COMMISSION MEETING SLIDES/EXHIBITS

MEETING ON RULEMAKING AND GUIDANCE DEVELOPMENT FOR URANIUM RECOVERY INDUSTRY

TUESDAY, APRIL 10, 2001

URANIUM RECOVERY: PART 41 AND STATUS

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Michael Layton, FCSS

Overview

- **Part 41 Rulemaking Alternatives**
- **Status of Uranium Recovery Actions**
- **Resources**
- **What We Learned from Other Stakeholders**

COMMENTS ON DRAFT RULEMAKING PLAN

- States and Industry
- Reflect issues in 1998 National Mining Association White Paper
- Uranium Industry economic status

SECY-01-0026 RULEMAKING ALTERNATIVES

- **Alternative 1 - Use National Material Programs Working Group**
- **Alternative 2 - Continue with Final Rulemaking Plan**
- **Alternative 3 - Discontinue Current Rulemaking and Revise Guidance**
- **Requesting Commission Guidance**

STATUS ON ACTIONS

- Two NRC/EPA meetings on ground-water protection at *In Situ* Leach facilities
- EPA views
  - Federal programs complementary
  - Some Authorized States more stringent
  - Duplication between NRC and States
  - Future meetings with States

STATUS ON ACTIONS

- **Regulatory Issues Summary (RIS 2000-23)**
  - **11e.(2) material at *In Situ* Leach facilities**
  - **Non- 11e.(2) material disposal**
  - **Alternate feed acceptability**
  - **Concurrent jurisdiction under the Atomic Energy Act**

STATUS ON ACTIONS

- **Issues being examined**
  - **Overlapping authority of the Atomic Energy Act and the Safe Drinking Water Act**
  - **Surface water discharges from some *In Situ* Leach facilities and uranium mills**

RESOURCES

- **Implemented efficiency and streamlining measures**
- **Reduction of resources in Fiscal Year 2001**
  - **reflected in the proposed fee rule**

WHAT WE LEARNED FROM OTHER STAKEHOLDERS

- EPA
- Non-Agreement States
- Agreement States
- Industry
- DOE
- Others

NMA Briefing on Selected Uranium Recovery Issues

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NMA Views on Alternatives for Rulemaking

Staff Paper Presents Three Options

- National Materials Program Pilot
- Continue to Develop Part 41 Rulemaking
- Discontinue the Part 41 Rulemaking

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Views on Option 1: Pilot Program

NMA Concerns

- Cost
- Timing
- Uncertain Expertise
- Consensus Format Inappropriate for Addressing Complex Technical and Legal Issues

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Views on Option 2: Continue to Develop Part 41

Part 41 Would Have Some Advantages

- Codification of Performance Based License Concept
- Rulemaking Provides Legal Certainty
- Reorganize to Delete Inappropriate or Unnecessary Requirements
- Add Appropriate and Necessary Requirements

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Views on Option 2 (Con't)

Concerns Regarding Development of Part 41

- Costs Overwhelms Advantages
- Industry Cannot Afford

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Views on Option 3: Discontinue the Part 41 Rulemaking

- NMA's Preferred Approach
  - Discontinue Rulemaking Efforts
  - Update Existing Guidance Documents

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Going Forward --Updating Guidance Documents

- NMA Will Provide NRC with Information Pertinent to Updating the Non11e.(2) Guidance
- NRC Can Address Listed Hazardous Waste Concerns in Updated Alternate Feed Guidance

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Going Forward --Non 11e.(2) Guidance

- NMA and Fuel Cycle Facilities Forum Developing Generic Criteria for Acceptance of Non-11e.(2) Material for Disposal in Tailings Piles
  - Criteria Will Ensure No Greater Health and Safety Concerns Will Be Presented by Added Materials
  - Criteria Will Identify Potential Jurisdictional Hurdles

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Going Forward -- Alternate Feed Guidance

- NRC Has Expressed Concerns About Listed Hazardous Wastes
  - Staff Should Review the State of Utah/IUC Protocol on Listed Hazardous Waste

