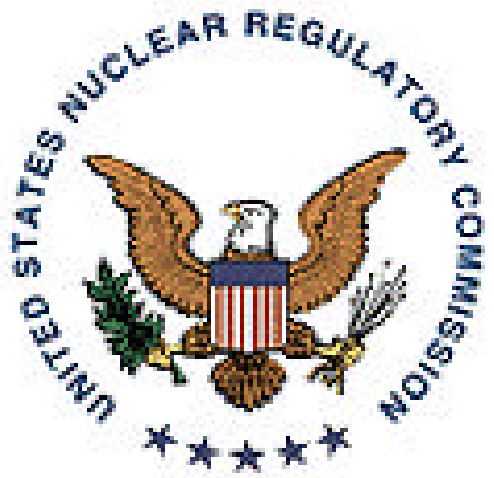

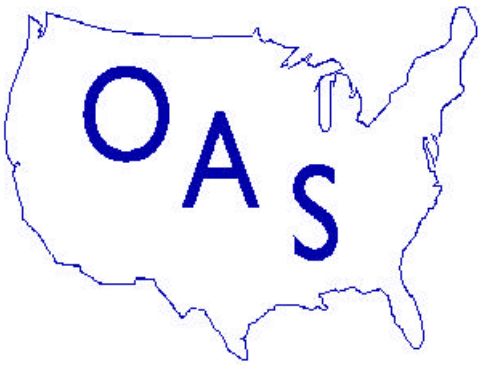

Organization of Agreement States

FINAL REPORT OF THE WORKING GROUP ON URANIUM MILLING LICENSE TERMINATION IN AGREEMENT STATES

July 2002

CONTENTS

CONTENTS			ii
EXECUTIVE SUMMARY			iii
WORKING GROUP ORGANIZATION AND OPERATIONS			v
INTRODUCTION			vi
Task 1	Recommendations for Improvement in the U.S. Nuclear Regulatory Commission Concurrence Process		1-1
Task 2	Draft Revision of STP Procedure SA-900		2-1
	I.	Introduction	
	II.	Objectives	
	III.	Background	
	IV.	Roles and Responsibilities	
	V.	Guidance	
Appendix A		License Termination Process	A-1
Appendix B		Sample Completion Review Report (Conventional)	B-1
Appendix C		Sample Completion Review Report (Non-conventional)	C-1
Appendix D		Sample NRC Determination Letter (Conventional)	D-1
Appendix E		Sample NRC Determination Letter (Non-conventional)	E-1
APPENDIX I	CHARTER FOR THE NRC/AGREEMENT STATE WORKING GROUP ON TERMINATION OF URANIUM MILL LICENSES IN AGREEMENT STATES		I-1
APPENDIX II	WORKING GROUP RESPONSE TO COMMENTS ON DRAFT REVISION OF STP PROCEDURE SA-900 (August 17, 2001 Version)		II-1
APPENDIX III	DRAFT REVISION OF STP PROCEDURE SA-900 (August 17, 2001 Version)		III-1

This page left blank intentionally.

EXECUTIVE SUMMARY

On March 29 , 2001, the U.S. Nuclear Regulatory Commission's (NRC) Office of State and Tribal Programs (STP) formed a Working Group to provide NRC with recommendations to address issues identified by the Working Group and stakeholders on the NRC concurrence process for uranium milling license termination in Agreement States. The charter for the Working Group is provided in Appendix I.

The STP Procedure SA-900, "Termination of Uranium Mill Licenses in Agreement States," has been used as guidance by NRC staff for review of uranium milling license termination proposals as well as by Agreement State staff on preparation of such proposals. The STP Procedure SA-900 is an implementing procedure based on conclusions stated in SECY-99-025, entitled "Guidance to Terminate Agreement State Uranium Recovery Licenses Under Requirements of 10 CFR 150.15a(a) and Section 274c." The NRC has made its concurrence determinations on one conventional and eight in-situ uranium milling license termination proposals submitted by Agreement States since the STP Procedure SA-900 was issued in April 1999.

During NRC review of the license termination proposals, especially Washington State's proposal for termination of the Western Nuclear (Sherwood) milling license, NRC staff recognized that in some areas the guidance needed to be expanded to better characterize the level of detail in information which should be provided by an Agreement State in support of a license termination proposal. Specifically, the level of information needed in the Completion Review Reports (CRR) requested from Agreement States should be similar or equivalent to that contained in the sample CRRs attached to the STP Procedure SA-900.

Currently, the sample CRR attached to the STP Procedure SA-900 for terminating a conventional uranium milling license was originally prepared by NRC staff for license termination of the Atlantic Richfield Company's (ARCO's) Bluewater site, a formerly NRC licensed facility. Since NRC staff would not have all the historical knowledge on licensing activities for sites that are under Agreement State jurisdiction, the level of detailed information equivalent to that contained in the ARCO's CRR may not be sufficient if Agreement States would use that as an example to submit their license termination proposals.

In addition, for termination of a non-conventional uranium milling license (mainly on in-situ uranium extraction license), there is no sample CRR attached to the STP Procedure SA-900 for use as guidance by NRC and Agreement State staff.

The Working Group was charged with the following two tasks.

Task 1: Identify areas that need improvements in the NRC concurrence process based on the review experience to date, such as early involvement in the Agreement State's license termination activities, and use of formal and/or informal processes to resolve issues identified during the review.

Task 2: Propose a draft revised STP Procedure SA-900 that addresses issues identified by the Working Group and stakeholders, such as comments provided in the National Mining Association (NMA) letter. The draft revision of the STP Procedure SA-900 should include two separate sample CRRs for termination of both conventional and non-conventional uranium milling licenses in Agreement States.

Under Task 1, the Working Group has identified the following three major areas where the NRC concurrence process can be improved by revising the current STP Procedure SA-900:

(1) The revised STP Procedure SA-900 should address Agreement State's early interaction with NRC on issues that are atypical with the normal, standard site closure proposals to avert difficulties during NRC's review of the CRR.

(2) The revised STP Procedure SA-900 should include a two-step CRR review process, i.e., an Agreement State should formally submit a draft CRR for NRC review and comment before a final CRR should be submitted.

(3) The revised STP Procedure SA-900 should clarify the scope of NRC's review in making a concurrence determination and provide better guidance for NRC staff in review of the CRRs submitted by Agreement States.

Under Task 2, the Working Group has proposed a draft revised STP Procedure SA-900 that addresses issues identified by the Working Group and stakeholders. A copy of the draft revised STP Procedure SA-900 which incorporates comments accepted by the Working Group is provided in Chapter 2. The draft revised STP Procedure SA-900 includes two separate sample CRRs for termination of both conventional and non-conventional uranium milling licenses in Agreement States.

WORKING GROUP ORGANIZATION AND OPERATIONS

Members:

Phil Egidi	Colorado Department of Public Health and Environment
Rob Herbert	Utah Department of Environment Quality
Kevin Hsueh[1]	NRC Office of State and Tribal Programs
Ted Johnson	NRC Office of Nuclear Material Safety and Safeguards
Gary McCandless	Illinois Department of Nuclear Safety
Dan Rom	NRC Office of Nuclear Material Safety and Safeguards
Gary Smith	Texas Department of Health
Dennis Sollenberger[2]	NRC Office of State and Tribal Programs
Dorothy Stoffel[3]	Washington Department of Health

[1] Co-Chair, NRC

[2] Resource Representative

[3] Co-Chair, OAS (Organization of Agreement States)

INTRODUCTION

The NRC Office of State and Tribal Programs (STP) announced the formation of a Working Group in a Federal Register notice (66 FR 17206) dated March 29, 2001. The Working Group was tasked to provide NRC with recommendations on the NRC concurrence process for uranium milling license termination in Agreement States.

The Working Group held four teleconference calls on April 24, May 30, July 31 and September 26, 2001 respectively and one face-to-face meeting in conjunction with the NRC/NMA uranium recovery workshop on June 12, 2001 in Denver, Colorado. The teleconference calls and face-to-face meeting were open to the public with participants including representatives from the uranium recovery industry, States, NRC, and a DOE contractor.

In the middle of August 2001, the Working Group completed a draft revision to the STP Procedure SA-900 (August 17, 2001 Version). On August 22, 2001 the draft revised STP Procedure SA-900 was distributed internally by STP for review by the Office of the General Counsel (OGC) and the Office of Nuclear Material Safety and Safeguards (NMSS). On the same date, the draft revised STP Procedure SA-900 was posted on the Working Group page of the STP web site (http://www.hsrd.ornl.gov/nrc/Umill.htm) and the availability of this procedure for review and comment was announced through an STP All Agreement State letter (STP-01-068). On August 23, 2001, the NRC published a document in the Federal Register notice (66 FR 44389) announcing the availability of and requesting comments on, the draft revised STP Procedure SA-900.

The Working Group has received about 70 comments on the draft revised STP Procedure SA-900 from the Illinois Department of Nuclear Safety (IDNS), the Nuclear Energy Institute (NEI), the National Mining Association (NMA), the Texas Department of Health (TDH), a private citizen, NMSS, and OGC. Based on the Working Group's discussions and review of the internal and external stakeholders' comments, the Working Group has made three recommendations which are discussed in Chapter 1. These recommendations have been incorporated into the draft revised STP Procedure SA-900 which is documented in Chapter 2. The charter for the Working Group is provided in Appendix I. Appendix II documents the Working Group's response to comments received on the draft revised STP Procedure SA-900 (August 17, 2001 Version).

Task 1 Recommendations for Improvement in the NRC Concurrence Process

The Working Group was tasked to identify areas that need improvements in the NRC concurrence process based on the review experience to date, such as early involvement in the Agreement State's license termination activities, and use of formal and/or informal processes to resolve issues identified during the review.

The Working Group has reviewed all the comments received from the internal and external stakeholders. These comments include those received during the Working Group teleconference calls and the face-to-face meeting held in Denver, Colorado as well as written comments received during or right after the public comment period. Detailed Working Group response to each comment received is documented in Appendix II.

Following are the Working Group's analyses and recommendations on three major issues raised by the stakeholders regarding the NRC concurrence process:

1. Agreement State's Early Interaction with NRC

One stakeholder commented that the responsibility for seeking NRC guidance early on should be placed on the Agreement State. Agreement States should request NRC guidance when a license termination proposal raises novel or unique issues that are atypical with respect to the normal, standard site closure proposals.

Another stakeholder commented that it appears to be a judgement call as to when to seek NRC guidance. It was noted that the draft procedure instructs giving NRC one month notice before sending the draft CRR. There is also mention of a possible visit by NRC which Agreement States may wish to undertake. Although it should not be in the form of a requirement, it might be beneficial to discuss contact and involvement with NRC earlier in the STP Procedure SA-900. This could avert difficulties later, such as the State preparing a CRR that NRC may not find acceptable.

We agree that Agreement State's early interaction with NRC on issues that are atypical with the normal, standard site closure proposals is the key to avert difficulties during NRC's review of the CRR. When a State licensing action is needed in response to such a licensee proposal, an Agreement State should make its own evaluation on whether the licensee's proposal meets the applicable standards and/or requirements. However, at that time, Agreement States should be encouraged to provide NRC an opportunity to review the basis for its conclusion before the licensing action is taken. We believe that understanding and possible agreement on the conclusion between NRC and the Agreement State prior to taking the licensing action would avert difficulty later during NRC's review of the CRR.

> **Recommendation:** There should be a section in the STP Procedure SA-900 to discuss issues related to Agreement State's early interaction with NRC including possible site visits and NRC review of unique or novel issues raised by Agreement States prior to license termination.

The following language has been included in the draft revised STP Procedure SA-900 under the Section V.A., entitled "Agreement State's early interaction with NRC" to address the above concern.

Agreement State's early interaction with NRC

Agreement States are encouraged to seek NRC guidance early-on when a licensing action raises novel or unique issues that are atypical with normal, standard site closure proposals from Agreement State licensees. When a State licensing action is needed in response to such a licensee proposal, an Agreement State should make its own evaluation and determination on whether the licensee's proposal meets the applicable standards and/or requirements. At that time, the Agreement State is encouraged to provide NRC an opportunity to review the basis for its conclusion before the licensing action is taken. NRC will review the State's determination and provide its views as to whether the basis is sufficient to support the conclusion to the Agreement State for consideration. Further interactions between NRC and the Agreement State may be needed to avert difficulties during NRC's review of the license termination if an agreement on the conclusion can not be reached.

In addition, approximately 2 years prior to submitting a draft CRR to NRC, Agreement States should consider whether NRC staff should be invited to visit sites that are in the process of license termination to discuss the histories and conditions of the sites and receive feedback, if any, from NRC staff. Agreement States may contact the Director, STP to discuss any early interaction activities.

2. Two-step CRR Review Process

A two-step CRR review process would involve an Agreement State formally submitting a draft CRR for NRC review and comment before the Agreement State submits its final CRR.

Some stakeholders commented that the two-step review process would replace the informal consultations that now take place between the NRC and Agreement State staff as the latter prepares the CRR. It was further commented that judging by the envisioned complexity of the draft CRR review process, the two-step process could entail large commitments of NRC and Agreement State personnel resources and a lot of time exchanging letters.

We do not agree that the two-step review process would replace the informal consultations that take place between the NRC and Agreement State staff. We noted that during NRC review of the Sherwood CRR submitted by the State of Washington, most informal consultations occur after NRC received the CRR instead of during the period when the CRR was being prepared. In the Sherwood case, both formal and informal processes were used to resolve issues identified during the NRC review of the CRR. As a result, NRC accepted the revision #2 to the CRR as the final CRR.

In terms of the amount of time needed for review of the CRR, we believe that the two-step review process will not significantly differ from the process used for the review of the Sherwood CRR. The only difference between the new and old processes is that the new process, i.e., review of a draft CRR, provides an opportunity for NRC staff to have an overall understanding of the State staff's bases before an Agreement State formerly makes a determination that all applicable standards and requirements have been met. The intention is to avoid situations where potential issues are identified by NRC staff after the Agreement State has formerly made its determination.

If all the issues identified in the draft CRR are addressed, the final CRR should be acceptable. Since all the outstanding issues have been resolved during the draft CRR review period, the amount of time needed for NRC review and acceptance of the final CRR would be minimal.

> **Recommendation:** The revised draft STP Procedure SA-900 should include a two-step review process. The language regarding a two-step review process has been included in the draft revised STP Procedure SA-900 under the Section V.F., entitled "CRR review process" to address the above concern.

3. Scope of NRC Concurrence Review

There were two major views expressed by stakeholders related to this issue. On one hand, some stakeholders commented that NRC staff should be involved in every step of major licensing actions and review all the detailed technical analyses conducted by Agreement States, such as reclamation plans and decommissioning plans. It was further commented that without review of the detailed technical analyses for the site, NRC staff would have difficulties in making determinations based on the CRRs submitted by Agreement States.

On the other hand, other stakeholders commented that early full-scale NRC involvement in Agreement State license termination efforts would be too costly and, thus, a questionable use of NRC staff resources. It was further commented that any such detailed involvement by NRC in Agreement Sate regulatory oversight would run counter to the fundamental concept of "relinquishing" Federal authority to the States.

We believe that Agreement States can make their licensing actions without NRC involvement except for the final license termination since NRC has relinquished its licensing authority to Agreement States. We agree that it would not be the best use of NRC staff resources to conduct full-scale NRC reviews in Agreement State license termination efforts. In the past, NRC has not been involved in Agreement State licensing actions unless NRC received requests from Agreement States for technical assistance in specific technical areas.

We noted that there are only six conventional (six licenses) and nine in-situ (three licenses) uranium milling sites in two Agreement States (Colorado and Texas) that are expected to be terminated in the next five years. We also recognize that most of the above uranium milling sites are in the final phase of license termination, i.e., reclamation and decommissioning plans have been reviewed and approved by Agreement States. It would not affect most of the sites even if NRC were to decide to start early full-scale involvement in Agreement State licensing actions.

We considered the fact that NRC staff would not have all the detailed analyses conducted by the Agreement State to make its determinations for sites that are under Agreement State jurisdiction and recognize the need for better guidance with respect to the scope of NRC's review of CRRs submitted by the Agreement State.

Recommendation: The scope of NRC review should be clearly stated in the revised draft STP Procedure SA-900 so that NRC reviewers would clearly understand the scope of NRC's review of CRRs submitted by Agreement States.

The following language has been included in the draft revised STP Procedure SA-900 under the Section V.E., entitled "Scope of NRC review of CRR" to address the above concern.

NRC staff would not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination or of any of the specific documentation submitted by the Agreement State licensee. Rather, NRC staff would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The level of detailed information contained in the CRR should be similar to that contained in the sample CRRs which can be found in Appendices B and C for conventional and non-conventional uranium milling licenses, respectively.

Unless there are obvious flaws identified in the CRR related to the State-approved reclamation plan or decommissioning plan, NRC staff will focus its review on whether the State has provided adequate bases in summary form to confirm that closure activities were performed according to the approved plans and specifications. In addition, if any changes or degradation of the design features have occurred since construction, NRC staff will determine whether the State has evaluated the changes to confirm that the site continues to meet all applicable standards and requirements.

Task 2 Draft Revised STP Procedure SA-900

The Working Group was tasked to prepare a draft revised STP Procedure SA-900 that addresses issues identified by the Working Group and stakeholders. The draft revised STP Procedure SA-900 should include two separate sample CRRs for termination of both conventional and non-conventional uranium milling licenses in Agreement States. The Working Group has reviewed all the comments received from internal and external stakeholders and incorporated them, if accepted, into the draft revised STP Procedure SA-900.

One stakeholder recommended that the STP Procedure SA-900 be restructured along the lines of an NRC "Standard Review Plan (SRP)" which outlines a uniform, consistent approach for guiding the review of submissions to the NRC. It was also recommended that adherence to the structure and format of an SRP would state the regulatory bases for the review and concurrence, clearly identify technical areas to be examined, provide acceptance criteria for the submitted information, and outline a common mechanism for conducting the concurrence review.

We believe that the STP Procedure SA-900 is intended to be used as a guidance document for Agreement State staff to prepare CRRs. Since the CRRs are not considered as Technical Review Reports (TERs) or Safety Evaluation Reports (SERs), the structure of the STP Procedure SA-900 should be different from that contained in SRPs.

Generally, Agreement State staff, like NRC staff, reviews licensing proposals from uranium milling licensees prior to taking licensing actions. Based on review of the licensee submittals using the SRPs, such as NUREG-1620, or equivalent documents as review guidance, the Agreement State Staff (or NRC staff) documents its evaluation results in TERs, SERs or equivalent reports to support its licensing actions. Prior to license termination, Agreement State staff may reference all the relevant reports, such as TERs or SERs, related to the site in preparation for the CRR which documents State staff's bases for its conclusion that all applicable standards and requirements have been met.

It is expected that draft CRRs submitted by Agreement States based on the guidance provided in the STP Procedure SA-900 may not contain all the information needed for NRC to make a determination since each uranium milling site is likely to have its own site-specific conditions that would be unique to that site. In addition, due to the different level of knowledge on the histories and conditions of the site, there may be different professional judgements between NRC and Agreement State staff as to what level of detailed information is sufficient to document the bases used to support the conclusion.

We believe that the best use of NRC and Agreement State staff resources would be for NRC to identify any additional information needed in a CRR during review of the draft CRR instead of developing a comprehensive guidance document covering all possible review areas and detailed CRR acceptance criteria. Especially in a situation where there are only six conventional (six licenses, three in Texas and three in Colorado) and nine in-situ (three licenses, all in Texas) uranium milling sites in two Agreement States that are expected to be terminated in the next five years.

We believe that the guidance provided in the draft revised STP Procedure SA-900 identifies the level of detailed information needed for NRC to make the determination. The information needed is clearly not the detailed documents submitted by the Agreement State licensees. Rather, it is the summary of the Agreement State's evaluation results based on the review of the detailed licensee documents and the bases for the State's conclusion that all applicable standards and requirements have been met.

The stakeholder further recommended that the STP Procedure SA-900 should address how the NRC's risk-informed, performance-based regulatory approach should be incorporated into the concurrence process. We believe that the guidance needed to address the risk-informed, performance-based regulations lies in the SRPs or equivalent documents. The STP Procedure SA-900 is intended to provide guidance to prepare a CRR which documents State staff's bases for its conclusion that all applicable standards and requirements (including the applicable risk-informed, performance-based regulations) have been met.

Finally, in addition to two sample CRRs, the draft revised STP Procedure SA-900 also includes two sample NRC determination letters for both conventional and non-conventional license termination proposals. Copies of sample documentation of NRC review on the termination findings are also attached to these letters.

The draft revised STP Procedure SA-900 (June 2002 Version) prepared by the Working Group follows.

I. INTRODUCTION

This procedure describes the review process for making the determination that all applicable standards and requirements have been met prior to Agreement State uranium milling license termination, as required by 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended (Act).

II. OBJECTIVES

A. To establish the procedures to be followed by NRC staff for review of uranium milling license termination proposals submitted by Agreement States.

B. To provide guidance for use by Agreement States on preparation and submittal of uranium milling license termination proposals for NRC staff review.

III. BACKGROUND

A. Section 150.15a(a) indicates that the NRC shall have made a determination that all applicable standards and requirements pertaining to material as defined in 10 CFR 150.3(c)(2) have been met prior to termination of any Agreement State license for such material. This provision in NRC's regulations stems from Section 274c(4) of the Act which reads in part: "[t]he Commission shall also retain authority under any such agreement to make a determination that all applicable standards and requirements have been met prior to termination of a license for byproduct material, as defined in 11e.(2)."

B. With the approval of Management Directive 9.15, "Organization and Functions, Office of State Programs" on July 6, 1993, Office of State and Tribal Programs (STP), then Office of State Programs (OSP), was explicitly assigned responsibility for making determinations under §150.15a(a). Management Directive 9.15 provides, in part, that the Office "[m]akes the determination required in Section 274c of the Act of 1954 that all applicable standards and requirements have been met before an Agreement State terminates a license for byproduct material as defined in Section 11e.(2). This determination will be made in consultation with the Office of Nuclear Material Safety and Safeguards."

C. Two kinds of Agreement State uranium milling licenses are involved: conventional and non-conventional (mainly in-situ uranium extraction licenses). A conventional uranium mill is a facility that generates mill tailings and will be transferred to a custodial agency for long term care in accordance with 10 CFR § 40.28 after the

entire license is terminated. A non-conventional uranium mill is a facility that generates limited byproduct materials which are normally transferred to conventional tailings impoundments for disposal and therefore no land transfer is required at license termination.

For both types of licenses, the Agreement State is expected to conduct its review for decommissioning, reclamation and/or groundwater restoration in accordance with license requirements and State standards which are compatible with the requirements of 10 CFR Part 40. Agreement States are responsible for approval of the remediation plans of uranium milling facilities in their States and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans. With NRC's determination that all applicable standards and requirements have been met, the Agreement State terminates the specific licenses for its licensees.

D. Historically, the NRC has reviewed non-conventional uranium milling license termination requests from Agreement States on a case-by-case basis without any specific guidance. This procedure describes the specific guidance the NRC staff would use to ensure consistency in the process and information that NRC would need from an Agreement State to make its determination prior to termination of pending and future Agreement State conventional and non-conventional uranium milling licenses. A detailed license termination process for termination of uranium milling licenses in Agreement States is documented in Appendix A.

IV. ROLES AND RESPONSIBILITIES

A. As stated in the Management Directive 9.15, the STP Director, has overall responsibility for the review and making the determination required in Section 274c of the Act that all applicable standards and requirements have been met before an Agreement State terminates a license for byproduct material as defined in Section 11e.(2).

B. The STP Project Manager (PM) is responsible for completing the NRC's review of uranium milling license termination proposals submitted by Agreement States. The PM is the primary NRC contact for the State during the review. Finally, the PM is the review team leader.

C. The review team is responsible for conducting the staff evaluation of Agreement State proposals according to this procedure. A team normally consists of the PM and the assigned staff contacts from the Office of Nuclear Material Safety and Safeguards (NMSS) and the Office of the General Counsel (OGC).

V. GUIDANCE

A. Agreement State's early interaction with NRC

Agreement States are encouraged to seek NRC guidance early-on when a licensing action raises novel or unique issues that are atypical with normal, standard site closure proposals from Agreement State licensees. When a State licensing action is needed in response to such a licensee proposal, an Agreement State should make its own evaluation and determination on whether the licensee's proposal meets the applicable standards and/or requirements. At that time, the Agreement State is encouraged to provide NRC an opportunity to review the basis for its conclusion before the licensing action is taken. NRC will review the State's determination and provide its views as to whether the basis is sufficient to support the conclusion to the Agreement State for consideration. Further interactions between NRC and the Agreement State may be needed to avert difficulties during NRC's review of the license termination if an agreement on the conclusion can not be reached.

In addition, approximately 2 years prior to submitting a draft CRR to NRC, Agreement States should consider whether NRC staff should be invited to visit sites that are in the process of license termination to discuss the histories and conditions of the sites and receive feedback, if any, from NRC staff. Agreement States may contact the Director, STP to discuss any early interaction activities.

B. Each Agreement State license amendment that terminates a portion of the site from a license should be considered as a partial license termination and the NRC would make the Atomic Energy Act, Section 274c(4) determination for each case.

C. Applicable standards and requirements to be used by NRC to make the determination:

The "applicable standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) would be the applicable standards in the Agreement States. Such Agreement State standards were established according to the rules requirements in Section 274o of the Act, during the initial or amendment of their Agreement, during revision of the regulations to maintain compatibility, or

during approval of an alternative standard.[1] Agreement State standards also include legally binding requirements, orders, or license conditions that implement the requirements of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA).

D. Bases to be used for NRC determination:

The determination that all applicable standards and requirements have been met prior to termination of an Agreement State license would have two primary supporting bases:

1. The first basis would be a Completion Review Report (CRR) submitted by the Agreement State containing the conclusions from the State's review of a licensee's completed remedial actions. This report would document the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met.

2. The second basis would be NRC reviews of the Agreement State's uranium recovery regulatory program, currently conducted under the Integrated Materials Performance Evaluation Program (IMPEP). The results of the IMPEP reviews would provide a basis for confidence on the determinations and conclusions reached by the Agreement State, as set out in the CRR, and also a basis of confidence that the State's reviews, licensing actions, and inspections associated with termination have been conducted appropriately. The periodic reviews of selected technical areas, conducted under IMPEP, which also include training and qualifications of staff and adherence to necessary program procedures, e.g., license termination process for uranium recovery licenses or equivalent procedures, will also serve as a basis that all applicable standards and requirements are met.

E. Scope of NRC review of CRR

NRC staff would not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination or of any of the

[1] As stated in the last paragraph of Section 274o of the Act, the Agreement State may adopt alternative standards if, after notice and opportunity for public hearing, the NRC determines that such alternative standards provide an equivalent or greater level of protection for public health, safety, and the environment.

specific documentation submitted by the Agreement State licensee. Rather, NRC staff would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The level of detailed information contained in the CRR should be similar to that contained in the sample CRRs which can be found in Appendices B and C for conventional and non-conventional uranium milling licenses, respectively.

Unless there are obvious flaws identified in the CRR related to the State-approved reclamation plan or decommissioning plan, NRC staff will focus its review on whether the State has provided adequate bases in summary form to confirm that closure activities were performed according to the approved plans and specifications. In addition, if any changes or degradation of the design features have occurred since the completion of construction, NRC staff will determine whether the State has evaluated the changes to confirm that the site continues to meet all applicable standards and requirements.

F. Two-step CRR review process

A two-step CRR review process would involve an Agreement State formally submitting a draft CRR for NRC review and comment before the Agreement State submits its final CRR.

1. Agreement States should submit draft CRRs to NRC for review and comment. The State staff should alert the PM or the Director, STP, at least one month before submitting the draft. The Director, STP should request that NMSS and OGC to assign staff level contacts for the review team.

2. The draft CRR should include the following information depending on whether the license being terminated is a conventional or non-conventional uranium milling license. Sample CRRs for conventional and non-conventional uranium milling licenses can be found in Appendices B and C, respectively.
   a. Conventional Uranium Milling License

      (i) A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

(ii) Documentation that the completed surface remedial actions were performed in accordance with applicable standards and requirements.

(iii) Documentation that the completed site decommissioning actions were performed in accordance with applicable standards and requirements. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets applicable standards and requirements for release.

(iv) Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with applicable standards and requirements.

(v) Discussion of results of State's site closure inspection(s).

(vi) For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact of releasing a portion of the site has been evaluated and includes the bases for the State's conclusion.

b. Non-conventional Uranium Milling License (Mainly In-situ Uranium Extraction License)

(i) A brief description of licensee's activities associated with decommissioning and license termination.

(ii) Groundwater information which demonstrates that the groundwater has been adequately restored to meet applicable standards and requirements.

(iii) Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with applicable standards and requirements. Such documentation

could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect.

(iv) Decommissioning information which documents that all contaminated materials have been properly disposed of, transferred to licensee(s) authorized to possess such materials, or meet applicable standards and requirements for release. Such documentation could be a statement which confirms that decommissioning activities have been evaluated and includes the bases for the State's conclusion.

(v) Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets standards and requirements for release.

(vi) Discussion of results of the State's site closure inspection(s).

(vii) For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact of releasing a portion of the site has been evaluated and includes the bases for the State's conclusion.

3. The review team will follow the guidance stated in Section V.E. and review the draft CRR using the acceptance criterion, i.e., whether the draft report has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met.

4. The review team prepares a letter to the State program Director to document the results of its review. The Director, STP, signs the letter following Office concurrence from NMSS and OGC. The PM may schedule telephone conference calls or meetings with State staff and team members, if needed, to discuss the results of the review.

5. The State should address NRC's comments by making changes to amend the draft CRR. The PM may schedule telephone conference calls or meetings with State staff and team members, if requested by the State, to discuss the amended draft CRR. When the State completes the amended draft CRR, the State program Director should submit it as the final CRR to the Director, STP.

6. The review team conducts a review of the final CRR to ensure that all the previous comments have been considered and reflected in the final CRR. The PM may schedule telephone conference calls or meetings with State staff and team members, if the comments are not properly addressed. The State should address those issues by making revisions to the final CRR, if needed.

7. After completing the review, the PM prepares a response letter (samples in Appendix D for conventional licenses and Appendix E for non-conventional licenses) back to the State and obtains concurrence from the OGC and NMSS.

G. Long-Term Surveillance Plan (LTSP)

For a full termination of a conventional uranium milling license, the NRC staff would also review a site LTSP submitted by the custodial agency. This guidance on NRC review of the LTSP can be found in Appendix D of the NUREG-1620 entitled "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act." NRC's review of the LTSP is not included in STP Procedure SA-900. Note that sites that have been partially terminated have involved areas surrounding the actual milling area which were released without the need for an LTSP.

The NRC review of the LTSP would be very similar for both NRC and Agreement State licensees since the review and acceptance of the LTSP is conducted in accordance with 10 CFR § 40.28 which is the sole purview of the NRC. Lack of NRC acceptance of a site LTSP can delay termination of the specific license. The NRC staff's acceptance of an LTSP would be documented by written notification to the relevant Agreement State and custodial agency.

H. Process to be followed for NRC determination:

1. A detailed step by step license termination process for conventional and non-conventional uranium milling licenses in Agreement States is documented in Appendix A. An Agreement State licensee's request for amendment to release a portion of site from its license also requires NRC to make a determination based on a site specific CRR for that portion of the site. Similar license termination processes would be followed for both partial and entire license termination cases.

2. Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. Upon notification from the NRC, the Agreement State should be prepared to terminate the specific license, if it is a non-conventional uranium milling license, or to amend the license to remove the remediated portion from that license, if the license is being partially terminated.

3. For the full termination of a conventional uranium milling license, the Agreement State should be prepared to terminate the specific license after the following occur: (1) upon notification from the NRC that all applicable standards and requirements have been met; (2) upon notification from the NRC that the LTSP has been accepted and (3) the long-term care funds have been transferred to the appropriate State agency or the custodial agency.

VI. APPENDICES

Appendix A - Termination Process for Conventional and Non-conventional Uranium Milling Licenses in Agreement States

Appendix B - Sample Completion Review Report for Conventional Uranium Milling License

Appendix C- Sample Completion Review Report for Non-conventional Uranium Milling License

Appendix D - Sample NRC determination letter for Conventional Uranium Milling License

Appendix E - Sample NRC determination letter for Non-conventional Uranium Milling License

VII REFERENCES

1. Section 274 Atomic Energy Act of 1954, as amended

2. 10 CFR Part 150, Exemptions and Continued Regulatory Authority in Agreement States and in Offshore Waters Under Section 274

3. Management Directive 5.6, "Integrated Materials Performance Evaluation Program"

4. Management Directive 9.15, "Organization and Functions, Office of State Programs"

5. SECY-99-025, "Guidance to Terminate Agreement State Uranium Recovery Licenses under Requirements of 10 CFR 150.15a(a) and Section 274c"

6. NUREG-1620 Rev. 1, "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act"

7. Final Report of the Working Group on Uranium Milling License Termination in Agreement States, May 2002

This page left blank intentionally.

APPENDIX A - License Termination Process

Termination of uranium milling licenses in Agreement States has been divided into two major parts as follows: (a) termination of conventional uranium milling licenses; and (b) termination of non-conventional uranium milling licenses (mainly in-situ uranium extraction licenses).

(a) Termination of Conventional Uranium Milling Licenses

Steps 1 through 4 and Step 6 are applied to entire license termination cases; steps 1 through 5 are applied to partial license termination cases.

Step 1: Licensee Documentation of Completed Remedial and Decommissioning Actions

Licensees are required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

Criteria 5A-5D, along with Criterion 13, of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations incorporate the basic groundwater protection standards imposed by U.S. Environmental Protection Agency (EPA) in 40 CFR Part 192, Subparts D and E. These standards apply during operations and prior to the end of closure. In addition, under Criterion 6(7), the licensee should address the non-radiological hazards associated with the wastes in planning and implementing closure. The licensee should ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. Licensees may refer to the introduction section of 10 CFR Part 40, Appendix A, or equivalent Agreement State regulations with respect to the use of alternative standards for groundwater protection.

If the groundwater protection standards are exceeded, the licensee is required to put into operation a groundwater corrective action program (CAP). The objective of the CAP is to return the hazardous constituent concentration levels to the concentration limits set as standards. For licensees with continuing groundwater cleanup, State approval is required for the termination of corrective action. Appropriate groundwater monitoring data and other information that provide reasonable assurance that the groundwater has been cleaned to meet the applicable standards and requirements are submitted to the State for review.

Step 2: Review of Completed Closure Actions by the Agreement State

Upon receipt of the decommissioning report, and if necessary, groundwater completion report, the State staff should review the content of the reports for documentation of acceptable completion of the applicable aspect of closure. The State staff should also review the licensee's completed reclamation of the tailings disposal cell. As part of its oversight process during decommissioning,

the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final construction-completion inspection, which is expected to consist of a site walk-over.

Typically, there is an observational period following the completion of remedial actions for the State to assess the potential long-term stability of the tailings disposal cell. Licensees should report significant cell degradation occurring during this period. All identified hazardous constituents for which groundwater compliance sampling is being conducted at a licensed site must be returned to the concentration limits or alternative concentration limits set as standards prior to termination of a specific license. The specific license would not be terminated while an active groundwater CAP is in operation. Passive groundwater CAPs are acceptable for license termination, as long as the CAP achieves the applicable standards and requirements before license termination, and shows that groundwater will remain at or below those standards for the design life of the disposal cell.

Step 3: Site Ready for License Termination

When a licensee has completed site reclamation, decommissioning, and/or groundwater corrective actions, and is ready to terminate its specific uranium milling license, the licensee should formally notify the State of its intentions.

Step 4: NRC Review of Draft and Final Completion Review Reports (CRRs)

Upon receipt of a draft CRR, NRC staff would follow the review process described in Section V.F. of STP Procedure SA-900 to conduct its review.

Step 5: License Amendment for Partial License Termination

Given a determination that all applicable standards and requirements have been met, the NRC would notify the State of its determination by formal correspondence. If it is a partial license termination case for which a Long-Term Surveillance Plan (LTSP) is not required, the State should be prepared to amend the license to remove the remediated portion from it.

Step 6: License Termination/Issuance of the General License

In cases involving termination of an entire license, NRC acceptance of the LTSP is required prior to termination of the specific uranium milling license and placement of the site and byproduct material under the 10 CFR 40.28.

Appendix A -- License Termination Process

Given (1) NRC's determination that all applicable standards and requirements have been met and (2) upon notification from the NRC that the LTSP has been accepted and the long-term care funds[2] have been transferred to the appropriate State agency and the custodial agency, the Agreement State should be prepared to terminate the specific license and to transfer the long-term care funds to the U.S. general treasury. The long-term custodian, for its part, should be prepared to accept title to the land and byproduct material.

(b) Termination of Non-Conventional Uranium Milling Licenses (Mainly In-Situ Uranium Extraction Licenses)

The following steps are applied to both partial and entire license termination cases.

Step 1: Licensee Documentation of Completed Decommissioning and/or Groundwater Restoration Actions

When the surface reclamation and/or groundwater restoration is complete, the licensee should submit (1) groundwater information which demonstrates that groundwater has been restored in accordance with the applicable standards and requirements and (2) documentation indicating that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria, to the State for review.

Licensees are also required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning, which is accomplished by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

Step 2: Review of Completed Closure Actions by the Agreement State

Upon receipt of the decommissioning report, and if necessary, groundwater restoration report, the State staff should review the content of the report for documentation of acceptable completion of the applicable aspect of closure. As part of its oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final site inspection, which is expected to consist of a site walk-over.

---

[2] Prior to license termination, the Agreement State should establish the final amount of the long-term site surveillance fund to be paid by the licensee in accordance with Criterion 10 of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations. The Agreement State's process for determining this amount should include consultations with the custodial agency. Payment of this amount to the appropriate State agency or the custodial agency is required prior to license termination.

Step 3: Site Ready for License Termination

When a licensee has completed site decommissioning, and/or groundwater restoration actions, and is ready to terminate its specific uranium milling license, the licensee should formally notify the State of its intentions.

Step 4: NRC Review of Draft and Final CRRs

Upon receipt of a draft CRR, NRC staff would follow a review process stated in Section V.F. of the STP Procedure SA-900 to conduct its review.

Step 5: License Termination/License Amendment for Partial License Termination

Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. Upon notification from the NRC, the Agreement State should be prepared to terminate the specific license or amend the license to remove the remediated portion from it, if the license is being partially terminated.

APPENDIX B - Sample Completion Review Report for Conventional Uranium Milling License

NOTE TO READER

The sample Completion Review Report (CRR) was developed by a Working Group composed of Agreement State and NRC staff. As stated in the procedure, prior to license termination, Agreement States submit CRRs for NRC review. The CRR would document State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The purpose of this sample CRR is intended to generally show the level of detailed information in a variety of technical areas which should be provided in the CRR. The Working Group recognized that no single site, or any existing documentation, could serve as a complete template for all aspects of site closure, since each conventional uranium milling site is likely to have its own site-specific conditions that would be unique to that site. To cover as many aspects of license termination activities as possible, the sample CRR is a composite of examples from a number of existing documents. Stakeholders' comments and input have also been considered and reflected in the sample CRR.

The reader is advised that the sample CRR does not provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

Appendix B -- Sample Completion Review Report (Conventional)

CONTENTS

I. SUMMARY

II. DOCUMENTATION OF BASES FOR CONCLUSION

1. A brief discussion of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

2. Documentation that the completed surface remedial actions were performed in accordance with applicable standards and requirements.

