was not considered a reasonable alternative by either the U.S. Department of Energy (DOE) or the State of New York, and it was therefore not included in this comparison of alternatives.

DEIS Alternatives II through IV are reviewed for consistency with 10 CFR Part 61 performance objectives and technical agreements because they provide for disposal of waste onsite. Alternatives II through IV generally do not meet 10 CFR Part 61 requirements. The performance assessment of the radwaste treatment system (RTS) drum cell is reviewed to examine the estimated radiological impact of the facility with respect to the 10 CFR Part 61 performance objectives. Doses to the public due to releases from the RTS drum cell to the general environment are within Part 61 limits, but doses to intruders upon loss of institutional control do not meet the limits. The stability of the disposal site after closure will be compromised by erosion if long-term maintenance cannot be assured. The RTS drum cell as developed for Alternatives II through IV is not consistent with some of the technical requirements for site suitability and site design of 10 CFR 61.50 and 61.51, as required by Stipulation 8 of the Stipulation of Compromise Settlement. However, the RTS drum cell waste appears to be consistent with the NRC requirements for near surface land disposal with respect to transuranic waste concentrations.

Methodologies used for conducting analyses that support the DEIS are evaluated. Information from appendices is compared to that from Volume I of the DEIS, with no significant differences noted. Comparison to a previously reviewed WVDP Safety Analysis Report (SAR) indicates a discrepancy in reported residual radioactive material in Tank 8D-1. Other comments of a more general nature related to management of radioactive waste are provided, including a comparison of the DEIS to the DOE EIS for the Hanford Site in Washington.

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TABLES

ACRONYMS

ACNW	Advisory Committee on Nuclear Waste
ALARA	As Low as Reasonably Achievable
BDBE	Beyond Design Basis Earthquake
CFR	Code of Federal Regulations
CNWRA	Center for Nuclear Waste Regulatory Analyses
D&D	Decontamination and Decommissioning
DEIS	Draft Environmental Impact Statement
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
GTCC	Greater-than-Class-C Waste
HLW	High-Level (Radioactive) Waste
IC	Institutional Control
LLNL	Lawrence Livermore National Laboratory
LLW	Low-Level (Radioactive) Waste
LLWTF	Low-Level Waste Treatment Facility
MAD	Mean Absolute Difference
MMI	Modified Mercalli Intensity
NDA	Nuclear Regulatory Commission-Licensed Disposal Area
NMSS	NRC Office of Nuclear Material Safety and Safeguards
NRC	Nuclear Regulatory Commission
PA	Performance Assessment
pga	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RC	Reinforced Concrete
RTS	Radwaste Treatment System
SAR	Safety Analysis Report
SDA	New York State-Licensed Disposal Area
SDMP	Site Decommissioning Management Plan
TEDE	Total Effective Dose Equivalent
VF	Vitrification Facility
WMA	Waste Management Area
WNYNSC	Western New York Nuclear Service Center (referred to as Center)
WVDP	West Valley Demonstration Project
WVNS	West Valley Nuclear Services Company, Inc.

ACKNOWLEDGMENTS

This report was prepared to document work performed by the Center for Nuclear Waste Regulatory Analyses (CNWRA) for the Nuclear Regulatory Commission (NRC) under Contract No. NRC-02-93-005. The activities reported here were performed on behalf of the NRC Office of Nuclear Material Safety and Safeguards (NMSS), Division of Fuel Cycle Safety and Safeguards, Fuel Cycle Licensing Branch. The report is an independent product of the CNWRA and does not necessarily reflect the views or regulatory position of the NRC.

The authors wish to acknowledge the assistance of Mrs. Lee Selvey in the preparation of the document. Appreciation is due to Dr. Narasi Sridhar, Mr. Michael Miklas, and Dr. Asad Chowdhury for technical review, and to Dr. Wesley Patrick for programmatic review of this report.

EXECUTIVE SUMMARY

This review and evaluation of the Draft Environmental Impact Statement (DEIS) for Completion of the West Valley Demonstration Project (WVDP) and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (WNYNSC or Center) has been conducted with respect to Nuclear Regulatory Commission (NRC) interests and authority in the decommissioning of the site of a former commercial spent fuel reprocessing plant and associated facilities. The following five alternatives have been proposed in the DEIS for these actions.

Alternative I:	Removal and Release to Allow Unrestricted Use
Alternative II:	Removal, On-Premises Waste Storage, and Partial Release to Allow Unrestricted Use
Alternative III:	In-Place Stabilization and On-Premises Low-Level Waste Disposal
Alternative IV:	No Action; Monitoring and Maintenance
Alternative V:	Discontinue Operations

This report presents the results of analyses performed to evaluate consistency of each of the five proposed alternatives with the draft NRC decontamination and decommissioning (D&D) rule and NRC regulations for Licensing Requirements for Land Disposal of Radioactive Waste, 10 CFR Part 61. Evaluations of alternatives with respect to criteria (such as ecology, socioeconomics, etc.) other than public and worker radiological health and safety are outside the scope of this report. Following is a discussion of the key findings resulting from the DEIS review.

Consistency of Alternatives with the Proposed Rule on Decontamination and Decommissioning

One NRC objective for this review is to determine whether an acceptable D&D plan can be developed from the alternatives presented in the DEIS. Therefore, the alternatives are compared against requirements of the proposed NRC rule on D&D. The following conclusions have been made with respect to determining whether each of the alternatives will support development of an acceptable future site decommissioning plan.

Alternative I could support development of appropriate decommissioning criteria for a follow-on decommissioning plan. Alternative I would not require an institutional control period or other restrictions, since the 15 mrem per year unrestricted site release dose limit would be met.

Alternatives II through IV are not consistent with the D&D rulemaking objective "to reduce the residual radioactivity in structures, materials, soils, groundwater, and other media at the site so that the concentration of each radionuclide that could contribute to residual radioactivity is indistinguishable from the background radiation concentration for that radionuclide." Alternatives II and IV will meet the dose limits for restricted release, but they require institutional control beyond 100 yr to meet the 100 mrem TEDE limit for the average member of the critical group. Alternatives IIIA and IIIB will not meet dose limits for unrestricted release, even with institutional controls in place.

Alternative V is not consistent with proposed site decommissioning standards. It is not considered a reasonable alternative by either the State of New York or the U.S. Department of Energy (DOE).

Consistency of Alternatives with 10 CFR Part 61

Since DEIS alternatives II through IV provide for disposal of waste onsite, they are reviewed for consistency with 10 CFR Part 61. The areas where these DEIS alternatives are not consistent with the performance objectives (10 CFR 61.40 through 61.44) and technical requirements (10 CFR 61.50 through 61.59) of 10 CFR Part 61 are identified in this report. Alternative I is not included in this comparison since it provides for removal of radioactive wastes from the site and does not require institutional control to meet release limits and dose limits. In general, Alternatives II through IV do not meet 10 CFR Part 61 requirements.

Evaluation of Radwaste Treatment System Drum Cell Performance for Compliance with 10 CFR Part 61 Performance Objectives and Technical Requirements

The performance assessment of the radwaste treatment system (RTS) drum cell is reviewed to compare the estimated radiological impact of the facility with the 10 CFR Part 61 performance objectives. The review considers 10 CFR 61.50 and 61.51, as agreed in Stipulation 8 of the Stipulation of Compromise Settlement, other 10 CFR Part 61 technical requirements, and concentration limits for transuranic elements (Stipulation 11).

Doses to the public due to releases from the RTS drum cell to the general environment are within 10 CFR Part 61 limits, but doses to intruders upon loss of institutional control do not meet the limits. The stability of the disposal site after closure is compromised by erosion if long-term maintenance cannot be assured. The RTS drum cell, as developed for Alternatives II through IV, is not consistent with some of the technical requirements for site suitability and site design in 10 CFR 61.50 and 61.51, as required by Stipulation 8 of the Stipulation of Compromise Settlement. However, the RTS drum cell waste appears to be consistent with the NRC requirements for near-surface land disposal with respect to transuranic waste concentrations.

Additional Comments

Other comments of a more general nature related to management of radioactive waste are provided. These include a comparison of the WVDP DEIS with the DOE EIS for the Hanford Site in Washington to ensure that comparable approaches and methodologies have been considered. It is noted that the Hanford DEIS includes predictions of site performance for 10,000 yr, while the WVDP DEIS evaluates performance for only 1,000 yr. The scope of the DEIS review did not include an evaluation as to whether these different time periods are appropriate.

Individual Section and Appendix Reviews

Methodologies used for conducting analyses that support the DEIS are evaluated, including hydrogeologic models, erosion studies, release models and source terms, risk assessment methods, evaluation of natural phenomena, radiation doses to the public from accidents, transportation analysis, evaluation of potential locations for new facilities, and long-term structural performance of selected reinforced concrete structures. Information presented in appendices was compared to the text in Volume I of the DEIS, and no significant inconsistencies were determined. Also, information previously reviewed in WVDP safety

analysis reports (SARs) was compared to that provided in the DEIS, primarily with respect to design basis (natural) events. No significant inconsistencies were identified concerning design basis events. However, the residual radioactive material in Tank 8D-1 was identified in the DEIS to be 3 percent of the tank volume, while a previously reviewed SAR indicated the residual radioactive material volume to be 5 to 20 percent.

1 INTRODUCTION

This review and evaluation of the Draft Environmental Impact Statement (DEIS) for Completion of the West Valley Demonstration Project (WVDP) and Closure or Long-Term Management of Facilities at the Western New York Nuclear Service Center (WNYNSC or Center) has been conducted with respect to Nuclear Regulatory Commission (NRC) interests and authority in the decommissioning of the former commercial spent fuel reprocessing plant and associated facilities. In particular, an analysis was performed to evaluate consistency of the DEIS alternatives with the proposed NRC decontamination and decommissioning (D&D) rule and NRC regulations for Licensing Requirements for Land Disposal of Radioactive Waste, 10 CFR Part 61. The five alternatives proposed in the DEIS are as follows:

Alternative I:	Removal and Release to Allow Unrestricted Use
Alternative II:	Removal, On-Premises Waste Storage, and Partial Release to Allow Unrestricted Use
Alternative III:	In-Place Stabilization and On-Premises Low-Level Waste Disposal
Alternative IV:	No Action; Monitoring and Maintenance
Alternative V:	Discontinue Operations

Evaluations performed included:

- Comparison of Alternatives I through V with the requirements of the proposed NRC rulemaking on D&D to determine if an appropriate decommissioning plan can be derived for the site

- Review of Alternatives II through IV for consistency with 10 CFR Part 61

- Review of the performance assessment (PA) of the radwaste treatment system (RTS) drum cell for consistency with 10 CFR Part 61

- Evaluation of methodologies used for conducting analyses that support the DEIS

This report does not include evaluations of alternatives with respect to criteria (such as ecology, socioeconomics, etc.) other than public and worker radiological health and safety.