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Dual Regulation Issues

- Non-Agreement State/NRC Jurisdiction in Light of Concurrent Jurisdiction Decision
- Jurisdiction over *In Situ* Leach Facilities
  - EPA/NRC Jurisdiction
  - State/NRC Jurisdiction

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Non-Agreement State Jurisdiction Over the Nonradiological Components of 11e.(2) Byproduct Material

- Some Non-Agreement States Appear Unwilling to Accept Commission Decision on Preemption
- NRC Should Clarify By Letter that the Commission's Preemption Decision is Effective Now

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Dual Regulation of *In Situ* Leach Uranium Recovery Facilities

- Overlapping Regulation by NRC/EPA (or State with Delegated UIC Program)
- Overlapping NRC Regulations and State ISL Regulations
  - Some States Have Extensive ISL Regulatory Programs
  - Submittals to State under ISL Program and to NRC Are Often Almost Identical

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Moving Forward --Dual Regulation of ISL Facilities (con't)

- MOUs
- Reliance on State ISL Program
  - Wyoming Governor Geringer Letter and Wyoming DEQ Letter
  - Review State Programs -- Nebraska, New Mexico, Wyoming

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Moving Forward --Dual Regulation of ISL Facilities (con't)

Reconsideration of NRC Jurisdiction Over ISL Program

- Asserting Jurisdiction Over All Wellfields Created Problems
  - §62 Requirement Regarding "Removal Place of Deposit in Nature" and Exemption for "Unimportant" Quantities
  - Making All Fluids 11e.(2) Created Additional Problems
  - NPDES Regulations Do Not Allow Discharge of Process Fluids From Mills or ISL Operations, but Do Allow Discharge of ISL Restoration Fluids, 40 C.F.R. §440.34.

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Consequences of Effluent Disposal Decision

- Decision to Treat Process and Restoration Fluids as 11e.(2) Byproduct Material is Inconsistent with Definitions of Byproduct Material, NPDES Regulations and Permits
- Distinction Between Process Fluids and Restoration Fluids is Not "Artificial" as Ore Body is Not 11e.(2) Byproduct Material

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Consequences of Effluent Disposal Decision Con't

- Decision Creates Complex, Burdensome and Unlawful Regulatory Scheme
  - Places All ISL Operations with NPDES Permits in Violation of Those Permits Ex Post Facto
  - Impacts Conventional Tailings Sites Also
  - Some Uranium Recovery Operators Have Received Implied NOVs
  - The Depleted Ore Body Effectively Becomes 11e.(2) Byproduct Material until Restoration is Complete

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Moving Forward -- Effluent Disposal

Move Forward by Moving Back – Reconsider Decision That All ISL Fluids Are 11e.(2) Byproduct Material

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Fee Structure for Uranium Recovery Licensees

- Economic State of the Industry
- Fees
  - Annual
  - Hourly
  - Project Manager Designation
- Possible Solutions

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Economic State of the Industry

- Price of U_3O_8
- Uranium Production
- NRC Fees
- What Fees Represent

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Price of U_3O_8

- Price Currently Hovers Around $8/lb
- NRC Fees May Be Last Nail in Coffin for Companies Just Holding On

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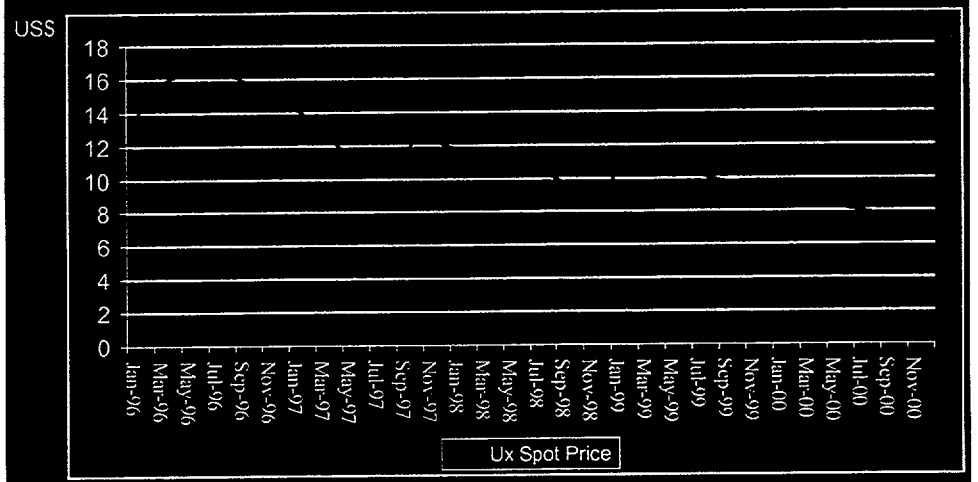
Decline of Uranium Spot Price Since Mid 1996