2.1 GEOTECHNICAL STABILITY

2.1.1 Introduction
2.1.2 Site Description
2.1.3 Disposal Cell Area
2.1.4 Borrow Areas
2.1.5 Geotechnical Investigation Conclusions
2.1.6 Testing Program
2.1.7 Slope Stability
2.1.8 Credible Faults
2.1.9 Seismic Evaluation
2.1.10 Settlement and Cover cracking
2.1.11 Liquefaction Potential
2.1.12 Cover Design
2.1.13 Subsidence
2.1.14 Construction Methods and Features
2.1.15 Testing and Inspection
2.1.16 Conclusion

2.2 SURFACE WATER HYDROLOGY AND EROSION PROTECTION

2.2.1 Flood Flow
2.2.2 Rock Durability and Gradation
2.2.3 Vegetation Cover
2.2.4 Sedimentation
2.2.5 Conclusion

Contents (continued)

3. Documentation that the completed site decommissioning actions were performed in accordance with applicable standards and requirements.

3.1 RADIATION CLEANUP AND CONTROL

3.1.1 Introduction
3.1.2 Millsite Decommissioning
3.1.3 Final Status Surveys
3.1.4 Independent Verification
3.1.5 State Oversight
3.1.6 Conclusion

3.2 RADON EMANATION

3.2.1 Radon 222 Measurements
3.2.2 Conclusion

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with applicable standards and requirements.

4.1 GROUNDWATER REMEDIATION
(EXAMPLE 1: No Action Scenario)

4.1.1 Monitoring Wells
4.1.2 State's Split Sampling
4.1.3 Geo-Chemistry
4.1.4 Conclusion

4.2 GROUNDWATER REMEDIATION
(EXAMPLE 2: Remediation Scenario)

4.2.1 Remedial Selection
4.2.2 Alternate Concentration Limits (optional)
4.2.3 Remedial Implementation
4.2.4 Remedial Monitoring
4.2.5 Permeable Reactive Barrier Closure
4.2.6 Post-closure Monitoring
4.2.7 Conclusion

Contents (continued)

5. Discussion of results of State's site closure inspections.

6. For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date.

III. REFERENCES

Appendix B -- Sample Completion Review Report (Conventional)

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: [John Smith, M.S.,P.E. (Hydrologic Engineer)]

I. SUMMARY

The ABC Company's XYZ site is a conventional uranium milling and tailings site which has been decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the U.S. Nuclear Regulatory Commission (NRC) shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The NRC STP Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report.

The applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled [Radiation Protection-Uranium and/or Thorium Milling]. This State regulation is consistent with and compatible with NRC regulations, as required by the State's Agreement State status with the NRC.

All applicable standards and requirements, with appropriate references to related sections of the CRR, are identified in Table 1. [Note to Reader: Table 1 in this sample CRR doses not contain a complete list of all applicable standards and requirements.] XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

Appendix B -- Sample Completion Review Report (Conventional)

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements			CRR Sections	TER Sections**
10 CFR Part 40 Appendix A or equivalent State Regulations	1.	tailings isolation	Section 2.1	Section X.XX
	4.			
	(a)	erosion potential	Section 2.3	Section X.XX
	(b)	wind protection	Section 2.3	Section X.XX
	(c)	flatness of slopes	Section 2.1.1	Section X.XX
	(d)	self-sustaining vegetative cover or rock cover	Section 2.3	Section X.XX
	(e)	seismic design	Section 2.1.3	Section X.XX
	5.	groundwater cleanup criteria	Section 4.1	Section X.XX
	6.			
	(2)	radon flux	Sections 2.4-2.5	Section X.XX
	(4)	radon measurements and limit	Section 2.4.1	Section X.XX
	(6)	radiation cleanup and control	Sections 3.1-3.2	Section X.XX
	(7)	closure and post-closure impacts	Sections 4.1-4.3	Section X.XX
	13.	groundwater cleanup criteria	Sections 4.1-4.3	Section X.XX
Other applicable standards and requirements				

*As defined in Section V.C. of the STP Procedure SA-900 issued on date month, [year].
**Sections in TERs or equivalent reference documents.

XDOH concludes that the specific criteria of 10 CFR Part 40 Appendix A (or State equivalent regulations) are met as follows:

Criterion 1. Tailing Isolation

Erosion, disturbance, and dispersion are minimized.

The contaminated tailings will be protected from flooding and erosion by an engineered rock riprap layer. The riprap has been designed in accordance with the applicable guidance (reference). XDOH staff considers that erosion protection that meets that guidance will provide adequate protection against erosion and dispersion by natural forces over the long term. As discussed in the CRR Section XX, adequate protection is provided by (1) selection of proper rainfall and flooding events; (2) selection of appropriate parameters for determining flood discharges; (3) computation of flood discharges using appropriate and/or conservative methods; (4) computation of appropriate flood levels and flood forces associated with the design discharge; (5) use of appropriate methods for determining erosion protection needed to resist the forces produced by the design discharge; (6) selection of a rock type for the riprap layer that will be durable and capable of providing the necessary erosion protection for a long period of time; and (7) placement of a riprap layer in accordance with accepted engineering practice and in accordance with appropriate testing and quality assurance controls.

As discussed in the CRR Sections XX, XDOH staff considers that the riprap layers will not require active maintenance over the 1000-year design life, for the following reasons: (1) the riprap has been designed to protect the tailings from rainfall and flooding events which have very low probabilities of occurrence over a 1000-year period, resulting in no damage to the layers from those rare events; (2) the rock for the riprap layers is designed to be durable and is not expected to deteriorate significantly over the 1000-year design life; and (3) during construction, the rock layers have been placed in accordance with appropriate engineering and testing practices, minimizing the potential for damage, dispersion, and segregation of the rock.

Criterion 4.

(a) erosion potential

The site is located in an area that is flooded by offsite floods from XXXX (area). However, as discussed in the CRR, the site is protected from direct onsite precipitation and flooding by engineered riprap layers for the top and side slopes; the tailings disposal cell will need this protection regardless of where it is located. The riprap for the side slopes and drainage ditches is large enough to resist flooding from the minimal flow velocities of floods occurring from a probable maximum flood (PMF) on the XXXX (area). A large rock apron has been provided to

provide protection against the potential migration of the XXXX (area). XDOH therefore concludes that the erosion potential at the site has been acceptably minimized, since any flooding at the site is mitigated by the erosion protection, and the forces associated with offsite floods are minimal.

(b) wind protection

XDOH staff considers that the site is adequately protected from wind erosion by the placement of an engineered riprap layer that protects the tailings from surface water erosion. Studies (reference) have shown that the engineered riprap layer designed to protect against water erosion is capable of providing adequate protection against wind erosion.

(c) flatness of slopes

The relatively flat top and side slopes of the covers is protected from erosion by an engineered riprap layer which has been designed to provide long-term stability (see the CRR Section XX). The erosion potential of the covers is minimized by the designing the rock to be sufficiently large to resist flooding and erosion, based on the slope selected. Thus, XDOH concludes that the slopes, with their corresponding rock designs, are sufficiently flat to meet this criterion.

(d) self-sustaining vegetative cover or rock cover

See discussions under Criterion 1 regarding erosion, disturbance, and dispersion for the type of information which should be included.

Other criteria

[insert similar summary information for other criteria]

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Act, that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

II. DOCUMENTATION OF BASES FOR CONCLUSION

Following are XDOH's review results for items specified in the STP Procedure SA-900 "Termination of Uranium Milling Licenses in Agreement States."

1. A brief discussion of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

ABC completed construction of the mill in [year], and it was operated until [year]. Nominal milling capacity was X,XXX tons of ore per day, with an average design ore grade of 0.XXX percent U_3O_8. The company received ore and processed it from [insert sources of ore or materials for reprocessing]. Approximately XX.X million tons of tailings were placed in the impoundment from milling operations. The estimated radium-226 activity in the impoundment is XXX curies, and Th-230 activity is estimated at XXX curies (reference).

Mill decommissioning activities began in [year] and were completed in [year]. Approximately XXX,XXX cubic yards (yd^3) of contaminated mill site soils, building equipment, and debris were excavated from the XYZ processing site and hauled approximately XXX miles for placement in the synthetically lined area of the tailings impoundment (reference). Other materials disposed of in the impoundment include [insert direct disposed materials from off-site sources] with estimated radium-226 activities of XXX curies, total uranium activity of XXX curies, and Th-230 activities of XXX curies.

[Impoundments that exist on-site as opposed to a new cell should describe dewatering and other pre-capping activities.]

The mill site was characterized using a combination of scans for gamma radiation and soil analyses of surface soils, and borehole logging and soils analyses for subsurface deposits. Areas with contamination found to exceed applicable standards and requirements were excavated. Contaminated materials were disposed in the [lined] tailings impoundment or repositories (reference). The site cleanup was monitored and a Final Status Survey was conducted following guidance in [NUREG 1575 (MARSSIM)].

Once filled, the impoundment was covered with XX.X feet of site borrow soils, and re-vegetated. A division channel was constructed around three upgrading sides of the impoundment. A rock-armored swale outlet for the impoundment cover watershed was installed. All impoundment and margin areas have been covered with either rock armor (riprap) or re-vegetated to provide structural stability (reference).

A Monitoring and Stabilization Plan, in effect during and after reclamation construction in [year], has been evaluating site performance. XDOH staff inspections and reviews of monitoring data and analytical justifications provided by ABC indicate that the site has reached a stable condition.

When all regulatory requirements are completed, the XYZ site will be transferred to XXX (custodial agency) responsibility. The site reclamation fund, held by XXX, will be terminated and the long-term surveillance and control surety fund, held by XDOH, will be transferred to XXX.

2. Documentation that the completed surface remedial actions were performed in accordance with applicable standards and requirements.

Surface remedial actions include the topics of geotechnical stability, surface water hydrology and erosion protection, and radon emanation.

2.1 GEOTECHNICAL STABILITY

2.1.1 Introduction

This section presents the results of the XDOH's review of the geotechnical engineering aspects of the closure action proposed at ABC's XYZ site. The closure action consists of the consolidation of all contaminated materials from the processing site to the adjacent tailings pile near [City, State]. The final disposal cell will be an above-grade stabilized-in-place embankment extending to a maximum height of XXX feet above the prevailing surface grade. Contaminated material and mill debris were added to the disposal cell. The cell was recontoured, and is covered with a X-foot-thick minimum sand cover, plus filter layer and rock armor on the embankment; a XX-inch-thick multiple layer cover plus rock armor over coarse tailings; and a XX-inch-thick multiple layer cover plus rock armor over at least XX feet of regraded coarse tailings over the fine tailings portions of the embankment (reference).

The geotechnical engineering aspects reviewed include: (1) information related to the disposal and borrow sites; (2) materials associated with the closure action, including the foundation and excavation materials, tailings, and other contaminated materials; and (3) design and construction details related to the disposal site, disposal cell, and its cover.

2.1.2 Site Description

The XXX-acre impoundment is adjacent to the former XXX mill, about XXX miles northwest of the town of [City, State]. The site is located within the [local area], and is drained by the XXXX River. The uranium mill tailings were placed in a single pile consisting of approximately XXX million tons. The XXX-acre pile forms a deposit with a maximum height of XXX feet. ABC has covered the sides of the pile with an interim soil cover of variable thickness. As the water in the pond atop the tailings has evaporated, additional interim cover has been placed on portions of the top of the pile, working from the edges inward toward the center.

The former mill area is XXX acres in size and contains building foundations and abandoned mill structures which have been partially demolished. Additional contaminated soil lies outside the confines of the tailings pile. The contaminated soil and building rubble generated from the mill demolition were added to the disposal cell.

2.1.3 Disposal Cell Area

Several subsurface investigations have been performed at the XYZ site in order to characterize the tailings and contaminated materials for geotechnical engineering and radiological aspects of the closure. Drawings in the month date, XXXX report (reference) illustrate the original test boring and test pit locations. Logs of soil borings and test pits were provided in the ABC's earlier submittals (reference). In month of [year], additional test pits were excavated within the confines of the mill and the tailings embankment. The [year] test pit logs are reported in Appendix X of the [month date, year] submittal (reference).

Exploration to depth within the tailings embankment was not previously performed since the presence of an active evaporation pond impeded drill rig access. To further characterize the tailings, and to evaluate the embankment with respect to stability and potential settlement, ABC has committed to perform piezocone or other in-situ tests after the cover has been placed. The piezocone is an instrument which measures the piezometric pressure at a cone tip as the test device penetrates a material. Cone Penetration Test (CPT) pore pressures, thus measured, reflect both the soil type and the stress history of the material. CPT or equivalent test data have been reviewed along with settlement records to better evaluate the time-rate of tailings consolidation.

2.1.4 Borrow Areas

Radon barrier clay soils from the XXXX area were evaluated by [reference]. The XXXX borrow area is located about XX miles [west] of the tailings pile. Sandy soil for the radon barrier was obtained from material excavated during the reconfiguration of XXXX area (reference). In [year], XX exploratory test pits were excavated in the XXXX area.

Finally, in addition to the sampling associated with the reconfiguration of XXXX area, three additional samples were taken from the borrow area.

2.1.5 Geotechnical Investigation Conclusions

XDOH staff has reviewed the subsurface exploration discussed above. XDOH concludes that the geotechnical investigations conducted at the processing, disposal, and borrow sites satisfactorily establish the stratigraphy, that the explorations are in general conformance with applicable provisions of Chapter X of the SRP (reference), and that they are adequate to support the

assessment of the geotechnical stability of the stabilized tailings and contaminated material in the disposal cell. Additional in-situ testing was performed to confirm the stratification and strength parameters of the tailings and to confirm the settlement analysis.

2.1.6 Testing Program

Geotechnical engineering characteristics and strength parameters for the tailings, contaminated soil, and natural soils have been determined by ABC, through laboratory analysis of samples from the investigations. Early laboratory testing by [reference], and later testing by [reference], included moisture-density (Proctor) determinations, gradation analyses, specific gravity, saturated hydraulic conductivity determinations, Atterberg Limits, capillary moisture, one-dimensional consolidation, static triaxial, and cyclic triaxial compression. XDOH has reviewed the geotechnical engineering testing program for the XYZ site and concludes that the tests identified above were conducted on representative materials.

ABC's laboratory testing of the XXXX (area) borrow material included gradation, Atterberg Limits, moisture-density determination, specific gravity, saturated hydraulic conductivity, capillary moisture relationships, dispersive tendencies, diffusion coefficient, and triaxial shear strength.

Within the XXXX area, one composite sample was made from the "affected" (contaminated) sandy soils. A second sample was made from "clean." The composite samples were then split into three subsamples, and were redivided for geotechnical and radiological sampling. Laboratory testing by ABC included gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and (for the "affected" soils) radium activity and emanation coefficient determination. Three composite samples from [west] of the tailings pile area were tested for gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and capillary moisture relationship.

Cover materials were evaluated for durability. Testing included Los Angeles Abrasion, sulfate soundness, absorption, specific gravity, Schmidt Hammer, and Brazilian disk tensile tests. Petrographic analyses were also conducted.

On the basis of the field exploration and laboratory testing programs, ABC concluded that the borrow sites contain suitable quantities of material acceptable for the radon barrier. Testing indicated the soils are non-dispersive.

Based on the review, XDOH staff found that the number and type of tests conducted in the testing program were appropriate for the support of the engineering analyses performed and that the scope of the testing program and the utilization of the test results to define the material properties are in general agreement with the applicable provisions of the guidance document (reference).

2.1.7 Slope Stability

The evaluation of the geotechnical stability of the slopes of the disposal cell containing stabilized tailings and other contaminated materials is presented in this section. XDOH has reviewed the exploration data, test results, slope characteristics, and methods of analyses pertinent to the slope stability aspects of the reclamation plan. The analyzed cross-sections with [10] horizontal to [3] vertical side slopes have been compared with the exploratory records and design details. XDOH found that the characteristics of the slopes have been satisfactorily represented and that the most critical slope sections have been considered for stability analyses.

Soil parameters for the various materials in the disposal cell slope have been adequately established by appropriate testing of representative materials. Soil parameter values have been assigned to other layers (riprap, gravel bedding, bedrock, etc.) by ABC, on the basis of data obtained from geotechnical explorations at the site and data published in the literature. XDOH found that the determinations of these parameters for slope stability evaluation follow conventional geotechnical engineering practice, and are also in compliance with the applicable provisions of the guidance document (reference). XDOH also found that an appropriate method of stability analysis (XXXX method) has been employed by ABC to address the likely extreme adverse conditions to which the slope might be subjected for the static case.

Factors of safety against failure of the slope for static and seismic loading conditions have been determined by ABC for both short-term (end of construction) and long-term states. Factors of safety for the static loading conditions were calculated by ABC to be X.X (short- and long-term) which are in excess of minimum required values of X.X and X.X, respectively.

The seismic stability of the proposed slopes was investigated by ABC using the pseudo-static method of analysis, with horizontal seismic coefficients of X.XXg for both the end-of-construction and the long-term cases. The value of the seismic coefficient was consistent with the design ground acceleration value used for the nearby XXXX site. In actuality, a horizontal seismic coefficient equal to X.XX times the maximum ground acceleration, or X.XXg, would be used in a long-term pseudo-static evaluation. As a further exercise, ABC arbitrarily increased the horizontal seismic coefficient in order to determine the value which would imply impending failure. The coefficient which resulted in a factor of safety of unity, implying impending failure, was X.XXg.

Subsequently, ABC performed deterministic and probabilistic ground motion evaluations in [month, year] (reference). XXXX determined that a peak horizontal acceleration of X.XXg, which represents an event with a mean return period of 10,000 years, was an appropriate value for design (see Section XXX). Since ABC's earlier analysis was based on a peak horizontal acceleration in excess of X.XXg, and stable conditions were confirmed, the conservativeness of the seismic design with respect to slope stability was substantiated.

Based on review of these analyses and the results, XDOH concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been made in a manner consistent with the guidance document (reference).

2.1.8 Credible Faults

The XDOH evaluated potential earthquake sources (such as capable faults) and earthquake hazards for the site. XDOH's determination that the impoundment has not been placed near a capable fault is based upon review and acceptance of geologic information from literature sources, personal communication with personnel at the State Geological Survey, XDOH review of field mapping of the site by ABC's contractor, XDOH review of subsurface geophysical surveys surrounding the tailings impoundment by ABC's contractor, and XDOH personnel conducting independent field evaluations of the structural geology at the site. Historical seismic activity was also reviewed by the XDOH.

XDOH review of regional geologic literature has found no evidence of local faulting in the Pleistocene age glacio-fluvial deposits, or in the Miocene age Basalt Member of the River Basalt Group, at least 14.5 million years before present (reference). The USGS Open-File Report 91-441-0, Known or Suspected Faults with Quaternary Displacement in the Pacific Northwest, was also reviewed (reference). Staff at the State Geological Survey was also consulted for information related to faults in the area during XDOH's assessment of ABC's closure plan. XDOH review of Quaternary faults has concluded that the nearest capable fault is in the XXXX area, approximately XXX miles to the northwest.

Detailed geologic mapping at the ABC's XYZ site performed by XXXX. found no evidence of faulting in the Pleistocene glacio-fluvial deposits or Miocene age River basalts, XX.X million years before present (reference). Geologic field evaluations at the ABC site by XDOH staff also found no evidence of faults in the glacio-fluvial deposits, XXX River basalts, or Tertiary aged clays found near the tailings impoundment. The layers in the unconsolidated sediments may generally be described as flat lying over structures that have been observed in the older granitic rocks of Cretaceous age. Therefore, the literature review and field mapping indicate that the fracturing and faulting in the Cretaceous rocks are a result of pre-Miocene deformation occurring at least XX.X million years before present.

Two geophysical seismic surveys were conducted for the subsurface around the tailings impoundment by a ABC contractor (reference). XDOH staff independently reviewed the information provided in the XXXX reports and determined that there is no evidence presented in these reports of a capable fault at depth.

Historic seismic data have been reviewed by XDOH and State's Dam safety program. Some of the historic seismic data reviewed are presented in reports prepared for ABC (reference), the XXXX Final Environmental Impact Statement for the ABC site (reference), and the initial engineering report (reference). There are no historic seismic data that suggests large-magnitude earthquakes near the ABC site. Recent earthquake analyses performed by XXXXX have indicated that there have been five low-magnitude events within XX km of the ABC site. However, XXXX's probabilistic seismic assessment analysis has determined that these low- magnitude seismic events are not significant with respect to stability of the site (reference).

In summary: (1) faults that have been identified and mapped in and near the site to a distance of 100 miles have not moved once in the last 35,000 years, or twice or more in the last 500,000 years, do not have macro seismicity associated with them, nor are they associated with capable faults such as the XXXX fault; and (2) no historic earthquakes have originated near the site that by magnitude, alignment, or magnitude-distance relationship to the site indicate a buried capable fault source, or any other earthquake source, that should be considered explicitly in the seismic design basis assessment for the site. XDOH evaluated low- magnitude seismic events that appear approximately XX-XX km northeast of the site by reviewing geologic maps for the area and personal communication with XXXX State's seismic experts at the State Geological Survey. Based upon XDOH review conducted in the fall of XXXX, XDOH concludes that these low-magnitude seismic events are not associated with earthquakes along the trace of a capable fault, and the data indicate that these events appear to be the result of mine blasts.

2.1.9 Seismic Evaluation

According to 10 CFR 40, Appendix A (or equivalent State regulations), the impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in Section III (g) of Appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material. The guidance document (reference) describes the methodologies that may be used to conduct this evaluation. Details of the review for XYZ site were presented in the TER (reference).

A review was conducted of all recorded earthquakes in [name the tectonic province in which the site is located] and in other tectonic provinces within XXX miles of the site. The review contained the date of occurrence of the earthquake, its magnitude, and the location of the epicenter.

Data were obtained by [e.g., standard photo geologic analysis] and field reconnaissance of the study area and from review of the pertinent literature (references). Information in the form of

maps, papers, or other, specific to the area or region, generated by State and Federal agencies or published in the literature were reviewed (references). [Insert conclusions]

Where possible, an association of epicenters or locations of highest intensity of historic earthquakes with tectonic structures was conducted. Epicenters or locations of highest intensity that were not reasonably identified with tectonic structures were identified with tectonic provinces. Maps on which the locations of epicenters of historic earthquakes associated tectonic structures, and tectonic provinces were produced and presented in the TER (references). [Insert conclusions].

In addition to the historical review, the proposed maximum earthquakes associated with [each tectonic province or capable fault or structure] was determined and a deterministic and/or probabilistic seismic hazard analyses was conducted.

Seismic design ground motion (PHA)

Capability was determined by [suitable methods, such as those outlined by (reference). For each maximum magnitude earthquake, the PHA at the site was determined using [an accepted attenuation relationship between earthquake magnitude and distance] (reference). The PHA value adopted for each capable fault or tectonic source was no less than the median value provided by the attenuation relationship. Possible soil amplification effects were considered (reference).

To assess potential ground motion at the site from earthquakes not associated with known tectonic structures (i.e., random or floating earthquakes), the largest floating earthquake reasonably expected within [the tectonic province] was identified. [insert site-specific results]. In addition, the largest floating earthquakes characteristic of [any adjacent tectonic provinces] was also identified, since such earthquakes may cause appreciable ground motion at the site [insert site specific results]. The XX miles was used as the site-to-source distance for floating earthquakes within [the host tectonic province]. (For floating earthquakes in other tectonic provinces, the distance between the site and the closest approach of the province boundary was used as the site-to-source distance). The PHA for the site was therefore the maximum value of the PHAs determined for earthquakes from all capable faults, tectonic sources, and tectonic provinces. In summary, ABC has presented information and used acceptable methods of investigations that support its conclusions about the seismic characterization of the site and the seismic design value. Information presented includes descriptions of historical earthquakes, locations of their epicenters, an analysis of the seismic hazard at the site, and the design considered a deterministic and/or a probabilistic PHA [PSHA]. The information presented is sufficient to support an analysis of the geotechnical stability.

2.1.10 Settlement and Cover Cracking

Long-term settlement of materials in the disposal cell, which could result in either local depressions or cracks on top of the cover, was addressed by ABC in XXXX's report of [month date, year]. A proposed settlement monitoring program was provided. Settlement monuments have been installed directly on the tailings prior to the initiation of regrading activities. Construction equipment is required to maintain a minimum distance of XXXX feet from all monuments.

The monuments were surveyed for vertical displacement on a daily basis for the first XXX weeks of initial fill placement, weekly for the following XXX months, and then monthly for the final two months. After ABC had concluded that XX percent of the consolidation settlement was complete, and with XDOH's concurrence, final soil cover placement operations began.

Settlement monuments were located in areas where consolidation is expected to be the greatest, including areas believed to have maximum thicknesses of fine tailings. Such an arrangement assures that differential settlement would not adversely affect the integrity of the cover. Additionally, the final soil cover was spread and compacted in a uniform manner to minimize the effects of settlement due to the weight of the final soil cover materials. ABC concluded that XX percent of the primary consolidation should take XX years, based on the fact that there has been no disposal of tailings since XXXX and that the pumping program conducted at the site has accelerated the dewatering process.

In addition, ABC conducted an exploration program within the embankment using XXXX methods. The in-situ data were evaluated along with settlement records to confirm the conclusion that XX percent of the expected settlement has occurred. The in-situ test results were also used to assess the potential for cover cracking. XDOH found that the settlement monitoring program is sufficient to satisfy applicable portions of Criteria 1, 6, and 12, of 10 CFR Part 40, Appendix A, regarding reclamation design to control radiological hazards for the design life without active maintenance after reclamation is complete.

2.1.11 Liquefaction Potential

The liquefaction potential for the XYZ site was initially evaluated for ABC by [reference]. XXXX evaluated the liquefaction potential based on empirical techniques and on the basis of a laboratory evaluation. Minimum factors of safety of X.XX (empirical) and X.XX (laboratory) were derived in the [reference] study. Based on the similarity in results, and considering minimum acceptable safety factors of X.X, XXXX concluded that no major problem related to liquefaction would occur during the postulated seismic event, which they considered to be a Magnitude X event with a hypocentral distance of approximately XX km and a maximum ground acceleration of X.XXg.

An understanding of seismic hazards and the liquefaction process has improved since [year]. Based on more recent interpretations of potential seismic events, and in accordance with a month date, year, request from the XDOH, ABC re-evaluated the liquefaction potential for the site [reference]. Liquefaction potential was re-evaluated using standard penetration test values, soil gradation, and sample descriptions from previous analyses with updated empirical relationships. The potential induced stresses were estimated from simplified procedures using field-based methods.

Liquefaction susceptibility can be estimated by either of two approaches. The first method correlates resistance with Standard Penetration Test (SPT) blowcounts, measured in-situ. The second method relies on laboratory measurements of dynamic tests that strain soil samples in repeated cycles of motion until liquefaction is induced. [Reference] stated that the field-based method is the preferred analytical procedure.

By using methods detailed in [reference], the in-situ liquefaction resistance was computed. In the [reference] analysis, corrected SPT values are normalized and correlated with the cyclic stress ratio required to trigger liquefaction, in observational data. The field cyclic stress ratio is thus obtained from curves dependent on the normalized blowcounts and soil fines content. For a calculated factor of safety less than X.X, failure is assumed to occur. For a factor of safety between X.X and X.X, liquefaction is not assumed to occur, but the soils may suffer some strength loss.

[Reference] showed that very few sample points indicate susceptibility to liquefaction, and that isolated incidences of liquefaction, if it were to occur, would be deep within the embankment. It was determined that liquefaction of the tailings and underlying soils is unlikely to occur, and that there is no threat to the stability of the embankment.

Based on a review of the analysis presented by ABC [reference], XDOH concludes that there is adequate assurance of safety with respect to liquefaction damage.

2.1.12 Cover Design

ABC has used three different embankment cover sections, depending on location:

(1) The final cover profile for the embankment consists of X feet (minimum) of sandy soil above the regraded coarse tailings. The sandy soil is capped by a filter layer and rock armor of variable thickness.

(2) The cover profile over coarse tailings consists of:

X inches (minimum) of low-grade ore from the mill area;
XX inches (minimum) of affected soil;

X inches (minimum) of compacted clay;
X inches of sandy soil;
The coarse tailings areas are covered with rock armor of variable thickness.

(3) The cover profile over fine tailings includes:

X feet (minimum) of regraded coarse tailings,
XX inches (minimum) of affected soil,
XX inches (minimum) of compacted clay,
X inches (minimum) of sandy soil

The sandy soil is covered with rock armor of variable thickness.

The cover system described above provides a minimum of XX inches of cover above tailings on the top and sides of the cell. The system has been designed to limit the infiltration of precipitation, protect the pile from erosion, and to control the release of radon from the tailings below.

Tests on the compacted clay from XXXX indicate that hydraulic conductivities are near XX-XX cm/sec at placement conditions. In addition, the physical shape and surface grading of the reclaimed tailings embankment effectively remove surface water resulting from precipitation which falls on the area. The relatively low permeability of the cover materials and the low annual rainfall with high evaporation rate prevent significant tailings recharge.

ABC has evaluated the potential for frost penetration using the [BERGGREN.BAS] computer code developed at the [U.S. Army Corps of Engineers (reference)]. The code has been used on several other uranium mill tailings remediation projects. In order to evaluate the potential for frost penetration, temperature data including the freezing index, mean annual air temperature, length of freezing season, and geotechnical parameters are considered. The model calculates the heat capacity, thermal conductivity, and latent heat of fusion for the soil layers unless these data are entered manually.

Values used in the computer analysis included the mean and worst-case situations based on the available XX years of weather records. In the worst-case scenario, ABC determined that the depth of frost penetration would be XX.X inches. By thickening the sand layer to X inches, and in conjunction with the exterior rock armor, the potential for frost penetration into the clay layer is eliminated, and the cover integrity should not be significantly affected.

XDOH has reviewed the input data used in determining the total frost penetration depth and concludes that these values are a reasonable representation of the extreme site conditions to be expected. Therefore, ABC's evaluation of the frost penetration depth is acceptable to XDOH.

The cover design has been evaluated by XDOH for geotechnical long-term stability and the design is acceptable.

2.1.13 Subsidence

ABC presented an analysis [reference] to show that a worst-case scenario of subsidence would not adversely affect the stabilized tailings. The (reference) approach was based on a simplified procedure by [reference], and considered instantaneous subsidence of XX meter and, for added conservatism, of XX meters.

The modified XXXX procedure was developed from finite element analyses and physical models for propagation of earthquake fault ruptures in the bedrock beneath cohesive soil deposits. The analytical and physical model results were also compared with case histories of earthquake fault rupture propagation through soil, such as those described by [reference]. XDOH considers ABC's approach to be conservative for evaluating the surface deformation associated with vertical subsidence caused by salt dissolution because it assumes the deformation to be instantaneous and concentrated within a single narrow zone rather than being incremental and more distributed, as would be expected for salt dissolution subsidence.

ABC's analysis [reference], using the simplified fault rupture propagation model of [reference], indicates that the thickness of alluvium and tailings is greater than the distance of propagation for XX and XX meter bedrock offsets. Thus, differential displacements of bedrock, resulting from salt dissolution subsidence under the tailings pile, would not be expected to propagate to the surface and impair the function of the clay cap and radon barrier. XDOH concludes that the analysis was conservative for the reasons discussed above. XDOH therefore concludes that the licensee provided adequate assurance that the potential for differential offsets reaching the surface of the pile as a result of salt dissolution over the next 1000 years is negligible.

2.1.14 Construction Methods and Features

XDOH has reviewed design text, tables, and drawings in the technical specifications submitted by ABC (reference). The text discusses the investigations and testing which formed the basis of the design and specifications. Additionally, the text discusses the design concept in detail. The text is supported by tables which summarize design parameters and figures which clearly show plans, profiles, and details of the proposed remedial action.

In summary, the side slopes were re-contoured to a [10]H to [3]V proportion. Mill debris has been buried systematically at the toe of the slope. A permanent layered cover provides protection from excessive radon emanation, and permits rainfall to drain away satisfactorily.

XDOH has reviewed and evaluated the geotechnical construction criteria provided in the Reclamation Plan. Based on this review, XDOH concludes that the plans and drawings clearly

convey the proposed closure action design features. In addition, the excavation and placement methods and specifications are consistent with accepted standard practice and the guidance document (reference).

2.1.15 Testing and Inspection

XDOH has reviewed drawings and technical specifications submitted by ABC (reference). The technical specifications discuss testing methods and quality control procedures applicable to the remedial work. Appropriate reference is made to [ASTM] methods which will govern the placement and testing of soil and rock materials.

Based on XDOH's review, the plan is found to provide a program for testing and inspection that is generally consistent with the XXXX guidance document (reference).

2.1.16 Conclusion

Based on the review of the geotechnical engineering aspects of the design of the ABC closure action as presented in the Reclamation Plan, XDOH concludes that the embankment and proposed borrow soils have been adequately characterized. Furthermore, the cover system appears to be adequately designed to resist the effects of freezing conditions which can reasonably be expected. XDOH concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been made in a manner consistent with the guidance document (reference). XDOH concludes that there is adequate assurance of safety with respect to liquefaction potential. In conclusion, the XDOH's review of geotechnical stability has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

2.2 SURFACE WATER HYDROLOGY AND EROSION PROTECTION

The constructed reclamation site is robust by design, and includes a thick, vegetated cover design of site soils surrounded by a large surface water diversion channel over X,XXX feet long. The tailings impoundment is situated in a relatively small watershed area (about XXX acres), which limits surface water flow potential. The small catchment area inside the diversion channel is less than XXX acres. The reclamation site is expected to return to a wildlife and forestry land use, similar to the surrounding area, which shows few erosional impacts.

Embankment dam (XX%), margins (XX to XX%), cover (X.XX%), and diversion channel (X.XX to X.XX%) slopes are relatively flat. Erosion protection studies have been performed on these topographic features. Some areas required stabilization by rock (riprap), some by vegetation, and some are naturally stable.

2.2.1 Flood Flow

The primary criteria used to evaluate erosion protection are a determination of long-term erosional stability using Criteron 6 (reference), which requires site stability for 1,000 years. [NRC guidance] was used to develop a conservative design basis. A probable maximum precipitation (PMP) event was selected and found to be a X-hour storm of XX.X inches, peaking at mid-storm at XX inches per hour (reference). Probable Maximum Flood (PMF) surface water flow rates were determined, based on the worst-case precipitation event, surface flow characteristics (elevations and contours, surface roughness and vegetation) at the site, and antecedent soil moisture (near-saturated or frozen ground), using the [XXX computer program]. The XXXX method was used to verify surface water flow rates on the cover.

XDOH reviewed and independently verified ABC's flood flow estimates. The [reference] method was used to determine that vegetation is not necessary for erosion protection (reference). The margin areas were found to require XX% vegetal coverage for long-term erosional stability, based on a PMF event. Short-term erosion protection requirements were also determined and require XX% vegetal cover, based on a 10,000-year storm (reference). The Monitoring and Stabilization Plan (MSP) was used to verify vegetation productivity performance after reclamation construction was completed. The XX% short-term requirement was met in [year], and the trend line for performance since reclamation construction in [year] predicts performance in the XX% range by the [summer] of [year] (reference).

PMF flow rates were determined for the diversion channel to be XXXX cfs (cubic feet per second), and for the swale outlet from the impoundment surface area to be XXX cfs. These worst-case flood flow rates were used to determine channel cross-sections and to size the riprap (reference). Diversion channel cross-sections were designed for both the minimum flow resistance, large velocity case, and for the high resistance, low velocity case. Rock protection is required for the first case with a smaller channel cross-section. Long-term performance requires limited rock protection but a larger cross-section channel.

Using these two cases, the diversion channel was designed for a large cross-section, but with rock placed only in the lower portion consistent with the smaller cross-section (reference). Rock and filter sizing was performed using the XXXX method, as recommended by [NRC guidance]. XDOH reviewed and independently verified ABC's analyses (reference). Rock sizes that were placed met, and generally exceeded the minimum rock sizing required by the analysis-based design. ABC chose to oversize the rock to limit the number of rock sizes produced and placed (reference).

2.2.2 Rock Durability and Gradation

Rock durability and gradation were evaluated during construction to meet approved construction design plans and specifications. An initial petrographic examination per [reference] was made to qualify the rock source. XDOH reviewed the report of the independent evaluation and accepted the rock source (reference). Rock samples were then tested every XX,XXX cubic yards of production for Bulk Specific Gravity and Absorption per [reference], Sodium Sulfate Soundness per [reference], Los Angeles Abrasion per [reference], and Schmidt Hammer Rebound per [reference].

Two different rock sources were used, including a local basalt borrow area and a quartz monzonite area that required blasting.

Rock durability scores, using the XXXX scoring method, averaged XX.X, with the lowest at XX and the highest at XX. XDOH reviewed rock durability test results from the independent laboratory. Rock source gradation was periodically sampled and evaluated by an independent contractor during construction. XDOH inspectors reviewed inspection records during construction and found the evaluations, methods, and records to be adequate. ABC performed a quality assurance construction performance audit program of ABC operations, contractor construction activities, and independent contractor inspections. The ABC auditor reported to corporate management and exercised independent authority, as observed by XDOH inspectors (reference).

XDOH reviewed the data from ABC's construction completion report (reference). The basalt rock source qualified and produced a small fraction of the produced rock (about X,XXX cubic yards). Rock durability test results for basalt scored XX on two tests. The quartz monzonite source qualified and produced most of the rock used during construction (about XX,XXX cubic yards). Rock durability test scores for the quartz monzonite averaged XX.X, with a standard deviation of X.X. XDOH believes that the quartz monzonite source produced uniform rock durability, based on department inspection, the consistency of the rock durability scores, and the small statistical standard deviation for the data.

[NRC guidance] provides a minimum rock durability score of XX, without oversizing. ABC oversized the rock placed by a considerable amount, on average. Oversizing of rock was by design. Rock production used a small number of screens. ABC used only X", X" and XX" D_{50} (median stone diameter) rock sizes. Placement sizes were greater, compared with design rock sizes developed to meet erosion protection criteria. The erosion protection criteria were also determined based on conservative criteria.

In addition to conservative methods for rock sizing and durability, the structural integrity of the site is not dependent only on rock for erosion protection. The XYZ millsite has site-specific attributes (soil, bedrock, weather, etc.) that suggest a durable long-term forest and wildlife environment. Therefore, the rock protection placed during construction becomes less important for structural

stability (erosion protection) as vegetation becomes established. The rock performance timeframe is about a thousand years (based on XXXX guidance and methods), while the forest succession timeframe is about a hundred years. This is a convenient overlap of performance features.

During reclamation plan development, ABC evaluated erosion protection requirements for the diversion channel for both the vegetated and non-vegetated conditions. For that area, rock was required in the lower section of the channel (for the non-vegetated condition), and not in the upper section of the channel (for the vegetated condition). The difference between conditions is a factor of three in velocity reduction and in channel cross-section increase, once vegetation establishes. The long-term performance expectation is for a similar velocity reduction in all areas of the site after vegetation succession occurs.

2.2.3 Vegetation Cover

For the design of the top slope, ABC addressed the stability of the slope under three conditions: (1) bare soil with no vegetation; (2) normal, fair vegetation cover; and (3) poor vegetation cover. The stability of these three cover conditions was evaluated using the allowable shear stress method (reference) and the maximum allowable velocity (reference), with corrections for depth (referene). Additionally, XDOH staff independently evaluated the stability of the top slope, using very conservative assumptions. It was assumed that the vegetation was burned, deteriorated, and/or damaged to the extent that approximately XX% of its shear resistance capability had been removed (reduced from X.X pounds per square foot to X.X pounds per square foot), coincident with the occurrence of the design PMF discharge of X.X cfs. Further, an evaluation was conducted assuming a XX% reduction in shear resistance (X.X pounds per square foot), coincident with a discharge of X.X cfs (PMF with no flow concentration, or FCF = 1). Under both conditions, the proposed slope of X.XX was found to be stable. Following is a summary of calculations performed by ABC and the XDOH regarding the stable slope design.