Other comments of a more general nature have also been provided with respect to management of radioactive waste.

To assist in understanding the results of analyses, the relevant regulatory requirements are presented. In reviewing the DEIS for these purposes, other resources were consulted, including NUREG reports and Regulatory Guides as identified in the reference list in Section 7.

Information in Section 4 on the affected environment was compared to information previously reviewed in WVNS-SAR-001, Rev. 2, Draft G (West Valley Nuclear Services Company, Inc., 1996).

Methodologies presented in appendices that support DEIS modeling of radionuclide releases and associated doses but are not addressed in the comparative analysis of alternatives are reviewed separately in Section 6. Section 6 of this report also contains comments from review of other DEIS appendices.

2 COMPARISON OF ALTERNATIVES TO THE REQUIREMENTS OF THE PROPOSED NUCLEAR REGULATORY COMMISSION RULE ON DECONTAMINATION AND DECOMMISSIONING

A primary NRC objective in evaluating the alternatives presented in the DEIS is whether an acceptable D&D plan could be developed from them. Therefore, this section examines the alternatives against the requirements of the proposed D&D rule. To assist in understanding the results of this examination, the significant requirements of the proposed NRC D&D rule are presented to provide a regulatory context.

2.1 SIGNIFICANT REQUIREMENTS OF THE PROPOSED DECONTAMINATION AND DECOMMISSIONING RULE

The proposed NRC D&D rule would incorporate new requirements into 10 CFR Part 20. The requirements would apply to decommissioning of facilities licensed under Parts 30, 40, 50, 60, 61, 70, and 72 of Title 10. For high-level (HLW) and low-level waste (LLW) disposal facilities (10 CFR Parts 60 and 61 sites, respectively), the criteria apply only to ancillary facilities that support radioactive waste disposal activities. Specific requirements of the proposed D&D rule follow.

- The licensee shall take reasonable steps to remove all readily removable residual activity from the site.

- The licensee shall demonstrate a reasonable expectation that residual radioactivity from the site will not cause the level of radioactivity in any groundwater that is a current or potential source of drinking water to exceed the limits specified in 40 CFR Part 141 as they exist on the date of the published regulation associated with the D&D rulemaking.

- The site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background results in a total effective dose equivalent (TEDE) to the average member of the critical group that does not exceed 15 mrem/yr and has been reduced to levels that are as low as reasonably achievable (ALARA).

- The site will be considered acceptable for license termination under restricted conditions if: (i) the conditions for unrestricted release are not technically achievable, are prohibitively expensive, or would result in net public harm; (ii) provisions for institutional controls enforceable by a responsible government entity or in a court of law provide reasonable assurance that the TEDE from residual radioactivity...will not exceed 15 mrem/yr; and (iii) residual radioactivity at the site has been reduced so that if the institutional controls were no longer in effect, there is reasonable assurance that the TEDE from residual activity...to the average member of the critical group would not exceed 100 mrem/yr (assuming no benefits from any earthen cover or other earthen barriers, unless specifically authorized by the Commission).

2.2 CONCLUSIONS WITH RESPECT TO COMPLIANCE OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ALTERNATIVES WITH THE PROPOSED DECONTAMINATION AND DECOMMISSIONING RULE

Table 2-1 summarizes the maximum doses estimated in the DEIS for each alternative and the site release limits of the proposed D&D rule. Using the NRC draft D&D rule as a foundation for determining whether the alternatives developed in the DEIS will support preparation of an acceptable future site decommissioning plan, the following determinations may be made.

Alternative I could potentially support development of an acceptable decommissioning plan. Only Alternative I meets the 15 mrem per year unrestricted site release dose limit.

Alternatives II through IV are not consistent with the D&D rulemaking objective "to reduce the residual radioactivity in structures, materials, soils, groundwater, and other media at the site so that the concentration of each radionuclide that could contribute to residual radioactivity is indistinguishable from the background radiation concentration for that radionuclide." Alternatives II and IV would apparently meet the 15 mrem dose limits for either unrestricted release or restricted release with institutional control, but they do not meet the 100 mrem/yr test for discontinuing institutional control. Alternatives IIIA and IIIB would not meet the dose limits for unrestricted release of the site, even with institutional controls in place.

Alternative V is not consistent with proposed site decommissioning standards.

Table 2-1. Comparison of maximum doses[1] and proposed decommissioning limits by alternative

	Unrestricted Site Release			Restricted Site Release			
					Maximum Restricted Release Dose Limit, mrem		
Alternative	DEIS Maximum Expected Dose, mrem	Maximum Unrestricted Release Dose Limit, mrem	Consistent with Proposed D&D Rule?	DEIS Maximum Intruder Dose with Loss of IC,* mrem (Scenario Dependent)	With IC*	Loss of IC*	Consistent with Proposed D&D Rule?
I	< < 15	15	Yes	< < 15	15	100	Yes
II	< < 15 (with IC*)	15	Yes	652 to 1.3×10^8	15	100	No
IIIA	126 (with IC*)	15	No	541 to 89×10^6	15	100	No
IIIB	126 (with IC*)	15	No	541 to 89×10^6	15	100	No
IV	2.2 (with IC*)	15	Yes	4,500 to 1.1×10^9	15	100	No

[1] See DEIS Table S-4 or Tables D-9 through D-17

* IC=Institutional Control

3 INCONSISTENCIES IN ALTERNATIVES II THROUGH IV WITH 10 CFR PART 61

DEIS Alternatives II through IV do not address ultimate removal of radioactive material from the site. They also propose that loss of institutional control is the "unexpected case." In effect, Alternatives II through IV provide for disposal of waste onsite. Accordingly, the DEIS alternatives were evaluated against criteria in 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste. These DEIS alternatives are not consistent with the performance objectives (10 CFR 61.40 through 61.44) and technical requirements (10 CFR 61.50 through 61.59) of 10 CFR Part 61. This section delineates the areas of inconsistency with 10 CFR Part 61 for Alternatives II through IV. Alternative V is not considered a reasonable alternative by either the U.S. Department of Energy (DOE) or the State of New York, and it is therefore not included in this comparison of alternatives. The following additional documents were used in conducting these evaluations to ensure consistency with other NRC LLW licensing actions.

- NUREG-1199, Standard Format and Content of a License Application for a Low-Level Radioactive Waste Disposal Facility, Safety Analysis Report (Nuclear Regulatory Commission, 1988a)
- NUREG-1200, Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility (Nuclear Regulatory Commission, 1988b)
- Regulatory Guide 4.19, Standard Format and Content of Environmental Reports for Near-Surface Disposal of Radioactive Waste (Nuclear Regulatory Commission, 1988c)
- NUREG-1300, Environmental Standard Review Plan for the Review of a License Application for a Low-Level Radioactive Waste Disposal Facility, Environmental Report (Nuclear Regulatory Commission, 1987)

It should be noted that 10 CFR 61.1(a) allows case-by-case consideration of the applicability of Part 61 requirements for waste disposal facilities existing on the effective date (December 27, 1982) of the rule. Also, 10 CFR 61.6 allows the Commission to grant an exemption from Part 61 requirements "...as it determines is authorized by law, will not endanger life or property or the common defense and security, and is otherwise in the public interest."

For convenience, each of the following sections begins with either the quoted or paraphrased regulatory text from the pertinent requirements with which Alternative II through IV do not comply.

3.1 10 CFR PART 61 REQUIREMENT § 61.50(a)(1)—PURPOSE

This requirement specifies minimum characteristics a disposal site must have to be acceptable for use as a near-surface disposal facility. The primary emphasis in disposal site suitability is given to isolation of wastes, and to disposal site features that ensure that the long-term performance objectives of 10 CFR Part 61 are met, as opposed to short-term convenience or benefits. This requirement, along with other statements in 10 CFR Part 61 (e.g., § 61.13(d)), has been construed to mean that 10 CFR Part 61 applies to permanent disposal, as opposed to other LLW management methods, such as long-term, retrievable storage.

Basis for Conclusion

In contrast to the intent of § 61.50(a)(1), the viability of Alternative II requires indefinite maintenance and monitoring of long-term storage facilities and other site features. These facilities utilize structures with 100-yr design lives. Alternatives III and IV similarly require indefinite institutional control and monitoring. All of these alternatives prescribe, in effect, long-term retrievable storage with no plan for waste removal for permanent disposal.

3.2 10 CFR PART 61 REQUIREMENT § 61.50(a)(7)—DEPTH TO WATER TABLE

The requirement of 61.50(a)(7) states that, "The disposal site must provide sufficient depth to the water table that ground water intrusion, perennial or otherwise, into the waste will not occur...."

Basis for Conclusion

Contrary to the requirement of § 61.50(a)(7), for much of the Project Premises and New York State-Licensed Disposal Area (SDA), subsurface waste disposal systems will not remain above the water table, and an exception to the requirement would be required. The Project Premises and the SDA site were selected and developed prior to the promulgation of 10 CFR Part 61. These areas may not have been considered suitable for LLW disposal if site selection had been conducted using requirements from 10 CFR Part 61.

3.3 10 CFR PART 61 REQUIREMENT § 61.50(a)(8)—DISCHARGE OF GROUND WATER ON-SITE

The requirement of § 61.50(a)(8) states that, "The hydrogeologic unit used for disposal shall not discharge ground water to the surface within the disposal site."

Basis for Conclusion

NRC Regulatory Guide 4.19, states that, "Areas are not suitable for LLW disposal if groundwater discharge features such as springs, seeps, swamps, or bogs are present." In contradiction to the requirement of § 61.50(a)(8) and Regulatory Guide 4.19, for Alternatives III and IV, several places exist where groundwater could be considered as discharging to the surface within the disposal site. The following instances are cited in the DEIS on page 3-151.