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Uranium Production

Total Production of Uranium Concentrate in the United States
(Pounds U_3O_8)

Calendar-Year Quarter	1996	1997	1998	1999	2000
1st Quarter	1,734,427	1,149,050	1,151,587	1,196,225	960,386
2nd Quarter	1,460,058	1,321,079	1,143,942	1,132,566	1,004,090
3rd Quarter	1,691,796	1,631,384	1,203,042	1,204,984	959,296
4th Quarter	1,434,425	1,541,052	1,206,003	1,076,897	860,389
Calendar-Year Total	**6,320,706**	**5,642,565**	**4,704,574**	**4,610,672**	**3,784,161**

Source Energy Information Agency
P – indicates preliminary data

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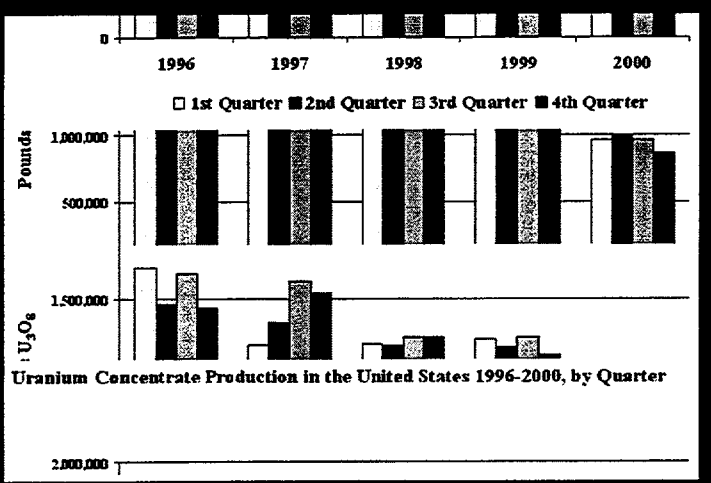

Uranium Concentrate Production in the United States 1996-2000, by Quarter

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NRC Fees

- NRC Required by Law to Recover Nearly 100 % of Costs -- Results in Licensees Charged for Activities Not Related to the License (Recent Changes are Not Enough)
- Hourly Fees Are Site-Specific but Are Quite High
- Project Manager Fees -- Recovery Began Last Year -- Bills Skyrocketed
- Unnecessary Duplication Further Boosts Fees Without Commensurate Benefit

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What Fees Represent

Example 1 -- Operating ISL Facility

- 2000 Fees Represent Approximately 12% Actual Payroll of All Site Employees
- 2000 Fees Represent Approximately 31% of the Actual Site Administrative Costs
- 2000 Fees Represent Approximately $0.25 Per Pound of Direct Production Costs
- 2000 Fees Represent Approximately 7.8 Employees

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What Fees Represent -- Con't

Example 2 --Mill on Standby Undergoing Reclamation

- 2000 Fees Represent Approximately 8% of Annual Site Reclamation Costs
- 2000 Fees Represent Approximately 32% of Actual Payroll for All Site Employees
- 2000 Fees Represent Approximately 7 Employees

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What Fees Represent -- Con't

Example 3 -- Tailings Site in Reclamation

- 2000 Fees Represent Approximately 12% of Annual Site Reclamation Costs
- 2000 Fees Represent Approximately 43% of Actual Payroll for All Site Employees
- 2000 Fees Represent Approximately 1.2 Employees