Design Method	Cover Condition	Allowable Stress (lb/ft^2)	Actual Stress (lb/ft^2)	Allowable Velocity (ft/sec)	Actual Velocity (ft/sec)	Stable Slope (ft/ft)
Allowable Shear Stress	Bare	[0.08]	[0.44]	NA		[0.0013]
	Poor	[3.0]	[0.5]			[0.012]
	Normal	[4.2]	[0.6]			[0.030]
Allowable Velocity	Bare	NA		[2.9]	[2.9]	[0.003]
	Poor			[3.8]	[3.8]	[0.01]
	Normal			[3.9]	[3.8]	[0.015]
XDOH Independent Estimate						
(FCF=3)	[90%] Lost	[0.4]	[0.4]	NA		[0.01]
(FCF=1)	[95%] Lost	[0.2]	[0.2]			[0.01]

Additionally, ABC provided further information and justification regarding the design of the vegetation cover in a report (reference) which addresses the concerns raised in XXXX (Reference). These concerns included a conclusion in the [reference] report which indicated that typical soil loss rates in this portion of the United States were so excessive that a soil cover could not be provided for a 1000-year period, based on results of the Universal Soil Loss Equation. ABC performed detailed calculations of the soil loss rates for the specific design and location chosen; these calculations indicated that the design would provide acceptable protection against sheet erosion.

2.2.4 Sedimentation

Sedimentation in the diversion channel was evaluated using the XXXX and XXXX computer programs. The analyses were performed on the PMF case, as well as several lesser flood flow cases, to determine if sedimentation would accumulate in the diversion channel over time and reduce diversion channel flow capacity. It was determined that, except for the first few years after construction, there is no likely flood flow in the channel for flood recurrence intervals less than XXX years, due to expected infiltration. For larger, low-probability flood events, sediment would likely flush out with the expected flood flow. Even without flushing, sediment accumulation predicted by the analysis was approximately X.X feet at the bottom of the diversion channel. The

channel was designed so that a minimum of X foot of freeboard would be present, and included a very conservative design PMF basis, sedimentation in the channel, and re-vegetation of the channel (reference). In addition, the channel was constructed somewhat oversized to meet the design cross-section minimum requirements, and therefore has a capacity excess from the design minimum required.

The impoundment swale outfall requires rock (riprap) erosion protection, since it is designed to convey concentrated flood flow from the impoundment surface and to discharge it away from the reclamation site. This area was evaluated with the same analytical tools as the diversion channel, and found to be adequate. The design was prepared by ABC, and evaluated and approved by XDOH. Worst-case assumptions were used to evaluate the design, based on [NRC guidance]. Vegetation productivity on the impoundment cover has reached a self-sustaining performance level and will continue to improve over time, limiting the probability of occurrence of maximum flood flow (reference). The swale outfall is located over a large area of competent quartz monzonite of sufficient structural capacity, extent, and elevation, that limits potential erosion of cover soils from the impoundment. The swale outfall therefore protects the cover from erosion and promotes sedimentation on the shallow-sloping impoundment surface (reference).

2.2.5 Conclusion

In conclusion, XDOH's review of surface water hydrology and erosion protection has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

3. Documentation that the completed site decommissioning actions were performed in accordance with applicable standards and requirements. This documentation should include a discussion of results of radiation survey and confirmatory soil samples that indicated that the subject site meets applicable standards and requirements for release.

3.1 RADIATION CLEANUP AND CONTROL

3.1.1 Introduction

Cleanup of the site was based on the approved decommissioning plan (reference) ([include license conditions or tie downs)]. The operating history of the facility was reviewed in order to ensue that all potential sources of contamination were identified. Applicable standards and requirements were identified during the development of the decommissioning plan and are outlined in Table 1. Cleanup parameters and guidelines were appropriate and designed to demonstrate compliance. Disequilibrium (Th-230, Ra-226, U-tot) was evaluated, and cleanup criteria were established in accordance with XXX (equivalent Criteria 6(6) rule). [MARSSIM methodologies (NUREG 1575)] were applied ([or an alternate approved method)] for demonstrating cleanup. The MARSSIM process utilized the Data Quality Objectives (DQO) process such that stakeholder data requirements were identified and applied (references). Characterization of the site was performed

to identify impacted areas outside the impoundment (e.g., mill buildings, haul roads, bone yards). Background was appropriately determined using reference areas representing the various media [include results]. Areas were then classified properly according to contamination potential.

3.1.2 Millsite Decommissioning

Remediation activities at the site commenced in [year] and ended in [year]. Remediation (demolition/excavation) technologies (or alternate methods) were evaluated and found to be effective. Effluent controls were in effect for air, water, and soil. Environmental monitoring was in place for all affected media. Changes from the decommissioning plan were explained and justified (reference). A total of XX structures were remediated, and approximately XXXX cubic yards of material were placed in the impoundment, including building rubble, soils, and other permitted materials. Buildings were remediated by XX process. XX acres of the site were remediated to free-release criteria. XDOH has reviewed the information as presented in the Mill Decommissioning Completion Report (reference) and the report was found acceptable.

3.1.3 Final Status Surveys

Concurrent with remediation activities, Final Status Surveys (FSS) were conducted to demonstrate cleanup to the stated goals. The FSS designs were reviewed and approved by XDOH (reference). Appropriate instrumentation was chosen for the contaminants of interest and properly calibrated. Th-230 was evaluated by correlation to Ra-226 where feasible, and through soil analysis where a correlation could not be demonstrated. Minimum detectable concentrations of survey instrumentation and other DQOs were compared to plans. The surveys consisted of a combination of gamma scans and soil samples. Borehole surveys for subsurface verification were also made, although subsurface contamination is not addressed under MARSSIM. A summary of survey units, scan and sample results is presented below in Tables X1-X3.

Table X1. Survey unit summary

Survey Unit Classification	Number of Survey Units	Samples per Survey Unit	Area of Survey Unit, m^2
I	75	18	100
II	26	10	1500
III	33	varies	varies

Table X2. Summary of gamma exposure rate ranges

Analytical categories	Gamma exposure rates (mR/h)
Number of surveys	[674]
Minimum	[9]
Maximum	[1,355]
Mean	[16]

[Note: The limit for gamma exposure rate is xxx mR/h]

Table X3. Summary of soil sample analyses

Analytical categories	Concentration (pCi/g		
	Ra-226	Th-230	U(total)
Number of soil samples	[354]	[271]	[251]
Minimum	[0.5]	[0.0]	[0.2]
Maximum	[34.3]	[35.1]	[82.4]
Mean	[2.2]	[1.7]	[7.6]

[Notes:
1. Results include background.
2. The limit for Ra-226 in value can range from XXX to XXX pCi/g.
3. The limit for Th-230 in value can range from XXX to XXX pCi/g.
4. The limit for U(total) in value can range from XXX to XXX pCi/g.]

Verification and validation of the survey results combined with an assessment of the quantity and quality of the data were conducted. The data were validated to ensure that the results supported the objectives of the survey. The Final Status Survey was found acceptable.

3.1.4 Independent Verification

An independent verification survey was conducted by XXXX. Approximately XX% of the survey units were surveyed by the independent verification contractor. Results from the independent verification surveys were compared to the results of the site contractor. The results were in relative agreement, indicating that the FSS report is representative of site conditions.

3.1.5 State Oversight [insert narrative]

In addition to the independent verification, XDOH conducted XX site visits, XX inspections, collected XX samples, and conducted XX gamma surveys on XX survey units. Results of the XDOH's surveys were compared to ABC's results and are in good agreement. (references). [Insert table with results of State analyses].

3.1.6 Conclusion

XDOH's review of radiation cleanup and control has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

3.2 RADON EMANATION

ABC designed the impoundment cover from site soils and determined that an average cover design thickness of XX.X feet was required in order to meet the regulatory limit of XX pCi/m^{2}s found in Criterion 6 (reference). ABC used the XXXX computer code to perform this analysis. The analysis is based on the concentration of radium 226 in the tailings, and on the soil parameter [default] values recommended by the [NRC in guidance documents] applicable to tailings impoundment cover design for radon emanation control. XDOH reviewed ABC's design and analysis reports, verified their results, and approved the design plans and specifications. A sensitivity analysis was performed, using realistic, expected long-term soil parameters, and found that a radon 222 flux of only X.XX pCi/m^{2}s would be expected during the summer and fall when the cover soils are not expected to be saturated (reference).

A thick soil cover of at least XX.X feet thick was placed over the impounded tailings at the XYZ site. The total volume of soil moved during construction to place the cover is in excess of X million cubic yards (yd^3). The vegetated cover was designed to have long-term performance. Natural materials (vegetation, soils, and rock) have been used to prepare and construct the cover design. Actual materials used in construction had a greater proportion of fine material than required by the construction design plans and specifications. The actual thickness of the constructed cover averaged over XX.X feet from the sloped sub-grade. The sub-grade, although made up of radium 226-contaminated material, was produced by re-grading the tailings to the required contour and adding additional soil from the contaminated soils cleaned up in the mill area, with clean fill to meet grade requirements. Therefore, the upper portion of the tailings had less radium 226 concentration than was used in the analysis for determining cover thickness. All together, the design is quite conservative and the actual construction met the requirements of the approved design plans and specifications.

3.2.1 Radon 222 Measurements

ABC submitted a reclamation plan which provided the design of a cover system which would reduce the radon 222 flux to XX pCi/m^2/s or less. Use of a published radon flux model (reference) with the design information provided by the licensee confirmed the radon flux reduction provided by the cover system. ABC also demonstrated that the cover system would continue to reduce radon flux for 1000 years or at least 200 years by using an environment dose assessment model (reference) to confirm that the cover system would perform adequately. After completion of the cover system ABC made radon flux measurements using the radon flux measurement methodology in [Appendix B, Method 115, 40 CFR Part 61]. A mean radon 222 flux rate of X.XX +/- X.XX pCi/m^{2}s was measured. This measurement is well below the regulatory standard from state regulation XDC-XXX-XXX, Criterion 6 (b), and consistent with analytical evaluations, using realistic assumptions and long-term expectations, performed at the XYZ site (reference).

3.2.2 Conclusion

In conclusion, the XDOH's review of radon emanation has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with applicable standards and requirements.

4.1 GROUNDWATER REMEDIATION (EXAMPLE 1: No Action Scenario)

There is no evidence of impact to groundwater at ABC's tailings facility. From the beginning of ABC's operations, tailings were neutralized prior to discharge to the lined impoundment, significantly reducing the risk for groundwater contamination (reference).

The hydrogeology of the site was evaluated prior to construction of the tailings impoundment in [year] and again as part of the design phase of the reclamation cover. The basin hydrologic evaluation was performed by ABC to characterize physical parameters, which control groundwater occurrence, flow, and potential transport of contaminants. Results of this evaluation and the tailings impoundment investigation were reviewed by XDOH (reference). XDOH supplemented review of ABC's hydrogeologic evaluation with geologic and hydrogeologic field evaluations by XDOH staff. XDOH staff also independently reviewed published geologic and hydrogeologic literature for the area of ABC's facility. XDOH staff reviews have confirmed the findings reported by ABC (reference).

4.1.1 Monitoring Wells

Monitoring wells have been in place surrounding the tailings impoundment since before operations began through the Monitoring and Stabilization phase of the project. Groundwater data have been

evaluated by XDOH since [year] for possible leakage from the impoundment (reference). ABC sampled tailings pore fluid for all hazardous constituents defined by State regulations (reference) and found that the hazardous constituents which could be of concern for groundwater are uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium (reference). Therefore, groundwater samples were analyzed for these constituents along with other indicator parameters such as TDS, pH, temperature, sulfate, chloride, and other metals. Samples have been obtained quarterly by ABC since before operations began.

4.1.2 State's Split Sampling

XDOH has split groundwater samples from all of the monitoring wells with ABC and had the samples analyzed at the XDOH's independent laboratory. Samples have been obtained from monitoring wells by XDOH semi-annually since operations began in [year], through [year]. Groundwater samples are collected by XDOH when static water levels of the aquifer are at the seasonally high and low periods of the year. Review of the analytical results from XDOH's laboratory shows the same water quality trends compared to the analytical results from ABC's laboratory.

The Monitoring and Stabilization Plan included three levels of monitoring for frequency and constituent evaluation depending upon conservative trigger exceedances. Although conservative trigger levels have resulted in increased monitoring surveillance, no federal or state regulatory standards have been exceeded (reference). XDOH's review of all groundwater quality data has determined that the hazardous constituents in the tailings impoundment (uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory levels. Fluctuations in static water levels and indicator parameter values (e.g., sulfate and chloride), observed during post-reclamation construction compliance monitoring, are consistent with anticipated trends and values (reference).

4.1.3 Geo-Chemistry

An extensive independent geochemical review of the tailings impoundment and chemistry of the groundwater was conducted by a XDOH Geochemist. The purpose of the review was to evaluate long-term water quality of the site. The conclusions of this review are that the tailings should remain saturated (not dewatered), and groundwater quality should remain good (reference). Dewatering of tailings was considered, but XDOH determined that for long-term groundwater protection, dewatering of tailings was not desirable or required (reference).

4.1.4 Conclusion

XDOH has made a determination that the closure of ABC's facility is in compliance with State groundwater regulations associated with uranium mill closure. The closure is specifically in compliance with the following groundwater criteria delineated in Chapter XXX-XXXX [State regulations], Criterion 5 and Criterion 13, which incorporate the basic groundwater protection

standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A which specifies groundwater monitoring requirements.

4.2 Groundwater Remediation (EXAMPLE 2: Remediation Scenario)

Analytical results of groundwater samples collected from monitoring wells at ABC's facility indicate that the shallow aquifer has been contaminated by the tailings impoundment at concentrations in excess of applicable standards (reference). Using these validated groundwater data, the extent of contamination was delineated by constructing isoconcentration plume maps for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium (reference). These data indicate that degradation of groundwater quality has occurred as a result of ABC's milling operations which warranted groundwater restoration actions. Subsequent to dewatering, removal, and transfer of the tailings to another licensed site, XDOH worked with ABC to remediate groundwater contamination (reference).

4.2.1 Remedial Selection

The following groundwater remedial alternatives were reviewed by XDOH (reference):

1) natural flushing,
2) hydraulic gradient control via infiltration galleries,
3) slurry wall, groundwater pumping wells, and evaporation pond disposal,
4) groundwater pumping wells, wastewater treatment, and discharge to the [XXXX area], and
5) permeable reactive barriers.

Results of the review indicated that Option 5, permeable reactive barriers, was the most technologically efficient and cost effective remedy based on site-specific characteristics and the nature and extent of groundwater contamination at ABC's facility (reference). Permeable reactive barriers avoid the technological limitations and budgetary constraints associated with traditional approaches such as pump and treat technology (reference). Another significant advantage of permeable reactive barriers is the greatly reduced operation and maintenance costs which are limited to simple groundwater head and water quality monitoring (reference). Permeable reactive barriers are placed in the path of a migrating plume of contaminated groundwater and reactive media within the barrier promote geochemical reactions that result in the destruction, immobilization, and/or stabilization of groundwater contaminants.

4.2.2 Alternate Concentration Limits (optional)

Additional assessment studies of tailings contaminant fate, aquatic toxicology, and environmental risk were conducted to develop alternate concentration limits (ACLs) for the contaminants of concern at ABC's facility including ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium (Reference). The establishment of ACLs was dependent on the approval by XXXX

and the exclusion of current and future water rights for local groundwater and surface water by XXXX (reference).

4.2.3 Remedial Implementation

After delineating the areal extent of groundwater contamination and characterizing the horizontal and vertical hydraulic gradients of the aquifer, two separate permeable reactive barriers were installed at ABC's facility including: 1) a zero-valent iron reactive wall was installed across the tailings area and the former mill site location to remediate uranium and heavy metals, and 2) a shorter zeolite reactive wall was installed in a second trench located behind the zero-valent iron reactive wall to remediate ammonia (reference). Both permeable reactive barriers were installed as simple reactive walls because site characteristics prevented the construction of low-permeability funnel walls on the sides of the reactive walls (reference). The design and installation of the permeable reactive barriers included groundwater flow modeling and engineering analysis for optimal reactive wall design and to properly position the reactive walls in the local groundwater flow system (reference).

The design analyses for the permeable reactive barrier included evaluations of the barrier's life-cycle; considering the amount of reactive mass necessary to assure that groundwater concentrations would remain within compliance limits for the closure design life, and whether the barrier permeability would not be adversely impacted by the precipitation of minerals or microbial growth (reference). Post-closure monitoring of the permeable reactive barrier was performed for a period of XX years before the license termination request was submitted to demonstrate the barrier was performing as designed (reference).

[Scenario for post-license termination monitoring of reactive barrier if warranted at a specific site]

Even though post-closure monitoring has confirmed that the reactive barrier is performing as designed, monitoring is recommended beyond license termination in order to evaluate long-term groundwater and reactive barrier chemistry. The costs associated with long-term groundwater monitoring and potential reactive barrier replacement have been calculated and included in the Perpetual Care and Maintenance Fund.

4.2.4 Remedial Monitoring

Monitoring wells and piezometers were completed in the contaminated and uncontaminated portions of the aquifer and in the permeable reactive barriers to monitor groundwater head and water quality during remediation (reference). Piezometers were installed in the zero-valent iron and zeolite reactive walls to monitor reactive wall performance including changes in internal groundwater head, flux, and water chemistry (reference). Bimonthly monitoring was conducted by ABC during the first two years of operation followed by semi-annual monitoring in years three to five, then annually thereafter (reference).

Split groundwater samples were analyzed by XXXX on a semi-annual basis for the first five years of remediation and annually thereafter. Groundwater samples were collected by the State when static water levels of the aquifer were at seasonally high and low periods of the year. Analytical results of split samples from the State Laboratory are in agreement with ABC's laboratory analytical results and indicate that all contaminants of concern have been reduced to concentrations below applicable standards (references).

4.2.5 Permeable Reactive Barrier Closure

In-place closure of the permeable reactive barriers was achieved by grouting the reactive walls in order to hydraulically and chemically isolate the zero-valent iron and zeolite reactive media.

4.2.6 Post-closure Monitoring

Post-closure groundwater monitoring of point-of-compliance (POC) wells will be conducted as part of the long-term surveillance plan (LTSP) to ensure that the closed reactive walls remain hydraulically and chemically isolated. Groundwater samples from POC wells will be analyzed for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium.

4.2.7 Conclusion

XDOH has determined that groundwater contamination at ABC's facility has been remediated to concentrations below applicable standards [or ACLs] and license requirements for the contaminants of concern which include ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium. As a result of these successful groundwater restoration actions, XDOH has determined that closure of ABC's facility is in compliance with State groundwater regulations (reference) associated with uranium mill closure. The closure is specifically in compliance with the following groundwater criteria delineated in Chapter XXX-XXX-XXX State regulations, Criteria 5, 6(g), and 13, which incorporate the basic groundwater protection standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A, Criteria, 5, 6(7), and 13, which specify groundwater monitoring requirements.

5. Discussion of results of State's site closure inspections

XDOH has performed site closure inspections over the years as the site remediation moved from one phase to the next. XDOH has employed inspection staff or provided specialized consultants to review and verify virtually every aspect of site closure.

Results of XDOH's site inspections have been to provide a presence to ensure the site reclamation activities are performed as required by regulations and license conditions. For significant aspects of reclamation, ABC submitted detailed plans and specifications for the work. These plans were reviewed and approved by XDOH. In these cases, XDOH inspectors have performed many field inspections to verify conformance of site activities to approved plans. This is particularly the case

for reclamation construction of the diversion channel and thick, vegetated cover. Of particular emphasis was inspection of soil, rock, vegetation, and groundwater.

Monitoring during site closure has continued to evaluate environmental media and site performance. Periodic inspection and monitoring activities have been performed to determine radionuclide concentrations in soil, air, and groundwater. ABC has been required to perform this monitoring and to report results annually. XDOH has performed split sampling and has evaluated monitoring results in the State's independent laboratory to provide verification of ABC's results.

6. For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact of releasing a portion of the site has been evaluated and included the bases for the State's conclusion.

XDOH has determined that the release for unrestricted use and removal of the subject site will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date, based on the following: The site being removed from the license is not contiguous with any other site associated with licensed activities: removal of the sites from their associated license will not in any way prevent or hinder the licensee ability to complete decommissioning of the remainder of the licensed areas.

III. REFERENCES

This page left blank intentionally.

APPENDIX C - Sample Completion Review Report for Non-conventional Uranium Milling License

NOTE TO READER

The sample Completion Review Report (CRR) was developed by a Working Group composed of Agreement State and NRC staff. As stated in the procedure, prior to license termination, Agreement States submit CRRs for NRC review. The CRR would document State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met.

The purpose of this sample CRR is intended to generally show the level of detailed information in a variety of technical areas which should be provided in the CRR. The Working Group recognized that no single site, or any existing documentation, could serve as a complete template for all aspects of site closure, since each non-conventional uranium milling site is likely to have its own site-specific conditions that would be unique to that site. To cover as many aspects of license termination activities as possible, the sample CRR is a composite of examples from a number of existing documents. Stakeholders' comments and input have also been considered and reflected in the sample CRR.

The reader is advised that the sample CRR does not provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

APPENDIX C - Sample Completion Review Report for Non-conventional Uranium Milling License

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: [John Smith, M.S.,P.E. (Hydrologic Engineer)]

I. SUMMARY

The ABC Company's XYZ site is an in-situ leach mining and processing site which has been decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the U.S. Nuclear Regulatory Commission (NRC) shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The NRC STP Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report. The primary applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled [Radiation Protection-Uranium and/or Thorium Milling]. This State regulation is consistent with and compatible with NRC regulations, as required by the State's Agreement State status with the NRC.

All applicable standards and requirements, with appropriate references to related sections of the CRR, are identified in Table 1. [Note to Reader: Table 1 in this sample CRR doses not contain a complete list of all applicable standards and requirements.] XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

APPENDIX C - Sample Completion Review Report for Non-conventional Uranium Milling License

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements	CRR Sections	TER Sections**
State regulation XX.XXXX Restoration of groundwater with all wells plugged and capped. Criteria for groundwater restoration	Sections 2 and 3	Section X.XX
State regulation XX.XXXX Surface decontamination to a level sufficient for unrestricted use. Criteria for release for unrestricted use	Section 4	Section X.XX
State regulation XX.XXXX Release of equipment and materials. Criteria for release of equipment and materials for unrestricted use	Section 4	Section X.XX
Other applicable standards and requirements		

*As defined in section V.C. of the STP Procedure SA-900 issued on [date month, year].
**Sections in TERs or equivalent reference documents.

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Act, that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

II. DOCUMENTATION OF BASES FOR CONCLUSION

Following are XDOH's review results for items specified in the STP Procedure SA-900 "Termination of Uranium Milling Licenses in Agreement States."

1. A brief description of licensee's activities associated with decommissioning and license termination.

The XYZ project is an in-situ leach uranium mine located near XXX, State. XYZ's uranium leases cover approximately X,XXX contiguous acres of land. The site facility included a main building (housing offices, a warehouse, a lab, and maintenance facilities), a processing plant, [four PVC lined] water storage ponds, a production well-field, an irrigation area, and a deep disposal well. The site was operated from [year] to [year] when production operations were ceased.

From [year] until [year] [active/passive] groundwater restoration was performed along with limited surface reclamation. The State Water Commission authorized ceasing groundwater restoration and final plugging of all wells [in the Fall of year]. Following plugging of all wells, full-scale surface reclamation and decommissioning began. Any material and/or equipment which was contaminated was disposed of by 1) transfer to another licensed mine site; 2) decontamination and release for unrestricted use; or 3) disposal at [a licensed byproduct disposal facility]. XDOH has determined that proper release for disposal, recycle or reuse, of all material and/or equipment was adequately documented by ABC.

ABC performed surveys to confirm the effectiveness of reclamation and decommissioning activities. The surveys consisted of scans, direct and/or swipe surveys of all affected areas. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from four 10 meter by 10 meter areas per acre, or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.] Reclamation and decommissioning activities were completed in [year].

In [year], XDOH performed confirmatory surveys of the facility. [Two times background was used as an allowable limit (reference). The survey was performed by walking 10 meters apart moving across the wellfield pattern. Soil samples were taken from a 100 square meter area around areas that exceeded two times background, or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.] Post-cleanup surveys conducted by XDOH staff indicate that the site has been decontaminated to a radiation level that meets the State release criteria (reference). Analysis of all soil samples indicates that average radium-226 and uranium concentrations were below release criteria of [5 pCi/g and 30 pCi/g, respectively].

On site disposal of radioactive materials was not authorized at this facility, thus there is no land to be transferred to the State or the Federal Government.

5. Groundwater information which demonstrates that the groundwater has been adequately restored to meet applicable standards and requirements.

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: XDOH has received the restoration data for Productions Area XX of the XYZ mine. A review of the data shows that the production area has been restored in accordance with the specifications contained in permit XX-XXXX and as required by State regulations XX-XXX-XXXX. ABC has been authorized to cease any restoration activities, including monitoring, at the production area.

6. Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with applicable standards and requirements.

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: In accordance with State regulations XX-XXXX-XX, XDOH revokes permit XXXX. Groundwater was restored following criteria set forth in State regulations XX-XXXX-XXXX. All of the Class III wells were plugged as of month year, and certifications have been received from the mine operator and from an independent registered processional engineer that plugging was accomplished in accordance with the plugging and abandonment plan in the permit.

7. Decommissioning information which documents that all contaminated materials have been properly disposed of, transferred to licensee(s) authorized to possess such materials, or meet applicable standards and requirements for release.

During surface reclamation and decommissioning all material and equipment was surveyed for radioactive contamination. Any material and/or equipment which was contaminated was released by utilizing one of the following methods: 1) transfer to licensee(s) authorized to possess such materials; 2) decontamination and released for unrestricted reuse or recycling; 3) or disposal at a licensed byproduct disposal facility.

All material and equipment to be released for unrestricted use (e.g., reuse, recycle, or disposal) have been surveyed by ABC to demonstrate compliance with [State regulations for control of radiation XX.XXX]. The surveys consisted of scans, direct measurements and swipes for determination of removable activity. These surveys have been taken and documented by ABC to meet these criteria as summarized below:

[(1) Removable surface contamination: 1000 dpm alpha per 1000 m^2
(2) Fixed surface contamination (average over 1 m^2): 5000 dpm alpha/beta per 100 cm^2
(3) Maximum fixed contamination: 15,000 dpm alpha/beta per 100 cm^2]

All soils have been surveyed to demonstrate compliance with the requirements of State regulation XX.XXX. These surveys have been completed and documented to meet these criteria:

[(1) 5 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over the first 15 cm depth of soil; (2) 15 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over any subsequent 15 cm depth of soil; and (3) 30 pCi/gm of U-nat.]

8. Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets standards and requirements for release.

Surveys, conducted by ABC, to confirm the effectiveness of reclamation and decommissioning activities were performed by scans, direct and/or swipe surveys of equipment and structures to be turned over to the landowner. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from three 10 meter by 10 meter areas per acre, or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.] ABC subsequently requested termination of its license.

In month, year, XDOH staff performed confirmatory surveys of the wellfield. The surveys were performed using [one-by-one sodium iodide probes and XXXX survey meters]. The survey was performed by [walking 10 meters apart moving across the well field pattern (reference), or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.].

Background gamma count rate readings were approximately [X.XXX cpm or mR/hr] on all meters. As a result of the surveys, [twenty-nine] areas were identified as having readings greater than the action level. These areas were cleaned up by ABC and resurveyed by XDOH staff. All areas resurveyed had readings which were less than action level.

Concurrently XDOH staff collected soil samples from XX areas. Soil sample results were within the regulatory limits for radium-226 and natural uranium soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively], except for [two] soil samples which exceeded these limits.

In month, year, XDOH staff returned to the production area to resurvey and take soil samples after the licensee had cleaned the two areas that had exceeded release limits. Soil sample results were within the regulatory limits for radium-226 and natural uranium soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively].

9. Discussion of results of the State's site closure inspection(s).

On month date, XDOH staff performed a survey of ABC's XYZ site. The surveys were performed using [one-by-one sodium iodide probes and XXXX instruments]. The purpose of the survey was to allow ABC to release the X.X acres for unrestricted use. Two times background was used as an allowable limit (reference). The survey was performed by walking 10 meters apart moving across the wellfield pattern. Background readings ranged from XXXX -XXXX cpm.

One area was identified which exceeded two times background. A visible pile of pipescale on the surface was the cause for the elevated reading. This area was cleaned up by ABC and a post-cleanup survey indicated no readings above background.

Since no elevated readings were found in the production [except for the pile of visible pipescale], soil samples were not collected.

On-site disposal of solid radioactive material or byproduct material was not authorized at the XYZ site, thus there is no land to be transferred to the State or the Federal Government. As a result of these findings, XDOH is proposing to remove the XYZ site from the license.

10. For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date.

XDOH has determined that the release for unrestricted use and removal of [the subject site] will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date. XDOH based its decision on the following: The site(s) being removed from the license [is/are] not contiguous with any other site associated with licensed activities that may lead to recontamination of the release site(s), and removal of the sites from their associated license will not in any way prevent or hinder the licensee's ability to complete decommissioning of the remainder of the licensed areas.

III. REFERENCES

This page left blank intentionally.

APPENDIX D - Sample NRC Determination Letter for Conventional Uranium Milling License

Month Date, Year
, Director
State Agency Address

Dear XXXX

We have completed review of your Month Date, Year submittal, regarding the proposed termination of Radioactive Material License, XX-XXXX-X, issued to ABC. The license covered the ABC's XYZ Site, a conventional uranium mill facility located near XXX, State. You requested in your submittal that the U.S. Nuclear Regulatory Commission make a determination that all applicable standards and requirements pertaining to reclamation of the XYZ Site have been met.

The process that we used to make the determination is set out in the Office of State and Tribal Programs STP Procedure SA-900. Our determination is based on two supporting bases: review of a Completion Review Report (CRR) documenting the State Department of Health (XDOH) staff's bases for its conclusion that all requirements have been met; and review of State Agreement State uranium recovery program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP).

First, the information you have submitted in the CRR, dated Month Date, Year, documents that the XDOH has performed a complete review of the XYZ Site for compliance with regulatory and license requirements. XDOH's review covered all necessary technical areas and regulatory requirements relating to reclamation of the XYZ Site including geotechnical engineering, surface water hydrology and erosion protection, radiation cleanup and control, and groundwater protection. XDOH also conducted appropriate inspections of site reclamation activities at the XYZ Site. Based on the review findings documented in the CRR, XDOH concluded that the XYZ Site has met all regulatory and license requirements.

Second, the most recent IMPEP review of the State Agreement State Program, conducted in Month Year, concluded that the State program is adequate to protect public health and safety, and compatible with NRC's regulatory program. This finding is consistent with previous State program evaluation findings.

Based on our review of the above information and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License, XX-XXXX-X.

Appendix D -- NRC Determination Letter (Conventional)

A copy of our evaluation report, without associated attachments, entitled "Documentation of NRC Review on the Termination Findings of the ABC's Uranium Milling License Submitted by the State Department of Health" is enclosed.

If you have any questions, or we can be of further assistance, please contact me or STP Staff Name at (301) 415-XXXX.

Sincerely,

STP Director
Office of State and Tribal Programs

Enclosure:
As stated

Appendix D -- NRC Determination Letter (Conventional)

Documentation of NRC Review on the Termination Findings of the ABC's XYZ Uranium Milling License Submitted by the XXXX State Department of Health

Licensee: A... B... C... (ABC)
Licensee No.: XX-XXXX-X
Location:
Area: approximately XXX acres
Type of License: Conventional Uranium Milling License
Full / Partial License Termination: Full License Termination

1. Documentation of major events/activities related to the review of the XYZ proposal

1. On [month date, year], the NRC staff received a letter from the U.S. Department of Energy (DOE) regarding the Long-Term Surveillance Plan (LTSP) for the ABC's XYZ site. The DOE letter can be found in Attachment X.

2. On [month date, year], NRC staff received the ABC's XYZ draft proposal from XDOH. A letter dated [month date, year] with a copy of the XDOH's draft Completion Review Report (CRR) can be found in Attachment X.

3. The review was conducted by an NRC staff team. A list of NRC staff technical reviewers can be found in Attachment X.

4. On [month date, year], NRC staff discussed the review process and status of NRC's review of the XYZ's draft proposal at a meeting with DOE, XDOH and ABC representatives.

5. On [month date, year], after completing review of the draft CRR, NRC staff provided comments to XDOH. The cover letter and attached comments can be found in Attachment X.

6. On [month date, year], NRC staff met at the ABC's XYZ site with DOE, XDOH and ABC representatives to observe site conditions and to discuss LTSP issues. NRC's comments (see Attachment X) on XDOH's draft CRR were also discussed.

7. On [month date, year], NRC staff received XDOH's response to the [month date, year] letter. The letter, dated [month date, year] and its attachment, ABC's response letter to NRC's comments, can be found in Attachment X.

8. On [month date, year], NRC and XDOH staff met to discuss the status of NRC's review, areas needing further information or clarification (see Table below), XDOH feedback and comments on the review process, future actions, and a proposed schedule for completion of the review.

Sample Table

No.	REVIEW AREA	POTENTIAL SIGNIFICANCE
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Staff needs further supporting information to complete our review of XDOH's basis for its conclusion that the subject site has been cleaned up to the standards.
2.	Identify applicable standards / requirements	Provide brief description of further supporting information needed to complete NRC's review of XDOH's basis for its conclusion.

9. On [month date, year], NRC staff met with DOE, XDOH and ABC representatives to discuss the status of NRC's review, areas where further information or clarification were needed, and the schedule for completion of the review.

10. On [month date, year], NRC staff received Revision #1 to the draft CRR from XDOH. XDOH indicated Revision #1 to the draft CRR provided responses to NRC's comments as documented in Attachment X. The [month date, year] letter and its attachment can be found in Attachment X.

11. On [month date, year], after completing review of Revision #1 to the draft CRR, NRC staff communicated with XDOH staff through e-mail on areas where further information or clarification was needed. On [month date, year], XDOH staff provided responses to NRC's comments through e-mail. These e-mails can be found in Attachment X.

12. On [month date, year], NRC staff provided comments to DOE on a draft LTSP. The comments reflect consideration of information contained in the draft CRR and resulting from NRC staff review of the draft CRR. The letter notes that because the mill tailings will be saturated for an indefinite period of time, and a large amount of water is impounded behind the dam, the tailings impoundment system is formally classified as a dam. To meet Federal obligations under the requirements of the National Dam Safety Program Act, the dam must be inspected at regular intervals. The letter concludes that additional inspection items must be included in the LTSP to meet applicable requirements. The comment letter and its attachment can be found in Attachment X.

13. On [month date, year] , NRC staff received the final CRR, from XDOH. Following review, NRC staff concluded that the final CRR addressed all NRC's comments and provided XDOH staff's bases for its conclusion that the ABC's XYZ Site has met all regulatory and license requirements. The letter and its attachment can be found in Attachment X.

14. The five issues identified during the [month date, year] meeting were closed based on additional information documented in the final CRR (Items X-X) or based on information provided in the [month date, year] letter from NRC to DOE (Item X). This is summarized in the Table below.

Sample Table

No.	REVIEW AREA	COMMENTS
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Additional information is documented in the Radiation Cleanup and Control portion of the final CRR.
2.	Identify applicable standards / requirements	Additional information is documented in the XXXX portion of the final CRR.

B. Documentation of review comments on items specified in the STP Procedure SA-900 "Termination of Uranium Mill Licenses in Agreement States."

1. A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

   Comment: This information is provided in section X of the final CRR. The submitted information was found to be complete.

2. Documentation that the completed surface remedial actions were performed in accordance with applicable standards and requirements.

   Comment: This information is provided in section X of the final CRR. XDOH staff reviewed geotechnical stability, surface water hydrology and erosion protection, and radon emanation aspects of the reclamation of ABC's XYZ site. Based on its evaluation, it was concluded that reclamation of the site has met all applicable standards and conformed with design specifications. The submitted information was found to be acceptable.

3. Documentation that the completed site decommissioning actions were performed in accordance with applicable standards and requirements.

   Comment: This information is provided in section X of the final CRR. It is stated that ABC's initial measurement indicated that XX% of all gamma and soil sample grids were below the radium regulatory limit. Following the initial surveys, all gamma grids and soil grids that were in excess of limits were excavated until results indicated concentrations below the applicable limit. XDOH data

confirm that ABC's sampling process was valid. It was concluded by XDOH that residual radioactive material in all the areas potentially impacted by the mill operation were cleaned up to the State standards. The submitted information was found to be acceptable.

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with applicable standards and requirements.

   Comment: This information is provided in section X of the final CRR. XDOH's review of all groundwater quality data has determined that the hazardous constituents in the tailings impoundment (uranium, Ra-226, Ra-228, Th-230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory limits. It was concluded by XDOH that the closure of ABC's XYZ site is in compliance with XXXX State groundwater regulations associated with uranium mill closure. The submitted information was found to be acceptable.

5. Discussion of results of State's site closure inspection(s).

   Comment: This information is provided in section X of the final CRR. It is stated that XDOH staff has performed appropriate site reclamation inspections over the years as site remediation moved from one phase to the next. XDOH employed inspection staff or provided specialized consultants to review and verify all important aspects of site closure. It was concluded that results of XDOH staff site inspections have provided a presence to ensure that site reclamation activities were performed as required by regulation and license conditions. The submitted information was found to be acceptable.

6. For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date.

   Comment: Not applicable. This is a full license termination.

7. IMPEP review of the XDOH uranium recovery regulatory program

   Comment: Based on [year] IMPEP review, the XDOH uranium recovery program was found to be satisfactory based on the IMPEP evaluation criteria. (A satisfactory rating is the highest rating possible for each IMPEP common and

non-common performance indicator.) The overall XXXX (State name) Agreement State program was found to be adequate to protect public health and safety and compatible with NRC's program. The IMPEP team had one recommendation in the Uranium Recovery area that the State develop additional specialized inspection procedures.

Based on review of the above information, as specified in the STP Procedure SA-900, and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, the staff determines that all applicable standards and requirements have been met for the termination of the Radioactive Material License, XX-XXXXX-X.

Project Manager: _____ Date: _____
Full Name, Title
Office of State and Tribal Programs

Office Director: _____ Date: _____
Full Name, Director
Office of State and Tribal Programs

This page left blank intentionally.

APPENDIX E -- Sample NRC determination letter for Non-conventional Uranium Milling License

Month Date, Year

, Director
State Agency Address

Dear XXXX

We have completed our review of your Month Date, Year and Month Date, Year submittals regarding the proposed termination of the Radioactive Material License, XX-XXXX-X, issued to ABC's XYZ Site, an in-situ leach uranium recovery facility located near XXX, State. You requested in your Month Date, Year submittal that the U.S. Nuclear Regulatory Commission (NRC) make a determination that all applicable standards and requirements pertaining to reclamation of the XYZ Site have been met.

The process that we used to make the determination is set out in the Office of State and Tribal Programs (STP) Procedure SA-900. Our determination is based on two supporting bases: review of a Completion Review Report (CRR) documenting the State Department of Health (XDOH) staff's bases for its conclusion that all applicable standards and requirements have been met; and review of State's Agreement State uranium recovery program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP).

As indicated in STP Procedure SA-900, closure of an in-situ leach uranium recovery site requires a demonstration that the groundwater has been adequately restored, all the wells have been closed and plugged according to the appropriate State statute, disposal or transfer of radioactive material is documented, and radiation surveys and confirmatory soil samples indicate that the site meets applicable standards and requirements for release.

First, the information you have submitted indicates that the groundwater has been restored by the licensee to the satisfaction of XDOH. All the wells have been plugged and abandoned by the licensee as authorized by XDOH. Based on XDOH's review of the license termination, you reported that proper disposition of radioactive materials took place at the site and there has been no on-site disposal of radioactive materials; therefore, there is no need to transfer ownership of land to the State or the Federal Government.

XDOH has reviewed the results of radiation surveys submitted by the licensee and performed confirmatory surveys for the subject site. Post-cleanup surveys conducted by XDOH indicate that the site has been decontaminated to a radiation level that meets the State criteria. According to the XDOH report, the analysis of soil samples indicates the radium-226 and Thorium-230, and uranium concentrations were below the release criteria of [insert derived criterion 6(6) values].

The statements made in the submittals indicate that the XDOH has adequately determined that all applicable standards and requirements have been met by the licensee.