- A groundwater pathway is described that discharges through seeps to Franks Creek. It is noted that the HLW tanks and process building foundations are in or connected to this pathway.
- A similar pathway exists through the weathered till near the surface and involves the RTS drum cell, Nuclear Regulatory Commission-Licensed Disposal Area (NDA), and SDA, which are located in this zone.
- A third pathway results from erosion and would effect such facilities as the Low-Level Waste Treatment Facility (LLWTF) lagoons, SDA, NDA, and RTS drum cell.

3.4 10 CFR PART 61 REQUIREMENT § 61.50(a)(10)—SURFACE GEOLOGIC PROCESSES

The requirement of § 60.50(a)(10) states that, "Areas must be avoided 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 of subpart C of this part, or may preclude defensible modeling and prediction of long-term impacts."

Basis for Conclusion

NRC has published guidance on site suitability and selection in Regulatory Guide 4.19, "Guidance for Selecting Sites for Near-Surface Disposal of Low-Level Radioactive Waste." In Regulatory Guide 4.19, NRC has emphasized its philosophy regarding site features and site suitability that "...in evaluating sites for LLW disposal, it is important that a reasonable effort be made to select candidate sites with natural conditions that will maintain radionuclide releases to the general environment as low as reasonably achievable. The NRC staff considers the long-term contribution of the natural conditions of the site essential in protecting the general population against releases of radioactive material. The effectiveness of other measures such as design features, waste form, waste packaging, and institutional controls is assumed to decrease with time after site closure."

NUREG-1200 notes that NRC will review a LLW disposal site license application to "...verify that...active erosion is not occurring in the site area to the extent that the site cannot be protected from potential effects of erosion, as required by 10 CFR 61.50(a)(10)."

Dependence on design features that are not considered permanent solutions, that will not last long enough for waste to decay to levels where 10 CFR Part 61 performance objectives can be met, or that require long-term active maintenance are not consistent with 10 CFR 61.50(a)(10) requirements. There are a number of instances where the DEIS presents information which indicates that requirements relating to surface geologic processes will not be met. The DEIS describes potentially rapid erosion of stream banks on the Project Premises and SDA, assuming no active remediation and continuing maintenance. The site, as it exists, is particularly prone to these effects. The DEIS cites several instances where uncontrolled erosion would yield unacceptable radiation exposures to the public for Alternatives II through IV. Some of the passages describing these conditions are cited below.

- Two erosion control strategies are proposed for Alternative III: a "local" system (said to be designed for 30-50 yr) and a "global" system (designed for a "long design life"). "In either case, the erosion control measures would require continued inspection, monitoring, maintenance, and replacement, as necessary" (DEIS, p. 3-97).

- With regard to the global erosion control measures, the DEIS states that, "...after the implementation phase actions, the global erosion control measures would have to be inspected and maintained as necessary" (DEIS, p. 3-104).

- "Erosion would be a long-term threat to the RTS drum cell tumulus, NDA, and SDA. Therefore, the Franks Creek stream banks on the south side of waste management area (WMA) 9 and east side of WMA 8 would be maintained and the slopes stabilized to limit advancing of the gullies and the eventual widening of Franks Creek. If these local erosion

control measures are not maintained, erosion would continue. Therefore, after the implementation phase, the local erosion control structures would have to be inspected, maintained, and replaced, as necessary" (DEIS, p. 3-110).

- Local erosion control has a design life of 50 yr, but global erosion control was assumed to fail after 1,000 yr (DEIS, p. 3-146).
- The RTS drum cell tumulus results in a dose exceeding the 10 CFR Part 61 objectives only for the erosion scenario (4,500 mrem to Buttermilk Creek individual) (DEIS, p. 3-150).
- "The most significant impact of large storm events on the Project Premises and the SDA is the turbulent stream velocities that erode several sensitive reaches (West Valley Nuclear Services Company, Inc., 1993) and may contribute to slope instability from erosion and saturation of surface soils, as discussed in Section 4.4 and Appendix L" (DEIS, p. 4-21).
- "The Center is actively eroding by a number of processes..." (DEIS, p. 4-27).
- Four general categories of intruder scenarios are assumed for post implementation long-term impacts. The fourth set involves assumptions of erosion such that waste containers are exposed in Buttermilk Creek (DEIS, p. 5-8).
- "...conservative estimates of erosion (worst case) indicate that portions of the disposal areas could erode without active control measures" (DEIS, p. 5-8).

3.5 10 CFR PART 61 REQUIREMENT § 61.51(a)(1)—DESIGN FOR LONG-TERM ISOLATION

The requirement of § 61.51(a)(1) states that, "Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure."

Basis for Conclusion

Consideration of this requirement and other NRC guidance indicates that this requirement will not be met under the DEIS alternatives. Examples include the following.

NUREG-1199 (Nuclear Regulatory Commission, 1988a) specifies that an applicant should provide the principal design criteria for a proposed facility, and that these "...design criteria should ensure that the principal design features under normal, abnormal, and accident conditions are designed to (1) provide long-term isolation of the disposed waste, (2) minimize the need for continued active maintenance after site closure, and (3) improve the site's natural characteristics in order to protect the public health and safety." This guidance also specifies that the "applicant describe the facility closure and stabilization plan and the design features that are intended to facilitate disposal site closure and to eliminate the need for on-going active maintenance." It further requires that "information and analyses should conclusively document that, in accordance with 10 CFR 61.51 and 61.52, site features have been designed and constructed in such a manner that erosion and flooding of disposal units will be prevented and active maintenance will not be required." "The applicant should present discussion, data, and stability analyses that provide reasonable assurance that there will be no need for on-going active maintenance of

the disposal site following closure." With respect to surface drainage and erosion protection, "the information and analyses presented should conclusively document that, in accordance with 10 CFR 61.44, the facility has been designed and sited and will be closed in such a manner that long-term stability can be achieved without the need for on-going active maintenance." For Alternatives II through IV, the approaches to long-term care are beyond the "surveillance, monitoring, or minor custodial care" contemplated by 10 CFR 61.44 or by 10 CFR 61.51(a)(1).

With respect to disposal unit covers, NUREG-1200 (Nuclear Regulatory Commission, 1988b) notes that "cover repair should not be assumed after the institutional control period." Alternative II is based upon the use of new above ground storage facilities with a 100-yr design life. These facilities are acknowledged to require active maintenance and/or possible replacement every 100 yr. The design features described for Alternatives II, III, and IV would require continuing active maintenance after site closure and decommissioning. The DEIS (Section 3.54, p. 3-109) states that, "implementing Alternative III would be followed by an indefinite period of monitoring and maintenance, requiring approximately 50 worker years per year."

Two erosion control strategies are proposed for Alternative III: (i) a "local" system (said to be designed for 30–50 yr), and (ii) a "global" system (designed for a "long design life"). "In either case, the erosion control measures would require continued inspection, monitoring, maintenance, and replacement, as necessary" (DEIS, p. 3-97). Similarly, the DEIS states that, "After the implementation phase has been completed, institutional control of the Center would be retained indefinitely" (DEIS, p. 3-115).

Alternative IV requires continued active care of the site, including active management of creek channels, site security, environmental monitoring, erosion monitoring, monitoring and maintenance of the waste storage and disposal areas, replacement of local erosion control systems at the end of their effective life, repairing of disposal area caps, and treatment of SDA leachate (DEIS, p. 3-126).

3.6 10 CFR PART 61 REQUIREMENT 61.51(a)(3)—DESIGN TO IMPROVE AND COMPLEMENT NATURAL SITE FEATURES

The requirement of § 61.51(a)(3) states that, "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 of Subpart C of this part will be met."

Basis for Conclusion

Contrary to the requirement of § 60.51(a)(3), the Executive Summary, Section 5, and Appendix D of the DEIS, note that loss of institutional control for Alternatives II through IV would result in doses to the public exceeding the performance objectives of Subpart C of 10 CFR Part 61. Consequently, even though the engineering measures prescribed for Alternatives II through IV complement and improve the disposal site's natural characteristics, they do not assure that the performance objectives of Subpart C will be met.

3.7 10 CFR PART 61 REQUIREMENT § 61.52—LAND DISPOSAL FACILITY OPERATION AND DISPOSAL SITE CLOSURE

10 CFR 61.52(a)(1) through 61.52(a)(5) require segregation of unstable Class A waste from other waste classes; isolation of Class C waste with appropriate intruder barriers; placement of waste packages to ensure package integrity and minimization of void spaces; and proper filling of void spaces between containers.

Basis for Conclusion

The NDA and SDA were licensed and permitted prior to development of 10 CFR Part 61. 10 CFR Part 61 technical requirements were derived in part from the unsatisfactory disposal experience at WVDP (particularly the SDA) and other sites. Many or most of the technical requirements of Part 61 are known to not have been practiced at the West Valley disposal areas. Remedial efforts proposed for Alternatives III through IV do not address these issues, although grouting of these waste disposal facilities, as proposed for Alternative III, may provide the intended structural stability.

3.8 10 CFR PART 61 REQUIREMENT § 61.54—ALTERNATIVE REQUIREMENTS FOR DESIGN AND OPERATION

The requirement of § 61.53 states that, "The Commission may, upon request or on its own initiative, authorize provisions other than those set forth in § 61.51 through § 61.53 for the segregation and disposal of waste and for the design and operation of a land disposal facility on a specific basis, if it finds reasonable assurance of compliance with the performance objectives of Subpart C of this part."

Basis for Conclusion

Although the disposal of LLW on the Project Premises and at the SDA does not comply with the provisions of 10 CFR Part 61 noted above, the provision of § 61.54 could allow other features, if the performance objectives can still be met. However, review of the DEIS indicates that, except for Alternative I, the performance objectives are not satisfied under the conditions of 10 CFR Part 61 that require that institutional control not be relied upon for greater than 100 yr. In fact, the Alternatives would require maintaining institutional control for up to 1,000 yr. Under these conditions, it is unlikely that 10 CFR 61.54 alternative requirements could be authorized consistent with the performance objectives of Subpart C of 10 CFR Part 61 without a significant change in established policy related to long-term institutional control.

3.9 10 CFR PART 61 REQUIREMENT § 61.55—WASTE CLASSIFICATION

Determination of the classification of radioactive waste involves two considerations. First, consideration must be given to the concentration of long-lived radionuclides (and their shorter-lived precursors) whose potential hazard will persist long after such precautions as institutional controls, improved waste form, and deeper disposal have ceased to be effective. These precautions delay the time when long-lived radionuclides could cause exposures. In addition, the magnitude of the potential dose is limited by the concentration and availability of the radionuclide at the time of exposure. Second, consideration must be given to the concentration of shorter-lived radionuclides for which requirements such as institutional controls, waste form, and disposal methods are effective.