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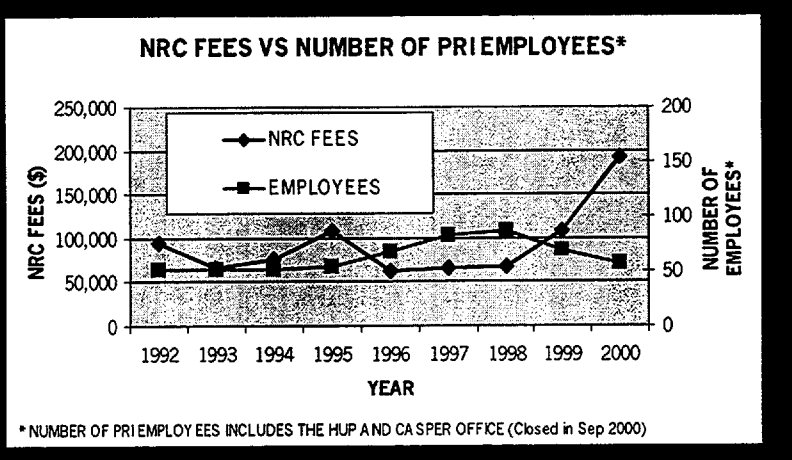

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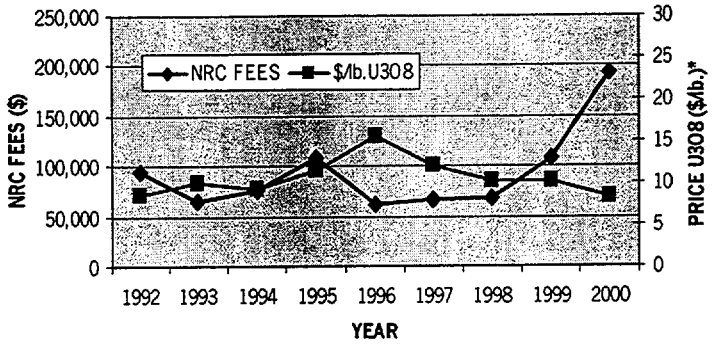
NRC FEES VS PRICE U3O8*



*AVERAGE ANNUAL PRICE (Restricted) OF U3O8 OBTAINED FROM TradeTech EXCHANGE VALUES

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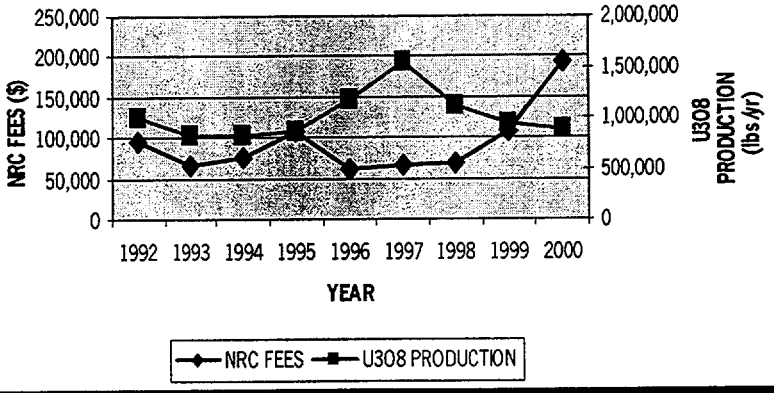
NRC FEES VS U3O8 PRODUCTION