Second, the most recent IMPEP review of the State Agreement State Program, conducted in Month Year, concluded that the Texas program is adequate to protect public health and safety, and compatible with NRC's regulatory program. This finding is consistent with the previous State program evaluations.

Based on our review of the above information and in accordance with 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License, XX-XXXX-X.

A copy of our evaluation report, without associated attachments, entitled "Documentation of NRC Review of the Termination Findings of the ABC's Uranium Mill License Submitted by the State Department of Health" is enclosed.

If we can be of further assistance in this regard, please contact me at (301) 415-3340 or STP Staff Name at (301) 415-XXXX.

Sincerely,

STP Director
Office of State and Tribal Programs

Enclosure:
As stated

APPENDIX E - Sample NRC determination (Non-conventional)

Documentation of NRC Review on the Termination Findings of the ABC's XYZ Uranium Milling License Submitted by the State Department of Health

Licensee: A...B...C... (ABC)
License No.: XX-XXXX-X
Location:
Area: approximately XXX acres
Type of License: Non-conventional (in-situ leach) Uranium Milling License
Full / Partial License Termination: Full License Termination

The following items were reviewed based on the Office of State and Tribal Programs (STP) Procedure SA-900 "Termination of Uranium Mill Licenses in Agreement States."

1. A brief description of licensee's activities associated with decommissioning and license termination.

   Comment: This information is provided in a State Department of Health (XDOH) letter dated Month Date, Year (Attachment 1). Acreage information for the mine site is provided in a XDOH letter dated Month Date, Year (Attachment 2).

2. Groundwater information which demonstrates that the groundwater has been adequately restored to meet applicable standards and requirements.

   Comment: This information is provided in Enclosure X of the XDOH letter dated Month Date, Year.

4. Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with applicable standards and requirements.

   Comment: This information is provided in Enclosure X of the XDOH letter dated Month Date, Year.

5. Decommissioning information which documents that all contaminated materials have been properly disposed of, transferred to licensee(s) authorized to possess such materials, or meet applicable standards and requirements for release.

   Comment: This information is provided in the XDOH letter dated Month Date, Year. XDOH indicated that any material and/or equipment which was contaminated was transferred to another licensed mine site, decontaminated and released for unrestricted use, or disposed of at a licensed byproduct disposal facility.

6. Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets standards and requirements for release.

   Comment: This information is provided in the XDOH letter dated Month Date, Year. Results of radiation surveys and confirmatory soil samples can be found in Enclosure X of the letter. Additional information related to the results of two confirmatory soil samples is provided in the Month Date, Year letter.

7. Discussion of results of the State's site closure inspection(s).

   Comment: This information is provided in the Enclosure X of the XDOH letter dated Month Date, Year. As stated above, additional information can also be found in the Month Date, Year letter.

8. For partial terminations, documentation that release of a portion of the site will not negatively impact the remainder of the site to be closed at a later date.

   Comment: Not applicable. This is a full license termination.

9. IMPEP review of the Texas uranium recovery regulatory program

   Comment: According to the results of the Year IMPEP review, the State uranium recovery regulatory program was found to be satisfactory based on the IMPEP evaluation criteria. (A satisfactory rating is the highest rating possible for each IMPEP common and non-common performance indicator.) The overall State Agreement State program was found to be adequate to protect public health and safety, and compatible with NRC's program.

Based on review of the above information, as specified in STP Procedure SA-900, and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, the staff determines that all applicable standards and requirements have been met for the termination of the Radioactive Material License, XX-XXXX-X.

Project Manager: _____Date:_____
Full Name, Title
Office of State and Tribal Programs

Office Director: _____ Date: _____
Full Name, Director
Office of State and Tribal Programs

APPENDIX I - CHARTER FOR THE NRC/AGREEMENT STATE WORKING GROUP ON TERMINATION OF URANIUM MILLING LICENSES IN AGREEMENT STATES

Purpose

Provide recommendations to the U.S. Nuclear Regulatory Commission (NRC) to address issues identified by the working group and stakeholders on the NRC concurrence process for uranium mill license termination in Agreement States.

Working Group Organization and Operations

NRC Personnel:
- Kevin Hsueh, STP
- Ted Johnson, NMSS
- Dan Rom, NMSS

Agreement State Personnel:
- Phil Egidi, State of Colorado
- Gary McCandless, State of Illinois
- Gary Smith, State of Texas
- Rob Herbert, State of Utah
- Dorothy Stoffel, State of Washington

Resource Representative:
- Dennis Sollenberger, STP

Background

The Office of State and Tribal Programs (STP) Procedure SA-900, "Termination of Uranium Mill Licenses in Agreement States," has been used as guidance by NRC staff for review of uranium mill license termination proposals as well as by Agreement State staff on preparation of such proposals. The NRC has made its concurrence determinations on one conventional and seven in-situ uranium mill license termination proposals submitted by Agreement States since the STP Procedure SA-900 was issued in April 1999.

During NRC review of the license termination proposals, especially Washington State's proposal for termination of the Western Nuclear (Sherwood) mill license, NRC staff recognized that in some areas the guidance may need to be expanded to better characterize the level of detail in information which should be provided by an Agreement State in support of a license termination proposal. Specifically, the level of information needed in the completion review reports (CRR) requested from Agreement States should be similar or equivalent to that contained in the sample CRRs attached to the STP Procedure SA-900.

Currently, the sample CRR for terminating a conventional uranium mill license was originally prepared by NRC staff for license termination of the Atlantic Richfield Company's (ARCO's) Bluewater site, a formerly NRC licensed facility. Since NRC staff would not conduct a detailed technical review of a license termination for sites that are under Agreement State jurisdiction and would not have all the historical knowledge on licensing activities of such sites, the level of detailed information equivalent to that contained in the ARCO's CRR may not be sufficient if Agreement States would use that as an example to submit their license termination proposals. For termination of a non-conventional uranium mill license (mainly in-situ uranium extraction license), there is no sample CRR attached to the STP Procedure SA-900 for use as guidance by NRC and Agreement State staff. In addition, the NRC also received comments from the National Mining Association (NMA) recommending clarifying changes to the guidance provided in the STP Procedure SA-900.

Tasks

In examining the concurrence process and the current STP Procedure SA-900, the working group should address two tasks:

1. Identify areas that need improvements in the NRC concurrence process based on the review experience to date, such as early involvement in the Agreement State's license termination activities, and use of formal and/or informal processes to resolve issues identified during the review.

2. Propose a draft revised STP Procedure SA-900 that addresses issues identified by the working group and stakeholders, such as comments provided in the NMA letter. The draft STP Procedure SA-900 should include two separate sample CRRs for termination of both conventional and non-conventional uranium mill licenses in Agreement States. The amount of detailed information and areas of technical aspects contained in the sample CRRs should be tailored to that needed by NRC staff for concurrence determinations of such proposed CRRs that are expected to be submitted by Agreement States in the next 3-5 years.

Desired Products

1. Documentation of working group recommendations to NRC for improvements on NRC concurrence process.

2. Draft revised STP Procedure SA-900 with two separate sample CRRs.

Schedule

The working group will complete the project by October 2001.

- First working group conference call (April 24, 2001)
- Second working group conference call (May 30, 2001)
- Working group meeting with stakeholders in Denver, Colorado (June 12, 2001)
- Prepare draft recommendations and draft revised STP Procedure SA-900 (early July 2001)
- Third working group conference call to discuss actions to complete final products (late July 2001)
- Fourth working group conference call to discuss actions to complete final products (September 2001)
- Make final changes and submit final products to NRC (October 2001)

This page left blank intentionally.

APPENDIX II - WORKING GROUP RESPONSE TO COMMENTS ON DRAFT REVISION OF SA-900 PROCEDURE

1. Response to Comments from the Illinois Department of Nuclear Safety (Comment letter dated January 10, 2002)

A. The revised draft of Procedure SA-900 is greatly improved from earlier versions. Guidance to Agreement States has been expanded, and more appropriate appendices are provided depicting the level of detailed information expected in a Completion Review Report.

> The Department concurs with NRC that a Completion Review Report documents, in *summary form,* the State's bases for its conclusion that all applicable standards and requirements have been met, we also agree that the intent of the NRC's review team is *not to duplicate* the State's review or conduct an independent detailed technical review of the proposed license termination.

Response: We appreciate the comment.

B. In Appendix A, page A-7, under step 3: Termination of the Specific License, item 4 should include an additional sentence defining documentation similar to the information provided in items 3 and 7 in that section.

Response: We agree with this comment. Item 4 has been referred to Section F.2.b.(iv) of the draft revised STP Procedure SA-900 to read as follows:

> *Decommissioning information which documents that all contaminated materials have been properly disposed of, transferred to licensee(s) authorized to possess such materials, or meet applicable standards and requirements for release. Such documentation could be a statement which confirms that decommissioning activities have been evaluated and includes the bases for the State's conclusion.*

2. Response to Comments from the Nuclear Energy Institute (Comment letter dated September 24, 2001)

General Concerns:

2-1 **Two-step Review Process**: The guidance would formalize Agreement State-NRC consultations on the content of the Completion Review Report (CRR) by requiring pre-submission and approval of a draft CRR before the Agreement State could formally request concurrence on termination of a uranium recovery license. This new requirement is not needed, will be burdensome and costly to Agreement States and will appreciably delay the license termination

process. Neither the Agreement States nor licensees should have to bear the significant, added costs that this additional paperwork would entail. The existing process, whereby the Agreement State consults with the NRC on a proposed license termination, but does not submit a draft CRR for pre-approval, has worked well and should not be modified. Cooperation and consultations between the two parties should be encouraged, but the added burden and delay of preparing and submitting a draft CRR for comment and consensus appears unnecessary.

The CRR is essentially what is referred to as a Safety Evaluation Report (SER). SERs present the results of NRC staff evaluations of documents submitted generally in support of licensing actions. An SER typically contains a description of the review, including aspects that required special emphasis, matters that were modified by the applicant during the review, matters that will be resolved in the future, aspects where the applicant's proposal deviate from the criteria in a Standard Review Plan (or other guidance document), and the bases for any deviations from the SRP or exemptions from applicable regulations or requirements. NEI would recommend use of the term "SER" rather than "CRR" in Procedure SA-900 to maintain consistency in Commission nomenclature for licensing action reviews.

Additional discussion under the Detailed Comments section of the NEI letter.

The draft revision proposes that an Agreement State formally submit a draft Completion Review Report (CRR) for NRC review and comment before the final CRR could be accepted. This process would replace the informal consultations that now take place between the NRC and Agreement State staff as the latter prepares the CRR. Judging by the envisioned complexity of the draft CRR review process (see the example chronology in Appendix D), this exercise will entail large commitments of NRC and Agreement State personnel resources and a lot of time exchanging letters and processing what amounts to multiple 'Requests for Additional Information'. Who will bear the costs for this multi-month exercise? How will this pre-review process expedite the termination of licenses? Does this new bureaucratic requirement enhance human health and safety and protection of the environment?

SECY-99-025 and Procedure SA-900 both state that the NRC is to make its concurrence determination based on the Agreement State's reviews and acceptance of the documentation submitted by the licensee. Both documents clearly state that the NRC will not conduct independent detailed technical reviews of the Agreement State documentation. In other words, the NRC's role is one of checking to ensure the completeness of the licensee's compliance with its approved Decommissioning Plan, 10 CFR 40 Appendix A requirements, Agreement State regulations and any specific license conditions or exclusions. Presumably, if the NRC's periodic Integrated Materials Performance Evaluation program (IMPEP) reviews confirm that an Agreement State's uranium recovery regulatory program is technically sound and in concurrence with federal requirements, the NRC should accept the validity of the Agreement State's license termination assessments and CRR proposals. If an Agreement State attests to the completeness and satisfactory execution of a licensee's approved Decommissioning Plan, the amount of information included in the CRR should be relatively limited. There should be no need for submission and pre-approval of a draft CRR. If the chronology of events for submittal and approval of a draft CRR is typical of that laid out in Appendix D (Pages D-3 to D-5), at least six to twelve months should be expected to complete approval of the draft CRR. The required expenditure of NRC, Agreement State and licensee resources can also be expected to be sizeable. Expenditure of these resources will neither enhance protection of human health and

safety nor protection of the environment. The existing system, whereby the NRC staff and Agreement State staff informally discuss preparation and submission of the CRR, works well. In view of the way in which the NRC is to assess and grant concurrence as presented in Procedure SA-900, burdening the process with an added pre-approval step cannot be justified. This is an unnecessarily costly and time-consuming bureaucratic step that is unwarranted.

Response:

A. See discussion and recommendation in item 2 under Task 1(pages 1-2 and 1-3).

B. The level of detailed information contained in the CRRs should be different from that contained in the SERs or the Technical Evaluation Reports (TERs). The SERs or TERs present the results of Agreement State staff's evaluations of documents submitted by its licensees. The CRRs present the Agreement State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. These bases may be found in the SERs or TERs prepared to support specific licensing actions. In the CRRs, Agreement State staff should refer to the relevant TERs or SERs where detailed evaluations (bases) can be found to support its conclusion that all applicable and standards and requirements have been met. We believe that the term "CRR" should continue to be used to differentiate from the SERs or TERs.

2-2 **Sample Completion Review Reports**: The draft revision of Procedure SA-900 includes example CRRs for both conventional and in-situ uranium recovery licenses. While the inclusion of specific content guidance is commendable, the sample CRRs for a conventional milling license (Appendix B) and an in-situ license (Appendix C) are poorly drafted, disjointed and incomplete. Appendix B is not a good example of what a CRR should contain or of how the information should be presented. Both example CRRs are based on actual CRRs from which specific names and data, but not detailed licensee-specific information, have simply been deleted. Time constraints may have forced the Working Group to simply "white-out" parts of existing CRRs, but the result is a mish-mash of inconsistent, confusing and unhelpful information. The CRR examples must be redone in a logical and helpful manner. Appendices B and C would be considerably more useful were they to enumerate those technical issues that should be addressed in the CRR in order to meet federal decommissioning and reclamation standards and requirements. Agreement State personnel will be better served by consulting actual CRRs from terminated licenses rather than attempting to decipher heavily edited, whiteout and disjointed CRRs as currently presented in Appendices B and C.

Additional discussion under the Detailed Comments section of the NEI letter.

Appendices B and C are edited versions of the CRRs prepared for Western Nuclear's Sherwood Uranium Project (Appendix B) and an unnamed Texas in-situ mining project (Appendix C). Unfortunately, the cursory manner in which sections of the respective CRRs have been excised from the original reports and pasted together is unsound and inconsistent and constitutes bad guidance. Both appendices provide little guidance to the NRC staff in judging whether a CRR is complete and acceptable. Inclusion of alternate approaches for certain issues (e.g. geotechnical stability, radiation clean-up in Appendix B) is confusing and simply contrasts bad and good writing styles. Clearly, little thought or consideration was put into drafting these appendices and the resulting mish-mash of disconnected text, misplaced references, and superfluous information (e.g. documentation of the exchange of correspondence in §3.1 of Appendix B is totally irrelevant) necessitates a major revision of these appendices.

To be truly useful, and not simply a source of "boilerplate" text for inclusion in a CRR, each appendix should first clearly enumerate those federal and state standards, as well as any specific license or Decommissioning Plan conditions, that must be satisfied. The appendix should relate each standard or condition to the federal requirement (primarily 10 CFR 40, Appendix A) and the corresponding section of the CRR or supporting technical study. In other words, the appendices should provide a listing of the issues to be addressed in the CRR along with sub-issues or expected data or completed analyses. This would be far more useful to the NRC reviewer than having to read a doctored-up version of an actual CRR. As an example, for groundwater remediation at a conventional mill, topics for possible inclusion in a CRR may include the following. There should be no need to provide paragraphs of example text for each topic, but simply identification of topics for which the NRC seeks reasonable assurance that were properly addressed by the licensee and attested to by the Agreement State in the CRR.

Groundwater Remediation:

(i) groundwater characterization

- monitoring well locations (well design(s), spatial proximity to tailings impoundments, completion depths, aquifers sampled, etc.)
- water quality sampling program description (methodology, frequency, protocols, split samples, Agreement State sampling, etc.)
- analytical results (analytical laboratory, analytical methods, quality assurance, temporal variation of water quality, agreement between licensee and Agreement State analytical results, etc.)
- applicable baseline water quality standards (EPA, state, or license-specific alternate concentration limits (ACLs), etc.)
- comparison of analytical results to applicable standards (temporal variation, analysis of licensee and Agreement State data, etc.)

(ii) definition of problem (if applicable)

1. definition of parameters exceeding applicable standards (environmental significance and risk, evaluation of the need to proceed with groundwater remediation, etc.)

2. definition of problem scope (aquifer hydrology characterization including horizontal and vertical hydraulic gradients, contaminant transport properties, extent of contamination, etc.)
3. evaluation of remedial options (technical and economic feasibility, modeling of contaminant fate and dispersion, assessment of immediate and long-term environmental risk, etc.)

(iii) remedial action program (if applicable)

- Ž implementation of remedial actions (program design, installation and construction, effectiveness monitoring parameters, etc.)
- Ž post-closure monitoring (selection of indicator chemical parameters, monitoring well location, achievement of groundwater restoration quality, demonstration of water quality stability, etc.)
- Ž impacts on Long-Term Surveillance Plan (LTSP) (including funding, etc.)

Keep in mind that every licensee and Agreement State will consult previously submitted and approved CRRs. There is no need to reproduce sections of such CRRs in the guidance appendices.

Response:

A. See discussion under Task 2 (pages 2-1 and 2-2).

B. Comments on Appendices B and C have been considered. We have revised these two Appendices to provide better guidance to the reader.

C. As indicated in the cover pages of Appendices B and C, the sample CRR does not provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

2-3 **Procedure Structure**: The draft revision of Procedure SA-900 now includes some general guidance on issues that should be reviewed in the CRR. This is an improvement. However, specific federal requirements (such as those of 10 CFR 40, Appendix A criteria) are lacking, as are acceptance criteria for information provided in the Agreement State's proposal. The usefulness of the guidance could be significantly improved were it to be restructured along the lines of a typical 'Standard Review Plan' in which the regulatory bases, areas of review and acceptance criteria are clearly and explicitly stated. There are several instances in which the draft revision of Procedure SA-900 addresses activities to be performed solely by the Agreement State (e.g. Step #2 of the termination process). How the Agreement State assesses and judges the adequacy of licensee information is a state prerogative and need not be addressed in Procedure SA-900. The procedure's presecriptiveness in "dictating" how an Agreement State should conduct its analyses should be removed. Considerable redundancy remains in the draft revision (e.g. multiple citations of regulatory bases, personnel assignments and responsibilities, etc.) that should be consolidated and deleted for clarity.

Additional discussion under the Detailed Comments section of the NEI letter.

The draft revision of Procedure SA-900 now states in very conceptual terms what information should be included in a CRR. SECY-99-025 identified a need for more specific guidance on the level of detailed information that should be in a CRR and specifically, which technical issues should be addressed. The draft revision has been modified and now lists six to seven topics for which information should be submitted. This is an improvement.

However, the draft revision lacks guidance on how the NRC reviewer should judge the adequacy and acceptability of information presented in the CRR. While Procedure SA-900 cannot address every possible approach for implementing an Agreement State approved Decommissioning Plan, the procedure must outline some high-level acceptance criteria for CRRs.

NEI recommends that Procedure SA-900 be restructured along the lines of an NRC 'Standard Review Plan (SRP)'. An SRP outlines a uniform, consistent approach for guiding the review of submissions to the NRC. Adherence to the structure and format of an SRP would state the regulatory bases for the review and concurrence, clearly identify technical areas to be examined, provide acceptance criteria for the submitted information, and outline a common mechanism for conducting the concurrence review. While information pertaining to several of the aforementioned topics is present in the draft revision of the procedure, it is often needlessly repeated, unclear or simply lacking.

To facilitate a CRR review, NEI recommends that the procedure include a table of all federal decommissioning and restoration criteria that must be met with cross-references to Agreement State requirements and sections of the CRR. (Any licensee-specific conditions in the Decommissioning Plan would also require examination).

Steps 2 and 3 of the license termination process (pages A-2 and A-6) are superfluous to the procedure. These steps state how the Agreement State should conduct its own analysis and, as such, are not appropriate for inclusion in Procedure SA-900. While the statements in these two steps are factually correct, Procedure SA-900 should guide the review of the adequacy and validity of information presented in the CRR, but <u>not</u> the Agreement State's procedures and approaches. Steps 2 and 3 should be revised or deleted from the draft, revised procedure.

Response:

A. See discussion under Task 2 (pages 2-1 and 2-2).

B. Agreement State staff members, co-regulators of NRC staff, are familiar with the specific requirements that are applicable to the specific site. Therefore, we do not believe that there is a need to list all the requirements in the procedure that can be applied to all the sites**.** Rather, the procedure serves as a road map indicating what information needs to be included and presented in a certain format that can be readily followed by the reader.

C. Steps 2 and 3 of the license termination process in Appendix A are included for the reader to understand the activities conducted by Agreement States prior to submitting a CRR for NRC review. We do not believe that they need to be revised.

2-4 **Risk-Informed, Performance-Based Regulation**: The draft revision of Procedure SA-900 does not address how the NRC's risk-informed, performance-based regulatory approach should be incorporated into the concurrence process. Nowhere does the guidance address, for example, how to evaluate the risk significance and potential impacts on human health and safety and the environment of the inability (whether technical or economic) to meet every detail of a 10 CFR 40 Appendix A decommissioning criterion. Guidance on how the NRC should act in such cases (e.g. authorize or delay termination, etc.) would be helpful.

The Working Group has made many improvements to Procedure SA-900 and the usefulness of the guidance has been significantly improved. However, NEI believes the draft revision could be further improved were some specific guidance included to explain how concurrence to an Agreement State application for license termination should be assessed and granted. To be really useful the procedure should not just state what information should be summarized in the CRR, but also guide the NRC reviewer in how to judge the acceptability and completeness of the CRR content. Appendices B and C require complete revision to make them useful to an NRC reviewer. Finally, the significant commitment of NRC, Agreement State and licensee resources that will be required to pre-approve a CRR is unnecessarily burdensome and will not enhance protection of human health and safety or the environment. The NRC should take full advantage of the opportunity to revise Procedure SA-900 to address previous deficiencies, but also to incorporate truly helpful and risk-informed, performance-based guidance structured in a user-friendly manner.

Additional discussion under the Detailed Comments section of the NEI letter.

As noted above, the absence of guidance on how to judge the adequacy and acceptability of a CRR is a serious deficiency in the draft revision of the procedure. Such guidance should include application of the NRC's risk-informed, performance-based regulatory philosophy. For example, guidance to the reviewer in evaluating the comparative risks to human health and safety and the environmental in the event that a decommissioning criteria cannot be totally met (whether as a result of technical or economic limitations) would be advisable. What should the NRC reviewer do in such cases?

Response:

A. We believe that guidance needed to address the risk-informed, performance-based regulations lies in the SRPs or equivalent documents. Based on review of licensee submittals using the SRPs or equivalent documents as review guidance, the State staff may reach conclusions that support a licensing action. The information needed in the CRR contains State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The applicable standards and requirements may include the risk-informed, performance-based regulations.

B. See item 3 (pages 1-3 and 1-4) under Task 1 for the discussion on the scope of NRC concurrence review.

Specific Comments:

2-5 NEI has prepared a detailed critique of the draft revision of Procedure SA-900. Suggested improvements are highlighted and redundant text has been struck through. As noted earlier, NEI would recommend structuring this guidance as an SRP, thereby necessitating significant modifications to the attached redlined version. Similarly, NEI recommends that Appendices B and C be significantly revised. A few editorial corrections:

- inconsistent usage of the terms "Agency", "Commission" and "NRC". Recommend consistent usage of one term throughout the procedure.

- inconsistent use of verb forms. Recommend using the present tense (rather than the subjunctive) to explicitly state, for example, what is expected in the CRR or what the NRC reviewer is to do.

Response: We appreciate the considerable amount of efforts NEI has made in its markup of the document. We have considered all the suggestions and comments, and incorporated them, if accepted, into the draft revised STP Procedure SA-900. We have chosen to use the term "NRC" whenever it is possible unless it appears in a cited statement where other equivalent terms, such as the Commission, are used.

2-6 Comment on Section III.B. (Editor: see Section III.C. in 2002 version)

The NRC Commissioners determined that fluids used in restoring wellfields are also 11e.(2) byproduct material. Disposition of such 11e.(2) material in a liquid form is unlikely. The language of the following sentence (Editor: Item 1) should be clarified (Editor: Item 2) to clarify the different types of 11e.(2) byproduct material.

Item 1:

> "A non-conventional uranium mill is a facility that generates limited byproduct materials which are normally transferred to conventional tailings impoundments for disposal and therefore no land transfer is required at license termination."

Item 2:

> "A non-conventional uranium mill is a facility that generates limited quantities of byproduct materials. Solid byproduct material from non-conventional milling licensees is normally transferred to tailings impoundments at conventional uranium mills for disposal and therefore no land transfer or long-term custodianship is required at license termination."

Response: Since the disposition of such 11e.(2) material in a liquid form is not impossible, we do not believe that the language needs to be revised.

2-7 Comment on Section III. C. (Editor: see Section III.D. in 2002 version)

[T]he following paragraph C should be relocated to Section V(A) for better continuity.

"C. Historically, the NRC has reviewed non-conventional uranium milling license termination requests from Agreement States on a case-by-case basis without any specific guidance. This procedure describes the specific guidance the NRC staff would use to ensure consistency in the process and information that NRC would need from an Agreement State to make its determination prior to termination of pending and future Agreement State conventional and non-conventional uranium milling licenses. A detailed license termination process for termination of uranium milling licenses in Agreement States is documented in Appendix A."

Response*:* We believe that the paragraph (Editor: see Section III.D. in 2002 version)should be part of the background information since it describes the old process and the reason why a new process is needed.

2-8 [S]hould the responsibilities and roles of OGC and NMSS personnel be stated here (Editor: Section IV. C., see paragraph below)?

"Section IV. C. The review team is responsible for conducting the staff evaluation of Agreement State proposals according to this procedure. A team normally consists of the PM and the assigned staff contacts from the Office of Nuclear Material Safety and Safeguards (NMSS) and the Office of the General Counsel (OGC)."

Response: OGC and NMSS staff will serve as team members. We do not believe that the role and responsibility of each individual team member should be addressed here in light of the responsibility of the team has been stated in Section V.F. (Editor: see this section in 2002 version). The paragraph was not revised in response to this comment.

2-9 [T]his paragraph A (Editor: Section V. A. in 2001 version, see paragraph below) repeats what was presented in Section III(A), albeit with a little historical perspective. As nothing new is stated, recommend deleting this entire section for it adds nothing new.

"Section V.A. A. With the approval of Management Directive 9.15, "Organization and Functions, Office of State Programs" on July 6, 1993, STP was explicitly assigned responsibility for making determinations under §150.15a(a). Management Directive 9.15 provides, in part, that the Office "[m]akes the determination required in Section 274c of the Act of 1954 that all applicable standards and requirements have been met before an Agreement State terminates a license for byproduct material as defined in Section 11e.(2). This determination will be made in consultation with the Office of Nuclear Material Safety and Safeguards."

Response: We have relocated this paragraph to Section III B. (Editor: 2002 version) for better continuity.

2-10 [T]he content of the following paragraph (Editor: last paragraph of Section V.D.2, see paragraph below) is very important and should not be deleted. There should be a clear statement towards the beginning of the Procedure that clearly states the extent of the NRC's review.

"Note that the NRC staff would not duplicate the State's review by conducting an independent detailed technical review of the proposed license termination or determination of any specific documentation for the Agreement State licensees. Rather, the NRC staff would rely on a review of the completeness and documentation of the Agreement State action as well as the normal periodic NRC review of the Agreement State program under IMPEP."

Response: We agree with the comment. A new Section V.E. has been added to the draft revised STP Procedure SA-900 to address the scope of NRC review of CRR.

2-11 [W]e do not concur with the need to submit a draft CRR for pre-approval. This section (Editor: Section V.E.1, see paragraph below) should be revised to remove this requirement.

"E.1 Agreement States should submit draft CRRs to NRC for review and comment. The State staff should alert the PM or the Director, STP, at least one month before submitting the draft. The Director, STP should then ask NMSS and OGC to assign staff level contacts for the review team."

Response*:* We disagree with the comment. See discussion and recommendation in item 2 under Task 1 (pages 1-2 and 1-3).

2-12 [t]he following comment (Editor: a note under Section E.2.b, see paragraph below) requires further elaboration. Some examples should be given. How is the reviewer to proceed in this event?

"E.2.b. Note: Additional information may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category."

Response: After reviewing a list of uranium milling sites in Agreement States that may be terminated within the next five years, we do not believe that there is a need to include such a note and therefore the note was deleted from the draft revised STP Procedure SA-900.

2-13 [T]his paragraph 3 (Editor: Section V.E.3, see paragraph below) is important and should be placed at the beginning of the section – for it tells the NRC reviewer what to do.

"V.E.3 The team would not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination. Rather the team would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The level of detailed information contained in the CRR should be similar to that contained in the sample CRRs."

Response: We agree with the comment. A new Section V.E. has been added to the draft revised STP Procedure SA-900 to address the scope of NRC review of CRR.

2-14 [T]his last sentence (Editor: the last sentence of Section V.E.3, see sentence below) is inapplicable if Appendices B and C are redrafted as recommended.

"The level of detailed information contained in the CRR should be similar to that contained in the sample CRRs."

Response: We disagree with the comment. See discussion under Task 2 (pages 2-1 and 2-2). The sentence (see Section V.E. in 2002 version) was not revised in response to this comment.

2-15 [T]he intent of the following sentence (Editor: the last sentence of Section V.E.4., see sentence below) is unclear. So long as the licensed facility had been decommissioned and reclaimed in accordance with provisions of the Agreement State-approved Decommissioning Plan, the NRC staff should not be concerned with whether the design features of the licensed facility remained in strict compliance with regulations during operations. Recommend clarification or deletion of this sentence.

"In addition, if any changes or degradation of the design features have occurred since construction, the team will determine whether the State has evaluated the changes to confirm that the site continues to meet all applicable standards and requirements."

Response: Although the licensed facility had been decommissioned and reclaimed in accordance with State-approved plans, changes or degradation of the design features may have occurred after the completion of construction and prior to license termination. Such situations may need to be focused by the review team to see if they have been evaluated by the State prior to license termination. The wording "since construction" was revised to "since the completion of construction" for clarity. See below for the revised sentence in Section V.E.

In addition, if any changes or degradation of the design features have occurred since the completion of construction, NRC staff will determine whether the State has evaluated the changes to confirm that the site continues to meet all applicable standards and requirements.

2-16 [T]he following paragraph (Editor: see Item V.E.5 in 2001 version) does not apply if the draft CRR requirement is deleted.

"The team prepares a letter to the State program Director to document the results of the review of the draft CRR. The Director, STP, signs the letter following Office concurrence from NMSS and OGC. The PM may schedule telephone conference calls or meetings with State staff and team members, if needed, to discuss the results of the review."

Response: Since we disagree with the deletion of the review of the draft CRR, the paragraph was not deleted (Editor: see Item V.E.4 in 2002 version)

2-17 [T]he following paragraph (Editor: see Item V.E.6) does not apply if the draft CRR requirement is deleted.

"The State should address NRC's comments by making changes in the final CRR. The PM may schedule telephone conference calls or meetings with State staff and team members, if requested by the State, to discuss the changes in the final CRR. The State program Director should not submit a second draft, or changes to the draft, unless coordinated with the Director, STP. When the preparation of the final CRR is completed, the State program Director should sign and submit the final CRR to the Director, STP."

Response: Since we disagree with the deletion of the review of the draft CRR, the paragraph was not deleted (Editor: see Item V.E.5 in 2002 version)

2-18 [R]ecommend combining paragraphs 7 and 8 (Editor: Sections V.E.7 and 8) as follows:

The review team conducts a review of the CRR. If the PM determines that the CRR is complete and that applicable standards and requirements have been met for license termination, after obtaining concurrence from OGC and NMSS, the PM will issue a letter to the Agreement State advising it of the Commission's concurrence with the license termination proposal. Examples of NRC response letters are provided in Appendices D and E.

Response: Since the paragraphs 7 and 8 provide possible communication mechanisms (conference calls or meetings) that can be used between NRC and Agreement States to resolve issues where revisions to the final CRR may be needed, these two paragraphs were not revised in response to this comment. These two paragraphs are located in Items V.F.6. and 7 of the draft revised STP Procedure SA-900 (2002 version).

2-19 [W]ho will pay for such visits (Editor: discussed in Section V.F.1)? If the state's CRR is well prepared and documented, there should be little need for NRC staff to require a visit to the site, unless for training or general interest purposes. As stated earlier, the NRC acknowledges that the state personnel will have a acquired a far broader and comprehensive

understanding of the licensed site and be in a better position to have prepared the decommissioning and reclamation reports**.**

Response: As described in the procedure, the purpose of the visit is for Agreement State staff to discuss the histories and conditions of the sites and receive feedback, if any, from NRC staff. It normally occurs one or two years before NRC receives the CRR. In the past, NRC staff has been invited to visit several uranium milling sites in Colorado and Texas. We believe that these visits would provide an opportunity for NRC staff to familiarize the site and help expedite the concurrence review process in the long run. NRC staff visits are supported by NRC program offices.

2-20 [T]he language in the following paragraph (Editor: the first paragraph under Section (a) step 2 in Appendix A) is too prescriptive to the Agreement State. It outlines activities that the Agreement State will itself conduct and does not address how the CRR will be assessed. If the NRC has confidence in the ability of the Agreement State authorities to prepare the CRR, it should not interfere with the state's methods to prepare the CRR. The language must be revised. Or Step #2 should be deleted.

"*Upon receipt of the decommissioning report, and if necessary, groundwater completion report, the State staff should review the content of the reports for documentation of acceptable completion of the applicable aspect of closure. The State staff should also review the licensee's completed reclamation of the tailings disposal cell. As part of its oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final construction-completion inspection, which is expected to consist of a site walk-over."*

Response: This paragraph is included for the reader to understand the activities conducted by Agreement States prior to submitting a CRR for NRC review. We do not believe that the paragraph needs to be revised or deleted.

2-21 [T]he language (Editor: see below for a portion of the last paragraph under Section (a) Step 2 in Appendix A) should be modified to address what is stated in the approved Decommissioning Plan.

"At license termination, the State should require licensees to sample for all constituents previously identified and in the tailings liquor to ensure that no further remediation is necessary."

Response: The sentence has been deleted for better clarity.

2-22 [W]hat is the meaning of the (following) final sentence (Editor: see below for the last sentence under Section (a) Step 2 in Appendix A)? In the previous sentence the guidance states that a license may not be terminated so long as a CAP is in progress. And yet the following sentence implies that the license may be terminated as the CAP progresses. This discrepancy should be addressed. This issue is one that should be discussed in terms of the risk-informed, performance-based regulatory philosophy: the risk should also be evaluated before such definitive statements are made. Revise this sentence text.

"Passive groundwater CAPs are acceptable for license termination, as long as the CAP achieves the applicable standards and requirements before license termination, and shows that groundwater will remain at or below those standards for the design life of the disposal cell."

Response: We believe that the guidance has stated the difference, i.e., one is an active groundwater CAP and the other is a passive groundwater CAP. The sentence was not revised in response to this comment.

2-23 A restatement (Editor: The first paragraph under Section (a) Step 4 in Appendix A, see paragraph below) of the regulatory basis for NRC concurrence is redundant as this has already been addressed in the 'Regulatory Basis' section of this guidance. This section is seriously lacking in that it states "…the NRC shall determine…" but does not provide any guidance to the NRC reviewer on **how** to make that determination. A new section of this SA-900 Procedure is needed to clearly specify the "Acceptance Criteria" that can be used to make this important determination.

"Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of site reclamation, decommissioning, and/or groundwater corrective action. After completing the review of the licensee's performance of remedial actions, the State will submit a CRR documenting the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met to the NRC for review."

Response: We agree with the comment. The paragraph has been deleted. The acceptance criterion is that the CRR, similar to samples CRRs in Appendices B and C, has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The acceptance criterion is stated in Item V.F.3. of the draft revised STP Procedure SA-900 (2002 version).

2-24 [T]he "unrestricted release requirement" statement (Editor: see below for item number 3 under Section (a) Step 4 in Appendix A) may not always be true. Conceivably, there could be some formerly licensed sites that may not be suitable for unrestricted release.

"3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements."

Response: We acknowledge that there was an oversight in this paragraph. The language in this paragraph has been referred to Item V.F.a.(iii) of the draft revised STP Procedure SA-900 (2002 version).

2-25 [T]he first sentence (Editor: see below for the first sentence in a paragraph following item 6 under Section (a) Step 4 in Appendix A) is very important and should be reproduced or moved to the beginning of the guidance where other guidance is presented to the reviewer on the scope of the NRC review of the CRR.

"NRC's determination shall rely upon the State's reviews and acceptance of the documentation provided by the licensee."

Response: We agree with the comment. The scope of NRC review of CRR is stated in V.E. of the draft revised STP Procedure SA-900 (2002 version).

2-26 [T]he following paragraph (Editor: see below for the first paragraph under Section (b) Step 1 in Appendix A] is not relevant to the NRC's review of the CRR. The guidance should specify what information the Agreement State should include in the CRR to demonstrate that the licensee has completed the facility decommissioning and groundwater quality restoration. This paragraph should be re-written as it simply addresses issues of relevance to the Agreement State.

"When the surface reclamation and/or groundwater restoration is complete, the licensee should submit (i) groundwater information which demonstrates that groundwater has been restored in accordance with the applicable standards and requirements and (ii) documentation indicating that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria, to the State for review."

Response: This paragraph is included for the reader to understand the activities conducted by Agreement States prior to submitting a CRR for NRC review. We do not believe that the paragraph needs to be revised.

2-27 [T]he following paragraph (Editor: see below for the paragraph under Section (b) Step 2 in Appendix A} is unnecessarily prescriptive by telling the Agreement State what to do. The guidance should specify what summary information is appropriate in the CRR to demonstrate well completion and groundwater restoration. This paragraph should be re-written as it simply addresses issues of relevance to the Agreement State.

"Upon receipt of the decommissioning report, and if necessary, groundwater restoration report, the State staff should review the content of the report for documentation of acceptable completion of the applicable aspect of closure. As part of its oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final site inspection, which is expected to consist of a site walk-over."

Response: This paragraph is included for the reader to understand the activities conducted by Agreement States prior to submitting a CRR for NRC review. We do not believe that the paragraph needs to be revised.

2-28 [C]hange the title of this sub-section (Editor: see below for the title of Step 3 under Section (b) in Appendix A) for consistency with earlier sections of the guidance.

" Step 3: Termination of the Specific License"

Response: We agree with the comment. The title has been revised accordingly. (See Step 4 title under Sections (a) and (b) in Appendix A)

2-29 A restatement (Editor: The first paragraph under Section (b) Step 3 in Appendix A, see paragraph below) of the regulatory basis for NRC concurrence is redundant as this has already been addressed in the 'Regulatory Basis' section of this guidance. This section is seriously lacking in that it states "*…the NRC shall determine…*" but does not provide any guidance to the NRC reviewer on how to make that determination. A new section of this SA-900 Procedure is needed to clearly specify the "Acceptance Criteria" that can be used to make this important determination.

"Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of decommissioning and/or groundwater restoration actions. After completing the review of the licensee's performance of remedial actions, the State will be requested to submit a completion review report documenting the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met to the NRC for review."

Response: We agree with the comment. The paragraph has been deleted. The acceptance criterion is that the CRR , similar to samples CRRs in Appendices B and C, has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The acceptance criterion is stated in Item V.F.3. of the draft revised STP Procedure SA-900 (2002 version).

2-30 [T]his item 3 (Editor: see below for item 3 under Section (b) Step 3 in Appendix A) mixes an 'Area of Review' and 'Acceptance Criteria' for the parameter. As noted earlier, in a restructuring of the guidance, these two topics will be separated.