10 CFR 61.55 also defines the three waste classes considered suitable for near-surface disposal: Class A, Class B, and Class C. In addition, the concentration limits of long-lived and short-lived radionuclides in each waste type are provided in Tables 1 and 2 of § 61.55(a)(2). These definitions and concentration limits comprise the "waste classification system" for LLW disposal.

Basis for Conclusion

There are several references to waste classification in the DEIS that indicate that requirements of § 61.55 will not be met. These include the following.

The DEIS analysis shows that waste concentrations in some on-site facilities for Alternatives II through IV exceed those established in Tables 1 and 2 of 10 CFR 61.55 (Section 8, p. 3-155). In analyzing doses to intruders following loss of institutional control, the DEIS states, "Large doses would occur from many of the facilities under these intruder scenarios. The doses are high because some facilities have a concentrated inventory. Intruder doses would be eliminated only if the concentrated wastes did not exist. These results show the need for institutional control to limit site access."

Based on data provided in the DEIS, average waste concentrations in the HLW Tanks appear to exceed the 10 CFR Part 61 limits. Table 2 of 10 CFR 61.55 limits Cs-137 concentrations to 4,600 curies per cubic meter, and Sr-90 concentrations to 7,000 curies per cubic meter. Table 1 of 10 CFR 61.55 limits the concentration of Am-241 to 100 nCi/gm. Considering the inventories of these radionuclides provided in Table C-5 of the DEIS and the projected waste volume in HLW Tank 8D-2, it appears that the concentrations of these radionuclides exceed these limits (using the sum-of-the-fractions rule for the Table 2 radionuclides).

From the limited descriptions provided in the DEIS, there may be Greater-than-Class C waste (GTCC) in the Vitrification Facility (VF) and melter, the Lag Storage Building, and the NDA. GTCC waste is not generally acceptable for near surface disposal and must meet the requirements of 10 CFR Part 60.

The DEIS states on p. 3-155 that, "the results...shows that the facilities with the greatest potential hazard over the next few decades are the HLW tanks. If Alternative IIIA or Alternative IIIB could be modified to improve its long-term performance, a weakness in the alternatives would be eliminated. Alternative II has lower risks because material has been moved from the ground and away from areas that are eroding. However, site access control and facility monitoring and maintenance would still be required to prevent intruder doses that are higher than 500 mrem."

Waste concentrations would apparently exist on site for Alternatives II through V that exceed the current NRC waste classification system radionuclide concentration limits for LLW considered suitable for near surface land disposal. (Waste characterization studies were not available to confirm this assessment.) 10 CFR 61.58 states that, "The Commission may...authorize other provisions for the classification of waste on a specific basis, if...it finds reasonable assurance of compliance with the performance objectives in Subpart C of this part." While NRC would allow other classification systems based on site specific analyses, the large doses estimated for loss of institutional control at WVDP make the concentrations, existing and assumed, for the WVDP PA analysis problematic. In addition, the Waste in HLW Tank 8D-2 is classified as HLW, and therefore is not suitable for near surface disposal under 10 CFR Part 61.

3.10 10 CFR PART 61 REQUIREMENT § 61.56—WASTE CHARACTERISTICS

This section of the regulations provides several requirements for waste form, stability, and other waste characteristics, including limits on certain container materials; free liquids; explosiveness; pyrophoricity; toxic gases or fumes; packaging of gases; hazardous, pathogenic, biological, and infectious materials; and structural stability.

Basis for Conclusion

It could not be directly determined from review of the DEIS whether waste characteristics requirements would be met, since these requirements were developed after licensing and operation of the SDA and NDA and the required data and other information was not documented. However, based on general knowledge regarding the materials and processes used at the site, the waste characteristics in these disposal units proposed for Alternatives II through IV may not be consistent with the requirements of 10 CFR 61.56.

3.11 10 CFR PART 61 REQUIREMENT § 61.59(b)—INSTITUTIONAL CONTROL

The requirement of § 61.59(b) states that, "The land owner or custodial agency shall carry out an institutional control program to physically control access to the disposal site.... The period of institutional controls will be determined by the Commission, but institutional controls may not be relied upon for more than 100 yr following transfer of control of the disposal site to the owner."

Basis for Conclusion

The approach taken for Alternatives II through IV of the DEIS is fundamentally different from that taken in 10 CFR Part 61, in that indefinite institutional control, monitoring, and intervention are assumed to be necessary to manage LLW materials and wastes at the Center.

The WVDP DEIS assumes that institutional control can be maintained indefinitely (expected case) for Alternatives II through IV. Under the assumption that institutional control is lost after 100 yr, it appears that the site would not meet the 10 CFR Part 61 performance objectives (dose to an off-site resident or an on-site intruder) for these alternatives (DEIS, p. S-13, Table S-4). As stated in Section 5, "...the expected post-implementation impacts for Alternatives II, III, and IV assume active monitoring and maintenance for the Project Premises and the SDA" (DEIS, p. 5-2).

As previously noted for Alternative II, "...site access control and facility monitoring and maintenance would still be required to prevent intruder doses that are higher than 500 mrem."

The DEIS states in Section 3.54, p. 3-109, that "...implementing Alternative III would be followed by an indefinite period of monitoring and maintenance, requiring approximately 50 worker years per year." "After the implementation phase has been completed, institutional control of the Center would be retained indefinitely" (DEIS, p. 3-115).

Alternative IV would also require continued active care of the site, including active management of creek channels, site security, environmental monitoring, erosion monitoring, monitoring and

maintenance of the waste storage and disposal areas, replacement of local erosion control systems at the end of their effective life, repairing of disposal area caps, and treatment of SDA leachate (DEIS, p. 3-126).

The assumption that institutional control cannot be relied upon for greater than 100 yr is a cornerstone of the 10 CFR Part 61 LLW disposal concept. It results in a waste classification system that limits radionuclide concentrations, thus allowing for the decay of Class A waste to safe levels within the 100 yr that institutional controls are reasonably assumed to be effective, and, along with intruder barrier provisions, protecting an inadvertent intruder at any time in the future after institutional controls may be lost. It also is integral to the NRC concept of disposal as a permanent and final disposition of LLW. The underlying premise is that if society can abandon a LLW facility after 100 yr of institutional control, and the resulting radiological consequences are estimated to be acceptable, then permanent disposal can be considered to be a reasonable approach to long-term LLW management.

4 REVIEW OF PERFORMANCE OF THE RADWASTE TREATMENT SYSTEM DRUM CELL WITH RESPECT TO 10 CFR PART 61 PERFORMANCE OBJECTIVES AND TECHNICAL REQUIREMENTS

The performance assessment of the RTS drum cell was reviewed for consistency with 10 CFR Part 61 requirements. The principle objective of the review was to examine the estimated radiological impact of the facility with respect to the 10 CFR Part 61 performance objectives. The RTS drum cell was also reviewed with respect to 10 CFR 61.50 and 61.51, as agreed in Stipulation 8 of the Stipulation of Compromise Settlement, other 10 CFR Part 61 technical requirements, and concentration limits for transuranic elements (Stipulation 11). Conclusions from this review are stated along with a basis for these conclusions.

4.1 10 CFR PART 61 REQUIREMENT § 61.41—PROTECTION OF THE GENERAL POPULATION FROM RELEASES OF RADIOACTIVITY

Conclusion

Releases to the general environment do not result in doses to public that exceed 10 CFR 61.41 limits, based on the analyses performed for the DEIS.

Basis for Conclusion

Analyses of doses to the general public from the RTS drum cell are contained in DEIS Section D.3.2.6 and Table D-10. This data indicates that the general public is properly protected.

4.2 10 CFR 61 REQUIREMENT § 61.42—PROTECTION OF INDIVIDUALS FROM INADVERTENT INTRUSION

Conclusion

Doses to intruders exceed those previously used by NRC in establishing waste classification concentration limits for performance assessment of intruder scenarios.

Basis for Conclusion

Table 4-1 indicates that, for loss of institutional control for Alternatives II through IV, maximum individual intruder doses could reach 900 and 4,500 mrem/yr for nearby Buttermilk Creek residents under global and local erosion control collapse scenarios, respectively, and 440 mrem/yr for on-site, agricultural/residential intruders.

Table 4-1. Summary of radwaste treatment system drum cell radiological impacts approaching or exceeding 10 CFR Part 61 performance objectives

Alternative	Alternative Description	Scenario	Pathway	Condition	Receptor	Maximum Dose, mrem/yr	DEIS Source Reference	10 CFR Part 61 Limit, mrem/yr
II	Maintenance on site as is	Local erosion control with erosional collapse	Surface water	Unexpected, loss of institutional control	Buttermilk Creek resident	4,500	Page 5-59 Page D-29	500 TEDE[1]
III	Convert to Tumulus	Rainwater percolation with blockage of drainage layer	Groundwater	Unexpected	On premises intruder, nearby residence and garden	450	Page D-25	500 TEDE[1]
III	Convert to Tumulus	Global erosion control with erosional collapse	Surface water	Unexpected, loss of institutional control	Buttermilk Creek resident	900	Table D-13	500 TEDE[1]
III	Convert to Tumulus	Local erosion control with erosional collapse	Surface water	Unexpected, loss of institutional control	Buttermilk Creek resident	4,500	Table D-14	500 TEDE[1]
IV	Maintenance on site as is	On-site intruder	Various	Unexpected, loss of institutional control	Agriculture/ residential	440	Table D-16	500 TEDE[1]
IV	Maintenance on site as is	Local erosion control with erosional collapse	Surface water	Unexpected, loss of institutional control	Buttermilk Creek resident	4,500	Page D-46 Table D-14	500 TEDE[1]
V	Abandon site as is	On-site intruder	Various	Expected	Agriculture/ residential	4,400	Table D-18	500 TEDE[1]
V	Abandon site as is	Local erosion control with erosional collapse	Surface water	Surface water	Buttermilk Creek resident	4,500	Table D-20	500 TEDE[1]

[1] This value of 500 mrem is not a regulatory limit of 10 CFR Part 61. It was proposed as a performance objective in the draft rulemaking for Part 61 and subsequently dropped. However, it was used as a limit in establishing the concentration limits for the waste classification system in § 61.55.