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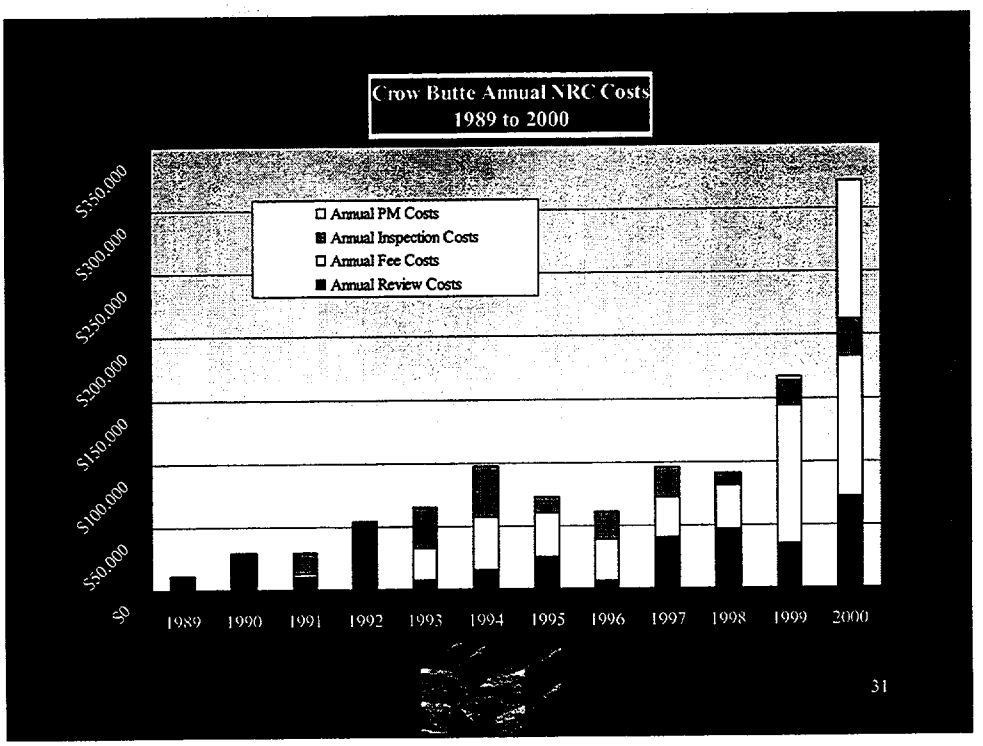

Fees 1996-2001

Fiscal Year	1996	1997	1998	1999	2000	2001
Class I Annual Fee	$57,000	$61,600	$61,800	$131,109	$132,000	$94,300
Class II Annual Fee	$32,200	$34,800	$34,900	$109,000	$111,000	$79,000
Hourly Rate	$120	$125	$121	$140	$143	$144

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Project Manager Fees -- 2000

Project Manager Fees Are Significant Portion of Hourly Fees

Facility	9/26/99- 12/30/00 Review Costs	9/26/99- 12/30/00 Project Manager	9/26/99- 12/30/00 Total
Smith Ranch	$71,628	$65,137	$136,765
Ambrosia Lake	$65,210	$47,302	$112,512
Lisbon	$49,095	$47,302	$96,397

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Moving Forward -- NRC Fees

- NMA Will Pursue Legislative Solution
- NMA Will Pursue Regulatory Exemption
- NRC Should Further Investigate Coding of Project Managers' Time
- NRC Should Eliminate Unnecessary Duplicative Oversight to Minimum Necessary to Fulfill Its Responsibilities

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Table of Contents

Comparison of New Mexico Environment Department Regulations to NRC Acceptance Requirements from Draft NUREG-1569 for ISL Uranium Recovery Wellfields

With respect to NRC regulation of ISL wellfields, the requirements for hydrological data, well construction, wellfield operations, and restoration is not directly stated in 10 CFR ♣ 20 and ♣ 40, but are applied through guidance documents, license conditions, and tie down documents, such as license applications. The basis of these requirements reflects the UIC regulations in 40 CFR ♣ 144 and 146 as well as requirements applied in Non-Agreement and Agreement States. Although all of the Non-Agreement States that have or will have operating ISL Uranium Recovery Facilities do enforce UIC regulations that mirror NRC requirements, NRC does not consider those requirements in their regulation of ISL wellfields.

In the case of the State of New Mexico, the New Mexico Environment Department enforces specific regulations for ISL Wellfields that are duplicative of typical NRC license requirements that exceed the requirements of 10 CFR ♣ 20 and ♣40. Section 3.1, 3.3, 5.7.8, and 6.1 of NUREG-1569 "Draft Standard Review Plan for In Situ Leach Uranium Extraction License Applications" provide acceptance criteria for license applications that are duplicative of NMED regulations for the permitting, operating, and restoration of an ISL wellfield.