"3. Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria. Such documentation could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect."

Response: We believe that this paragraph provides clear guidance on what information needs to be included in the CRR and what documentation is acceptable to be used as bases for conclusion. Since the STP Procedure SA-900 is a guidance document for preparing CRRs instead of TERs or SERs [see discussions under Task 2 (pages 2-1 and 2-2)], we do not believe that this item needs to be revised in response to the comment.

2-31 [T]he following sentence (Editor: see below for item 4 under Section (b) Step 3 in Appendix A) is wrong. License conditions may permit on-site disposal of contaminated materials that, for example, have trace concentrations of radionuclides below state or federal standards. Modify the language.

"4. Decommissioning information which documents that all contaminated materials have been removed from the site."

Response: We acknowledge that there was an oversight in this item. The language in this item has been referred to Item V.F.b.(iv) of the draft revised STP Procedure SA-900 (2002 version).

2-32 NEI recommends a complete revision of this Appendix B. Rather than consisting of edited excerpts from existing CRRs, Appendix B should concisely list those technical topics that the Agreement State's CRR should address. The Appendix should also provide some guidance as to what information for each topic might be reasonably expected in the CRR to enable the NRC to conclude that applicable federal decommissioning and reclamation standards have been met and to, therefore, conclude whether or not a concurrence determination is warranted.

Several high-level concerns have been flagged in the existing Appendix B. But in view of our recommendation for a complete re-write, our comments are very limited.

Response: We do not believe that a complete revision of the Appendix B is needed. We believe that the guidance provided in the draft procedure identifies the level of detailed information needed for NRC to make the determination. See further discussions under Task 2 (pages 2-1 and 2-2).

2-33 [T]he following sentences (Editor: see below from the first paragraph on the cover page of Appendix B) simply repeat the concurrence procedure that has been thoroughly outlined in the guidance. Delete as redundant.

"Prior to license termination, Agreement States submit CRRs for NRC review. The CRR would document State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met."

Response: The language is included for completeness. These sentences were not revised in response to this comment.

2-34 Criterion 12 is mentioned in the example, but is missing here (editor: see Table 1 in Appendix B)

Response: As indicated in the cover page of the Appendix B, the sample CRR does not intend to provide a complete list of all applicable standards and requirements that need to be dressed. The users are expected to fill out all the applicable standards and requirements that apply to the specific site in this Table.

2-35 [Y]ou need some sort of break here – between the Summary and Step 1 (Editor: as presented in Appendix B) of the issues to be discussed.

Response: We agree with the comment. A new title and a new sentence providing introduction to the discussion items followed have been added.

2-36 [L]eave in the Summary section., not here. (Editor: The last sentence of the paragraph as shown below under Section 1 in Appendix B.)

... that all applicable standards and requirements have been met, and that the license may be terminated (reference).

Response: We agree with the comment. The sentence has been deleted.

2-37 [T]here is a danger that by citing this long-winded example (Editor: see Section 2 in Appendix B) as "the NRC expectation" that other licensed facility CRRS will have to address each of these issues in as much detail. This sets a bad example. There is also very uneven coverage of the technical issues – contrast §2.1 with §2.1.6.

Response: We have reorganized the contents of Sections 2.1 and 2.2 into one section to reduce the amount of information that may be redundant. Note that the purpose of the examples is to demonstrate the level of detailed information that is needed to be included in the CRR. The users are expected to reference relevant technical areas that need to be addressed based on their own site specific conditions.

2-38 [A]n explanation is required as to why the Agreement State would use example 1 rather than example 2 (Editor: see Section 2.1 and 2.2 in Appendix B). The latter is shorter, with far superior prose and clarity in its explanations, etc. When would the state have to use Example 1?

Response: We have reorganized the contents of Sections 2.1 and 2.2 into one section to reduce the amount of information that may be redundant.

2-39 [U]se of the future in this sentence (Editor: the second sentence in the second paragraph under the sub-Section 2.2.12 in Appendix B) suggests that the reclamation work is not complete. How can a CRR be submitted if this is true?]

Response: We agree with the comment. The sentence has been revised to read as follows: (See Section 2.1.14)

Mill debris has been buried systematically at the toe of the slope.

2-40 [T]his discussion (Editor: Section 2.4) may be better suited for Step 3 rather than Step 2 (Editor: Section 3 rather than Section 2 in Appendix B). Relocate?

Response: We agree with the comment. The radon emanation section (Section 2.4, 2001 version) has been relocated to Section 3.2 (2002 version).

2-41 [W]hy blank out the regulatory limit from Appendix A [Editor: see the first sentence under Section 2.4 (2001 version) or Section 3.2 (2002 version) in Appendix B]? Put it back in with careful editing.

Response: We believe that it is appropriate to leave it blank so that Agreement State staff can fill in the regulatory limit based on equivalent State regulations.

2-42 [S]everal red-lining errors (i.e. text that should have been deleted has not been) in these paragraphs (Editor: see the first paragraph of the sub-section 2.4.1 in Appendix B). Correct.

Response: These paragraphs have been reorganized and the section with the errors has been deleted for clarity.

2-43 "…may have received this report…" is far too detailed for a generic CRR example (Editor: see the sentence in the second paragraph under sub-Section 2.4.1 in Appendix B.) Delete.

Response: We agree with the comment. The paragraph has been reorganized and the sentence has been deleted

2-44 [T]he following paragraph (Editor: from sub-Section 2.4.1 in Appendix B.) should be relocate to the Summary.

"The licensee satisfied the regulatory requirements for attenuation of radon flux. The licensee submitted a reclamation plan which provided the design of a cover system which would reduce the radon flux to XX pCi/m^2/s or less. Use of a published radon flux model (reference) with the design information provided by the licensee confirmed the radon flux reduction provided by the cover system. The licensee also demonstrated that the cover system would continue to reduce radon flux for 1000 years or at least 200 years by using an environment dose assessment model (reference) to confirm that the cover system would perform adequately. After completion of the cover system the licensee made radon flux measurements using the radon flux measurement methodology in Appendix B, Method 115, 40 CFR Part 61. Radon flux measurements averaged over the entire impoundment were less than 20 pCi/m^2/s."

Response: We have reorganized Section 2.4.1 (2001 version) and revised the paragraph. [(see Section 3.2.1. (2002 version)]

2-45 [T]he following paragraph (Editor: the first paragraph under sub-Section 3.1 in Appendix B) is totally redundant. Delete.

"On month date, year, ABC submitted the Radiological Verification Program (RVP) (reference) to XDOH for review and comment. Following several meetings between XDOH and ABC, a formal response letter was sent to ABC on month date, year. In response to XDOH's letter, ABC submitted Revisions X and X to the Mill Decommissioning Plan (reference), which XDOH subsequently found acceptable and approved on month date, year through issuance of Amendment XX to ABC's radioactive materials license (reference)."

Response: We have reorganized the Section 3.1(2001 version) and this paragraph has been deleted.

2-46 [S]ome explanation should be given why this Example 2 (Editor: see sub-Section 3.2 in Appendix B), which is far better written than Example 1 (Editor: see sub-Section 3.1), would be acceptable or preferable. Simply cutting out sections from two CRRs without any supporting commentary is not useful or helpful to the reviewer. Add some explanation.

Response: We have reorganized the contents of Sections 3.1 and 3.2 (2001 version) into one section (see Section 3.1 in 2002 version) to reduce the amount of information that may be redundant and to improve clarity.

2-47 [T]his first paragraph (Editor: see below from the first paragraph of sub-Section 3.2.1 in Appendix B) is redundant and should be deleted. It is already in the Regulatory Basis section.

"*Cleanup of the site was based on the approved Decommissioning Plan (reference)[include License Conditions or tie downs]. The operating history of the facility was reviewed such that all potential sources of contamination were identified. Applicable Federal and State regulations and standards were identified during the development of the Decommissioning Plan and are outlined in Table XX. [insert table with drivers, including equivalent 10 CFR 40 App. A Criteria 6(6) state regulations, if alternate standards were approved, the basis for approval, and demonstration of protectiveness of public health and the environment from the alternate methods need to be discussed too]. Cleanup parameters and guidelines were appropriate and designed to demonstrate compliance to the drivers. Disequilibrium (Th-230, Ra-226, U-tot) was evaluated, and cleanup criteria were established in accordance with XXX (equivalent Criteria 6(6) rule).*"

Response: We believe that the information is appropriate to be included in the introduction section. The paragraph was not revised in response to this comment.

2-48 [T]he NRC would never accept the following definitive statement (Editor: see below from the second paragraph of the sub-Section 3.2.3). Correct!

"The Final Status Survey was accurate and complete."

Response: The sentence has been revised to read as follows: (see Section 3.1.3 in 2002 version)

"The Final Status Survey was found acceptable."

2-49 See identical comments for the introduction to Appendix B. (Editor: see Comment 2-33. This comment is on the introduction to Appendix C.)

Response: The language is included for completeness. These sentences were not revised in response to this comment.

2-50 [T]he following phrase (Editor: see below from the fourth paragraph under Section 1 in Appendix C) is misplaced. Perhaps you mean to say "*Two times background concentration was used as the permissible limit for residual radioactivity.*

"... [Two times background (reference). The survey...] Post-cleanup surveys..."

Response: The phrase has been revised to read as follows: (See Item 1 on page C-4 in 2002 version)

[Two times background was used as an allowable limit (reference). The survey...]

2-51 [T]he following two paragraphs (Editor: see below from the Section 5 in Appendix C) provide far too detailed and site-specific information that is inappropriate for general guidance. Revise.

"Background gamma count rate readings were approximately [x,xxx cpm or mR/hr] on all meters. As a result of the surveys, [twenty-nine] areas were identified as having readings greater than the action level. These areas were cleaned up by the licensee and resurveyed by XDOH personnel. All areas resurveyed had readings which were less than action level.

Concurrently XDOH personnel collected soil samples form xx areas. Soil sample results were within the regulatory limits for radium-226 and natural uranium soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively], except for [two] soil samples which exceeded these limits."

Response: We believe that a brief discussion of results of radiation surveys and confirmatory soil samples is appropriate. The two paragraphs were not revised in response to this comment.

2-52 [T]he following paragraph (Editor: see below from the Section 6 in Appendix C) is far too detailed. Delete.

"One area was identified which exceeded two times background. A visible pile of pipescale on the surface was the cause for the elevated reading. This area was cleaned up by ABC and a post-cleanup survey indicated no readings above background."

Response*:* We believe that a brief discussion of radiation surveys taken during the site closure inspection is appropriate. The paragraph was not revised in response this comment.

2-53 [T]his letter (Editor: see letter in Appendix D) reads very well.

Response: We appreciate the comment.

3. Response to Comments from the National Mining Association (Comment letter dated September 24, 2001)

General Comments:

3-1. The National Mining Association (NMA) appreciates the Office of State and Tribal Program's (OSTP) efforts to streamline the process for Nuclear Regulatory Commission (NRC) concurrence determinations on license termination proposals for uranium recovery (UR) facilities located in Agreement States. Given that § 274(c) of the Atomic Energy Act (Act), as amended, and 10 C.F.R. 150, 15a(a) require this unique "extra step" for license termination of UR licenses, which is not required for other Agreement State AEA licenses, it is important to make the process as efficient and cost-effective as possible. It is important for the Agreement State program itself and for all such UR licensees. Although, as NMA has noted previously, § 274(c) necessarily diminishes the normal scope of Agreement State license termination authority in the interests of "a uniform national program" for UR facilities, it still does not imply increased NRC involvement in such decisions "on a scale

that results in duplicative regulation."[1] Any such detailed involvement by NRC in Agreement State regulatory oversight would run counter to the fundamental concept of "relinquishing" federal authority and as NRC recently stated:

"It has never been the Commission's intent, or practice, to place itself into the position of regulating such activities conducted by Agreement State licensees. Any change of policy in this area would require the pervasive involvement by NRC in specific Agreement State Licensing activities. This would run afoul of one of the purposes of § 274 of the AEA, which is to promote an orderly pattern of regulation between the Commission and the States in a manner which will avoid dual or concurrent regulation."[2]

It would also plainly conflict with the purposes of, and thereby the need for, NRC's Integrated Materials Performance Evaluation Program (IMPEP) which purports to determine if Agreement State programs have the necessary economic/technical resources and compatible regulatory requirements to perform appropriate AEA regulatory oversight. Thus, anything that smacks of duplicative regulatory oversight, inappropriate interference or routine second-guessing must be avoided if the Agreement State concept is to be meaningful. As a result, NMA believes that the proposed Draft Revision of Procedure SA-900 has some fundamental flaws that make it less likely to increase efficiency in spite of the good intentions of the drafters.

Response: As stated in the draft STP Procedure SA-900 (2001 version), the NRC review team would not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination. If the NRC has found that the State's program is adequate to protect public health and safety, and compatible with NRC's program, and found that the CRR is acceptable, the finding would be made that all applicable standards and requirements have been met. We recognize that there are some areas in the draft revised STP Procedure SA-900 (2001 version) that may need further clarifications but we do not believe that the draft procedure has any fundamental flaws as indicated.

3-2 During various meetings over the last year or more, UR licensee/Agreement State/NRC discussions have consistently indicated that early full-scale NRC involvement in Agreement State license termination efforts would be far too costly and, thus, a questionable use of NRC Staff resources. Assuming that this conclusion is accurate, then on-going, full-scale NRC staff involvement in the evolution of such license termination plans would be even less appropriate. Therefore, in accordance with a suggestion made at the NMA/NRC Conference in Denver in June, 2001, NMA believes that the most efficient approach to streamlining this process while still fulfilling the statutory mandate of §274(c) is to place the responsibility on the Agreement State to seek NRC guidance early-on when a license termination proposal raises novel or unique issues or poses potentially significant incremental environmental or public health impacts that are atypical with normal, standard site closure proposals.

Thus, in situations where due to site specific conditions and/or particular license circumstances (e.g., financial resources) license termination involves something other than the standard 1,000 year closure pursuant to NRC's BTP on surface stabilization and ACL

---

[1] NMA May 2, 2000 comments on the Nuclear Regulatory Commission's (NRC) Guidance Regarding Termination of Uranium Recovery (UR) Licenses in Agreement States, p. 2.

[2] Id.

guidance, the Agreement State should actively seek NRC staff guidance. The Sherwood proposal is a good example of an atypical site closure proposal in several respects such as the amount of cover, the lack of rock armor on the top of the impoundment and the retention of liquids in the pile. Other examples of atypical closure proposals might be a 200 year closure plan, removal of all or part of the tailings to another site, a cover containing a synthetic liner or an Alternate Concentration Limit (ACL) proposal with multiple points of compliance and multiple points of exposure. Given the highly site-specific nature of site-closure activities and the right of Agreement States and their licensees to propose alternatives in accordance with § 84(a) of the AEA, as amended, the possibilities for unique or novel proposals is bounded only by the ingenuity of licensees and State regulators.

NRC involvement early-on in these types of situations would result in a more be focused and more cost-efficient approach to avoiding the problems encountered on the Sherwood license termination matter. Otherwise, assuming the Agreement State UR program is in good standing with OSTP, NRC concurrence should be a routine stamp of approval if the Completion Review Report (CRR) satisfies "fundamental completeness" requirements.

Response: See discussions and recommendation in item 1 under Task 1 (pages 1-1 and 1-2).

3-3 In keeping with NMA's comments in (2) above, NMA does not recommend that a *draft* CRR be submitted as proposed by the draft SA-900. On its face this suggests unnecessary and costly duplicative review of concurrence requests. Initially, NRC's CRR review should be for "completeness", as it is with all NRC licensee proposals. If the submission is incomplete NRC can send it back or request additional information to make it complete. Assuming unique, novel or potentially significant incremental environment or public health issues have been addressed early-on, barring highly unusual circumstances such as a blatant failure to fulfill regulatory requirements, final NRC concurrence should be routine – indeed, almost perfuntory. Again, a draft CRR fairly begs for bureaucratic interference that should be entirely unnecessary.

Response: See discussions and recommendation in item 2 under Task 1 (pages 1-2 and 1-3).

3-4 NMA believes that rather than using old CRR's that are themselves not entirely internally consistent OSTP should reference relevant Standard Review Plan (SRP) sections so that Agreement State regulators will look at the same things their NRC counterparts would for NRC licensees. By cross-referencing the Staffs SRP's for conventional mills and ISL UR facilities everyone will be operating from the same play book. Of course if some issues (eg. alternatives) merit additional discussion it should be included in SA-900.

Response: We believe that NRC and Agreement State staffs have been using the same guidance documents. For conventional uranium mills, there are many CRRs written by NRC staff for termination of NRC licenses, but there is only one CRR written by Agreement State staff based on the guidance provided in the STP Procedure SA-900. The old CRRs written by NRC staff would not have all the necessary information as described in the STP Procedure SA-900 because NRC staff already

has all the other supporting documents for the site and does not have a need to document all the basis for its conclusion that all applicable standards and requirements have been met in one single CRR.

On the contrary, Agreement State staff needs to provide all the basis for its conclusion that all applicable standards and requirements have been met in one single CRR because Agreement State staff has all the supporting documents. Since NRC staff needs to make a determination based on the review of the CRR without review of the detailed supporting documents, the STP Procedure SA-900 is intended to be used as a guidance document for Agreement State staff to prepare the CRR.

3-5 Finally, state standards under other (i.e., non-AEA) programs that may be relevant to a given licensed site are not matters for NRC concurrence and should have no part in NRC's concurrence review or concurrence determination. These are matters between the State and its permittee and are not properly the subject of NRC regulatory oversight.

Response: We believe that the Section V.C. (see below) of the draft revised STP Procedure SA-900 has clearly defined the term applicable standards and requirements to be used by NRC for making a determination.

C. Applicable and requirements to be used by NRC to make the determination:

The "applicable standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) would be the applicable standards in the Agreement States. Such Agreement State standards were established according to the rules requirements in Section 274o of the Act, during the initial or amendment of their Agreement, during revision of the regulations to maintain compatibility, or during approval of an alternative standard.[3] Agreement State standards also include legally binding requirements, orders, or license conditions that implement the requirements of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA).

Specific comments:

3-6 In our May 2, 200 comments, NMA suggested that the title of SA-900, "Termination of Uranium Mill Licenses in Agreement States" was inappropriate. Specifically, NMA commented:

> This title is incorrect or at least ill conceived since SA-900 addresses *in situ* leach (ISL) UR operations which, although having some elements in common with portions of conventional milling, do not share the bulk of the potential health and safety issues associated with uranium mills and uranium mill tailings. This mischaracterization is compounded by the reference in Section III.A of the SA-900 document to the Commission's oversight determination being applicable to "material as defined in 10 CFR. 150.3(c)(2) (*i.e. uranium mill tailings*)" (emphasis

[3] As stated in the last paragraph of Section 274o of Act, the Agreement State may adopt alternative standards if, after notice and opportunity for public hearing, the NRC determines that such alternative standards provide an equivalent or greater level of protection for public health, safety, and the environment.

> added). The regulations at 10 C.F.R. § 150.3(c)(2) pertain to 11e.(2) byproduct material, and the Guidance document itself proceeds to address "11e.(2) byproduct material." Byproduct material as defined in AEA Section 11e.(2) includes uranium mill tailings, of course, but it also includes other wastes that are not *tailings* and that do not pose similar potential threats to public health and safety. This raises the question: is the Guidance attempting to draw a distinction between uranium mill tailings versus other kinds of 11e.(2) byproduct material, or is this merely careless use of terminology on the part of NRC?

NMA suggested that to avoid confusion or misunderstanding within the regulated community and among the interested or affected elements of the public at large, SA-900 and any accompanying SECY documents should distinguish between uranium mill tailings and other forms of 11e.(2) byproduct material which, as the discussion hereafter will demonstrate, are not necessarily subject to the same disposal requirements

In this latest version of SA-900, NRC has changed the name to "Termination of Uranium **Milling** Licenses in Agreement States." NMA does not believe that this adequately addresses its concern about the differences between conventional and ISL wastes.

Response: We believe that the change of term from "uranium mill" to "uranium milling" would make it clear that the STP Procedure SA-900 would apply to termination of licenses with activities involving uranium milling as defined in the 10 CFR Part 40.

3-7 In the May 2, 2000 comments, NMA expressed concern that SA-900 required "*non-conventional*" uranium mill licensee decommissioning documents to demonstrate that "all contaminated materials have been removed from the site." NMA commented that:

> This statement is incorrect for either type of UR licensee (i.e., either "conventional" or "non-conventional" licensees). Criterion 6(b) of 10 C.F.R. Part 40, Appendix A, provides that site soils which do not contain in excess of 5 picocuries per gram (pCi/g) of radium-226 in the first 15 centimeters (cm) or 15 pCi/g in the second 15 cm and succeeding 15 cm soil horizons (the so-called 5/15 rule), may be released for unrestricted use. If soil levels satisfy this standard without remediation then no such contaminated material (i.e., 11e.(2) byproduct material) need be removed from the site. The recent modifications to Criterion 6 (6) contained in Radiological Criteria for License Termination of Uranium Recovery Facilities (64 Fed. Reg. 17506 (April 12, 1999)) also make it clear that uranium or thorium wastes from production activities may or may not have to be removed from the site.

STP revised Page 7 of SA-900 to reflect NMA's comment on this point but Appendix A (page 19) of SA-900 still contains the statement that the license must document that all contaminated material has been removed from the site.

Response: We acknowledge that there was an oversight in the Appendix A (item 4 under Section (b) Step 3 in 2001 version). The language in item 4 have been referred to Section F.2.b.(iv) of the draft revised STP Procedure SA-900 (See step 4 under Section (b) in 2002 version).

3-8 NMA's May 2, 2000 comments stressed that the Guidance does not reflect the licensee's statutory (§ 84(c)) and regulatory (Introduction to 10 CFR 20, Appendix A) right to propose *alternatives* that provide equivalent or greater protection than NRC, Agreement State or even EPA requirements.

The revised SA-900 still does not reflect this point despite vague references on pages 4 and 14 of the guidance to alternative standards. The guidance must explicitly discuss the Agreement State's authority to propose different UR regulatory requirements (generally or on a site-specific basis) and the procedural requirements that must be satisfied for any such state or licensee actions. The AEA, as amended, provides these rights so they must be explicitly addressed.

Response: We believe that State approved alternative standards, if any, should have been in place long before an Agreement State prepares its CRRs for NRC review. As indicated in the draft revised STP Procedure SA-900, all applicable standards and requirements include State approved alternative standards. Since the main purpose of the STP Procedure SA-900 is to provide guidance for the preparation of the CRR, detailed discussion on how to establish an alternative standard should not be part of the procedure.

We agree that the draft revised STP Procedure SA-900 should include a note to highlight that Agreement State may adopt alternative standards as part of the applicable standards and requirements according to the regulations. A footnote has been added to the draft revised STP Procedure SA-900 to address this issue.

1 (footnote) As stated in the last paragraph of Section 274o of the Act, the Agreement State may adopt alternative standards if , after notice and opportunity for public hearing, the NRC determines that such alternative standards provide an equivalent or greater level of protection for public health, safety, and the environment.

4. <u>Response to Comments from the Texas Department of Health</u> <u>(Comment letter dated September 28, 2001)</u>

4-1 Appendix B of the procedure goes into a great degree of detail and suggests the format for reporting. A disadvantage to this is that the format may not fit every situation. There may be unique features or perhaps the construction or reclamation proceeded in a fashion that does not fit the reporting format of the completion review report (CRR). Although the instructions say the appendix provides a "suggested form" which may be used, once it is on paper, any deviation from the "suggested form" often becomes unacceptable.

Response: We believe that NRC would accept a CRR as long as it documents State staff's basis in summary form for conclusion that all applicable standards and requirements have been met. The

suggested form is intended to provide examples that generally show the level of detailed information in a variety of technical areas which should be provided in the CRR.

4-2 When to involve the U.S. Nuclear Regulatory Commission (NRC) is a judgement call. We note that the procedure instructs giving NRC one month notice before sending the draft CRR (p. 7). There is also mention of a possible visit by NRC which the state may wish to undertake (p.10). Although it should not be in the form of a requirement, it might be beneficial to discuss contact and involvement with NRC earlier in the document. This could avert difficulties later, such as the state preparing something that is not what the NRC will find acceptable or a state not completing (or not knowing how to complete) the work.

Response: We agree with the comment. The following language has been included in the draft revised STP Procedure SA-900:

V.A. Agreement State's early interaction with NRC

Agreement States are encouraged to seek NRC guidance early-on when a licensing action raises novel or unique issues that are atypical with normal, standard site closure proposals from Agreement State licensees. When a State licensing action is needed in response to such a licensee proposal, an Agreement State should make its own evaluation and determination on whether the licensee's proposal meets the applicable standards and/or requirements. At that time, the Agreement State is encouraged to provide NRC an opportunity to review the basis for its conclusion before the licensing action is taken. NRC will review the State's determination and provide its views as to whether the basis is sufficient to support the conclusion to the Agreement State for consideration. Further interactions between NRC and the Agreement State may be needed to avert difficulties during NRC's review of the license termination if an agreement on the conclusion can not be reached.

In addition, approximately 2 years prior to submitting a draft CRR to NRC, Agreement States should consider whether NRC staff should be invited to visit sites that are in the process of license termination to discuss the histories and conditions of the sites and receive feedback, if any, from NRC staff. Agreement States may contact the Director, STP to discuss any early interaction activities.

4-3 NRC uses IMPEP to ensure the state is competent to review and present the findings on closure. Since the IMPEP interval is every four years and staff changes occur fairly often, especially in this "retirement era," the document should reference the last IMPEP with a provision that key staff present at that time are still employed by the program. A suggestion is wording such as, "...provided there have been no significant changes in the program since the last IMPEP." As an example, the Texas uranium program went through nearly 100% turnover in 1997 when the program was transferred from Texas Natural Resources Conservation Commission to Texas Department of Health.

Response: We believe that the IMPEP is a programmatic review of the entire Agreement State radiation control program. As indicated, there is a possibility that there may have been some

significant staff changes during the four year review period. However, if a program has been found satisfactory in the staffing and training indicator in the previous IMPEP, we believe that the program should have the mechanism in place to address the staff change issue. In addition, NRC's periodic meetings with the Agreement State staff between the IMPEPs may also be used to discuss the issue.

4-4 The document should include a written summary or at least note any involvement of the public in the process. For some programs, this may be a significant part of the termination process.

Response: The purpose of CRR is to document the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. As long as the CRR contains the all the necessary bases, NRC will make a determination that all applicable standards and requirements have been met. A written summary in CRRs on any involvement of the public in the process would not be the information needed for NRC to make the determination.

4-5 The Long Term Surveillance Plan is mentioned in several places in the document. We suggest devoting a section to address this. The section could include a more complete description of its purpose, content, etc. and include resources where more guidance on such a plan might be found.

Response: We agree with the comment. The following language in a separate section has been added in the draft revised STP Procedure SA-900 (2002 version) to briefly discuss the LTSP review and include resources where more guidance on the LTSP can be found.

V.G. Long-Term Surveillance Plan (LTSP)

For a full termination of a conventional uranium milling license, the NRC staff would also review a site LTSP submitted by the custodial agency. This guidance on NRC review of the LTSP can be found in Appendix D of the NUREG-1620 entitled "Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act." NRC's review of the LTSP is not included in STP Procedure SA-900. Note that sites that have been partially terminated have involved areas surrounding the actual milling area which were released without the need for an LTSP.

The NRC review of the LTSP would be very similar for both NRC and Agreement State licensees since the review and acceptance of the LTSP is conducted in accordance with 10 CFR § 40.28 which is the sole purview of the NRC. Lack of NRC acceptance of a site LTSP can delay termination of the specific license. The NRC staff's acceptance of an LTSP would be documented by written notification to the relevant Agreement State and custodial agency.

4-6 In terms of format, a document of this size needs a table of contents. Consider a second table of contents for Appendix B, which is rather long. In the final editing, an effort should be made to delete redundancy throughout the document.

Response: We agree with the comment. A table of contents has been added to Appendix B. An effort has been made to delete redundancy throughout the document.

5. Response to comments from Mr. John Surmeier (Comment letter dated September 14, 2001)

5-1 **Section 83b.(7) of the Atomic Energy Act**

Given the review and approval process for license terminations by Agreement States in SA-900, how will the Commission ensure that it also has complied with the requirements of Section 83b.(7)? Section 83b provides:

> (7) Material and land transferred to the United States or a State in accordance with this subsection shall be transferred without cost to the United States or a State (other than administrative and legal costs incurred in carrying out such transfer.)

The purpose for the above provision is to ensure that the United States long-term care custodian (or State, if it so chooses) would not be required to expend significant amounts of taxpayers' dollars in correcting known (at the time of transfer) deficiencies in the design, construction and groundwater remediation at the uranium mill tailings licensed sites.

Based on the review process in SA-900, the highly technically-specialized NRC uranium recovery staff (e.g., geotechnical engineers, surface and groundwater hydrologists) may not have: (1) participated in any substantive Agreement States Program Reviews such as IMPEP; (2) seen any submittals by the licensees; or (3) ever visited the licensed sites. The SA-900 Agreement States license termination process is based strictly on a paper review of secondary documents. This type of review may fulfill the Commission's obligations under Section 274c.

I question, however, whether such a SA-900 review process can adequately address the Commission's responsibility under Section 83b. DOE and its contractors would be more than willing to do remediation work to correct serious site problems after DOE becomes the long-term care custodian of the sites. That's not the problem. The problem is who pays for this type of work after license termination. If due diligence is not followed by the Commission, any resulting significant costs would be borne, not by former Agreement States licensees, but by the taxpayers of the United States.

Section 83b is integrally related with Section 274c. SA-900 on termination of Agreement States uranium recovery licenses should address both.

Response: The Section 83b.(7) language can also be found under 10 CFR Appendix A Criterion 11 E. Based on the Compatibility Category & Health and Safety Identification stated in STP Procedure SA-200, the entire 10 CFR Part 40 Appendix A is designated as Category C for Agreement States with authority to regulate uranium milling activities. The essential objectives of the Category C regulations are required to be adopted by Agreement States to avoid conflicts, duplications or gaps. Therefore as long as Agreement State programs are found adequate and compatible with NRC programs, the Section 83b.(7) requirement would be part of the applicable standard and requirements and should be addressed in the CRR.

Through the IMPEP review process, Agreement State programs would have the technical staff with equivalent qualifications like NRC staff to ensure that the milling site that is in the process of license termination meets all the applicable standards and requirements. As indicated in the STP Procedure SA-900, NRC staff would not duplicate the State's review by conducting an independent detailed technical review of the proposed license termination or of any of the specific documentation submitted by the Agreement State licensee. Rather, the NRC staff would rely on a review of the CRR as well as the normal periodic NRC review of the Agreement State program under IMPEP.

In addition, in the past two years, NRC staff has been invited to visit several conventional uranium milling sites that are expected to be terminated in Agreement States within the next five years, and the uranium recovery staff has participated in the Agreement State IMPEP reviews. These activities enable NRC staff to familiarize with the sites that are in process of license termination and Agreement State uranium recovery programs.

5-2 Furthermore, has the Commission approved SA-900 and the procedures for terminating Agreement States uranium recovery licenses? If not, this should be done before implementing any revisions.

Response: The Working Group referred the response of this comment to NRC staff. The NRC staff has provided the following response to the Working Group:

As stated in the conclusion (see below) of the Commission paper SECY-99-025, the Commission was informed of the NRC staff's approach to issue a guidance document (STP Procedure SA-900) for termination of uranium milling licenses in Agreement States. There was no direction from the Commission requesting that the STP Procedure SA-900 has to be approved by the Commission before it is issued. The NRC staff has not identified any NRC policy changes to the STP Procedure SA-900 that warrant the Commission's attention and does not believe that the revised STP Procedure SA-900 requires the Commission's approval.

Following is quoted from the Commission paper SECY-99-025:

"Staff will request review and comments on Attachment 3 (Editor: earlier version of the Appendix A of the draft revised STP Procedure SA-900) from Agreement States with authority to regulate uranium recovery operations. After receipt and analysis of comments, Attachment 3 will be modified as warranted and issued as a final guidance document. Currently, the staff plans to apply similar license termination processes for both partial and entire license termination cases and make the determination relying on the review of a site specific completion review report requested from the Agreement State and NRC reviews of the Agreement State program conducted under the IMPEP. The completion review report should contain the conclusions from the State's review of a licensee's performance of remedial actions and document the State staff's bases for its conclusion that all requirements have been met. If the NRC has found that the State's program is adequate to protect public health and safety, found that the State's program for regulating uranium recovery is compatible with NRC's program, and found that the State staff's review of license termination is complete, the finding would be made that all applicable standards and requirements have been met."

6. **Staff members from the Office of Nuclear Material Safety and Safeguards, and the Office of the General Counsel provided editorial comments to the Working Group. Those comments have been considered and reflected in the draft revised STP Procedure SA-900 (2002 version).**

APPENDIX III - DRAFT REVISION OF STP PROCEDURE SA-900
(August 17, 2001 Version)

DRAFT

~~OSP~~ STP Procedure Approval

Termination of Uranium ~~Mill~~ Milling Licenses in Agreement States - SA-900

Issue Date: ~~April 20, 1999~~

Expiration Date: ~~April 20, 2000~~

Paul H. Lohaus
Director, ~~OSP~~ STP

Original signed by:
Paul H. Lohaus

Date: ~~4/20/99~~

Deputy Director, ~~OSP~~ STP

Date:

Kevin Hsueh
Procedure Contact, ~~OSP~~ STP

Original signed by:
Kevin Hsueh

Date: ~~4/20/99~~

NOTE

The ~~OSP~~ STP Director's Secretary is responsible for the maintenance of this master copy document as part of the ~~OSP~~ STP Procedure Manual. Any changes to the procedure will be the responsibility of the ~~OSP~~ STP Procedure Contact. Copies of ~~OSP~~ STP procedures will be distributed for information.

This page left blank intentionally.

I. INTRODUCTION

This procedure describes the review process for making the determination that all applicable standards and requirements have been met prior to Agreement State uranium ~~recovery~~ milling license termination, as required by 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended (AEA).

II. OBJECTIVES

A. To establish the procedures to be followed by NRC staff for review of uranium milling license termination proposals submitted by Agreement States.

B. To provide guidance for use by Agreement States on preparation and submittal of uranium milling license termination proposals for NRC staff review.

III. BACKGROUND

A. Section 150.15a(a) indicates that the Commission shall have made a determination that all applicable standards and requirements pertaining to material as defined in 10 CFR 150.3(c)(2) ~~(i.e., uranium mill tailings)~~ have been met prior to termination of any Agreement State license for such material. This provision in NRC's regulations stems from Section 274c(4) of the AEA which reads in part: "[t]he Commission shall also retain authority under any such agreement to make a determination that all applicable standards and requirements have been met prior to termination of a license for byproduct material, as defined in 11e.(2)."

B. Two kinds of Agreement State uranium ~~recovery~~ milling licenses are involved: conventional and non-conventional (mainly in-situ uranium extraction licenses). ~~uranium mill licenses.~~ A conventional uranium mill is a facility that generates mill tailings and will be transferred to a custodial agency for long term care in accordance with 10 CFR § 40.28 after the entire license is terminated. A non-conventional uranium mill is a facility that generates limited byproduct materials which are normally transferred to conventional tailings impoundments for disposal and therefore no land transfer is required at license termination. For both types of licenses, the Agreement State is expected to conduct its review for decommissioning, reclamation and/or groundwater restoration in accordance with ~~State standards and regulations~~ license requirements and State standards which are compatible with the requirements of 10 CFR Part 40. Agreement States are responsible for approval of the remediation plans of uranium ~~recovery~~ milling facilities in their States and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans. With NRC's ~~concurrence~~ determination that all applicable standards and requirements have been met, the Agreement State terminates the specific licenses for its licensees.

C. Historically, the NRC has reviewed non-conventional uranium ~~recovery~~ milling license termination requests from Agreement States on a case-by-case basis without any specific guidance. This procedure describes the specific guidance the NRC staff would use to ensure consistency in the process and information that NRC would need from an Agreement State to make its determination prior to termination of pending and future Agreement State conventional and non-conventional uranium ~~recovery~~ milling licenses. A detailed license termination process for termination of uranium milling licenses in Agreement States is documented in Appendix A.

IV. ROLES AND RESPONSIBILITIES

A. The Director, Office of State and Tribal Programs (~~OSP~~ STP), has overall responsibility for the review and making the determination required in Section 274c of the Act that all applicable standards and requirements have been met before an Agreement State terminates a license for byproduct material as defined in Section 11e.(2).

B. The STP Project Manager (PM) is responsible for completing the Agency's review of uranium milling license termination proposals submitted by Agreement States. The PM is the primary NRC contact for the State during the review. Finally, the PM is the review team leader.

~~The Reviewer is responsible for completing reviews of uranium license termination proposals submitted by Agreement States. The reviewer should consult with the Office of Nuclear Material Safety and Safeguards (NMSS) or other NRC offices as necessary to support completion of the review based on issues raised during the review and their significance. After completing the review, the reviewer prepares a response letter back to the State and obtains the concurrence from the Office of the General Counsel (OGC) and NMSS.~~

F. The review team is responsible for conducting the staff evaluation of Agreement State proposals according to this procedure. A team normally consists of the PM and the assigned staff contacts from the Office of Nuclear Material Safety and Safeguards (NMSS) and the Office of the General Counsel (OGC).

V. GUIDANCE

A. With the approval of Management Directive 9.15, "Organization and Functions, Office of State Programs" on July 6, 1993, ~~OSP~~ STP was explicitly assigned responsibility for making determinations under §150.15a(a). Management Directive 9.15 provides, in part, that the Office "[m]akes the determination required in Section 274c of the Act of 1954 that all applicable standards and requirements have been met before an Agreement State terminates a license for byproduct material as defined in Section 11e.(2). This

determination will be made in consultation with the Office of Nuclear Material Safety and Safeguards."

B. Each Agreement State license amendment that terminates a portion of the site from a license should be considered as a partial license termination and the NRC would make the AEA Section 274c(4) determination for each case.

C. Applicable ~~S~~standards and requirements to be used by NRC to make the determination:

The "applicable standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) would be the applicable standards in the Agreement States. Such Agreement State standards were established according to the ~~rules~~ requirements in Section 274o of the AEA, during the initial or amendment of their agreement, during revision of the regulations to maintain compatibility, or during approval of an alternative standard. Agreement State standards also include legally binding requirements, orders, or license conditions that implement the requirements of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). ~~were reviewed and approved by NRC when agreements were amended. Agreement States are also expected to adopt any changes to NRC's uranium recovery milling rules or programs that are identified as required for compatibility or because of their health and safety significance within 3 years of their enactment.~~

~~The "standards and requirements" to be used by NRC in making a determination under Section 150.15a(a) would be applicable State regulations, State-adopted alternative standards and license requirements in the Agreement State. Agreement States are also expected to adopt any changes to NRC's uranium recovery rules or programs that are identified as required for compatibility or because of their health and safety significance within 3 years of their enactment.~~

D. Bases to be used for NRC determination:

The determination that all applicable standards and requirements have been met prior to termination of an Agreement State license would have two primary supporting bases:

1. The first basis would be a ~~c~~Completion ~~r~~Review ~~r~~Report (CRR) ~~requested from~~ submitted by the Agreement State containing the conclusions from the State's review of a licensee's completed remedial actions. This report would document the State staff's bases in summary form for its conclusion that all ~~requirements~~ applicable standards and requirements have been met. ~~NRC staff would request a completion review report similar to that contained in Appendix A. Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the Agreement State prior to making its determination. The completion review report~~

~~should include the following information depending on whether the license being terminated is a conventional or non-conventional uranium mill license.~~

~~a. Conventional Uranium Mill License~~

~~(i) A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.~~

~~(ii)Documentation that the completed surface remedial actions were performed in accordance with license requirements and regulations .~~

~~(iii) Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.~~

~~(iv) Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.~~

~~(v) Discussion of results of State's site closure inspection.~~

~~(vi) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.~~

~~b. Non-conventional Uranium Mill License (Mainly In-situ Uranium Extraction License)~~

~~(i) A brief description of licensee's activities associated with license termination.~~

~~(ii) Groundwater information which demonstrates that the groundwater has been adequately restored to meet the State restoration criteria.~~

~~(iii) Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria . Such documentation could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect.~~

~~(iv) Decommissioning information which documents that all contaminated materials have been removed from the site.~~

~~(v) Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.~~

~~(vi) Discussion of results of the State's site closure inspection.~~

~~(vii) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.~~

~~Note: Additional information may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium license category.~~

2. The second basis would be NRC reviews of the Agreement State's uranium recovery regulatory program, currently conducted under the Integrated Materials Performance Evaluation Program (IMPEP). The results of the IMPEP reviews would provide a basis for confidence on the determinations and conclusions reached by the Agreement State, as set out in the ~~completion report~~ CRR, and also a basis of confidence that the State's reviews, licensing actions, and inspections associated with termination have been conducted appropriately. The periodic reviews of selected technical areas, conducted under IMPEP, which also include training and qualifications of staff and adherence to necessary program procedures, e.g., license termination process for uranium recovery licenses or equivalent procedures, will also serve as a basis that all applicable standards and requirements are met.