4.3 10 CFR 61 REQUIREMENT § 61.43—PROTECTION OF INDIVIDUALS DURING OPERATIONS

Conclusion

Individuals will be protected from radiation doses from the RTS drum cell during operation.

Basis for Conclusion

For Alternative II, there is no significant occupational dose. During the institutional control period, there would be minimal long-term occupational effects from monitoring the facility. Considering the effort to monitor the retrievable storage areas, it was estimated in the DEIS that less than 1 person-rem/yr dose would result.

During the implementation phase (10 yr for Alternative IIIA and 26 yr for IIIB), which includes facility closure as a tumulus, the RTS drum cell has been estimated to result in a collective occupational exposure of 4 person-rem. This is well within the limits of 10 CFR Part 20. Essentially no dose to the public is expected. For the post-implementation phase, continuing monitoring and maintenance would be required. Occupational exposures have been estimated at 10 person-rem annually initially, and 1 person-rem/yr after the first 100 yr. These levels are within the 10 CFR Part 20 limits.

For Alternative IV, implementation phase occupational exposures were estimated to be zero, and long-term monitoring and maintenance exposures were estimated to be a maximum of 30 person-rem/yr initially and 3 person-rem/yr after 100 yr. The 30 and 3 person-rem exposures are within Part 20 limits.

4.4 10 CFR PART 61 REQUIREMENT § 61.44—STABILITY OF THE DISPOSAL SITE AFTER CLOSURE

Conclusion

Based on the stated need to provide long-term care and on-going erosion control maintenance, the performance of the RTS drum cell site and facility are not consistent with the requirements of 10 CFR 61.44 that the facility be sited and closed to "achieve long-term stability of the disposal site and to eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure so only surveillance, monitoring, or minor custodial care are required."

Basis for Conclusion

As previously noted for other facilities at the Center, erosion potential at the site requires construction of substantial erosion control features and the long-term maintenance of these features. The DEIS alludes to the severity of this problem in several places. The following statements from the DEIS confirm that site stability cannot be achieved without continuing active maintenance.

- "Under Alternative III, ...the RTS drum cell tumulus would remain on the Project Premises and would require measures to control erosion and stabilize soil" (DEIS, p. 3-94).

- "Many local erosion control structures could be installed with design lives of approximately 30 to 50 years.... Long-term solutions could be implemented that would require substantial engineering efforts, including stream diversion in certain areas. In either case, the erosion control measures would require continued inspection, monitoring, maintenance, and replacement as necessary" (DEIS, p. 3-97).

- "Erosion would be a long-term threat to the RTS drum cell tumulus.... Therefore, the Franks Creek stream banks...would be maintained and the slopes stabilized to limit developing and advancing of gullies and the eventual widening of Franks Creek." "...the local erosion control structures would have to be inspected, maintained, and replaced, as necessary" (DEIS, p. 3-100).

4.5 10 CFR PART 61 REQUIREMENTS § 61.50—DISPOSAL SITE SUITABILITY REQUIREMENTS FOR LAND DISPOSAL AND § 61.51—DISPOSAL SITE DESIGN FOR LAND DISPOSAL (STIPULATION 8 OF COMPROMISE SETTLEMENT)

Conclusion

The RTS drum cell as developed for Alternatives II through IV is not consistent with the technical requirements for site suitability and site design of 10 CFR 61.50 and 61.51 as discussed in the following.

Basis for Conclusion

The waste management concept for the RTS drum cell as developed for Alternatives II and IV is based on a long-term monitored retrievable storage design. Continuing active maintenance of the facility would be required for the indefinite future. The facility primarily houses solidified Class B and Class C waste and is considered a "major waste storage" facility. The waste form characteristics are said to be consistent with 10 CFR Part 61 and NRC guidance (DEIS, p. D-24).

For Alternatives IIIA and IIIB, the RTS drum cell would be converted to a tumulus and the drum cell would be covered with a clay cap and appropriate intruder barrier. The tumulus design presumably would be consistent with 10 CFR Part 61 requirements. Since the RTS drum cell or tumulus is located in an active erosion area, the erosion control measures and continued monitoring and maintenance discussed previously would be required for the expected case.

Following is a summary of inconsistencies with 10 CFR Part 61 (some of these were discussed in more detail in Section 3 of this report).

- The concept for Alternative II (monitored retrievable storage) is not consistent with the intent of § 61.50(a)(1) to provide permanent disposal that does not require long-term active maintenance.

- The RTS drum cell appears to be in a hydrogeologic formation that would allow discharge of ground water to the surface within the disposal site, inconsistent with § 61.50(a)(8).

- Significant erosion potential that could affect the RTS drum cell for Alternatives II through IV is not consistent wit' the requirements of § 61.50(a)(10).

- The facility and site features described for Alternatives II through IV are not "directed toward long-term isolation and avoidance of the need for continuing active maintenance after site closure," as required by § 61.51(a)(1).

- For Alternatives III and IV, the RTS drum cell tumulus proposed in the DEIS does not improve or complement the disposal site's natural features adequately (due primarily to its location which is susceptible to severe erosion) to assure that the performance objectives of Subpart C of 10 CFR Part 61 will be met, as required by § 61.51(a)(3).

In addition, it should be noted that the RTS drum cell storage or tumulus disposal concepts as presented for Alternatives II through IV do not meet the 10 CFR Part 61 requirement that institutional control not be relied upon for more than 100 yr in determining radiological consequences [(10 CFR 61.59(b)]. The expected case for these alternatives whereby indefinite institutional control is assumed is also not consistent with the intent and policy related to LLW management on which 10 CFR Part 61 is based.

4.6 10 CFR PART 61 REQUIREMENT § 61.55—WASTE CLASSIFICATION (STIPULATION 11 OF COMPROMISE SETTLEMENT)

Conclusion

The RTS drum cell waste appears to be consistent with NRC requirements for near surface land disposal of transuranic waste.

Basis for Conclusion

On page D-24, the DEIS states that, "The waste liquids...contained isotopes with atomic number greater than 92 and half-lives greater than 5 years, at levels such that the concentration of these radionuclides in the cement waste form was approximately 55 nCi/g.... The waste form has been tested and meets NRC Branch Technical Position guidance for waste form stability and leachability" (Nuclear Regulatory Commission, 1991).

Although limited data on radionuclide concentrations in the RTS drum cell waste are provided in the DEIS (Table C-15), average concentrations were independently calculated for radionuclides with half-lives greater than 5 yr and with atomic numbers greater than 92 and were estimated to be well below 100 nCi/g.

5 ADDITIONAL COMMENTS

This section presents additional comments from review of Volume I of the DEIS. Each comment is presented as a conclusion, followed by a basis for the conclusion.

5.1 RISKS ASSOCIATED WITH LOSS OF INSTITUTIONAL CONTROL

Conclusion

Risks presented in the DEIS under conditions of loss of institutional control are unacceptably high.

Basis for Conclusion

For the "Expected Conditions" cases, Alternatives II through V generally represent acceptable radiological doses to the public, based on 10 CFR Part 61 and the proposed D&D rulemaking. The exceptions are doses from the HLW tanks which are as high as 126 mrem/yr to off-site receptors from surface and groundwater pathways for the Alternative III expected conditions case (DEIS, Table D-10). However, for Alternative III, doses resulting from loss of institutional control are estimated to be very large and their consequences potentially fatal to an intruder (DEIS, p. 5-90, and DEIS, Table 5-27). In addition, doses for Alternatives II, IV, and V were similarly high, for both undisturbed and erosion conditions. The maximum individual doses for the four alternatives were in the 10^8 to 10^9 mrem range.

To consider the viability of Alternatives II through V for loss of institutional control, an evaluation must be made as to whether the conservatism in the calculated estimates of consequences is so great and the probability of losing institutional control is so small that the overall risk from human exposure is acceptably low. Exposures for Alternatives II through V are clearly larger than intended by 10 CFR Part 61. 10 CFR 61.1(a) allows case-by-case consideration for waste disposal facilities in effect on the effective date (December 27, 1982) of the rule. However, it should be noted that the likelihood of some events occurring may be fairly high. This is particularly true for erosion of various stream banks. As noted on page 5-8 of the DEIS, "This scenario is a concern because conservative estimates of erosion...indicate that portions of the disposal areas could erode without active control measures."

The performance of the HLW tanks represents an inconsistency with respect to the 10 CFR 61.41 performance objective for protection of the general population from releases of radioactivity because doses from those tanks may be as high as 126 mrem per year. In addition, the waste in these tanks does not meet waste classification requirements in § 61.55.

5.2 ESTIMATES OF CANCER INCIDENCE BASED ON COLLECTIVE DOSE

Conclusion

The use of collective dose to estimate fatal cancers in an exposed population should be re-examined.

Basis for Conclusion

The DEIS uses collective dose to estimate fatal cancers in an exposed population (e.g., DEIS, p. 5-5). Several members of the health physics community have urged caution when making these kinds of estimates. Some guidelines and comments follow:

- "...it is questionable whether the collective dose is a true measure of the societal impact of the aggregate of exposures to individual members of a population." "At high doses and dose rates where the risk coefficients are best known, the concept of collective dose cannot be applied since the dose-response curve is non-linear, and at low doses and low dose rates where linearity between dose and the associated health effects is assumed to apply, the risk coefficients are less certain. This leads to additional restrictions in the application of the collective dose concept because (i) the exposed population must be well known with respect to size and possibly age, sex, and temporal distributions; and (ii) the exposure pathways must be characterized for the population at risk. Individual contributions to the collective dose must consist of doses to the whole body, or to specific organs or tissues for which stochastic risk coefficients are known" (Moeller, 1991).

- "In short, application of the collective dose concept requires detailed knowledge of the exposed population and the radiation doses to its members. The collective dose concept is valid for representing the collective risk only if both of these factors can be described and qualified, and it should be used for risk assessments only if the associated uncertainties are sufficiently small that the calculated collective dose itself is within an acceptable range of uncertainty. In addition, it is important to note that a high individual risk to a small number of people is not necessarily the same as a low individual risk to a large number of people, even though the collective dose may be the same" (Moeller, 1991).