Section 3.1.3 - Acceptance Criteria for Solution Mining Process and Equipment

Criterion 1 requires a sufficiently detailed description of the ore and wellfield to be leached. *Required by NMAC 20.6.2.5102 (B) PRE-CONSTRUCTION REQUIREMENTS: Notification Requirement for In Situ Extraction Wells.*

Criteria 2and 3 sets standards for well design, testing and inspection.
Required by NMAC 20.6.2.5200 TECHNICAL CRITERIA AND PERFORMANCE STANDARDS FOR EFFLUENT DISPOSAL WELLS AND IN SITU EXTRACTION WELLS:

> *20.6.2.5201 PURPOSE: Sections 20.6.2.5200 through 20.6.2.5210 NMAC provide the technical criteria and performance standards for effluent disposal wells and in situ extraction wells.*

Specifically, NMAC 20.6.2.5204 - MECHANICAL INTEGRITY and 20.6.2.5205 - CONSTRUCTION REQUIREMENTS are applicable for meeting the requirements of Criterion 2 and 3.

Criterion 4 requires an operating plan and schedule including timetables for wellfield operation, surface reclamation, and groundwater resoration.
Required by NMAC 20.6.2.5210 INFORMATION TO BE CONSIDERED BY THE SECRETARY

Section 3.3.3 - Acceptance Criteria for Instrumentation

Criterion 4 sets limits and monitoring requirements for operating pressures on wellheads and casing.
Required by NMAC 20.6.2.5206 - OPERATING REQUIREMENTS and 20.6.2.5207 - MONITORING REQUIREMENTS

Section 5.7.8.3 - Acceptance Criteria for Groundwater and Surface Water Monitoring Programs

A criterion 1 through 6 are conditions by NRC that set requirements for determining baseline water quality, set monitor well placement, excursion detection, and requires a corrective action plan for excursions.
Required by NMAC 20.6.2.5101 - DISCHARGE PLAN AND OTHER REQUIREMENTS, 20.6.2.5203 - CORRECTIVE ACTION, 20.6.2.5208 - REPORTING REQUIREMENTS, and 20.6.2.5210 - INFORMATION TO BE CONSIDERED BY THE SECRETARY

Section 6.1.3 - Acceptance Criteria for Plans and Schedules for Groundwater Quality Restoration.

This section describes NRC expectations for determining the impacts of ISL mining on the groundwater aquifer, including estimated volumes of water to be restored, methods of predicting pore volume size,

wellfield restoration plans, restoration goals, post restoration stability monitoring, methods of plugging and abandonment of wells, and impacts of water consumption.
All of these parts of the acceptance criteria are required by NMAC 20.6.2.4103 - ABATEMENT STANDARDS AND REQUIREMENTS, 20.6.2.5101 - DISCHARGE PLAN AND OTHER REQUIREMENTS, 20.6.2.5203 - CORRECTIVE ACTION, 20.6.2.5209 - PLUGGING AND ABANDONMENT, and 20.6.2.5210 - INFORMATION TO BE CONSIDERED BY THE SECRETARY

Sweeney,Katie

From: Mike Griffin [mgriffin_cbr@hotmail.com]
Sent: Wednesday, March 28, 2001 4:38 PM
To: Katie Sweeney
Cc: Bill Kearney; Steve Collings; Steve Magnuson; Fletcher Newton
Subject: Fw: NRC


NRC.doc

Attached is an email sent by Dave Miesbach from NDEQ. This summary is in response to a request from Mike Layton in preparation for the April 10 briefing of the NRC commissioners. Mike

----- Original Message -----
From: <David.Miesbach@NDEQ.State.NE.US>
To: <mgriffin_cbr@hotmail.com>
Sent: Wednesday, March 28, 2001 7:59 AM
Subject: NRC

> (See attached file: NRC.doc)

- Nebraska was granted primacy for the UIC program by the EPA in 1984.