~~Note that the NRC staff would not duplicate the State's review by conducting an independent detailed technical review of the proposed license termination or determination of any specific documentation for the Agreement State licensees. Rather, the NRC staff would rely on a review of the completeness and documentation of the Agreement State action as well as the normal periodic NRC review of the Agreement State program under IMPEP.~~

E. Review of CRRs submitted by Agreement States

1. Agreement States should submit draft CRRs to NRC for review and comment. The State staff should alert the PM or the Director, STP, at least one month before submitting the draft. The Director, STP should then ask NMSS and OGC to assign staff level contacts for the review team.

2. The draft CRR should include the following information depending on whether the license being terminated is a conventional or non-conventional uranium ~~mill~~ milling license. Sample CRRs for conventional and non-conventional uranium milling licenses can be found in Appendices B and C.

   a. Conventional Uranium ~~Mill~~ Milling License

      (i) A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

      (ii) Documentation that the completed surface remedial actions were performed in accordance with ~~license requirements and regulations~~ applicable standards and requirements.

      (iii) Documentation that the completed site decommissioning actions were performed in accordance with ~~license requirements and regulations~~ applicable standards and requirements. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets ~~unrestricted release requirements.~~ applicable standards and requirements for release.

      (iv) Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with ~~license requirements and regulations.~~ applicable standards and requirements.

      (v) Discussion of results of State's site closure inspection(s).

      (vi) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

   b. Non-conventional Uranium ~~Mill~~ Milling License (Mainly In-situ Uranium Extraction License)

      (i) A brief description of licensee's activities associated with decommissioning and license termination.

      (ii) Groundwater information which demonstrates that the groundwater has been adequately restored to meet ~~the State restoration criteria~~ applicable standards and requirements.

(iii) Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with ~~the State criteria~~ applicable standards and requirements. Such documentation could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect.

(iv) Decommissioning information which documents that all contaminated materials have been ~~removed from the site~~ properly disposed of, transferred to licensee(s) authorized to possess such materials, or meet applicable standards and requirements for release.

(v) Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets ~~unrestricted release requirements~~ applicable standards and requirements for release.

(vi) Discussion of results of the State's site closure inspection(s).

(vii) Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

Note: Additional information may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.

3. The team would not duplicate the State's review or conduct an independent detailed technical review of the proposed license termination. Rather the team would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. The level of detailed information contained in the CRR should be similar to that contained in the sample CRRs.

4. Unless there are obvious flaws identified in the CRR related to the State-approved reclamation plan or decommissioning plan, the team will focus on whether the State has provided adequate bases in summary form to confirm that closure activities were performed according to the approved plans and specifications. In addition, if any changes or degradation of the design features have occurred since construction, the team will determine whether the State has evaluated the changes to confirm that the site continues to meet all applicable standards and requirements.

5. The team prepares a letter to the State program Director to document the results of the review of the draft CRR. The Director, STP, signs the letter following Office concurrence from NMSS and OGC. The PM may schedule telephone conference calls or meetings with State staff and team members, if needed, to discuss the results of the review.

6. The State should address NRC's comments by making changes in the final CRR. The PM may schedule telephone conference calls or meetings with State staff and team members, if requested by the State, to discuss the changes in the final CRR. The State program Director should not submit a second draft, or changes to the draft, unless coordinated with the Director, STP. When the preparation of the final CRR is completed, the State program Director should sign and submit the final CRR to the Director, STP.

7. The review team conducts a review of the final CRR to ensure that all the previous comments have been considered and reflected in the final CRR. The PM may schedule telephone conference calls or meetings with State staff and team members, if the responses to the comments are not satisfactory. The State should address those issues by making revisions to the final CRR, if needed.

8. After completing the review, the PM prepares a response letter (samples in Appendices D and E) back to the State and obtains concurrence from the OGC and NMSS.

~~E~~F. Process to be followed for NRC determination:

1. A detailed step by step license termination process for conventional and non-conventional uranium ~~mill~~ milling licenses in Agreement States is documented in Appendix ~~B~~ A. The NRC staff would review the CRR and rely on the adequacy and compatibility of the Agreement State's program to regulate uranium ~~recovery~~ milling licensees to confirm that the State's conclusions demonstrate that all ~~appropriate requirements~~ applicable standards and requirements have been met by its licensee. Note that prior to submitting a draft CRR to NRC, Agreement States should consider whether NRC staff should be invited to visit sites that are being terminated to discuss the histories and conditions of the sites and receive feedback, if any, from NRC staff. An Agreement State licensee's request for amendment to release a portion of site from its license also requires NRC to make a determination based on a site specific ~~completion review report~~ CRR for that portion of the site. Similar license termination processes would be followed for both partial and entire license termination cases.

2. Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. Upon notification from the NRC, the Agreement State should be ~~ready~~ prepared to terminate the specific license, if it is a non-conventional uranium ~~mill~~ milling license, or to amend the license to remove the remediated portion from that license, if the license is being partially terminated.

3. For the full termination of a conventional uranium milling license, the Agreement State should be prepared to terminate the specific license given the following: (1) upon notification from the NRC that all applicable standards and requirements have been met; (2) upon notification from the NRC that the Long-Term Surveillance Plan (LTSP) has been accepted[1] and (3) the long-term care funds have been transferred to the appropriate State agency or the custodial agency.

~~3. For the full termination of a conventional uranium mill license, the NRC staff would also review a site Long-Term Surveillance Plan (LTSP) submitted by the custodial agency. Provisions and activities identified in the final LTSP will form the bases of the custodial agency's long-term surveillance at the site. Note that sites that have been partially terminated have involved areas surrounding the actual milling area which were released without the need for a LTSP. The review of the LTSP would be very similar for both NRC and Agreement State licensees since the review and acceptance of the LTSP is conducted in accordance with 10 CFR § 40.28 which is the sole purview of the NRC.~~

~~Given NRC's determination that all applicable standards and requirements have been met and upon notification from the NRC that a LTSP has been accepted the Agreement State should be ready to terminate the conventional uranium license.~~

VI. APPENDICES

~~Appendix A - Sample Completion Review Report~~

Appendix A - Termination Process for Conventional and Non-conventional Uranium Milling Licenses in Agreement States

~~Appendix B - Termination Process for Conventional and Non-conventional Uranium Mill Licenses in Agreement States~~

Appendix B - Sample Completion Review Report for Conventional Uranium Milling License

Appendix C- Sample Completion Review Report for Non-nonventional Uranium Milling License

Appendix D - Sample NRC determination letter for Conventional Uranium Milling License

---

[1] For the full termination of a conventional uranium milling license, the NRC staff would also conduct a separate review (the review process is not included in this procedure) of a site LTSP submitted by the custodial agency. Provisions and activities identified in the final LTSP will form the bases of the custodial agency's long-term surveillance at the site. Note that sites that have been partially terminated have involved areas surrounding the actual milling area which were released without the need for a LTSP.

Appendix E - Sample NRC determination letter for Non-conventional Uranium Milling License

VII REFERENCES

1. Section 274 Atomic Energy Act of 1954, as amended.

2. 10 CFR Part 150, Exemptions and Continued Regulatory Authority in Agreement States and in Offshore Waters Under Section 274.

3. Management Directive 5.6, “Integrated Materials Performance Evaluation Program.”

4. Management Directive 9.15, “Organization and Functions, Office of State Programs.”

5. SECY-99-025, “Guidance to Terminate Agreement State Uranium Recovery License

Appendix A -- License Termination Process

APPENDIX ~~B~~ A

Termination Process for Conventional and Non-Conventional Uranium ~~Mill~~ Milling Licenses in Agreement States

Termination of uranium ~~mill~~ milling licenses in Agreement States has been divided into two major parts as follows: (a) termination of conventional uranium ~~mill~~ milling licenses; and (b) termination of non-conventional uranium ~~mill~~ milling licenses (mainly in-situ uranium extraction licenses).

(a) Termination of Conventional Uranium ~~Mill~~ Milling Licenses

Step 1 through step ~~7~~ 5 are applied to entire license termination cases; steps 1~~, 2, 5 and 6~~ through 4 are applied to partial license termination cases.

Step 1: Licensee Documentation of Completed Remedial and Decommissioning Actions

Licensees are required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning, which is accomplished by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

Criteria 5A-5D, along with Criterion 13, of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations incorporate the basic groundwater protection standards imposed by U.S. Environmental Protection Agency (EPA) in 40 CFR Part 192, Subparts D and E. These standards apply during operations and prior to the end of closure. In addition, under Criterion 6(7) , the licensee should address the non-radiological hazards associated with the wastes in planning and implementing closure. The licensee should ensure that disposal areas are closed in a manner that minimizes the need for further maintenance. Licensees may refer to the introduction section of the 10 CFR Part 40, Appendix A, or equivalent Agreement State regulations with respect to the use of alternative standards for groundwater protection.

If the groundwater protection standards are exceeded, the licensee is required to put into operation a groundwater corrective action program (CAP). The objective of the CAP is to return the hazardous constituent concentration levels to the concentration limits set as standards. For licensees with continuing groundwater cleanup, State approval is required for the termination of corrective action. Appropriate groundwater monitoring data and other information that provide reasonable assurance that the groundwater has been cleaned to meet the ~~appropriate~~ applicable standards and requirements are submitted to the State for review.

Step 2: Review of Completed Closure Actions by the Agreement State

Upon receipt of the decommissioning report, and if necessary, groundwater completion report, the State staff should review the content of the reports for documentation of acceptable completion of the applicable aspect of closure. The State staff should also review the licensee's completed reclamation

of the tailings disposal cell. As part of its ~~review~~ oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final construction-completion inspection, which is expected to consist of a site walk-over.

Typically, there is an observational period following the completion of ~~surface~~ remedial actions for the State to assess the potential long-term stability of the tailings disposal cell. Licensees should report significant cell degradation occurring during this period. All identified hazardous constituents for which groundwater compliance sampling is being conducted at a licensed site must be returned to the concentration limits or alternative concentration limits set as standards prior to termination of a specific license. ~~At license termination, the State should require licensees to sample for all constituents previously identified and in the tailings liquor to ensure that no further remediation is necessary. The State should not terminate a~~ The specific license would not be terminated while an active groundwater CAP is in operation. Passive groundwater CAPs are acceptable for license termination, as long as the CAP achieves the applicable standards and requirements before license termination, and shows that groundwater will remain at or below those standards for the design life of the disposal cell.

~~**Step 3: Long-Term Site Surveillance Funding**~~

~~Prior to termination of the specific license, the State should establish the final amount of the long-term site surveillance fund to be paid by the licensee in accordance with Criterion 10 of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations. The State's process for determining this amount should include consultations with the custodial agency. Payment of this amount to the appropriate State agency or the custodial agency is required prior to termination of the specific license.~~

~~**Step 4: Preparation of the Long-Term Surveillance Plan (LTSP)**~~

~~While surface remediation and groundwater cleanup activities are ongoing, it is in the best interest of the licensee to begin interaction with the custodial agency with regard to that agency's preparation of the site LTSP. The custodial agency's responsibilities under the general license are defined in the LTSP. The required contents of which are provided at 10 CFR 40.28 and in Criterion 12 of Appendix A.~~

~~In addition to the regulatory requirements, the NRC should also require that the LTSP contain documentation of title transfer of the site from the licensee to the custodial agency. Because the LTSP must reflect the remediated condition of the site, it is expected that the existing licensee will interact with the custodial agency in the preparation of the LTSP.~~

Step ~~5~~ 3: Site Ready for License Termination

When a licensee has completed site reclamation, decommissioning, and/or groundwater corrective action, and is ready to terminate its specific source material license, the licensee should formally notify the State of its intentions.

Step ~~6~~ 4 : ~~Termination of the Specific License~~ NRC review of Completion Review Report (CRR)

Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of site reclamation, decommissioning, and/or groundwater corrective action. After completing the review of the licensee's performance of remedial actions, the State will ~~be requested to~~ submit a ~~completion review report~~ CRR documenting the State staff's bases for its conclusion that all applicable standards and requirements have been met to the NRC for review.

Upon receipt of the Completion Review Report submitted by the State, NRC staff would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. If the content of the completion review report did not provide sufficient bases for the conclusions, the NRC could request additional information from the State prior to making its determination. The CRR, similar to that contained in Appendix B, should include the following information.

~~Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the State prior to making its determination. The completion review report, similar to that contained in Appendix A of the SA-900 procedure, should include the following information:~~

1. A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

2. Documentation that the completed ~~surface~~ remedial actions were performed in accordance with license requirements and regulations.

3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

5. Discussion of results of State's site closure inspection.

6. Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

NRC's determination shall rely upon the State's reviews and acceptance of the documentation provided by the licensee. In addition, results of the State site closure inspection activities, potentially including limited confirmatory radiological surveys, will provide supplemental information to the NRC's determination.

NRC's periodic Integrated Materials Performance Evaluation Program (IMPEP) reviews of the Agreement State's regulatory program provide confidence that the State's reviews, licensing actions, and inspections associated with termination have been conducted appropriately, from a health and safety (adequacy) and compatibility perspective.

Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. If it is a partial license termination case which an Long-Term Surveillance Plan (LTSP) is not required, the State should be ~~ready~~ prepared to amend the license to remove the remediated portion from it.

Step ~~7~~ 5: Termination of the Specific License/Issuance of the General License

In termination of an entire license, NRC acceptance of the ~~an~~ LTSP is required prior to termination of the specific license and placement of the site and byproduct material under the 10 CFR 40.28 general license[1]. ~~Review and acceptance of the LTSP is the sole purview of the NRC.~~ Note that the NRC review process for the LTSP is not included in this procedure[2].

~~The NRC staff's acceptance of an LTSP should be documented in written notification to the relevant Agreement State, custodial agency, and, separately, by noticing the action in the Federal Register.~~ Given i) NRC's determination that all applicable standards and requirements have been met ~~and~~ ii) upon notification from the NRC that the LTSP has been accepted and the long-term care funds[3] have

---

1 While surface remediation and groundwater cleanup activities are ongoing, it is in the best interest of the licensee to begin interaction with the custodial agency with regard to that agency's preparation of the site LTSP. The custodial agency's responsibilities under the general license are defined in the LTSP. The required contents of which are provided at 10 CFR 40.28 and in Criterion 12 of Appendix A.

2 Review and acceptance of the LTSP is the sole purview of the NRC. Lack of NRC acceptance of a site LTSP can delay termination of the specific license. The NRC staff's acceptance of an LTSP should be documented in written notification to the relevant Agreement State and custodial agency.

3 Prior to termination of the specific license, the State should establish the final amount of the long-term site surveillance fund to be paid by the licensee in accordance with Criterion 10 of Appendix A under 10 CFR Part 40 or equivalent Agreement State regulations. The State's process for determining this amount should include consultations with the custodial agency.

been transferred to the appropriate State agency and the custodial agency, the Agreement State should be ~~ready~~ prepared to terminate the specific license and to transfer the long-term care funds to the U.S. general treasury. The long-term custodian, for its part, should be prepared to accept title to the land and byproduct material.

(b) Termination of Non-Conventional Uranium ~~Mill~~ Milling Licenses (Mainly In-Situ Uranium Extraction Licenses)

The following steps are applied to both partial and entire license termination cases.

Step 1: Licensee Documentation of Completed Decommissioning and/or Groundwater Restoration Actions

When the surface reclamation and/or groundwater restoration is complete, the licensee should submit (i) groundwater information which demonstrates that groundwater has been restored in accordance with the ~~State criteria~~ applicable standards and requirements and (ii) documentation indicating that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria, to the State for review.

Licensees are also required under 10 CFR 40.42(j) or equivalent Agreement State regulations to document the results of site decommissioning, which is accomplished by conducting a radiation survey of the premises where the licensed activities were carried out. The results of this survey, the contents of which are specified at the Agreement State regulation equivalent to 10 CFR 40.42(j)(2), are submitted to the State for review.

When a licensee is ready to terminate its specific ~~source material~~ uranium milling license, the licensee should formally notify the State of its intents.

Step 2: Review of Completed Closure Actions by the Agreement State

Upon receipt of the decommissioning report, and if necessary, groundwater restoration report, the State staff should review the content of the report for documentation of acceptable completion of the applicable aspect of closure. As part of its ~~review~~ oversight process during decommissioning, the State staff should conduct site inspections, examining first-hand the closure actions taken. Additionally, the State staff should conduct a final site inspection, which is expected to consist of a site walk-over.

Step 3: Termination of the Specific License

Under Section 150.15a(a), the NRC determines whether all applicable standards and requirements have been met by the licensee in the completion of decommissioning and/or groundwater restoration

---

Payment of this amount to the appropriate State agency or the custodial agency is required prior to termination of the specific license.

actions. After completing the review of the licensee's performance of remedial actions, the State will be requested to submit a completion review report documenting the State staff's bases in summary form for its conclusion that all ~~requirements~~ applicable standards and requirements have been met to the NRC for review.

~~Upon receipt of the completion review report submitted by the State, the NRC staff would review the document for completeness of the State's review process. If the content of the completion review report did not demonstrate that a complete review has been performed, the NRC could request additional information from the State prior to making its determination. The completion review report, similar to that contained in Attachment 1, should include the following information:~~

Upon receipt of the CRR submitted from the State, NRC staff would examine whether the CRR has documented the State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met. If the content of the completion review report did not provide sufficient bases for the conclusions, the NRC could request additional information from the State prior to making its determination. The CRR, similar to that contained in Appendix C, should include the following information[4].

1. A brief description of licensee's activities associated with decommissioning and license termination.

2. Groundwater information which demonstrates that the groundwater has been adequately restored to meet the State restoration criteria.

3. Documentation that the production, injection, and monitoring wells have been closed and plugged in accordance with the State criteria. Such documentation could be a copy of correspondence from the State to the licensee which confirms that all wells have been closed and plugged in accordance with the State criteria or a statement from the appropriate State regulatory agency to that effect.

4. Decommissioning information which documents that all contaminated materials have been removed from the site.

5. Discussion of results of radiation survey and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.

6. Discussion of results of the State's site closure inspection.

7. Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such

---

[4] Additional information or steps may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.

documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

~~Note: Additional information or steps may be required on a case-by-case basis for the termination of a non-in-situ uranium extraction license under the non-conventional uranium milling license category.~~

NRC's determination will rely primarily upon the State's reviews and acceptance of the documentation provided by the licensee. In addition, results of the State site closure inspection activities, potentially including limited confirmatory radiological surveys, provide supplemental information to the NRC's determination. NRC's periodic IMPEP reviews of the Agreement State's regulatory program provide confidence that the State's reviews and licensing actions associated with termination have been conducted appropriately, from a health and safety (adequacy) and compatibility perspective.

Given a determination that all applicable standards and requirements have been met, the NRC should notify the State of its determination by formal correspondence. Upon notification from the NRC, the Agreement State should be ~~ready~~ prepared to terminate the specific license or amend the license to remove the remediated portion from it, if the license is being partially terminated.

Appendix B - Sample Completion Review Report for Conventional Uranium Milling License

Note to the reader who may use this appendix as a guidance document to prepare a Completion Review Report

The sample Completion Review Report (CRR) was developed by a working group composed of Agreement State and NRC staff. As stated in the procedure, prior to license termination, Agreement States submit CRRs for NRC review. The CRR would document State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met.
The purpose of this sample CRR is intended to generally show the level of detailed information in a variety of technical areas which should be provided in the CRR. The working group recognized that no single site, or any existing documentation, could serve as a complete template for all aspects of site closure, since each conventional uranium milling site is likely to have its own site-specific conditions that would be unique to that site. To cover as many aspects of license termination activities as possible, the sample CRR is a composite of examples from a number of existing documents. Stakeholders' comments and input have also been considered and reflected in the sample CRR.

The reader is advised that the sample CRR is by no means to provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: John Smith, M.S.,P.E. (Hydrologic Engineer)

SUMMARY

The ABC Company's XYZ site is the conventional uranium mill and tailings site decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the regulatory agency shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The U.S. Nuclear Regulatory Commission's (NRC's) Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report.

The applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled Radiation Protection-Uranium and/or Thorium Milling. This State regulation is consistent with and compatible with federal regulations, as required by the State's Agreement State status with the NRC.

All applicable standards and requirements, with appropriate references to related sections of the CRR, are identified in Table 1. XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements			CRR Sections	TER Sections**
10 CFR Part 40 Appendix A or equivalent State Regulations	1.	tailings isolation	Section 2.1	Section X.XX
	4.			
	(a)	erosion potential	Section 2.3	Section X.XX
	(b)	wind protection	Section 2.3	Section X.XX
	(c)	flatness of slopes	Section 2.1.1	Section X.XX
	(d)	self-sustaining vegetative cover or rock cover	Section 2.3	Section X.XX
	(e)	seismic design	Section 2.1.3	Section X.XX
	5.	groundwater cleanup criteria	Section 4.1	Section X.XX
	6.			
	(2)	radon flux	Sections 2.4-2.5	Section X.XX
	(4)	radon measurements and limit	Section 2.4.1	Section X.XX
	(6)	radiation cleanup and control	Sections 3.1-3.2	Section X.XX
	(7)	closure and post-closure impacts	Sections 4.1-4.3	Section X.XX
	13.	groundwater cleanup criteria	Sections 4.1-4.3	Section X.XX
Other applicable standards and requirements				

* As defined in section V.C of the STP SA-900 Procedure issued on date month, 2XXX.
**Sections in TERs or equivalent reference documents.

XDOH concludes that the specific criteria of 10 CFR Part 40 Appendix A (or State equivalent regulations) are met as follows:

Criterion 1. Tailing Isolation

Erosion, disturbance, and dispersion are minimized.

The contaminated tailings will be protected from flooding and erosion by an engineered rock riprap layer. The riprap has been designed in accordance with the guidance (reference). XDOH staff considers that erosion protection that meets that guidance will provide adequate protection against erosion and dispersion by natural forces over the long term. As discussed in CRR Section XX, adequate protection is provided by (1) selection of proper rainfall and flooding events; (2) selection of appropriate parameters for determining flood discharges; (3) computation of flood discharges using appropriate and/or conservative methods; (4) computation of appropriate flood levels and flood forces associated with the design discharge; (5) use of appropriate methods for determining erosion protection needed to resist the forces produced by the design discharge; (6) selection of a rock type for the riprap layer that will be durable and capable of providing the necessary erosion protection for a long period of time; and (7) placement of a riprap layer in accordance with accepted engineering practice and in accordance with appropriate testing and quality assurance controls.

As discussed in CRR Sections XX, XDOH staff considers that the riprap layers will not require active maintenance over the 1000-year design life, for the following reasons: (1) the riprap has been designed to protect the tailings from rainfall and flooding events which have very low probabilities of occurrence over a 1000-year period, resulting in no damage to the layers from those rare events; (2) the rock for the riprap layers is designed to be durable and is not expected to deteriorate significantly over the 1000-year design life; and (3) during construction, the rock layers have been placed in accordance with appropriate engineering and testing practices, minimizing the potential for damage, dispersion, and segregation of the rock.

Criterion 4

(a) erosion potential

The site is located in an area that is flooded by offsite floods from XXXX (area). However, as discussed in the CRR, the site is protected from direct onsite precipitation and flooding by engineered riprap layers for the top and side slopes; the tailings disposal cell will need this protection regardless of where it is located. The riprap for the side slopes and drainage ditches is large enough to resist flooding from the minimal flow velocities of floods occurring from a probable maximum flood (PMF) on the XXXX (area). A large rock apron has been provided to provide protection against the potential migration of the XXXX (area). XDOH therefore concludes that the erosion potential at the site has been acceptably minimized, since any flooding at the site is mitigated by the erosion protection, and the forces associated with offsite floods are minimal.

(b) wind protection

XDOH staff considers that the site is adequately protected from wind erosion by the placement of an engineered riprap layer that protects the tailings from surface water erosion. Studies (reference) have shown that the engineered riprap layer designed to protect against water erosion is capable of providing adequate protection against wind erosion.

(c) flatness of slopes

The relatively flat top and side slopes of the covers is protected from erosion by an engineered riprap layer which has been designed to provide long-term stability (CRR Section XX). The erosion potential of the covers is minimized by the designing the rock to be sufficiently large to resist flooding and erosion, based on the slope selected. Thus, XDOH concludes that the slopes, with their corresponding rock designs, are sufficiently flat to meet this criterion.

(d) self-sustaining vegetative cover or rock cover

See discussions under Criterion 1 regarding Erosion, disturbance, and dispersion.

Other criteria

[insert summary for other criteria]

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Atomic Energy Act of 1954, as amended (AEA), that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

1. Licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

ABC completed construction of the mill in 19XX, and it was operated until XXXX. Nominal milling capacity was X,XXX tons of ore per day, with an average design ore grade of 0.XXX percent U_3O_8. The company received ore and processed it from [insert sources of ore or materials for reprocessing]. Approximately XX.X million tons of tailings were placed in the impoundment from milling operations. The estimated radium-226 activity in the impoundment is XXX curies, and Th-230 activity is estimated at XXX curies (reference).

Mill decommissioning activities began in XXXX and were completed in XXXX. Approximately XXX,XXX cubic yards (yd^3) of contaminated mill site soils, building equipment, and debris were excavated from the XYZ processing site and hauled approximately XXX miles for placement in the synthetically lined area of the tailings impoundment (reference). Other materials disposed of in the impoundment include [insert direct disposed materials from off-site sources] with estimated radium-226 activities of XXX curies, total uranium activity of XXX curies, and Th-230 activities of XXX curies.

[Impoundments that exist on-site as opposed to a new cell should describe dewatering and other pre-capping activities.]

The millsite was characterized using a combination of scans for gamma radiation and soil analyses of surface soils, and borehole logging and soils analyses for subsurface deposits. Areas with contamination found to exceed applicable standards and requirements were excavated. Contaminated materials were disposed in the [lined] tailings impoundment or repositories (reference). The site

cleanup was monitored and a Final Status Survey was conducted following guidance in NUREG 1575 (MARSSIM).

Once filled, the impoundment was covered with more than XX.X feet of site borrow soils, and re-vegetated. A division channel was constructed around three upgrading sides of the impoundment. A rock-armored swale outlet for the impoundment cover watershed was installed. All impoundment and margin areas have been covered with either rock armor (riprap) or re-vegetated to provide structural stability (reference).

A Monitoring and Stabilization Plan, in effect during and after reclamation construction in 19XX, has been evaluating site performance. Recent XDOH staff inspections and reviews of monitoring data and analytical justifications provided by ABC indicate that the site has reached a stable condition, that all applicable standards and requirements have been met, and that the license may be terminated (reference).

When all regulatory requirements are completed, the XYZ site will be transferred to XXX (custodial agency) responsibility. The site reclamation fund, held by XXX, will be terminated and the long-term surveillance and control surety fund, held by XDOH, will be transferred to XXX**.**

2. Documentation that the completed surface remedial actions were performed in accordance with license requirements and regulations.

Surface remedial actions include the topics of geotechnical stability, surface water hydrology and erosion protection, and radon emanation.

2.1 GEOTECHNICAL STABILITY (EXAMPLE 1)

All aspects of reclamation were planned in advance, prepared by experienced professionals, reviewed by XDOH, performed under a quality assurance program, and evaluated in as-built completion reports. All aspects of reclamation have been found technically feasible during XDOH's reviews (reference).

The ABC's XYZ site is located away from large population centers and isolated from natural transportation routes or roadways. The impoundment is not located near a capable fault, as determined by geophysical studies, technical document review, seismic analysis, and field investigations (reference). The XYZ site impoundment received only ore material from their own mine site.

The reclamation design used at the XYZ site is based on conformity to the surrounding natural environment, and is built so that no ongoing active maintenance is expected.

2.1.1 Slope Stability

Dike structures constructed at the XYZ site include the impoundment dam embankment and the margin areas (berm) located between the impoundment and the up=gradient surface water diversion channel. The embankment dam was initially constructed at the beginning of operations. It had[33]% ([1]v:[3]h) side-slopes and was designed, approved and constructed under the state's Dam Safety regulatory program (reference). During reclamation construction in XXXX, the dam was shortened in

height so that it was consistent with the impoundment cover elevation, and graded to a more gentle [20]% ([1]v:[5]h) front-slope. A rock armor (riprap) was placed in the groins on each side of the dam and on the sloped surface of the reconstructed dam embankment. The dam embankment and the margin areas were evaluated for slope stability and found to be acceptable, based on ABCs analysis, as reviewed by the department (reference).

The dam embankment reconstruction design was prepared by ABC, including an evaluation for earthquake and slope stability. Licensed engineers from both the Dam Safety regulatory program and XDOH reviewed the design, independently verified the design calculations, and approved construction plans and specifications.

2.1.2 Credible Faults

The XDOH evaluated potential earthquake sources (such as capable faults) and earthquake hazards for the site. XDOH's determination that the impoundment has not been placed near a capable fault is based upon review and acceptance of geologic information from literature sources, personal communication with personnel at the State Geological Survey, XDOH review of field mapping of the site by ABC's contractor, XDOH review of subsurface geophysical surveys surrounding the tailings impoundment by ABC's contractor, and XDOH personnel conducting independent field evaluations of the structural geology at the site. Historical seismic activity was also reviewed by the XDOH and State's Dam Safety program.

XDOH review of regional geologic literature has found no evidence of local faulting in the Pleistocene age glacio-fluvial deposits, or in the Miocene age Basalt Member of the River Basalt Group, at least 14.5 million years before present. (Reference). The USGS Open-File Report 91-441-0, Known or Suspected Faults with Quaternary Displacement in the Pacific Northwest, was also reviewed. (Reference). Staff at the State Geological Survey were also consulted for information related to faults in the area during XDOH's assessment of ABC's closure plan. XDOH review of Quaternary faults has concluded that the nearest capable fault is in the XXXX area of the [Cascade Mountains], approximately XXX miles to the northwest.

Detailed geologic mapping at the ABC's XYZ site performed by DEF, Inc. found no evidence of faulting in the Pleistocene glacio-fluvial deposits or Miocene age River basalts, XX.X Million Years Before Present (reference). Geologic field evaluations at the ABC site by XDOH personnel also found no evidence of faults in the glacio-fluvial deposits, XXX River basalts, or Tertiary aged clays found near the tailings impoundment. The layers in the unconsolidated sediments may generally be described as flat lying over structures that have been observed in the older granitic rocks of Cretaceous age. Therefore, the literature review and field mapping indicate that the fracturing and faulting in the Cretaceous rocks are a result of pre-Miocene deformation occurring at least XX.X million years before present.

Two geophysical seismic surveys were conducted for the subsurface around the tailings impoundment by a ABC contractor (reference). XDOH staff independently reviewed the information provided in the XXXX reports and determined that there is no evidence presented in these reports of a capable fault at depth.

Historic seismic data have been reviewed by XDOH and State's Dam safety program. Some of the historic seismic data reviewed are presented in reports prepared for ABC (reference), the XXXX

Final Environmental Impact Statement for the ABC site (reference), and the initial engineering report (reference). There are no historic seismic data that suggests large- magnitude earthquakes near the ABC site. Recent earthquake analyses performed by XXXXX have indicated that there have been five low- magnitude events within XX km of the ABC site. However, XXXX's probabilistic seismic assessment analysis has determined that these low- magnitude seismic events are not significant with respect to stability of the site (reference).

In summary:, (1) faults that have been identified and mapped in and near the site to a distance of 100 miles have not moved once in the last 35,000 years, or twice or more in the last 500,000 years, do not have macroseismicity associated with them, nor are they associated with capable faults such as the XXXX fault; and (2) no historic earthquakes have originated near the site that by magnitude, alignment, or magnitude-distance relationship to the site indicate a buried capable fault source, or any other earthquake source, that should be considered explicitly in the seismic design basis assessment for the site. XDOH evaluated low- magnitude seismic events that appear approximately XX-XX km northeast of the site by reviewing geologic maps for the area and personal communication with XXXX State's seismic experts at the State Geological Survey. Based upon XDOH review conducted in the fall of XXXX, XDOH concludes that these low- magnitude seismic events are not associated with earthquakes along the trace of a capable fault, and the data indicate that these events are appear to be the result of mine blasts.

2.1.3 Seismic Evaluation (Example 1)

A Probabilistic Seismic Hazard Analysis (PSHA) of the likelihood of both cracking of the cap and liquefied tailings reaching the ground surface has been performed. That analysis reflects the combined probability of experiencing ground motions sufficient to trigger liquefaction and the probability that the liquefied zone would have a surface manifestation in the form of cracking or boils of tailings material. The PSHA predicts an annual probability of experiencing liquefaction within some zone of the tailings of 0.XXXXXX (1/XXXX annually).

The PSHA was performed, as there are no known credible faults in the general vicinity of the project. The PSHA considered as loads the suite of earthquakes between Magnitude 5 and the Maximum Credible Earthquake for each seismotectonic source zone as is accepted practice in the field. The resulting cyclic shear stresses (load) induced in the soil column by the suite of earthquakes were assessed with SHAKE91. The cyclic shear resistance (capacity) was estimated from an empirical relationship based on the SPT N-value data from site borings. The Seed-Idriss criteria were employed to predict the occurrence of liquefaction. One boring (reference) was selected as representative of the worst--case conditions in the tailings material. The PSHA considered uncertainty in the maximum magnitude of earthquakes, attenuation relationships, and the magnitude-frequency of earthquakes.

The occurrence of a surface manifestation of liquefaction given liquefaction at depth is a function of the thickness of the non-liquefied cap. For a cap thickness greater than XX feet, case histories (reference) suggest that there will not be a surface manifestation for ground surface accelerations up to XX% of gravity (X.XXg). Accordingly, a second analysis was performed to determine whether there would be a surface manifestation of liquefaction of the process slimes at depth. This analysis involved generating a ground surface acceleration of approximately XX% of gravity for the range of earthquakes between magnitude X and the maximum credible magnitude. The thickness of the non-liquefied cap was calculated. In all cases, the analysis predicted that the non-liquefied thickness of

the cap would exceed XX feet. Thus, an empirical correlation developed from case histories suggests there would not be a surface manifestation from liquefied zones at depth. The calculated annual probability of experiencing a peak ground acceleration of X.XXg at the site, considering all earthquake source zones, was 0.XXXXXXX (1/XXXX annually). Thus, the occurrence of a surface manifestation of liquefaction is more remote than 1 in 10,000, the 1,000-year regulation-based longevity requirement.

The probability of cracks occurring in the cap is essentially the same as for the occurrence of tailings material reaching the ground surface. Focusing on surface cracking as a separate event was judged unnecessary for the specific conditions of the cap at XYZ site for the following reasons. The XX.X foot minimum thickness (as-built) cap is composed of a non-cohesive, slightly gravelly, silty sand. While cracking could result from earthquakes, cracks that might form would collapse, as the soil lacks cohesion to maintain a free-standing void.

The reclamation cap therefore affords a level of structural stability, longevity, and reliability, in accord with the intent of the governing statute.

Although the probability of a surface manifestation is acceptably remote, liquefaction can still occur. As a responsible steward of the facility, it would be appropriate to have a contingency plan to inspect the site, should a large earthquake occur in the immediate vicinity of the facility.

2.1.3 Seismic Evaluation (Example 2)

According to 10 CFR 40, Appendix A (or equivalent State regulations), the impoundment may not be located near a capable fault that could cause a maximum credible earthquake larger than that which the impoundment could reasonably be expected to withstand. As used in this criterion, the term "capable fault" has the same meaning as defined in section III (g) of appendix A of 10 CFR Part 100. The term "maximum credible earthquake" means that earthquake which would cause the maximum vibratory ground motion based upon an evaluation of earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material. The SRP describes the methodologies that may be used to conduct this evaluation. Details of the review for [XXX site] were presented in the TER (reference).

A review was conducted of all recorded earthquakes in [name the tectonic province in which the site is located] and in other tectonic provinces within 200 km (124 miles) of the site. The review contained the date of occurrence of the earthquake, its magnitude, and the location of the epicenter.

Data were obtained by [e.g., standard photogeologic analysis] and field reconnaissance of the study area and from review of the pertinent literature (references). Information in the form of maps, papers, or other, specific to the area or region, generated by State and Federal agencies or published in the literature were reviewed (references). [Insert conclusions]

Where possible, an association of epicenters or locations of highest intensity of historic earthquakes with tectonic structures was conducted. Epicenters or locations of highest intensity that were not reasonably identified with tectonic structures were identified with tectonic provinces. Maps on which the locations of epicenters of historic earthquakes associated tectonic structures, and tectonic provinces were produced and presented in the TER (references). [Insert conclusions].

In addition to the historical review, the proposed maximum earthquakes associated with [each tectonic province or capable fault or structure] was determined and a deterministic and/or probabilistic seismic hazard analyses was conducted.

Seismic design ground motion (PHA)

Capability was determined by [suitable methods, such as those outlined by (reference). For each maximum magnitude earthquake, the PHA at the site was determined using [an accepted attenuation relationship between earthquake magnitude and distance] (reference). The PHA value adopted for each capable fault or tectonic source was no less than the median value provided by the attenuation relationship. Possible soil amplification effects were considered (reference).

To assess potential ground motion at the site from earthquakes not associated with known tectonic structures (i.e., random or floating earthquakes), the largest floating earthquake reasonably expected within [the tectonic province] was identified. [insert site-specific results]. In addition, the largest floating earthquakes characteristic of [any adjacent tectonic provinces] was also identified, since such earthquakes may cause appreciable ground motion at the site [insert site specific results]. The 15 km (9 miles) was used as the site-to-source distance for floating earthquakes within [the host tectonic province]. (For floating earthquakes in other tectonic provinces, the distance between the site and the closest approach of the province boundary was used as the site-to-source distance). The PHA for the site was therefore the maximum value of the PHAs determined for earthquakes from all capable faults, tectonic sources, and tectonic provinces.

Conclusion

The licensee has presented information and used acceptable methods of investigations that support its conclusions about the seismic characterization of the site and the seismic design value. Information presented includes descriptions of historical earthquakes, locations of their epicenters, an analysis of the seismic hazard at the site, and the design considered a deterministic and/or a probabilistic PHA [PSHA]. The information presented is sufficient to support an analysis of the geotechnical stability.

2.1.4 Liquefaction Potential

Earthquake potential to cause liquefaction was evaluated by ABC and reviewed by professional engineers from the Dam Safety regulatory program. Both the dam embankment and the tailings slimes were evaluated. The dam embankment was found to be incapable of liquefaction due to low probability for soil moisture saturation. However, since the tailings slimes are expected to remain saturated over the long term, they could become “liquefied” during a significant seismic event, which could produce rafting of the surface if a conventional thin clay barrier surface cover had been used. As indicated in the Seismic Evaluation section, this likelihood is remote.