- In 1995, NRC responded to the U.S. Environmental Protection Agency (EPA) proposed changes to the federal Radiation Protection Guide, noting that, "Contrary to EPA's view, NRC believes that the linear hypothesis is used as a precaution and that there is no convincing evidence of proportional risks at background levels of lifetime exposure. The scientific and ethical limitations of the linear hypothesis and the impacts to society have become increasingly clear to NRC in projecting potential health impacts associated with very low doses of radiation (e.g., doses that are a small fraction of the doses associated with natural background radiation). These problems have been particularly illuminated in evaluating radioactive waste management and decommissioning projects, where the uncertainty in the health risk estimates is compounded by the long periods over which risks to society are expected to accrue" (Nuclear Regulatory Commission, 1995).

5.3 OTHER SCENARIOS

Conclusion

The "bathtub scenario," an overflow effect that tends to occur in burial areas where infiltration through the caps and/or lateral groundwater flow enters at rates greater than the steady-state outflow, should be considered for the WVDP site.

Finally, allowing indefinite, long-term monitoring and site maintenance (e.g., erosion control) would be a significant departure from NRC policies with respect to other LLW disposal and regulation, the operation of existing sites, and the development of new commercial LLW sites.

5.6 COMPARISON WITH THE U.S. DEPARTMENT OF ENERGY ENVIRONMENTAL IMPACT STATEMENT FOR THE HANFORD, WASHINGTON, SITE

In this section, the alternatives and methodologies used in the DEIS are compared to those presented in the DOE EIS for the Hanford, Washington, Site (U.S. Department of Energy and Washington State Department of Ecology, 1996). Following is a discussion of the most significant differences between the two EIS documents.

Predictions of site performance after closure of the WVDP facilities or during long-term management extend to 1,000 years in the future. Uncertainty in predicting effects of long-term erosion processes is the primary limiting factor. In contrast, the Hanford EIS evaluates performance for 10,000 years in the future (p. S-25, paragraph 1). The scope of this DEIS review did not include analysis of the acceptability of either of these time periods or the reasons for the differences between them.

In some instances, the WVDP DEIS presents alternatives that do not comply with various requirements for disposal. For example, backfilling tanks which contain a residual volume of HLW does not meet the requirements of 10 CFR Part 60 for HLW disposal (DEIS p. 5-61, paragraph 3; p. 5-62, second bullet). A rationale is needed in the DEIS to explain inclusion of alternatives that do not meet these requirements. The Hanford EIS includes such rationale by stating that "NEPA requires that EISs address the full range of reasonable alternatives, including alternatives that would not be in compliance with laws and regulations" (p. S-32, paragraph 4).

5.7 COMPARISON WITH INFORMATION IN PREVIOUS WVDP SAFETY ANALYSIS REPORTS

Part of the review of the DEIS included a comparison of information in the DEIS with information previously presented in three safety analysis reports (West Valley Nuclear Services Company, Inc., 1995a; 1995b; and 1996). The focus of this comparison was primarily on design basis events and processes, such as seismic acceleration and erosion processes. No significant inconsistencies were identified with respect to these topics; details of comparison are included elsewhere in this report. However, the value reported for the volume of residual radioactive material present in Tank 8D-1 before implementation of the alternatives was 3 percent (DEIS, p. C-25, paragraph 2), while WVNS-SAR-002 (West Valley Nuclear Services Company, Inc., 1995a) reported that a heel of 5 to 20 percent of the zeolite originally in Tank 8D-1 is anticipated at the end of vitrification operations (p. B.6-9, paragraph 6).

6 INDIVIDUAL SECTION AND APPENDIX REVIEWS

Comments from the review of Section 4 and various specific appendices of the DEIS are presented in this section. These reviews were performed to evaluate the methodologies by which specific topics were analyzed in the DEIS. They do not include evaluations or comparisons of the DEIS alternatives, since these appear in previous sections of this report.

Information in Section 4 on the affected environment was compared to information previously reviewed in WVNS-SAR-001, Rev. 2, Draft G (West Valley Nuclear Services Company, Inc., 1996). Methodologies presented in appendices which support DEIS modeling of radionuclide releases and associated doses but which are not addressed in the comparative analysis of alternatives are reviewed separately herein.

Review of information presented in Appendices A through E is integral to, and was incorporated within, the comparative analysis given in the main body of this report. Therefore, comments on these appendices are not separately identified in this section.

6.1 REVIEW OF SECTION 4—AFFECTED ENVIRONMENT

Reference is made to an outdated revision (Rev. 1, Draft I) of WVNS-SAR-001 (p. 4-1, paragraph 2). The latest revision of this document, which was reviewed by CNWRA this year (Center for Nuclear Waste Regulatory Analyses, 1996), is Rev. 2, Draft G. The DEIS was reviewed against the latest revision.

The DEIS concedes on page 4-18, paragraph 4 that the emergency spillway would not contain the probable maximum precipitation (PMP). However, the similar discussion in WVNS-SAR-001 (West Valley Nuclear Services Company, Inc., 1996) states in addition that the PMP event would subsequently cause dam failure, which is not noted in the DEIS (p. A.3-32, paragraph 3). Further, the same reference (p. A.3-35, paragraph 2) states that "...the most critical water levels occur as a result of dam failures associated with the probable maximum flood (PMF)." The DEIS should include a similar discussion. Although WVNS-SAR-001, Rev. 2, Draft G, indicates that "There are no project facilities that would be directly affected by the dam failure stream flow," associated erosive effects could be capable of damage to the facilities (p. A.3-34, paragraph 3).

6.2 REVIEW OF APPENDIX G—RADIATION DOSES TO THE PUBLIC FROM ACCIDENTS

Methodologies described in Appendix G for evaluating radiation doses to the public from accidents are acceptable and consistent with those used in the nuclear industry. The GENII computer code (Napier et al., 1988) was used to determine dose conversion factors for inhalation for site-specific X/Q dispersion factors. The extent of atmospheric dispersion is expressed by the ratio, X/Q, where X is the concentration (Ci/m^3) at a distance from the source and Q is the release rate from the source. The use of 95 percent dispersion factors (exceeded 5 percent of the time) provides a conservative estimate of impacts.

Figure G-1, page G-8 is based on Figure M-2, page M-3, which presents the median peak ground acceleration (pga) with site amplification using input from six independent teams. For consistency,

the DEIS analysis should be based on Figure M-1, page M-2, which represents the pga fractile hazard with site amplification. The interpretation of the results is unaffected because the values presented in the text are consistent with Figure M-1.

Figure G-1 and paragraph 5.5.2.2 indicate that various components will fail as a result of the beyond design basis event. The process of utilizing the hazard curves, given in Figure M-1, the response spectrum, and analysis to arrive at what components fail is not described in the DEIS. However, CNWRA review leads to the same conclusion drawn by the DEIS.

6.3 REVIEW OF APPENDIX H—TRANSPORTATION ANALYSIS

Page H-1, Section H.2 of the DEIS notes that the four objectives of packaging and transportation are to: (i) protect people from the radiation, (ii) contain the radioactive materials, (iii) prevent nuclear criticality, and (iv) protect against theft or sabotage. Appendix H addresses the first two but makes no mention of the latter two objectives. For completeness, criticality and nuclear materials protection should be included in the DEIS.

Page H-4, paragraph 1 indicates that benchmark routes by truck and rail have been defined, but criteria for selection of routes (e.g., risk to the community, total travel distance, etc.) need to be presented.

Page H-22, Table H-6 of the DEIS should justify why collective doses and health effects from Hanford and Nevada Test Site routes are identical for entries on page H-13, WMA 2, case 2; and page H-14, WMA 5, case 1.

Page H-40, paragraph 1 of the discussion on transportation accident risks should include consideration of radiological doses and risks for cleanup crews and other radiological workers responding to accidents. If specially trained cleanup crews of radiological workers are needed at remote locations, radiological exposure of workers and the public may be more extensive than anticipated in the DEIS.

The DEIS should justify the results of analyses which show more expected fatalities due to the inhalation of vehicle exhaust than by accidents or exposure to radiation. This seems to be in disagreement with the results of the transportation analysis summarized in Table E-28 of the DOE Waste Management Programmatic Environmental Impact Statement (U.S. Department of Energy, 1995). An estimated 0.16 deaths per million truck miles have been attributed to inhalation of sulfur dioxide and particulates from diesel exhaust in urban areas (Rao et al., 1982). Risk factors related to rural and suburban areas are not available. This rate is higher than the rate of accident fatalities [0.016 to 0.082 deaths per million miles (U.S. Department of Transportation, 1990)] in urban areas, but not in rural areas. In rural areas, population densities are lower, and exhaust has more opportunity to disperse. This consideration is applicable only in urban population zones. Only about 2 percent or 50 mi of the routes between WNYNSC and the Hanford or Nevada Test Sites is urban (as shown in Table H-1). The high estimate of inhalation fatalities stems from the conservative assumption that the entire 800-mile route required for the disposal of industrial wastes is through urban areas. This distorts the apparent relative risk of radiological versus non-radiological factors.

6.4 REVIEW OF APPENDIX J—HYDROGEOLOGIC MODELS USED TO CALCULATE GROUNDWATER FLOW AND TRANSPORT

The model's ability to simulate the expected distribution of radioactive isotopes in groundwater and to adequately represent the resulting potential human health and environmental impacts has not been adequately demonstrated. The conceptual model and code selection are satisfactory and the model is apparently based on adequate geological data. However, the limited way groundwater contamination data was incorporated makes the model results questionable. Furthermore, there is no check that the modeled water balance is accurate. Additional results are required to evaluate model calibration. It is particularly important that the modeled water balance be compared against an independently calculated water balance and that a contaminant mass balance be performed.

It is unclear whether the hydrogeologic flow and transport models consider spatial variations in hydraulic conductivity at the site, and, if so, to what degree. From conductivity values given in Appendix J and Section 4, it appears that these values can vary by orders of magnitude. The following are examples.

> From Section 4, the hydraulic conductivity of the saturated Till Sand on the North Plateau is given as 1.3×10^{-4} cm/s (bottom of p. 4-25), while that of the South Plateau is given as 3×10^{-7} to 2×10^{-5} cm/s (top of page 4-27, for silt and fine sand interlayers in Lavery Till). These compare to values in Table J-3 (used in the model) of 0.4 ft/d (1.41×10^{-4} cm/s) for horizontal conductivity and 0.04 ft/d (1.41×10^{-5} cm/s) for vertical conductivity.
>
> From page J-36, Table J-6, conductivities for the sand and gravel unit are listed as 1.0–12 ft/day (3.5×10^{-4}–4.2×10^{-3} cm/s). There is no explanation of the distribution of these conductivities, the number of conductivity zones or how they were altered during calibration (e.g., whether each zone was altered individually, or the entire layer was altered as a single zone).

The 3DFEMWATER code allows spatial variability in hydraulic conductivity. As an example, the calibrated hydraulic conductivity of the Sand and Gravel Layer is listed in Table J-6 as 1.0-12.0 ft/d (3.5×10^{-4}–4.2×10^{-3} cm/s). Since no map of conductivity distribution is presented, the conductivity distribution is unknown. All other hydrogeologic units are apparently assigned a single hydraulic conductivity.

Significantly limited data are available for all units other than the Sand and Gravel Layer. Section 4.3.4.1 presents hydraulic conductivity data for the Weathered Lavery Till, the Unweathered Lavery Till, silt and sand interlayers in the Lavery Till, and the Kent Recessional Unit. Assuming that the Till Sand Unit is not the same as the silt and sand interbeds (p. 4-9, Section 4.1.2, paragraph 1), it appears that hydraulic conductivity data for each unit is available only from the North or South Plateaus. No explanation of techniques used to extrapolate data has been provided.

Hydraulic conductivity data are not presented in a manner that allows for proper evaluation. If the DEIS had tabulated all hydraulic conductivity data and presented the data on a map, the need (or lack thereof) for a spatially variable hydraulic conductivity distribution could easily be determined. If maps of the modeled hydraulity conductivity were also presented (at least for the Sand and Gravel Layer), then the hydraulic conductivity data maps and modeled conductivity maps could be compared.

Section E.2 on page E-3; paragraph 4 on page E-24; last paragraph on page E-26; and first and last paragraphs on page E-27 indicate that the primary release models described in Appendix E and selected for the DEIS impact evaluations are groundwater flow and solubility limited leaching, radionuclide diffusion in concrete, and erosion collapse. Radionuclide transport models should also incorporate the contribution from releases in colloidal form. Ignoring the radionuclide contribution from colloids may result in underestimation of the source-term. The effect of the waste container corrosion and releases from concrete on the groundwater geochemistry (e.g., pH, concentration of ionic species, groundwater colloids) also needs to be evaluated and included in the source-term for a realistic modeling of releases from the waste form. Also, for the RTS drum cell (WMA 9), if the concentration of a radionuclide in the infiltrating water exceeded the solubility, the resulting release rate was estimated as the product of infiltration rate and solubility rather than as the estimated diffusional release rate.

Underestimating the source-term by using a solubility limited leaching approach to modeling and ignoring the radionuclides present in colloidal form is of greatest concern for actinides with low solubility. Literature studies show that in some cases the quantity of radionuclides present in colloidal form exceeds the amount present in solution by two or more orders of magnitude (Manaktala et al., 1995). There is no straightforward method for using the solubility limit to calculate the amount that can be present in colloidal form. The transport characteristics of colloids depend upon a number of site-specific parameters such as groundwater chemistry (ionic species present in solution and in colloidal form); pH; temperature; charge and charge density of the groundwater colloids; colloid morphology; presence or absence of organic matter; groundwater flow path; and chemical and physical interactions of the colloids released from the waste form with the geologic site materials, construction materials (concrete, etc), the waste package, backfill, etc.

Page E-7, paragraph 2 states that the estimates of radionuclide concentrations in groundwater are the final data needed for estimates of flow-dissolution mechanism release rates. Limited on-site measurement data are available, and no site-specific experiments have been conducted to establish radionuclide concentrations in groundwater. Thus, geochemical modeling was used to supplement the existing data by estimating equilibrium solubility. The DEIS should assess the level of uncertainty in these results.

The report does not provide any information on the methodology that will be used to assess the uncertainty in the computer models used for estimating the radionuclide concentration in the groundwater. In the absence of site-specific data for validating the computer models, the level of confidence in the estimates provided by computer models could be very low.

Page J-4, bullet 1 states that one of the model purposes is to determine the baseline distribution of radiological contamination in the year 2000. This purpose was not adequately met. By using only existing groundwater contamination, and ignoring certain potential radiological source terms, the baseline radiological concentrations are inaccurate.

Page J-4, bullet 2 states that one of the model purposes is to simulate flow and transport for the five alternatives in the EIS. This purpose was not adequately met. The model results present baseline conditions for the five alternatives, but do not present results from implementation of the alternatives. The distribution of radioactive isotopes resulting from implementing each of the five alternatives needs to be presented.

Justification is necessary for choosing Tritium, Sr-90, and Np-237 as representative radioactive isotopes in the transport model (p. J-33, Table J-5). Tables C-21, C-22, and C-24 of Appendix C indicate that numerous other radioactive isotopes of potential concern exist at the site, including substantial quantities of Plutonium (many isotopes) and Cesium-137.

Page J-40, paragraph 5 presents model results only for tritium and gross beta activity. Gross beta activity is not indicative of any one radioactive isotope, and it is unclear how the transport of beta activity was modeled. Transport of individual isotopes must be modeled to predict future isotope concentrations.

Because the groundwater model does not account for daughter product formation, or ongoing radioactive sources, the baseline concentrations of gross beta and tritium activity for the year 2000 presented on page J-46, paragraph 1, represent the lowest reasonable concentrations possible. Consequently, these concentrations result in the lowest reasonable risk in a risk assessment. Upper estimates of potential beta and tritium concentrations should be developed by including daughter product formation and time-dependent radioactive sources in the model. These two estimates (lowest and highest reasonable concentrations) will provide bounds for the risk assessment.

The accuracy or validity of the groundwater flow model can not be established without a more complete water budget discussion. A water budget of the modeled area needs to be presented and compared to the model results. Portions of the water budget are distributed throughout the report, for example:

- Subsurface inflow in the Sand and Gravel Layer (p. J-18)
- Recharge estimates for the Sand and Gravel Layer (p. J-18)
- Recharge estimates for the Lavery Till (p. J-18)
- Leakage to the Unweathered Till on the South Plateau (p. J-18)
- Recharge from precipitation on the North Plateau (p. 4-21)
- Recharge from precipitation on the South Plateau (p. 4-24)
- Discharge to surface springs, streams, drains, and evapotranspiration from the Sand and Gravel Layer on the North Plateau (p. 4-25)

These components, along with others, should be consolidated into a single water budget. The water budget can then be compared to model results to determine if the model adequately simulates observed flows.

A mass balance discussing the fate of contaminants is needed. The mass balance must include the radioactive isotope starting quantities, the radioactive decay process, the amount remaining onsite, and the amount flowing offsite through subsurface flow and seepage into streams.

The code selection given on page J-18, Section J.4 is adequate; however, other codes exist that are written principally for simulating radioactive isotope transport (e.g., SWIFT/486). These other codes incorporate daughter products and are more appropriate for this project.

The modeled flux into the Kent Recessional Unit through the model lower boundary seems too high (p. J-40, paragraph 4). The measured hydraulic conductivity of the Kent Recessional Unit is between 1.8×10^{-8} and 4.9×10^{-8} ft/s (p. 4-27), or an average of 3.35×10^{-8} ft/s (2.89×10^{-3} ft/day). Under the most conservative assumption that the vertical conductivity is equal to the horizontal conductivity, the Kent Recessional Unit could accept a flux of 2.89×10^{-3} ft/day under a unit downward gradient and remain unsaturated. The modeled flux through the Lavery Till, and into the Kent Recessional Unit is up to 7×10^{-2} ft/yr (p. J-40). The Kent Recessional Unit should be saturated at these fluxes.

Recharge from precipitation is likely overestimated using the approach presented on page J-31, Section J.5.5, paragraph 2. The rainfall recharge into the model should be compared with the recharge estimates presented on page 4-21.

It is difficult to match the boundary conditions described on page J-31 with Figures J-5 and J-3. Following are specific comments on the boundary conditions.

- Specified head boundaries simulating the northern and southern swamps and the base of the Unweathered Till are appropriate.

- It is unclear where the specified head boundary along the southeastern boundary is, or what it physically represents.

- The no-flow boundaries completely surrounding the Unweathered Till seem appropriate based on Prudic's (1986) observations of substantial vertical flow and no other geologic controls.

- It is unclear how the specified flux at the western boundary was modeled. The specified flux was calculated by the model, and therefore could not have been specified as a boundary condition (p. J-31, Section J.5.5, paragraph 4). The modeled specified flux should be compared to the 4 in. per year estimated on page J-18.

- Figure J-3 does not suggest any topographic control of groundwater flow direction near the western portion of the southern boundary. The assumption might be that groundwater flows parallel to topography, and therefore a model boundary perpendicular to equal ground elevations will approximate a flow line. If possible, data should be presented that supports this boundary as a flow line.

- The boundary condition along the creeks is unclear. Page J-31 states that creek boundaries are special flux boundaries; however, they should be specified head boundaries (a seepage face).

- Figure 4-3 shows the Lavery Till outcropping along Franks Creek adjacent to the southern plateau. This portion of the boundary should be treated as a seepage face, not a no-flow boundary.

The purpose for transient modeling is unclear (p. J-36, Section J.7.1.2). The steady state model is used for modeling future scenarios, and therefore a transient model is unnecessary. If a transient model is necessary, a more detailed discussion of the implications of the transient model results should be presented.

The mean absolute difference (MAD) of hydraulic heads at the end of the transient simulation (8.6 ft) is not as accurate as the MAD of the steady-state simulation (2 ft) (p. J-40, paragraph 2). This suggests that the Van Genuchten parameters may need modification, or the modeled water budget may be incorrect.

Results from the transient modeling are only presented for a single time (p. J-41, Table 8). The results should compare measured and simulated water level fluctuations in a number of wells over the entire duration of the modeled period. No evidence is presented indicating that the transient simulation adequately simulates the water table fluctuations observed in the shallow groundwater wells.

The first reason given for inaccurately low tritium and beta concentrations in the model is that the steady-state flow model covers more saturated area, which dilutes the contaminant concentrations (p. J-46, paragraph 1). This is only correct if the initial concentration is created by introducing a given mass of contaminant into the model. If the initial condition is created by introducing an initial concentration of contaminant, then the volume of modeled groundwater does not affect the modeled concentrations.