The cover design approved and constructed for the XYZ site is a thick (XX.X feet minimum) cover of non-cohesive local borrow soils, which ameliorates the liquefaction concern. Specifically, the potential for surface expression of slimes is limited because of the thick cover design, which is expected to continue performing as designed because of its self-healing nature (reference). Therefore, in the unlikely event of liquefaction, the thick cover of unconsolidated material would not have broad areas of failure.

2.1.5 Settlement Potential

Earthquake potential to cause liquefaction was evaluated by ABC and reviewed by professional engineers from the Dam Safety regulatory program. Both the dam embankment and the tailings slimes were evaluated. The dam embankment was found to be incapable of liquefaction due to low probability for soil moisture saturation. However, since the tailings slimes are expected to remain saturated over the long term, they could become "liquefied" during a significant seismic event, which could produce rafting of the surface if a conventional thin clay barrier surface cover had been used. As indicated in the Seismic Evaluation section, this likelihood is remote.

The cover design approved and constructed for the XYZ site is a thick (XX.X feet minimum) cover of non-cohesive local borrow soils, which ameliorates the liquefaction concern. Specifically, the potential for surface expression of slimes is limited because of the thick cover design, which is expected to continue performing as designed because of its self-healing nature (reference). Therefore, in the unlikely event of liquefaction, the thick cover of unconsolidated material would not have broad areas of failure.

2.1.6 De-watering of Tailings

An evaluation of the geochemical properties of the tailings by department staff determined that dewatering of tailings pore fluid was not practical or technically necessary (reference).

In conclusion, the XDOH's review of geotechnical stability has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or State equivalent regulations).

2.2 GEOTECHNICAL STABILITY (EXAMPLE 2)

2.2.1 Introduction

This section presents the results of the XDOH staff review of the geotechnical engineering aspects of the closure action proposed at ABC's XYZ site. The closure action consists of the consolidation of all contaminated materials from the processing site to the adjacent tailings pile near [City, State]. The final disposal cell will be an above-grade stabilized-in-place embankment extending to a maximum height of XXX feet above the prevailing surface grade. Contaminated material and mill debris were added to the disposal cell. The cell was recontoured , and is covered with a X-foot-thick minimum sand cover, plus filter layer and rock armor on the embankment; a XX-inch-thick multiple layer cover plus rock armor over coarse tailings; and a XX-inch-thick multiple layer cover plus rock armor over at least seven feet of regraded coarse tailings over the fine tailings portions of the embankment (reference).

The geotechnical engineering aspects reviewed include: (1) information related to the disposal and borrow sites; (2) materials associated with the closure action, including the foundation and excavation materials, tailings, and other contaminated materials; and (3) design and construction details related to the disposal site, disposal cell, and its cover.

2.2.2 Site Description

The XXX-acre impoundment is adjacent to the former XXX mill, about XXX miles northwest of the town of [City, State]. The site is located within the [local area], and is drained by the XXXX River. The uranium mill tailings were placed in a single pile consisting of approximately XX.X million tons. The XXX-acre pile forms a deposit with a maximum height of XXX feet. ABC has covered the sides of the pile with an interim soil cover of variable thickness. As the water in the pond atop the tailings has evaporated, additional interim cover has been placed on portions of the top of the pile, working from the edges inward toward the center.

The former mill area is XXX acres in size and contains building foundations and abandoned mill structures which have been partially demolished. Additional contaminated soil lies outside the confines of the tailings pile. The contaminated soil and building rubble generated from the mill demolition will be added to the disposal cell.

2.2.3 Disposal Cell Area

Several subsurface investigations have been performed at the XYZ site in order to characterize the tailings and contaminated materials for geotechnical engineering and radiological aspects of the closure. Drawings in the month date, XXXX report (reference) illustrate the original test boring and test pit locations. Logs of soil borings and test pits were provided in the ABC's earlier submittals (reference). In month of XXXX, additional test pits were excavated within the confines of the mill and the tailings embankment. The [year] test pit logs are reported in Appendix X of the month date, year, submittal (reference), as modified by the month date, XXXX, submittal (reference).

Exploration to depth within the tailings embankment was not previously performed since the presence of an active evaporation pond impeded drill rig access. To further characterize the tailings, and to evaluate the embankment with respect to stability and potential settlement, ABC has committed to perform piezocone or other in-situ tests after the cover has been placed. The piezocone is an instrument which measures the piezometric pressure at a cone tip as the test device penetrates a material. Cone Penetration Test (CPT) pore pressures, thus measured, reflect both the soil type and the stress history of the material. CPT or equivalent test data have been reviewed along with settlement records to better evaluate the time-rate of tailings consolidation.

2.2.4 Borrow Areas

Proposed radon barrier clay soils from the XXXX area were evaluated by [reference]. The XXXX borrow area is located about XX miles north of the tailings pile. Sandy soil for the radon barrier was obtained from material excavated during the reconfiguration of XXXX area (reference). In [year], XX exploratory test pits were excavated in the XXXX area.

Finally, in addition to the sampling associated with the reconfiguration of XXXX area, three additional samples were taken from the proposed borrow area located [west] of the tailings disposal area on the ABC property.

2.2.5 Geotechnical Investigation Conclusions

XDOH staff has reviewed the subsurface exploration discussed above. XDOH concludes that the geotechnical investigations conducted at the processing, disposal, and borrow sites satisfactorily establish the stratigraphy, that the explorations are in general conformance with applicable provisions of Chapter X of the SRP (reference), and that they are adequate to support the assessment of the geotechnical stability of the stabilized tailings and contaminated material in the disposal cell. Additional in-situ testing was performed to confirm the stratification and strength parameters of the tailings and to confirm the settlement analysis. Prior to approval of the settlement evaluation, ABC submitted a field exploration plan for the in-situ exploration program.

2.2.6 Testing Program

Geotechnical engineering characteristics and strength parameters for the tailings, contaminated soil, and natural soils have been determined by ABC, through laboratory analysis of samples from the investigations. Early laboratory testing by [reference], and later testing by [reference], included moisture-density (Proctor) determinations, gradation analyses, specific gravity, saturated hydraulic conductivity determinations, Atterberg Limits, capillary moisture, one-dimensional consolidation, static triaxial, and cyclic triaxial compression. XDOH has reviewed the geotechnical engineering testing program for the XYZ site and concludes
that the tests identified above were conducted on representative materials.

ABC's laboratory testing of the XXXX (area) borrow material included gradation, Atterberg Limits, moisture-density determination, specific gravity, saturated hydraulic conductivity, capillary moisture relationships, dispersive tendencies, diffusion coefficient, and triaxial shear strength. ABC states that additional tests will be made on the borrow soils during construction to confirm conformance with the project specifications.

Within the XXXX area, one composite sample was made from the "affected" (contaminated) sandy soils. A second sample was made from "clean" soils (see Section XXX for additional information). The composite samples were then split into three subsamples, and were redivided for geotechnical and radiological sampling. Laboratory testing by ABC included gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and (for the "affected" soils) radium activity and emanation coefficient determination. Three composite samples from west of the tailings pile area were tested for gradation, Atterberg Limits, moisture-density relationships, specific gravity, diffusion coefficient, and capillary moisture relationship.

Cover materials were evaluated for durability. Testing included Los Angeles Abrasion, sulfate soundness, absorption, specific gravity, Schmidt Hammer, and Brazilian disk tensile tests. Petrographic analyses were also conducted. Further discussion regarding the tests on proposed cover materials is presented in Section XXX.

On the basis of the field exploration and laboratory testing programs, ABC concluded that the borrow sites contain suitable quantities of material acceptable for the radon barrier. Testing indicated the soils are non-dispersive.

Based on the review, XDOH staff finds that the number and type of tests conducted in the testing program were appropriate for the support of the engineering analyses performed and that the scope of

the testing program and the utilization of the test results to define the material properties are in general agreement with the applicable provisions of the SRP (reference).

2.2.7 Slope Stability

The evaluation of the geotechnical stability of the slopes of the disposal cell containing stabilized tailings and other contaminated materials is presented in this section. XDOH has reviewed the exploration data, test results, slope characteristics, and methods of analyses pertinent to the slope stability aspects of the reclamation plan. The analyzed cross-sections with [10] horizontal to [3] vertical side slopes have been compared with the exploratory records and design details. XDOH finds that the characteristics of the slopes have been satisfactorily represented and that the most critical slope sections have been considered for stability analyses.

Soil parameters for the various materials in the disposal cell slope have been adequately established by appropriate testing of representative materials. Soil parameter values have been assigned to other layers (riprap, gravel bedding, bedrock, etc.) by ABC, on the basis of data obtained from geotechnical explorations at the site and data published in the literature. XDOH finds that the determinations of these parameters for slope stability evaluation follow conventional geotechnical engineering practice, and are also in compliance with the applicable provisions of the guidance document (reference). XDOH also finds that an appropriate method of stability analysis (XXXX method) has been employed by ABC to address the likely extreme adverse conditions to which the slope might be subjected for the static case.

Factors of safety against failure of the slope for static and seismic loading conditions have been determined by the licensee for both short-term (end of construction) and long-term states. Factors of safety for the static loading conditions were calculated by ABC to be X.X (short- and long-term) which are in excess of minimum required values of X.X and X.X, respectively.

The seismic stability of the proposed slopes was investigated by the licensee using the pseudo-static method of analysis, with horizontal seismic coefficients of X.XXg for both the end-of-construction and the long-term cases. The value of the seismic coefficient was consistent with the design ground acceleration value used for the nearby XXXX site. In actuality, a horizontal seismic coefficient equal to X.XX times the maximum ground acceleration,or X.XXg, would be used in a long-term pseudo-static evaluation, thus ABC's model is over-conservative. As a further exercise, ABC arbitrarily increased the horizontal seismic coefficient in order to determine the value which would imply impending failure. The coefficient which resulted in a factor of safety of unity, implying impending failure, was X.XXg.

Subsequently, the licensee performed deterministic and probabilistic ground motion evaluations in month, XXXX (reference). The purpose of XXXX's re-evaluation was to determine a peak horizontal acceleration value more reasonable than that used by DOE at XXXX (area), yet still conservative. XXXX determined that a peak horizontal acceleration of X.XXg, which represents an event with a mean return period of 10,000 years, was an appropriate value for design (see section XXX). Since the licensee's earlier analysis was based on a peak horizontal acceleration in excess of X.XXg, and stable conditions were confirmed, the conservativeness of the seismic design with respect to slope stability was substantiated.

Based on review of these analyses and the results, XDOH staff concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been made in a manner consistent with the guidance document (reference).

2.2.8 Settlement and Cover Cracking

Long-term settlement of materials in the disposal cell, which could result in either local depressions or cracks on top of the cover, was addressed by the licensee in XXXX's report of [month date, year]. A proposed settlement monitoring program was provided. Settlement monuments have been installed directly on the tailings prior to the initiation of regrading activities. Construction equipment is required to maintain a minimum distance of XXXX feet from all monuments.

The monuments were surveyed for vertical displacement on a daily basis for the first XXX weeks of initial fill placement, weekly for the following XXX months, and then monthly for the final two months. After ABC had concluded that XX percent of the consolidation settlement was complete, and with XDOH's concurrence, final soil cover placement operations began.

Settlement monuments were located in areas where consolidation is expected to be the greatest, including areas believed to have maximum thicknesses of fine tailings. Such an arrangement assures that differential settlement would not adversely affect the integrity of the cover. Additionally, the final soil cover was spread and compacted in a uniform manner to minimize the effects of settlement due to the weight of the final soil cover materials. ABC concluded that XX percent of the primary consolidation should take XX years, based on the fact that there has been no disposal of tailings since XXXX and that the pumping program conducted at the site has accelerated the dewatering process.

In addition, ABC conducted an exploration program within the embankment using XXXX methods. The in-situ data were evaluated along with settlement records to confirm the conclusion that XX percent of the expected settlement has occurred. The in-situ test results were also used to assess the potential for cover cracking. XDOH finds that the settlement monitoring program is sufficient to satisfy applicable portions of Criteria 1, 6, and 12, of 10 CFR Part 40, Appendix A, regarding reclamation design to control radiological hazards for the design life without active maintenance after reclamation is complete.

2.2.9 Liquefaction Potential

The liquefaction potential for the XYZ site was initially evaluated for ABC by [reference]. [reference] evaluated the liquefaction potential based on empirical techniques and on the basis of a laboratory evaluation. Minimum factors of safety of X.XX (empirical) and X.XX (laboratory) were derived in the [reference] study. Based on the similarity in results, and considering minimum acceptable safety factors of X.X, [reference] concluded that no major problem related to liquefaction would occur during the postulated seismic event, which they considered to be a Magnitude X event with a hypocentral distance of approximately XX km and a maximum ground acceleration of X.XXg.

An understanding of seismic hazards and the liquefaction process has improved since [year]. Based on more recent interpretations of potential seismic events, and in accordance with a month date, year, request from the XDOH, the licensee re-evaluated the liquefaction potential for the site [reference].

Liquefaction potential was re-evaluated using standard penetration test values, soil gradation, and sample descriptions from previous analyses with updated empirical relationships. The potential induced stresses were estimated from simplified procedures using field-based methods.

Liquefaction susceptibility can be estimated by either of two approaches. The first method correlates resistance with standard penetration test (SPT) blowcounts, measured in-situ. The second method relies on laboratory measurements of dynamic tests that strain soil samples in repeated cycles of motion until liquefaction is induced. [Reference] stated that the field-based method is the preferred analytical procedure.

By using methods detailed in [reference], the in-situ liquefaction resistance was computed. In the [reference] analysis, corrected SPT values are normalized and correlated with the cyclic stress ratio required to trigger liquefaction, in observational data. The field cyclic stress ratio is thus obtained from curves dependent on the normalized blowcounts and soil fines content. For a calculated factor of safety less than X.X, failure is assumed to occur. For a factor of safety between X.X and X.X, liquefaction is not assumed to occur, but the soils may suffer some strength loss.

[Reference] showed that very few sample points indicate susceptibility to liquefaction, and that isolated incidences of liquefaction, if it were to occur, would be deep within the embankment. It was inferred that liquefaction of the tailings and underlying soils is unlikely to occur, and that there is no threat to the stability of the embankment.

Based on a review of the analysis presented by the licensee [reference], XDOH concludes that there is adequate assurance of safety with respect to liquefaction damage.

2.2.10 Cover Design

ABC has used three different embankment cover sections, depending on location:

(1) The final cover profile for the embankment consists of X feet (minimum) of sandy soil above the regraded coarse tailings. The sandy soil is capped by a filter layer and rock armor of variable thickness.

(2) The cover profile over coarse tailings consists of:

X inches (minimum) of low-grade ore from the mill area,
XX inches (minimum) of affected soil,
X inches (minimum) of compacted clay,
X inches of sandy soil
The coarse tailings areas are covered with rock armor of variable thickness.

3) The cover profile over fine tailings includes:

X feet (minimum) of regraded coarse tailings,
XX inches (minimum) of affected soil,
XX inches (minimum) of compacted clay,
X inches (minimum) of sandy soil
A rock armor of variable thickness will cover the sandy soil.

The cover system described above provides a minimum of XX inches of cover above tailings on the top and sides of the cell. The system has been designed to limit the infiltration of precipitation, protect the pile from erosion, and to control the release of radon from the tailings below. Details of the XDOH's review of the cover's performance related to limiting infiltration are addressed in Section XXX of this report; the review of the cover's erosion protection features is presented in Section XXX, and the review of the radon attenuation aspects of the cover is presented in Section XXX. Certain other design aspects of the proposed cover are discussed herein.

Tests on the compacted clay from XXXX indicate that hydraulic conductivities are near XX-XX cm/sec at placement conditions. In addition, the physical shape and surface grading of the reclaimed tailings embankment effectively remove surface water resulting from precipitation which falls on the area. The relatively low permeability of the cover materials and the low annual rainfall with high evaporation rate prevent significant tailings recharge.

ABC has evaluated the potential for frost penetration using the [BERGGREN.BAS] computer code developed at the U.S. Army Corps of Engineers (reference). The code has been used on several other uranium mill tailings remediation projects. In order to evaluate the potential for frost penetration, temperature data including the freezing index, mean annual air temperature, length of freezing season, and geotechnical parameters are considered. The model calculates the heat capacity, thermal conductivity, and latent heat of fusion for the soil layers unless these data are entered manually.

Values used in the computer analysis included the mean and worst-case situations based on the available XX years of weather records. In the worst-case scenario, ABC determined that the depth of frost penetration would be XX.X inches. By thickening the sand layer to X inches, and in conjunction with the exterior rock armor, the potential for frost penetration into the clay layer is eliminated, and the cover integrity should not be significantly affected.

XDOH has reviewed the input data used in determining the total frost penetration depth and concludes that these values are a reasonable representation of the extreme site conditions to be expected. Therefore, ABC's evaluation of the frost penetration depth is acceptable to XDOH.

The cover design has been evaluated by XDOH for geotechnical long-term stability and the design is acceptable. The radon attenuation ability of the cover is discussed in Section XX and the hydraulic conductivity aspects of the cover in Section XX.

2.2.11 Subsidence

Possible mechanisms for ground subsidence due to dissolution or creep of underlying salt are discussed in Section XXXX. XDOH concluded that X meter of bedrock subsidence at any location below the pile is a reasonable design basis. ABC presented an analysis [reference] to show that a worst-case scenario of subsidence would not adversely affect the stabilized tailings. The [reference] approach was based on a simplified procedure by [reference], and considered instantaneous subsidence of XX meter and, for added conservatism, of XX meters.

The modified XXXX procedure was developed from finite element analyses and physical models for propagation of earthquake fault ruptures in the bedrock beneath cohesive soil deposits. The analytical and physical model results were also compared with case histories of earthquake fault rupture propagation through soil, such as those described by [reference]. XDOH considers ABC's approach

to be conservative for evaluating the surface deformation associated with vertical subsidence caused by salt dissolution because it assumes the deformation to be instantaneous and concentrated within a single narrow zone rather than being incremental and more distributed, as would be expected for salt dissolution subsidence.

ABC's analysis [reference], using the simplified fault rupture propagation model of [reference], indicates that the thickness of alluvium and tailings is greater than the distance of propagation for XX and XX meter bedrock offsets. Thus, differential displacements of bedrock, resulting from salt dissolution subsidence under the tailings pile, would not be expected to propagate to the surface and impair the function of the clay cap and radon barrier. XDOH concludes that the analysis was conservative for the reasons discussed above. XDOH
therefore concludes that the licensee provided adequate assurance that the potential for differential offsets reaching the surface of the pile as a result of salt dissolution over the next 1000 years is negligible.

2.2.12 Construction Methods and Features

XDOH has reviewed design text, tables, and drawings in the technical specifications submitted by ABC (reference). The text discusses the investigations and testing which formed the basis of the design and specifications. Additionally, the text discusses the design concept in detail. The text is supported by tables which summarize design parameters and figures which clearly show plans, profiles, and details of the proposed remedial action.

In summary, the side slopes were re-contoured to a [10]H to [3]V proportion. Mill debris is to be buried systematically at the toe of the slope. A permanent layered cover provides protection from excessive radon emanation, and permits rainfall to drain away satisfactorily.

XDOH has reviewed and evaluated the geotechnical construction criteria provided in the Reclamation Plan. Based on this review, XDOH concludes that the plans and drawings clearly convey the proposed closure action design features. In addition, the excavation and placement methods and specifications are consistent with accepted standard practice and the guidance document (reference).

2.2.13 Testing and Inspection

XDOH staff has reviewed drawings and technical specifications submitted by ABC (reference). The Technical Specifications discuss testing methods and quality control procedures applicable to the remedial work. Appropriate reference is made to [ASTM] methods which will govern the placement and testing of soil and rock materials. The specifications are presented in a conventional outline form. Tables and figures are appended to the Technical Specifications.

Based on the XDOH staff review, the plan is found to provide a program for testing and inspection that is generally consistent with the XXXX guidance document (reference).

2.2.14 Conclusions

Based on the review of the geotechnical engineering aspects of the design of the ABC closure action as presented in the Reclamation Plan, XDOH concludes that the embankment and proposed borrow soils have been adequately characterized. Furthermore, the cover system appears to be adequately

designed to resist the effects of freezing conditions which can reasonably be expected. XDOH concludes that the slopes of the disposal cell are designed to endure the effects of the geologic processes and events, including resistance to earthquake and settlement, to which they may reasonably be subjected during the design life and that the analyses have been made in a manner consistent with the guidance document (reference). XDOH concludes that there is adequate assurance of safety with respect to liquefaction potential. In conclusion, the XDOH's review of geotechnical stability has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

2.3 SURFACE WATER HYDROLOGY AND EROSION PROTECTION

The constructed reclamation site is robust by design, and includes a thick, vegetated cover design of site soils surrounded by a large surface water diversion channel over X,XXX feet long. The tailings impoundment is situated in a relatively small watershed area (about XXX acres), which limits surface water flow potential. The small catchment area inside the diversion channel is less than XXX acres. The reclamation site is expected to return to a wildlife and forestry land use, similar to the surrounding area, which shows few erosional impacts.

Embankment dam (XX%), margins (XX to XX%), cover (X.XX%), and diversion channel (X.XX to X.XX%) slopes are relatively flat. Erosion protection studies have been performed on these topographic features. Some areas required stabilization by rock (riprap), some by vegetation, and some are naturally stable.

2.3.1 Flood Flow

The primary criteria used to evaluate erosion protection are a determination of long-term erosional stability using Criteron6 (reference), which requires site stability for 1,000 years. NRC guidance was used to develop a conservative design basis. A probable maximum precipitation (PMP) event was selected and found to be a X-hour storm of XX.X inches, peaking at mid-storm at 18 inches per hour (reference). Probable Maximum Flood (PMF) surface water flow rates were determined, based on the worst-case precipitation event, surface flow characteristics (elevations and contours, surface roughness and vegetation) at the site, and antecedent soil moisture (near-saturated or frozen ground), using the HEC-1 computer program. The Modified Rational Method was used to verify surface water flow rates on the cover.

XDOH reviewed and independently verified ABC's flood flow estimates. The [reference] method was used to determine that vegetation is not necessary for erosion protection (reference). The margin areas were found to require XX% vegetal coverage for long-term erosional stability, based on a PMF event. Short-term erosion protection requirements were also determined and require XX% vegetal cover, based on a 10,000-year storm (reference). The Monitoring and Stabilization Plan (MSP) was used to verify vegetation productivity performance after reclamation construction was completed. The XX% short-term requirement was met in [year], and the trend line for performance since reclamation construction in XXXX predicts performance in the XX% range by the [summer] of [year] (reference).

PMF flow rates were determined for the diversion channel to be XXXX cfs (cubic feet per second), and for the swale outlet from the impoundment surface area to be XXX cfs. These worst-case flood flow rates were used to determine channel cross-sections and to size the riprap (reference). Diversion channel cross-sections were designed for both the minimum flow resistance, large velocity case

(expected just after reclamation is completed), and for the high resistance, low velocity case (expected after the channels have re-vegetated). Rock protection is required for the first case with a smaller channel cross-section. Long-term performance requires limited rock protection but a larger cross-section channel.

Using these two cases, the diversion channel was designed for a large cross-section, but with rock placed only in the lower portion consistent with the smaller cross-section (reference). Rock and filter sizing was performed using the Safety Factors Method or the Stephenson Method, as recommended by NRC guidance. XDOH reviewed and independently verified ABC's analyses (reference). Rock sizes that were placed met, and generally exceeded the minimum rock sizing required by the analysis-based design. ABC chose to oversize the rock to limit the number of rock sizes produced and placed (reference).

2.3.2 Rock Durability and Gradation

Rock durability and gradation were evaluated during construction to meet approved construction design plans and specifications. An initial petrographic examination per [reference] was made to qualify the rock source. XDOH reviewed the report of the independent evaluation and accepted the rock source (reference). Rock samples were then tested every XX,XXX cubic yards of production for Bulk Specific Gravity and Absorption per [reference], Sodium Sulfate Soundness per [reference], Los Angeles Abrasion per [reference], and Schmidt Hammer Rebound per [reference].

Two different rock sources were used, including a local basalt borrow area~~,~~ and a quartz monzonite area that required blasting.

Rock durability scores, using the NRC-recommended scoring method, averaged XX.X, with the lowest at XX and the highest at XX. XDOH reviewed rock durability test results from the independent laboratory. Rock source gradation was periodically sampled and evaluated by an independent contractor during construction. Department inspectors reviewed inspection records during construction and found the evaluations, methods, and records to be adequate. ABC performed a quality assurance construction performance audit program of ABC operations, contractor construction activities, and independent contractor inspections. The ABC auditor reported to corporate management and exercised independent authority, as observed by XDOH inspectors (reference).

XDOH reviewed the data from the licensee's construction completion report (reference). The basalt rock source qualified and produced a small fraction of the produced rock (about X,XXX cubic yards). Rock durability test results for basalt scored XX on two tests. The quartz monzonite source qualified and produced most of the rock used during construction (about XX,XXX cubic yards). Rock durability test scores for the quartz monzonite averaged XX.X, with a standard deviation of X.X. The department believes that the quartz monzonite source produced uniform rock durability, based on department inspection, the consistency of the rock durability scores, and the small statistical standard deviation for the data.

NRC guidance provides a minimum rock durability score of 80, without oversizing. ABC oversized the rock placed by a considerable amount, on average. Oversizing of rock was by design. Rock production used a small number of screens. The licensee used only X", X" and XX" D_{50} (median stone diameter) rock sizes. Placement sizes were greater, compared with design rock sizes developed

to meet erosion protection criteria. The erosion protection criteria were also determined based on conservative criteria.

In addition to conservative methods for rock sizing and durability, the structural integrity of the site is not dependent only on rock for erosion protection. The XYZ millsite has site-specific attributes (soil, bedrock, weather, etc.) that suggest a durable long-term forest and wildlife environment. Therefore, the rock protection placed during construction becomes less important for structural stability (erosion protection), as vegetation becomes established. The rock performance timeframe is about a thousand years (based on NRC guidance and methods), while the forest succession timeframe is about a hundred years. This is a convenient overlap of performance features.

During reclamation plan development, ABC evaluated erosion protection requirements for the diversion channel for both the vegetated and non-vegetated conditions. For that area, rock was required in the lower section of the channel (for the non-vegetated condition), and not in the upper section of the channel (for the vegetated condition). The difference between conditions is a factor of three in velocity reduction and in channel cross-section increase, once vegetation establishes. The long-term performance expectation is for a similar velocity reduction in all areas of the site after vegetation succession occurs.

2.3.3 Vegetation Cover

For the design of the top slope, ABC addressed the stability of the slope under three conditions: (1) bare soil with no vegetation; (2) normal, fair vegetation cover; and (3) poor vegetation cover. The stability of these three cover conditions was evaluated using the allowable shear stress method (reference) and the maximum allowable velocity (reference), with corrections for depth (referene). Additionally, the staff independently evaluated the stability of the top slope, using very conservative assumptions. It was assumed that the vegetation was burned, deteriorated, and/or damaged to the extent that approximately XX% of its shear resistance capability had been removed (reduced from X.X pounds per square foot to X.X pounds per square foot), coincident with the occurrence of the design PMF discharge of X.X cfs. Further, an evaluation was conducted assuming a XX% reduction in shear resistance (X.X pounds per square foot), coincident with a discharge of X.X cfs (PMF with no flow concentration, or FCF = 1). Under both conditions, the proposed slope of X.XX was found to be stable. Following is a summary of calculations performed by ABC and the XDOH regarding the stable slope design.

Design Method	Cover Condition	Allowable Stress (lb/ft^2)	Actual Stress (lb/ft^2)	Allowable Velocity (ft/sec)	Actual Velocity (ft/sec)	Stable Slope (ft/ft)
Allowable Shear Stress	Bare	[0.08]	[0.44]	NA		[0.0013]
	Poor	[3.0]	[0.5]			[0.012]
	Normal	[4.2]	[0.6]			[0.030]
Allowable Velocity	Bare	NA		[2.9]	[2.9]	[0.003]
	Poor			[3.8]	[3.8]	[0.01]

	Normal		[3.9]	[3.8]	[0.015]
XDOH Independent Estimate					
(FCF=3)	[90%] Lost	[0.4]	[0.4]	NA	[0.01]
(FCF=1)	[95%] Lost	[0.2]	[0.2]		[0.01]

Additionally, ABC provided further information and justification regarding the design of the vegetation cover in a special report (reference) which addresses the concerns raised in XXXX (Reference). These concerns included a conclusion in the NRC report which indicated that typical soil loss rates in this portion of the United States were so excessive that a soil cover could not be provided for a 1000-year period, based on results of the Universal Soil Loss Equation. ABC performed detailed calculations of the soil loss rates for the specific design and location chosen; these calculations indicated that the design would provide acceptable protection against sheet erosion.]

2.3.4 Sedimentation

Sedimentation in the diversion channel was evaluated using the XXXX and XXXX computer programs. The analyses were performed on the PMF case, as well as several lesser flood flow cases, to determine if sedimentation would accumulate in the diversion channel over time and reduce diversion channel flow capacity. It was determined that, except for the first few years after construction, there is no likely flood flow in the channel for flood recurrence intervals less than XXX years, due to expected infiltration. For larger, low-probability flood events, sediment would likely flush out with the expected flood flow. Even without flushing, sediment accumulation predicted by the analysis was approximately X.X feet at the bottom of the diversion channel. The channel was designed so that a minimum of X foot of freeboard would be present, and included a very conservative design PMF basis, sedimentation in the channel, and re-vegetation of the channel (reference). In addition, the channel was constructed somewhat oversized to meet the design cross-section minimum requirements, and therefore has a capacity excess from the design minimum required.

The impoundment swale outfall requires rock (riprap) erosion protection, since it is designed to convey concentrated flood flow from the impoundment surface and to discharge it away from the reclamation site. This area was evaluated with the same analytical tools as the diversion channel, and found to be adequate. The design was prepared by ABC, and evaluated and approved by the State XXX program and XDOH. Worst-case assumptions were used to evaluate the design, based on NRC guidance. Vegetation productivity on the impoundment cover has reached a self-sustaining performance level and will continue to improve over time, limiting the probability of occurrence of maximum flood flow (reference). The swale outfall is located over a large area of competent quartz monzonite of sufficient structural capacity, extent, and elevation, that limits potential erosion of cover soils from the impoundment. The swale outfall therefore protects the cover from erosion and promotes sedimentation on the shallow-sloping impoundment surface (reference).

2.3.5 Conclusion

In conclusion, the XDOH's review of surface water hydrology and erosion protection has found the XYZ site to be in conformance with regulatory requirements of criteria X, X, X, X, and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

2.4 RADON EMANATION

ABC designed the impoundment cover from site soils and determined that an average cover design thickness of XX.X feet was required in order to meet the regulatory limit of XX pCi/m^{2}s found in Criterion 6 (reference). ABC used the RADON computer code to perform this analysis. The analysis is based on the concentration of radium 226 in the tailings, and on the soil parameter default values recommended by the NRC in guidance documents applicable to tailings impoundment cover design for radon emanation control. The department reviewed ABC's design and analysis reports, verified their results, and approved the design plans and specifications. A sensitivity analysis was performed, using realistic, expected soil parameters, and found that a radon 222 flux of only X.XX pCi/m^{2}s would be expected during the summer and fall when the cover soils are not expected to be saturated (reference).

A thick, homogeneous soil cover of at least XX.X feet thick was placed over the impounded tailings at the XYZ Project site (per as-built inspection reports). The total volume of soil moved during construction to place the cover is in excess of X million cubic yards (yd^3). The vegetated cover was designed to have long-term performance. Natural materials (vegetation, soils, and rock) have been used to prepare and construct the cover design. Actual materials used in construction had a greater proportion of fine material (percent less than #XXX sieve) than required by the construction design plans and specifications. The actual thickness of the constructed cover averaged over XX.X feet from the sloped sub-grade. The sub-grade, although made up of radium 226-contaminated material, was produced by re-grading the tailings to the required contour and adding additional soil from the contaminated soils cleaned up in the mill area, with clean fill to meet grade requirements. Therefore, the upper portion of the tailings had less radium 226 concentration than was used in the analysis for determining cover thickness. All together, the design is quite conservative and the actual construction more than exceeded the minimum requirements of the approved design plans and specifications.

2.4.1 Radon 222 Measurements

ABC performed radon 222 flux measurements on the tailings impoundment after final cover placement. Measurements were performed in compliance with requirements of ~~WAC 246-252-030~~ XDC XXX-XXX-XXX(10 CFR Part 40, Appendix A). Sampling was performed using the Large Area Activated Charcoal Canister (LAACC) method. Measurements of the approximately XX-acre surface were performed month date, year. A mean radon 222 flux rate of X.XX +/- X.XX pCi/m^{2}s was measured (PQL of X.X pCi/m^{2}s). This measurement is well below the regulatory standard from state regulation XDC-XXX-XXX, Criterion 6 (b), and consistent with analytical evaluations, using realistic assumptions and expectations, performed at the XYZ site (reference).

A report of results of testing and analysis for the month date, year radon 222 emanation flux rate evaluation was received month date, year, and reviewed by department staff. The report includes details of the testing equipment, methods, and analytical procedures used in the evaluation. This report remains on file with the department and is available to the custodial agency (DOE) upon request. DOE has requested and received many of the main reports and documents necessary to

manage the site and may have already received this report. Criterion 6(c) requirements for radon 222 flux emanation rate measurement reporting and records management have therefore been met (reference).

(Sample paragraph)

The licensee satisfied the regulatory requirements for attenuation of radon flux. The licensee submitted a reclamation plan which provided the design of a cover system which would reduce the radon flux to XX pCi/m^2/s or less. Use of a published radon flux model (reference) with the design information provided by the licensee confirmed the radon flux reduction provided by the cover system. The licensee also demonstrated that the cover system would continue to reduce radon flux for 1000 years or at least 200 years by using an environment dose assessment model (reference) to confirm that the cover system would perform adequately. After completion of the cover system the licensee made radon flux measurements using the radon flux measurement methodology in Appendix B, Method 115, 40 CFR Part 61. Radon flux measurements averaged over the entire impoundment were less than 20 pCi/m^2/s.

2.4.2 Conclusion

In conclusion, the XDOH's review of radon emanation has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation survey and confirmatory soil samples that indicated that the subject site meets applicable standards and requirements for release.

3.1 RADIATION CLEANUP AND CONTROL (EXAMPLE 1)

On month date, year, ABC submitted the Radiological Verification Program (RVP) (reference) to XDOH for review and comment. Following several meetings between XDOH and ABC, a formal response letter was sent to ABC on month date, year. In response to XDOH's letter, ABC submitted Revisions X and X to the Mill Decommissioning Plan (reference), which XDOH subsequently found acceptable and approved on month date, year through issuance of Amendment XX to ABC's radioactive materials license (reference).

XDOH determined that the RVP provided reasonable assurance that:

- appropriate regulatory standards for soil cleanup are utilized;
- all potentially contaminated areas associated with ABC's mill are properly identified for soil verification;
- background values for radium, thorium, and uranium established by ABC are representative of each soil type identified by ABC and XDOH staff at the XYZ facility (reference);
- soil cleanup standards could be met in process areas such as the millsite barium chloride pond and the clairicone spill area where an accurate correlation or association cannot be developed, through 100% soil sampling and analysis;

- soil cleanup standards for Ra-226 and Th-230 could be met in areas of natural soil deposition by gamma surveys because of the correlation to radium concentrations, and the assurance that an accurate association exists between radium and thorium;
- soil cleanup action levels ensure a XX% or greater confidence that cleanup standards are complied with;
- ABC's Quality Assurance and Quality Control Program would properly control field and laboratory activities, and data management.

Following mill building demolition and disposal into the tailings disposal area, and prior to initiation of the RVP, ABC excavated approximately XX,XXX cubic yards of soil from the mill area. The majority of the excavated soil was from areas where it was believed that elevated residual radioactivity might exist (XX,XXX cubic feet equates to an average depth of approximately X.X feet). In accordance with the approved RVP, approximately X,XXX ten-meter by ten-meter grids were established for gamma correlation surveying. In approximately XXX of these grids, soil samples and analyses were conducted to confirm the gamma-radium correlation. In areas where a correlation could not be demonstrated, approximately XXX additional ten-meter by ten-meter grids were established for soil sample analysis. Core samples approximately 3" in diameter and 6" deep were taken. Since contamination resulting from the milling operation originated at the ground surface, the concentration of contaminants would be greater near the surface and would decrease with depth. Therefore, it was determined that the soil sample protocol would only require sampling below 6" if contamination was found in the upper 6" soil profile. For the 11 grids where the subsurface radium standard was applied, the average minimum and maximum for Ra-226 was X.XX, X.XX, and X.XX; for Th-230 it was XX.XX, XX.XX, and XX.XX. The estimated Ra-226 at 1,000 years is XX.XX, XX.XX, and XX.XX. ABC documented that at least six inches (but in most cases several feet) of fill were placed on these areas.

ABC's standard procedure for excavating areas identified as requiring cleanup was to over-excavate several feet of material in an effort to lower residual radionuclide concentrations to levels which could be considered ALARA, rather than excavating only to surface soil regulatory limits. ALARA philosopy was considered when establishing action limits for soil cleanup, and the allowable action limits were reduced by a value of XX%. As a result, grids having soil sample results in excess of approximately X.XX pCi/g of radium 226 or thorium 230 were cleaned and re-sampled. After these areas had been cleaned up to the approved radium/thorium concentration levels, a new issue regarding uranium concentrations in soils arose. In response to this issue, XDOH evaluated and approved ABC's proposed concentration limit for uranium and their verification procedure. An additional XXX ten-meter by ten-meter grids were established for uranium soil sample analysis, and approximately XX% of them were found to be below the cleanup action level. In areas where soil cleanup action levels were exceeded, soil was removed and the area re-tested until it complied (reference).

3.1.1 ABC Results

A total of XXX,XXX additional cubic yards of potentially contaminated soil were excavated and placed in the tailings disposal area as a result of soil cleanup activities. By the time the millsite cleanup was complete, ABC had performed ~~4968~~ [674] gamma surveys and had ~~1320~~ [354] soil samples analyzed (reference).

[A summary of survey units, scan and sample results is presented below in Tables X-X.]

Table X. Survey unit summary

Survey Unit Classification	Number of Survey Units	Samples per Survey Unit	Area of Survey Unit, m^2
I	75	18	100
II	26	10	1500
III	33	varies	varies

Table X. Summary of gamma exposure rate ranges

Analytical categories	Gamma exposure rates (µR/h)
Number of surveys	[674]
Minimum	[9]
Maximum	[1,355]
Mean	[16]

[Note: The limit for gamma exposure rate is xxx µR/h]

Table X. Summary of soil sample analyses

Analytical categories	Concentration (pCi/g)		
	Ra-226	Th-230	U(total)
Number of soil samples	[354]	[271]	[251]
Minimum	[0.5]	[0.0]	[0.2]
Maximum	[34.3]	[35.1]	[82.4]
Mean	[2.2]	[1.7]	[7.6]

[Notes:
1. Results include background.
2. The limit for Ra-226 in value can range from XXX to XXX pCi/g.
3. The limit for Th-230 in value can range from XXX to XXX pCi/g.
4. The limit for U(total) in value can range from XXX to XXX pCi/g.]

3.1.2 State's Results

During the millsite cleanup, XDOH conducted numerous inspections to ensure compliance with conditions of the RVP. XDOH also conducted its own sampling and analysis verification program. XDOH staff collected or split [100] samples with ABC and sent them to the state laboratory for independent analysis, and performed approximately [140] gamma grid confirmation surveys in the

same areas as ABC. [Results of the state's surveys were compared to the ABC's results and are in good agreement.]

3.1.3 Millsite Decommissioning

The only structures remaining within the former mill area are the pump house and its water storage tank. Following mill demolition, the exterior siding and insulation were removed from the pump house and disposed of in the tailings impoundment. The metal siding, pump equipment, interior piping, and the water storage tank were surveyed by ABC and found to meet regulatory requirements. The department has reviewed this information as presented in the Mill Decommissioning Completion Report (reference) and concurred with ABC's finding that these structures can be free-released.