A more structured sensitivity analysis that includes and compares other factors would be more informative (p. J-50, paragraph 1). The analysis should include distribution coefficients, dispersivities, Van Genuchten parameters, and saturated hydraulic conductivities of units other than the Sand and Gravel Layer. Comparing the relative sensitivity of each factor indicates where additional data collection is necessary for model refinement.

A consistent measure of model results should be used throughout the report. Results are currently reported in various ways, including MAD in piezometric heads (p. J-36), cumulative absolute deviation in piezometric heads (p. J-50), and descriptively (p. J-40, paragraph 2).

The necessity of a saturated/unsaturated flow and transport model is not well justified. Since no radiological source term is incorporated into the model, there is no vadose zone migration of radiological contamination. The radiological transport appears to be simulated solely in the saturated zone. This model could be simplified using a saturated-only flow and transport model.

Model layers should be shown in relation to geologic layers and water table elevation.

6.5 REVIEW OF APPENDIX L—EROSION STUDIES

The DEIS should include a discussion similar to that in WVNS-SAR-001 (West Valley Nuclear Services Company, Inc., 1996, p. A.3-32, paragraph 3; p. A.3-34, paragraph 3; and p. A.3-35, paragraph 2) concerning the dam failure associated with the PMF. (See Section 6.1, paragraph 2 of this report.)

Appendix L correctly recognizes the three primary erosional processes at the WNYNSC: sheet and rill erosion, stream valley rim widening (p. L-2, paragraph 1).

Techniques employed to measure the three types of erosion at the WNYNSC are generally acceptable (p. L-2, paragraph 2). However, as recognized in Appendix L, uncertainty in measured rates is high due to several factors. First, the recent erosion rates at active sites may not be sustainable over the long term as slopes stabilize and erosion rate declines. Second, recent erosion rates have been affected at some places by runoff from relatively impermeable surfaces at the industrialized WNYNSC site, and they may not be indicative of future erosion rates if such surfaces are altered significantly during decommissioning. Finally, the relatively short period of time over which data are available does not allow reliable predictions over the significantly longer period of time of interest (1,000 yr). For example, limited data on sheet and rill erosion collected to date do not confirm whether the trend in erosion is aggrading or degrading.

Such facilities as the LLWTF lagoons, the SDA, the NDA, and the RTS drum cell would provide pathways for radionuclide transport through erosion. The DEIS uses numerical modeling and empirical equations which are considered acceptable by the technical community for predicting the long-term rates of erosion (p. L-5, paragraph 4).

Long-term rim widening for both Erdmann Brook and Franks Creek is significant, estimated to range from about 0.13 to 0.16 m/yr under current drainage conditions (p. L-10, last paragraph through page L-11). The near-surface bedrock at Quarry Creek is expected to limit rim widening to less than these values. If a global erosion control strategy as described in the DEIS is employed, rim widening is reduced to less than one percent of these values. Maintenance is required for erosion control in either case (current drainage conditions or global erosion control conditions), which means that institutional control will be required for any of the alternatives except Alternative I.

Methods for predicting the rate of erosion due to gully advance are not currently available, although existing data indicate that advance in the gullies identified as SDA, NP3, and 006 is great enough that integrity of existing facilities is threatened within the next 1,000 yr (p. L-8, Section L.3.2).

6.6 REVIEW OF APPENDIX M—EVALUATION OF NATURAL PHENOMENA

The basic approach for seismic review is in accordance with methods used in the previous safety analysis reports (SARs) and is in conformance with standard engineering practice (p. M-1 and M-4, Section M.1). The basis for the definition of the seismic hazard assessment is DOE-STD-1024, which is referenced by the results of (West Valley Nuclear Services Company, Inc., 1992). The seismic review process begins with the computation of the median pga based on the geometric average of the Electric Power Research Institute (EPRI) and Lawrence Livermore National Laboratory (LLNL) median values. The median value is then converted to a mean value (factor 1.65) and finally to the site-specific mean value (factor 1.2). The resulting annual frequency of exceedance versus pga curves are given in Figure M-1, page M-2. These are consistent with previous SARs and presentations made by Dames & Moore (Gates, 1993).

The beyond design basis earthquake (BDBE) was defined at a level of 0.33 g pga. Based on the mean curve on Figure M-1 (p. M-2), this corresponds to an annual frequency of exceedance of 6×10^{-5}

or a return period of 16,700 yr. However, paragraph 5.4.2.2 on page 5-94 gives an annual return period of 33,000 yr. This discrepancy in the annual return period needs to be clarified.

The loading due to high winds is based on an analysis of data over a 31-yr span in Buffalo, New York (p. M-5, paragraph 3). The important result is the approximation given on page M-6 for the fastest-mile wind, Equation M-1. Note that there is no tolerance given on this equation. In fact, if one calculates the fastest-mile wind speed for a 31-yr period, the resulting value is 71 mph, which is about 10 percent less than the measured value of 78 mph. Extrapolated values beyond the 31-yr experience base would be expected to exhibit greater uncertainty. Some bounds should be placed on this curve to account for this type of variation.

6.7 REVIEW OF APPENDIX N—POTENTIAL LOCATIONS FOR NEW FACILITIES

Factors included in 10 CFR 61.50(a) and Regulatory Guide 4.19 (Nuclear Regulatory Commission, 1988c) but not discussed in the DEIS Appendix N are (1) capability to be characterized, modeled, analyzed, and monitored [§ 61.50(a)(2)]; (2) population distribution and land use [§ 61.50(a)(3)]; (3) natural resources [§ 61.50(a)(4)]; (4) depth to water table [§ 61.50(a)(7)]; (5) tectonic processes [§ 61.50(a)(9)]; and (6) adverse impacts from nearby facilities [§ 61.50(a)(11)] (p. N-2, Table N-1). For completeness, a rationale should be provided in Appendix N to explain why these factors are not important for site selection for treatment, storage, and disposal facilities.

For storage facilities and the LLW Disposal Facility, which require 500- and 1,000-yr erosion considerations, respectively, location relative to floodplains should consider 500- and 1,000-yr floodplains instead of the 100-yr floodplain noted in Table N-1 (p. N-2). However, as noted in Section 4.3.2 of the DEIS, page 4-21, no 500-yr floodplain map is currently available, so such long-term siting considerations have been postponed until an alternative is selected.

The valley widening (0.15 m/y) rates of erosion (p. N-4, paragraph 3) are less than those identified in Appendix L for the 90 percent quantile for either Erdman Brook (0.158 m/y) or Franks Creek (0.153 m/y) assuming current drainage conditions (see Table L-2, p. L-11). However, Figure N-3 shows the same 1,000-yr plateau edge as that given in Figure L-2, page L-12. These differences should be reconciled.

6.8 REVIEW OF APPENDIX O—LONG-TERM STRUCTURAL PERFORMANCE OF SELECTED REINFORCED CONCRETE STRUCTURES AT THE WESTERN NEW YORK NUCLEAR SERVICE CENTER

The DEIS states on page O-2, paragraph 4 that the expected lifetime of the process building, the VF and the tank vaults is "at least 500 years, with 1,000 to 2,000 years being the probable time scale." Based upon the analyses given in this document and structural engineering experience, there can be little confidence given to this conclusion. Much of the necessary information and theory for long-term performance of reinforced concrete (RC) structures is subjective, due to unknowns in material behavior and loadings. This adds great uncertainty to the lifetime estimate of 500 yr (DEIS, p. O-1, paragraph 2).

The main bases for the analyses of the degradation of concrete structures as presented in DEIS page O-2, last paragraph, are the two NUREG reports (Clifton and Knab, 1989; Walton et al., 1990). A main conclusion of the Walton report is that "The lack of adequate models and physical understanding for many of the degradation processes makes the application of Monte-Carlo and other statistical techniques...of questionable validity." Clifton and Knab write "Some research has been carried out on predicting the service life of concrete based on the development of models. ...These models appear to give at least semi-quantitative estimates of service lives. Further work on developing models is recommended." The state-of-the-art is such that RC structural lifetimes greater than 100 yr cannot be predicted with acceptable confidence.

There are a number of significant factors that were not included in the DEIS analysis. Examples include the following.

- The combined effects of the many potential degradation mechanisms are not considered. The potential for strong synergism between the mechanisms can be seen in the behavior of RC bridges. In the first 75 percent of a well-made bridge's life, very little decay will occur; however, during the last 25 percent, deterioration quickly accelerates. During this period, the rebar-corrosion-induced cracking allows more water to reach the rebar, which promotes more corrosion and more cracking, allowing more water to infiltrate, etc. The rate of deterioration is decidedly nonlinear with rapid increases at the end of a structure's life.

- Only flexural failure modes are considered. However, as the concrete degrades, column shear/buckling is a possibility, as is direct shear failure at the face of a column-beam joint.

- Two other potential types of loading should be investigated: (i) ponding on any flat roofs, including the roofs of the buried tank vaults; and (ii) differential foundation settlement, due to creep and movement of the soil.

- The combined effects of the loadings should be considered, rather than assuming independence between them. For a 500- or 1,000-yr span, it is not unlikely that a structure with a distressed foundation could be subjected to an earthquake during the winter, when a large snow load is on the roof.

The discussion on effects of corrosion on long-term degradation of RC structures on page O-3, Section O.2.1, should be expanded to include potential effects of corrosive chemicals on tank vaults, if the tanks should fail. For completeness, the discussion should also include degradation effects due to corrosive chemicals (chlorides, sulfates) present in the soil.

If a reduction in rebar strength of 0.1 percent occurs every year as stated in the DEIS, page O-4, Section O.2.1.1 (and such a linear rate of loss would seem to be unlikely), then only 75 percent of the strength will remain after 250 yr. Combining this with the degradation of the concrete would indicate that failure of a RC section could easily occur in 250 yr, even if no other degradation mechanisms are considered.

The discussion on plant growth presented on page O-4, Section O.2.1.4 should include consideration of roots of large plants. An aggressive native tree could grow to full size in 40 yr, with roots as deep as 20 ft. Buried concrete structures, such as the tank vaults, could be degraded by intrusion of such roots.

The 1,000-yr snow load introduced in this section on page O-8, Section O.2.2.2 has not been defined in previously reviewed WVDP documents, such as WVNS-SAR-001, Rev. 2, Draft G (West Valley Nuclear Services Company, Inc., 1996). The DEIS should quantify the 1,000-yr snow load and provide reference to an analysis by which it was determined.

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