3.1.4 Cover Material

Most of the cover material used in the tailings impoundment came from areas identified by ABC in their RVP as secondary and tertiary, as well as a borrow site in which topsoil was stored when the tailings disposal area was first constructed. These areas were surveyed by ABC and found to be at background levels. In Appendix C, Revision X of the XYZ Project Mill Decommissioning Plan dated month year, radium levels in the borrow areas averaged between X.X and X.X pCi/gm, depending on soil type. The department has conducted a confirmatory survey of XXX gamma measurements, using microR meters, which found that gamma radiation levels on the top of the completed impoundment are at background (XX-XX uR/hr). Competent monzonite outcrops off the tailings disposal area, in unimpacted background areas near the impoundment, had readings as high as XX uR/hr.

3.1.5 Summary

WNI's initial measurements revealed that XX% of all gamma and soil sample grids were below the radium regulatory limit. Following the initial surveys, all gamma grids and soil grids that were in excess of limits were excavated until results indicated concentrations below the applicable limit. XDOH data confirm that ABC's sampling process was valid. In conclusion, the XDOH's review of radiation cleanup and control has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

3.2 RADIATION CLEANUP AND CONTROL (EXAMPLE 2)

3.2.1 Introduction

Cleanup of the site was based on the approved Decommissioning Plan (reference) ~~(~~[include License Conditions or tie downs~~)~~]. The operating history of the facility was reviewed such that all potential sources of contamination were identified. Applicable Federal and State regulations and standards were identified during the development of the Decommissioning Plan and are outlined in Table XX. ~~(~~[insert table with drivers, including equivalent 10 CFR 40 App. A Criteria 6(6) state regulations, if alternate standards were approved, the basis for approval, and demonstration of protectiveness of public health and the environment from the alternate methods need to be discussed too~~)~~]. Cleanup parameters and guidelines were appropriate and designed to demonstrate compliance to the drivers. Disequilibrium (Th-230, Ra-226, U-tot) was evaluated, and cleanup criteria were established in accordance with XXX (equivalent Criteria 6(6) rule).

MARSSIM methodologies (NUREG 1575) were applied ~~{~~[or an alternate approved method~~}~~]for demonstrating cleanup. The MARSSIM process utilized the Data Quality Objectives process such that stakeholder data requirements were identified and applied (references).

Characterization of the site was performed to identify impacted areas outside the impoundment (e.g., mill buildings, haul roads, bone yards). Background was appropriately determined using reference areas representing the various media [include results]. Areas were then classified properly according to contamination potential.

3.2.2 Millsite Decommissioning

Remediation activities at the site commenced in XXX and ended in XXX. Remediation (demolition/excavation) technologies (or alternate methods) were evaluated and found to be effective. Effluent controls were in effect for air, water, and soil. Environmental monitoring was in place for all affected media. Changes from the Decommissioning Plan were explained and justified (reference). A total of xx structures were remediated, and approximately XXXX cubic yards of material were placed in the impoundment, including building rubble, soils, and other permitted materials. Buildings were remediated by xx process. XX acres of the site were remediated to free-release criteria. Due to XXX factors, sections XXX will require institutional controls, and will be transferred to [DOE's Long Term ~~Custody~~ Surveillance and Maintenance Program] along with the impoundment, as agreed to in XXXX.

3.2.3 Final Status Surveys

Concurrent with remediation activities, Final Status Surveys (FSS) were conducted to demonstrate cleanup to the stated goals. The FSS designs were reviewed and approved by the State (reference). Appropriate instrumentation was chosen for the contaminants of interest and properly calibrated. Th-230 was evaluated by correlation to Ra-226 where feasible, and through soil analysis where a correlation could not be demonstrated. Minimum detectable concentrations of survey instrumentation and other DQOs were compared to plans. The surveys consisted of a combination of gamma scans and soil samples. Borehole surveys for subsurface verification were also made, although subsurface contamination is not addressed under MARSSIM. [A summary of survey units, scan and sample results is presented below in Tables XX-XX (see example 1).]

Verification and validation of the survey results combined with an assessment of the quantity and quality of the data were conducted. The data were validated to ensure that the results supported the objectives of the survey. The Final Status Survey was accurate and complete.

3.2.4 Independent Verification

An independent verification survey was conducted by XXX. Approximately XX% of the survey units were surveyed by the independent verification contractor. Results from the independent verification surveys were compared to the results of the site contractor. The results were in relative agreement, indicating that the FSS report is representative of site conditions. A letter of verification accompanied the report (reference).

3.2.5 State Oversight [insert narrative]

In addition to the independent verification, the state conducted XX site visits, XX inspections, collected XX samples, and conducted XX gamma surveys on XX survey units. Results of the state's surveys were compared to the site contractor's results and are in good agreement. (references). [Insert table with results of State analyses].

3.2.6 Summary

Remedial Action was effective and comprehensive. The Completion Report is comprehensive and represents decommissioning efforts. Appropriate oversight for the project was maintained through the licensing process. In conclusion, the XDOH's review of radiation cleanup and control has found the XYZ site to be in conformance with regulatory requirements of criteria X, X and X in 10 CFR Part 40 Appendix A (or equivalent State regulations).

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

4.1 GROUNDWATER REMEDIATION (EXAMPLE 1: No Action Scenario)

There is no evidence of impact to ground water at ABC's tailings facility. From the beginning of ABC's operations, tailings were neutralized prior to discharge to the lined impoundment, significantly reducing the risk for ground water contamination (reference).

The hydrogeology of the site was evaluated prior to construction of the tailings impoundment in 1978 and again as part of the design phase of the reclamation cover. The basin hydrologic evaluation was performed by ABC to characterize physical parameters, which control groundwater occurrence, flow, and potential transport of contaminants. Results of this evaluation and the tailings impoundment investigation were reviewed by XDOH (reference). XDOH supplemented review of ABC's hydrogeologic evaluation with geologic and hydrogeolgic field evaluations by XDOH staff. XDOH staff also independently reviewed published geologic and hydrogeologic literature for the area of ABC's facility. XDOH staff reviews have confirmed the findings reported by XDOH (reference).

4.1.1 Monitoring Wells

Monitoring wells have been in place surrounding the tailings impoundment since before operations began through the Monitoring and Stabilization phase of the project. Groundwater data have been evaluated by XDOH since 1978 for possible leakage from the impoundment (reference). ABC sampled tailings pore fluid for all hazardous constituents defined by XDOH regulations (reference) and found that the hazardous constituents which could be of concern for ground water are uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium (reference). Therefore, ground water samples were analyzed for these constituents along with other indicator parameters such as TDS, pH, temperature, sulfate, chloride, and other metals. Samples have been obtained quarterly by ABC since before operations began.

4.1.2 State's Split Sampling

XDOH has split ground water samples from all of the monitoring wells with ~~WNI~~ ABC and had the samples analyzed at the department's independent laboratory. Samples have been obtained from monitoring wells by XDOH semi-annually since operations began in 1978, through 1999. Ground water samples are collected by XDOH when static water levels of the aquifer are at the seasonally high and low periods of the year. Review of the analytical results from the department's laboratory shows the same water quality trends compared to the analytical results from ABC's laboratory.

The Monitoring and Stabilization Plan included three levels of monitoring for frequency and constituent evaluation depending upon conservative trigger exceedances. Although conservative trigger levels have resulted in increased monitoring surveillance, no federal or state regulatory standards have been exceeded (reference). XDOH's review of all ground water quality data has determined that the hazardous constituents in the tailings impoundment (uranium, radium 226, radium 228, thorium 230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory levels. Fluctuations in static water levels and indicator parameter values (e.g., sulfate and chloride), observed during post-reclamation construction compliance monitoring, are consistent with anticipated trends and values (reference).

4.1.3 Geo-Chemistry

An extensive independent geochemical review of the tailings impoundment and chemistry of the groundwater was conducted by a XDOH Geochemist. The purpose of the review was to evaluate long-term water quality of the site. The conclusions of this review are that the tailings should remain saturated (not dewatered), and groundwater quality should remain good (reference). Dewatering of tailings was considered, but XDOH determined that for long-term groundwater protection, dewatering of tailings was not desirable or required (reference).

4.1.4 Summary

XDOH has made a determination that the closure of licensee's facility is in compliance with State ground water regulations associated with uranium mill closure. The closure is specifically in compliance with the following ground water criteria delineated in Chapter XXX-XXXX [State regulations], Criterion 5 and Criterion 13, which incorporate the basic groundwater protection standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A which specifies groundwater monitoring requirements.

4.2 GROUNDWATER REMEDIATION (EXAMPLE 2: Remediation Scenario)

Analytical results of groundwater samples collected from monitoring wells at the licensee's facility indicate that the shallow aquifer has been contaminated by the tailings impoundment at concentrations in excess of applicable standards (reference). Using these validated groundwater data, the extent of contamination was delineated by constructing isoconcentration plume maps for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium (reference). These data indicate that degradation of groundwater quality has occurred as a result of the licensee's milling operations which warranted groundwater restoration actions. Subsequent to dewatering, removal, and transfer of the tailings to another licensed site, XDOH worked with the licensee to remediate groundwater contamination (reference).

4.2.1 Remedial Selection

The following groundwater remedial alternatives were reviewed by XDOH (reference):

1) natural flushing,
2) hydraulic gradient control via infiltration galleries,
3) slurry wall, ground water pumping wells, and evaporation pond disposal,
4) groundwater pumping wells, wastewater treatment, and discharge to the XXXX River, and
5) permeable reactive barriers.

Results of the review indicated that Option 5, permeable reactive barriers, was the most technologically efficient and cost effective remedy based on site-specific characteristics and the nature and extent of groundwater contamination at ABC's facility (reference). Permeable reactive barriers avoid the technological limitations and budgetary constraints associated with traditional approaches such as pump and treat technology (reference). Another significant advantage of permeable reactive barriers is the greatly reduced operation and maintenance costs which are limited to simple groundwater head and water quality monitoring (reference). Permeable reactive barriers are placed in the path of a migrating plume of contaminated ground water and reactive media within the barrier promote geochemical reactions that result in the destruction, immobilization, and/or stabilization of groundwater contaminants.

4.2.2 Alternate Concentration Limits (optional)

Additional assessment studies of tailings contaminant fate, aquatic toxicology, and environmental risk were conducted to develop alternate concentration limits (ACLs) for the contaminants of concern at ABC's facility including ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium (Reference). The establishment of ACLs was dependent on the approval by the State Water Quality Board and the exclusion of current and future water rights for local groundwater and surface water by the State Engineers Office (reference).

4.2.3 Remedial Implementation

After delineating the areal extent of groundwater contamination and characterizing the horizontal and vertical hydraulic gradients of the aquifer, two separate permeable reactive barriers were installed at ABC's facility including: 1) a zero-valent iron reactive wall was installed across the tailings area and the former mill site location to remediate uranium and heavy metals, and 2) a shorter zeolite reactive wall was installed in a second trench located behind the zero-valent iron reactive wall to remediate ammonia (reference). Both permeable reactive barriers were installed as simple reactive walls because site characteristics prevented the construction of low-permeability funnel walls on the sides of the reactive walls (reference). The design and installation of the permeable reactive barriers included ground water flow modeling and engineering analysis for optimal reactive wall design and to properly position the reactive walls in the local groundwater flow system (reference).

The design analyses for the permeable reactive barrier included evaluations of the barrier's life-cycle; considering the amount of reactive mass necessary to assure that groundwater concentrations would remain within compliance limits for the closure design life, and whether the barrier permeability would not be adversely impacted by the precipitation of minerals or microbial growth (reference). Post-closure monitoring of the permeable reactive barrier was performed for a period of

XX years before the license termination request was submitted to demonstrate the barrier was performing as designed (reference).

[Scenario for post-license termination monitoring of reactive barrier if warranted at a specific site]

Even though post-closure monitoring has confirmed that the reactive barrier is performing as designed, monitoring is recommended beyond license termina tion in order to evaluate long-term groundwater and reactive barrier chemistry. The costs associated with long-term groundwater monitoring and potential reactive barrier replacement have been calculated and included in the Perpetual Care and Maintenance Fund.

4.2.4 Remedial Monitoring

Monitoring wells and piezometers were completed in the contaminated and uncontaminated portions of the aquifer and in the permeable reactive barriers to monitor groundwater head and water quality during remediation (reference). Piezometers were installed in the zero-valent iron and zeolite reactive walls to monitor reactive wall performance including changes in internal groundwater head, flux, and water chemistry (reference). Bimonthly monitoring was conducted by the licensee during the first two years of operation followed by semi-annual monitoring in years three to five, then annually thereafter (reference).

Split groundwater samples were analyzed by the State Laboratory on a semi-annual basis for the first five years of remediation and annually thereafter. Groundwater samples were collected by the State when static water levels of the aquifer were at seasonally high and low periods of the year. Analytical results of split samples from the State Laboratory are in agreement with ABC's laboratory analytical results and indicate that all contaminants of concern have been reduced to concentrations below applicable standards (references).

4.2.5 Permeable Reactive Barrier Closure

In-place closure of the permeable reactive barriers was achieved by grouting the reactive walls in order to hydraulically and chemically isolate the zero-valent iron and zeolite reactive media.

4.2.6 Post-Closure Monitoring

Post-closure ground water monitoring of point-of-compliance (POC) wells will be conducted as part of the long-term surveillance plan (LTSP) to ensure that the closed reactive walls remain hydraulically and chemically isolated. Groundwater samples from POC wells will be analyzed for ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium.

4.2.7 Summary

XDOH has determined that groundwater contamination at ABC's facility has been remediated to concentrations below applicable standards [or ACLs] and license requirements for the contaminants of concern which include ammonia, chloride, molybdenum, nitrate, selenium, sulfate, and uranium. As a result of these successful groundwater restoration actions, XDOH has determined that closure of ABC's facility is in compliance with State groundwater regulations (reference) associated with

uranium mill closure. The closure is specifically in compliance with the following groundwater criteria delineated in Chapter XXX-XXX-XXX State regulations, Criteria 5, 6(g), and 13, which incorporate the basic groundwater protection standards imposed by EPA in 40 CFR Part 192, Subparts D and E; and imposed by NRC in 10 CFR Part 40, Appendix A, Criteria, 5, 6(7), and 13, which specify groundwater monitoring requirements.

(Sample Paragraph**)**
The licensee provided sufficient information to characterize the geologic units of interest, the transport properties, extent of contamination, and water use from the aquifer. A groundwater sampling program (monitoring well placement and sampling protocols) was proposed and approved by XDOH. The licensee presented the results of the groundwater monitoring program which enabled the licensee to devise a remediation strategy and justification which was approved by XDOH.

5. Discussion of results of State's site closure inspections

XDOH has performed many site closure inspections over the years as the site remediation moved from one phase to the next. XDOH has employed inspection staff or provided specialized consultants to review and verify virtually every aspect of site closure. Please see page 1 of this report, indicating the technical reviewers (and their credentials and expertise) involved in recent reclamation aspects (over the past XX years). There have been many other department staff involved in the ABC project, who have provided state regulatory responsibility and stewardship of this site during its early phases.

Results of XDOH's site inspections have been to provide a presence to ensure the site reclamation activities are performed as required by regulation and license condition. For significant aspects of reclamation, ABC submitted detailed plans and specifications for the work. These plans were reviewed and approved by XDOH. In these cases, XDOH inspectors have performed many field inspections to verify conformance of site activities to approved plans. This is particularly the case for reclamation construction of the diversion channel and thick, vegetated cover. Of particular emphasis was inspection of soil, rock, vegetation, and groundwater.

Monitoring during site closure has continued to evaluate environmental media and site performance. Periodic inspection and monitoring activities have been performed to determine radionuclide concentrations in soil, air, and ground water. ABC has been required to perform this monitoring and to report results annually. XDOH has performed split sampling and has evaluated monitoring results in the State's independent laboratory to provide verification of ABC's results.

6. **Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and included the bases for the State's conclusion.**

XDOH has determined that the release for unrestricted use and removal of the subject site will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date, based on the following: The site being removed from the license is not contiguous with any other site associated with licensed activities: removal of the sites from their associated license will not in any way prevent or hinder the licensee ability to complete decommissioning of the remainder of the licensed areas.

REFERENCES

This page left blank intentionally.

Appendix C - Sample Completion Review Report for Non-conventional Uranium Milling License

Note to the reader who may use this appendix as a guidance document to prepare a Completion Review Report

The sample Completion Review Report (CRR) was developed by a working group composed of Agreement State and NRC staff. As stated in the procedure, prior to license termination, Agreement States submit CRRs for NRC review. The CRR would document State staff's bases in summary form for its conclusion that all applicable standards and requirements have been met.
The purpose of this sample CRR is intended to generally show the level of detailed information in a variety of technical areas which should be provided in the CRR. The working group recognized that no single site, or any existing documentation, could serve as a complete template for all aspects of site closure, since each non-conventional uranium milling site is likely to have its own site-specific conditions that would be unique to that site. To cover as many aspects of license termination activities as possible, the sample CRR is a composite of examples from a number of existing documents. Stakeholders' comments and input have also been considered and reflected in the sample CRR.

The reader is advised that the sample CRR is by no means to provide a complete list of all applicable standards and requirements that need to be addressed nor complete boiler-plate language to be used as bases for conclusions. Rather, the level of detailed information contained in the sample CRR covering a variety of technical issues is what is expected to be included in the CRR.

Agreement State Radiation Control Program

COMPLETION REVIEW REPORT

Date:
Licensee: XXXXX
License Number: XX-XXXX-X
Facility Name: XXXXX
Location: XXXXX, State
Licensed Area Being Terminated: approximately X,XXX acres
Manager:
Technical Reviewers: John Smith, M.S.,P.E. (Hydrologic Engineer)

SUMMARY

The ABC Company's XYZ site is ~~the~~ an in-situ leach mining and processing site decommissioned and reclaimed under XXX State Department of Health (XDOH) Agreement State authority, derived from Title II of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). UMTRCA requires that prior to termination of the license, the regulatory agency shall make a determination that the licensee has complied with all applicable standards and requirements. Under the Agreement State program, the State of XXX is responsible for approval of the remediation plans for ABC and for site inspections to ensure that the actual remedial actions have been completed pursuant to the approved plans.

This report documents XDOH's basis for its conclusion that decommissioning and reclamation have been acceptably completed at the XYZ site. The U.S. Nuclear Regulatory Commission's (NRC's) Procedure SA-900 entitled, "Termination of Uranium Milling Licenses in Agreement States," was used to prepare this report.

The primary applicable standards for uranium mill reclamation is Chapter XXX-XXX XAC (State Administrative Code), entitled Radiation Protection-Uranium and/or Thorium Milling. This State regulation is consistent with and compatible with federal regulations, as required by the State's Agreement State status with the NRC.

All applicable standards and requirements, with appropriate references to related sections of the CRR, are identified in the Table below. XDOH has performed a complete review of the XYZ site for compliance with all applicable standards and requirements. As part of that review, XDOH has prepared a Technical Evaluation Report (TER) (reference) or other technical reviews (reference(s)) to document the State's review. The TER or other technical reviews may provide reference to more detailed evaluations by the State and to ABC's documents submitted for State review during the site's reclamation period.

Appendix C -- Sample Completion Review Report (Non-conventional)

Table 1. Applicable Standards and Requirements* Related to Topics Discussed in the CRR

Applicable Standards / Requirements	CRR Sections	TER Sections**
State regulation XX.XXXX Restoration of ground water with all wells plugged and capped. Criteria for groundwater restoration	Sections 2 and 3	Section X.XX
State regulation XX.XXXX Surface decontamination to a level sufficient for unrestricted use. Criteria for release for unrestricted use	Section 4	Section X.XX
State regulation XX.XXXX Release of equipment and materials. Criteria for release of equipment and materials for unrestricted use	Section 4	Section X.XX
Other applicable standards and requirements		

* As defined in section V.C of the STP SA-900 Procedure issued on date month, 2XXX.
**Sections in TERs or equivalent reference documents.

In conclusion, XDOH believes that the ABC's XYZ site has met all applicable standards and requirements. With a determination by NRC, as required by Section 274c(4) of the Atomic Energy Act of 1954, as amended (AEA), that all applicable standards and requirements have been met, the radioactive material license, XX-XXXX-X, may be terminated.

1. Licensee's activities associated with decommissioning license termination.

The XYZ project is an in-situ leach uranium mine located near XXX, State. XYZ's uranium leases cover approximately X,XXX contiguous acres of land. The site facility included a main building (housing offices, a warehouse, a lab, and maintenance facilities), a processing plant,[four PVC lined] water storage ponds, a production well-field, an irrigation area, and a deep disposal well. The site was operated from 19XX to 19XX when production operations were ceased.

From XXXX until XXXX [active/passive] ground water restoration was performed along with limited surface reclamation. The State Water Commission authorized ceasing groundwater restoration and final plugging of all wells [in the Fall of 19XX]. Following plugging of all wells, full-scale surface reclamation and decommissioning began. Any material and/or equipment which was contaminated was disposed of by 1) transfer to another licensed mine site; 2) decontamination and release for

unrestricted use; or 3) disposal at [a licensed byproduct disposal facility]. The State staff has determined that proper release for disposal, recycle or reuse, of all material and /or equipment was adequately documented by the licensee.

The licensee performed surveys to confirm the effectiveness of reclamation and decommissioning activities. The surveys consisted of scans, direct and /or swipe surveys of all affected areas. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from four 10 meter by 10 meter areas per acre or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.]. Reclamation and decommissioning activities were completed in XXXX.

In XXXX, XDOH staff performed confirmatory surveys of the facility. [Two times background (reference). The survey was performed by walking 10 meters apart moving across the wellfield pattern. Soil samples were taken from a 100 square meter area around areas that exceeded two times background. Or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.] Post-cleanup surveys conducted by XDOH staff indicate that the site has been decontaminated to a radiation level that meets the State release criteria (reference). Analysis of all soil samples indicates that average radium-226 and uranium concentrations were below release criteria of [5 pCi/g and 30 pCi/g, respectively].

On site disposal of radioactive materials was not authorized at this facility, thus there is no land to be transferred to the State or the Federal Government.

2. Groundwater Restoration Information

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: XDOH has received the restoration data for Productions Area XX of the XYZ mine. A review of the data shows that the production area has been restored in accordance with the specifications contained in permit XX-XXXX and as required by State regulations XX-XXX-XXXX. ABC has been authorized to cease any restoration activities, including monitoring, at the production area.

3. Wellfield Decommission Documentation

A letter/letters (attached) dated XXXX from XDOH to the ABC provides the following information: In accordance with State regulations XX-XXXX-XX, XDOH revokes permit XXXX. Groundwater was restored following criteria set forth in State regulations XX-XXXX-XXXX. All of the Class III wells were plugged as of month year, and certifications have been received from the mine operator and from an independent registered processional engineer that plugging was accomplished in accordance with the plugging and abandonment plan in the permit.

4. Site Decommissioning Documentation

(Sample Paragraph 1)
During surface reclamation and decommissioning all material and equipment was surveyed for radioactive contamination. Any material and/or equipment which was contaminated was released by utilizing one of the following methods: 1) transfer to another licensee; 2) decontamination and released for unrestricted reuse or recyling; 3) or disposal at a licensed byproduct disposal facility.

(Sample Paragraph 2)
All materials, equipment and facilities to be released for unrestricted use (e.g., reuse, recycle, or disposal) have been surveyed by ABC to demonstrate compliance with State regulations for control of radiation xx.xxx. The surveys consisted of scans, direct measurements and swipes for determination of removable activity. These surveys ~~has~~ have been taken and documented by ABC to meet these criteria as summarized below:

[(1) Removable surface contamination: 1000 dpm alpha per 1000 m^2
(2) Fixed surface contamination (average over 1 m^2): 5000 dpm alpha/beta per 100 cm^2
(3) Maximum fixed contamination: 15,000 dpm alpha/beta per 100 cm^2]

All soils have been surveyed to demonstrate compliance with the requirements of State regulation xx.xxx. These surveys have been completed and documented to meet these criteria:

[(1) 5 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over the first 15 cm depth of soil
(2) 15 pCi/gm of Ra-226 averaged over any 100 m^2 area and averaged over any subsequent 15 cm depth of soil.
(3) 30 pCi/gm of U-nat.]

(Sample Paragraph 3)
A closure plan was written that identified all areas potentially contaminated by licensed activities and accidents included:

(a). Radiological surveys (including measurement, sampling, and laboratory analysis)
to assess radiological contamination of all soil, equipment, and buildings.
(b). Criteria and procedures for decontamination of soil, equipment, and buildings.
(c). Criteria for release of soil, equipment and buildings for unrestricted use.
(d). Disposal of contaminated soil, equipment, and buildings.
(e). Decommissioning of storage/treatment ponds.
(f). Post-cleanup surveys.

5. Discussion of Results of Radiation Survey and Confirmatory Soil Samples

Surveys, conducted by ABC, to confirm the effectiveness of reclamation and decommissioning activities were performed by scans, direct and /or swipe surveys of equipment and structures to be turned over to the landowner. [Direct survey of land was conducted by taking readings at 10 meter intervals across the wellfield pattern. Soil samples were taken from three 10 meter by 10 meter areas per acre. or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc]. ABC subsequently requested termination of its license.

In month, year, XDOH staff performed confirmatory surveys of the wellfield. The surveys were performed using [one-by-one sodium iodide probes and XXXX survey meters]. The survey was performed by [walking 10 meters apart moving across the well field pattern (reference) Or insert applicable survey protocol (e.g., MARSSIM), DCGLs, etc.]

Background gamma count rate readings were approximately [x,xxx cpm or mR/hr] on all meters. As a result of the surveys, [twenty-nine] areas were identified as having readings greater than the action level. These areas were cleaned up by the licensee and resurveyed by XDOH personnel. All areas resurveyed had readings which were less than action level.

Concurrently XDOH personnel collected soil samples form xx areas. Soil sample results were within the regulatory limits for radium-226 and natural uranium soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively], except for [two] soil samples which exceeded these limits.

In month, year, XDOH staff returned to the production area to resurvey and take soil samples after the licensee had cleaned the two areas that had exceeded release limits. Soil sample results were within the regulatory limits for radium-226 and natural soil concentrations of [5 pCi/gm and 30 pCi/gm, respectively].

6. Discussion of results of State's site closure inspections.

On month date, XDOH staff performed a survey of ABC's XYZ site. The surveys were performed using [one-by-one sodium iodide probes and XXXX ~~survey~~ instruments]. The purpose of the survey was to allow ABC to release the X.X acres for unrelestricted use. Two times background was used as an allowable limit (Reglatory Guide X.XX). The survey was performed by walking 10 meters apart moving acorss the wellfield pattern. Background readings ranged from XXXX -XXXX cpm.

One area was identified which exceeded two times background. A visible pile of pipescale on the surface was the cause for the elevated reading. This area was cleaned up by ABC and a post-cleanup survey indicated no readings above background.

Since no elevated readings were found in the production [except for the pile of visible pipescale], soil samples were not collected.

On-site disposal of solid radioactive material or byproduct material was not authorized at the XYZ site, thus there is no land to be transferred to the State or the Federal Government. As a result of these findings, XDOH is proposing to remove the XYZ site from the license.

7. Statement of Basis for Release [Partial license termination]

XDOH has determined that the release for unrestricted use and removal of [the subject site] will not negatively impact the remainder of the sites associated with the license, which will be released for unrestricted use and removed from the license at a later date,. XDOH based its decision on the following: The site(s) being removed from the license [is/are] not contiguous with any other site associated with licensed activities that may lead to recontamination of the release site(s), and removal of the sites from their associated license will not in any way prevent or hinder the licensee's ability to complete decommissioning of the remainder of the licensed areas.

REFERENCES

This page left blank intentionally.

Appendix D - Sample NRC determination letter for Conventional Uranium Milling License

Month Date, Year

, Director
State Agency Address

Dear

We have completed review of your Month Date, Year submittal, regarding the proposed termination of Radioactive Material License, xx-xxxx-x, issued to ABC. The license covered the ABC's XYZ Site, a conventional uranium mill facility located near XXX, State. You requested in your submittal that the U.S. Nuclear Regulatory Commission make a determination that all applicable standards and requirements pertaining to reclamation of the XYZ Site have been met.

The process that we used to make the determination is set out in the Office of State and Tribal Programs Procedure SA-900. Our determination is based on two supporting bases: review of a Completion Review Report (CRR) documenting the State Department of Health (XDOH) staff's bases for its conclusion that all requirements have been met; and review of State Agreement State uranium recovery program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP).

First, the information you have submitted in the CRR, dated Month Date, Year, documents that the XDOH has performed a complete review of the XYZ Site for compliance with regulatory and license requirements. XDOH's review covered all necessary technical areas and regulatory requirements relating to reclamation of the XYZ Site including geotechnical engineering, surface water hydrology and erosion protection, radiation cleanup and control, and groundwater protection. XDOH also conducted appropriate inspections of site reclamation activities at the XYZ Site. Based on the review findings documented in the CRR, XDOH concluded that the XYZ Site has met all regulatory and license requirements.

Second, the most recent IMPEP review of the State Agreement State Program, conducted in Month Year, concluded that the State program is adequate to protect public health and safety, and compatible with NRC's regulatory program. This finding is consistent with previous State program evaluation findings.

Based on our review of the above information and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License, XX-XXXX-X.

Appendix D -- NRC Determination Letter (Conventional)

A copy of our evaluation report, without associated attachments, entitled "Documentation of NRC Review on the Termination Findings of the ABC's Uranium Milling License Submitted by the State Department of Health" is enclosed.

If you have any questions, or we can be of further assistance, please contact me or STP Staff Name at (301) 415-XXXX.

Sincerely,

STP Director
Office of State and Tribal Programs

Enclosure:
As stated

Appendix D -- NRC Determination Letter (Conventional)

Documentation of NRC Review on the Termination Findings of the ABC's XYZ Uranium Milling License Submitted by the XXXX State Department of Health

Licensee: A... B... C... (ABC)
Licensee No.: XX-XXXX-X
Location:
Area: approximately XXX acres
Type of License: Conventional Uranium Milling License
Full / Partial License Termination: Full License Termination

A. Documentation of major events/activities related to the review of the XYZ Proposal

1. On month date, 2XXX, the NRC staff received a letter from the U.S. Department of Energy (DOE) regarding the Long-Term Surveillance Plan (LTSP) for the ABC's XYZ site. The DOE letter can be found in Attachment X.

2. On month date, 2XXX, NRC staff received the ABC's XYZ draft proposal from XDOH. A letter dated month date, 2XXX with a copy of the XDOH's draft Completion Review Report (CRR) can be found in Attachment X.

3. The review was conducted by an NRC staff team. A list of NRC staff technical reviewers can be found in Attachment X.

4. On month date, 2XXX, NRC staff discussed the review process and status of NRC's review of the XYZ's draft proposal at a meeting with DOE, XDOH and ABC representatives.

5. On month date, 2XXX, after completing review of the draft CRR, NRC staff provided comments to XDOH. The cover letter and attached comments can be found in Attachment X.

6. On month date, 2XXX, NRC staff met at the ABC's XYZ site with DOE, XDOH and ABC representatives to observe site conditions and to discuss LTSP issues. NRC's comments (See Attachment X) on XDOH's draft CRR were also discussed.

7. On month date, 2XXX, NRC staff received XDOH's response to the month date, 2XXX letter. The letter, dated month date, 2xxx and its attachment, ABC's response letter to NRC's comments, can be found in Attachment X.

8. On month date, 2XXX, NRC and XDOH staff met to discuss the status of NRC's review, areas needing further information or clarification (See Table below), XDOH feedback and comments on the review process, future actions, and a proposed schedule for completion of the review.

Sample Table

No.	REVIEW AREA	POTENTIAL SIGNIFICANCE
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Staff needs further supporting information to complete our review of XDOH's basis for its conclusion that the subject site has been cleaned up to the standards.
2.	Identify applicable standards / requirements	Provide brief description of further supporting information needed to complete NRC's review of XDOH's basis for its conclusion.

9. On month date, 2XXX, NRC staff met with DOE, XDOH and ABC representatives to discuss the status of NRC's review, areas where further information or clarification were needed, and the schedule for completion of the review.

10. On month date, 2XXX, NRC staff received Revision #1 to the draft CRR from XDOH. XDOH indicated Revision #1 to the draft CRR provided responses to NRC's comments as documented in Attachment X. The month date, 2XXX letter and its attachment can be found in Attachment X.

11. On month date, 2XXX, after completing review of Revision #1 to the draft CRR, NRC staff communicated with XDOH staff through e-mail on areas where further information or clarification was needed. On month date, 2XXX, XDOH staff provided responses to NRC's comments through e-mail. These e-mails can be found in Attachment X.

12. On month date, 2XXX, NRC staff provided comments to DOE on a draft LTSP. The comments reflect consideration of information contained in the draft CRR and resulting from NRC staff review of the draft CRR. The letter notes that because the mill tailings will be saturated for an indefinite period of time, and a large amount of water is impounded behind the dam, the tailings impoundment system is formally classified as a dam. To meet Federal obligations under the requirements of the National Dam Safety Program Act, the dam must be inspected at regular intervals. The letter concludes that additional inspection items that must be included in the LTSP to meet applicable requirements. The comment letter and its attachment can be found in Attachment X.

13. On month date, 2XXX , NRC staff received the final CRR, from XDOH. Following review, NRC staff concluded that the final CRR addressed all NRC's comments and provided XDOH staff's bases for its conclusion that the ABC's XYZ Site has met all regulatory and license requirements. The letter and its attachment can be found in Attachment X.

14. The five issues identified during the month date, 2XXX meeting were closed based on additional information documented in the final CRR (Items X-X) or based on information provided in the month date, 2XXX letter from NRC to DOE (Item X). This is summarized in the Table below.

Sample Table

No.	REVIEW AREA	COMMENTS
1.	Radiation Cleanup and Control Appendix A to 10 CFR Part 40, Criterion 6(1)(ii), (5) and (6), Radiation Surveys and Soil Sample Analyses	Additional information is documented in the Radiation Cleanup and Control portion of the final CRR.
2.	Identify applicable standards / requirements	Additional information is documented in the XXXX portion of the final CRR.

B. Documentation of review comments on items specified in the STP procedure SA-900 "Termination of Uranium Mill Licenses in Agreement States."

1. A brief description of licensee's activities associated with decommissioning, tailings remediation and/or groundwater cleanup.

   Comment: This information is provided in section X of the final CRR. The submitted information was found to be complete.

2. Documentation that the completed surface remedial actions were performed in accordance with license requirements and regulations.

   Comment: This information is provided in section X of the final CRR. XDOH staff reviewed geotechnical stability, surface water hydrology and erosion protection, and radon emanation aspects of the reclamation of ABC's XYZ site. Based on its evaluation, it was concluded that reclamation of the site has met all applicable standards and conformed with design specifications. The submitted information was found to be acceptable.

3. Documentation that the completed site decommissioning actions were performed in accordance with license requirements and regulations. This documentation should include a discussion of results of radiation surveys and confirmatory soil samples which indicates that the subject site meets unrestricted release requirements.

   Comment: This information is provided in section X of the final CRR. It is stated that ABC's initial measurement indicated that XX% of all gamma and soil sample grids were below the radium regulatory limit. Following the initial surveys, all gamma grids and soil grids that were in excess of limits were excavated until results indicated concentrations below the applicable limit. XDOH data confirm that ABC's sampling process was valid. It was concluded by XDOH that residual radioactive material in all the areas potentially impacted by the mill operation were cleaned up to the State standards. The submitted information was found to be acceptable.

4. Documentation that the completed groundwater corrective actions, if necessary, were performed in accordance with license requirements and regulations.

   Comment: This information is provided in section X of the final CRR. XDOH's review of all groundwater quality data has determined that the hazardous constituents in the tailings impoundment (uranium, Ra-226, Ra-228, Th-230, arsenic, nickel, and thallium) are stable in groundwater within the range of natural variability and remain below regulatory limits. It was concluded by XDOH that the closure of ABC's XYZ site is in compliance with XXXX State groundwater regulations associated with uranium mill closure. The submitted information was found to be acceptable.

5. Discussion of results of State's site closure inspection(s).

   Comment: This information is provided in section X of the final CRR. It is stated that XDOH staff has performed appropriate site reclamation inspections over the years as site remediation moved from one phase to the next. XDOH employed inspection staff or provided specialized consultants to review and verify all important aspects of site closure. It was concluded that results of XDOH staff site inspections have provided a presence to ensure that site reclamation activities were performed as required by regulation and license conditions. The submitted information was found to be acceptable.

6. Documentation that release of this portion of the site will not negatively impact the remainder of the site to be closed at a later date, if it is a partial license termination case. Such documentation could be a statement from the appropriate State regulatory agency which confirms that the impact has been evaluated and includes the bases for the State's conclusion.

   Comment: Not applicable. This is a full license termination.

7. IMPEP review of the XDOH uranium recovery regulatory program

   Comment: Based on 2XXX IMPEP review, the XDOH uranium recovery program was found to be satisfactory based on the IMPEP evaluation criteria. (A satisfactory rating is the highest rating possible for each IMPEP common and non-common performance indicator.) The overall XXXX (State name) Agreement State program was found to be adequate to protect public health and safety and compatible with NRC's program. The IMPEP team had one recommendation in the Uranium Recovery area that the State develop additional specialized inspection procedures.

Based on review of the above information, as specified in the STP SA-900 Procedure, and in accordance with the provisions at 10 CFR 150.15a(a) and Section 274c of the Atomic Energy Act of 1954, as amended, the staff determines that all applicable standards and requirements have been met for the termination of the Radioactive Material License, XX-XXXXX-X.

Appendix D -- NRC Determination Letter (Conventional)

Project Manager: _____ Date: _____
Full Name, Title
Office of State and Tribal Programs

Office Director: _____ Date: _____
Full Name, Director
Office of State and Tribal Programs

This page left blank intentionally.

Appendix E - Sample NRC determination letter for Non-conventional Uranium Milling License

State Agency
Address
Austin, Texas 78756-3189

Dear XXXX

We have completed our review of your month date, year submittal regarding the proposed termination of the Radioactive Material License No. XXXX issued to ABC, an in-situ leach uranium recovery facility located near City, State.

Closure of an in-situ leach uranium recovery site requires a demonstration that the groundwater has been adequately restored, all the wells have been closed and plugged according to the appropriate State statute, disposal or transfer of radioactive material is documented, and radiation surveys and confirmatory soil samples indicate that the site meets unrestricted release requirements.

The information you have submitted indicates that the groundwater has been restored by the licensee to the satisfaction of the State Agency. All the wells have been plugged and abandoned by the licensee as authorized by the State Agency. Based on the XDOH of the license termination, you reported that proper disposition of radioactive materials took place at the site and there has been no on-site disposal of radioactive materials; therefore, there is no need to transfer ownership of land to the State or the Federal Government.

XDOH has reviewed the results of radiation surveys submitted by the licensee and performed confirmatory surveys for the subject site. Post-cleanup surveys conducted by XDOH indicate that the site has been decontaminated to a radiation level that meets the State criteria. According to the XDOH report, the analysis of soil samples indicates that average radium-226, Thorium-230, and uranium concentrations were below the release criteria of [insert derived criterion 6(6) values]. The statements made in the submittals indicate that the XDOH has adequately determined that all license obligations have been met by the licensee.

The most recent review of the State Name Agreement State Program, conducted under the Integrated Materials Performance Evaluation Program (IMPEP) in month year, indicates that the State program is adequate to protect public health and safety, and compatible with NRC's program. This finding is consistent with the previous State program evaluations. Based on our review of the above information and in accordance with 10 CFR 150.15a(a), we determine that all applicable standards and requirements for the protection of the public health, safety and the environment have been met for the termination of the Radioactive Material License No. XXXX.

If we can be of further assistance in this regard, please contact me or [name] at
(301) 415-2598.

Sincerely,

Name , Director
Office of State Programs