- Nebraska developed Title 122 – Rules and Regulations for Underground Injection and Mineral Production Wells and Title 135 – Rules and Regulations for Mineral Exploration Holes specifically for *in-situ* uranium mining.

- An *in-situ* uranium R & D mining operation was permitted through the State of Nebraska UIC program with the help of the NRC in 1985.

- The R & D facility operated for two years before restoration began. Successful restoration of the site was completed in 1988.

- The facility was permitted by the State of Nebraska UIC program again with the help of the NRC for full-scale operation in 1990. The facility has been in continuous operation since that time and has completely restored one area of mining, and is in the process of restoring two more areas.

- The effectiveness of the permit and associated rules has been tested several times with mining solution excursions. Each time, the problem was identified and remediated in a timely fashion.

The State of Nebraska UIC program is designed to protect the underground sources of drinking water in our state. We feel that we can and have sufficiently regulated the *in-situ* uranium mining industry in our state when it comes to ground water and reclamation issues under our UIC program.

Nebraska agrees that there are certain areas of the *in-situ* mining industry that the NRC must regulate. However, having the NRC write new rules to regulate an area we are already addressing effectively seems like reinventing the wheel.

Attached is a copy of the Nebraska Statute concerning protection of air, soil and water resources. The statute (at 81-1505.9(C) requires restoration for mineral production wells.

81-1505

Council; rules and regulations; standards of air, land, and water quality.

(1) In order to carry out the purposes of the Environmental Protection Act, the Integrated Solid Waste Management Act, and the Livestock Waste Management Act, the council shall adopt and promulgate rules and regulations which shall set standards of air, water, and land quality to be applicable to the air, waters, and land of this state or portions thereof. Such standards of quality shall be such as to protect the public health and welfare. The council shall classify air, water, and land contaminant sources according to levels and types of discharges, emissions, and other characteristics which relate to air, water, and land pollution and may require reporting for any such class or classes. Such classifications and standards made pursuant to this section may be made for application to the state as a whole or to any designated area of the state and shall be made with special reference to effects on health, economic and social factors, and physical effects on property. Such standards and classifications may be amended as determined necessary by the council.

(2) In adopting the classifications of waters and water quality standards, the primary purpose for such classifications and standards shall be to protect the public health and welfare and the council shall give consideration to:

(a) The size, depth, surface area, or underground area covered, the volume, direction, and rate of flow, stream gradient, and temperature of the water;

(b) The character of the area affected by such classification or standards, its peculiar suitability for particular purposes, conserving the value of the area, and encouraging the most appropriate use of lands within such area for domestic, agricultural, industrial, recreational, and aquatic life purposes;

(c) The uses which have been made, are being made, or are likely to be made, of such waters for agricultural, transportation, domestic, and industrial consumption, for fishing and aquatic culture, for the disposal of sewage, industrial waste, and other wastes, or other uses within this state and, at the discretion of the council, any such uses in another state on interstate waters flowing through or originating in this state;

(d) The extent of present pollution or contamination of such waters which has already occurred or resulted from past discharges therein; and

(e) Procedures pursuant to section 401 of the Clean Water Act, as amended, 33 U.S.C. 1251 et seq., for certification

by the department of activities requiring a federal license or permit which may result in a discharge.

(3) In adopting effluent limitations or prohibitions, the council shall give consideration to the type, class, or category of discharges and the quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable or other waters of the state, including schedules of compliance, best practicable control technology, and best available control technology.

(4) In adopting standards of performance, the council shall give consideration to the discharge of pollutants which reflect the greatest degree of effluent reduction which the council determines to be achievable through application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, when practicable, a standard permitting no discharge of pollutants.

(5) In adopting toxic pollutant standards and limitations, the council shall give consideration to the combinations of pollutants, the toxicity of the pollutant, its persistence, degradability, the usual or potential presence of the affected organisms in any waters, the importance of the affected organisms, and the nature and extent of the effect of the toxic pollutant on such organisms.

(6) In adopting pretreatment standards, the council shall give consideration to the prohibitions or limitations to noncompatible pollutants, prohibitions against the passage through a publicly owned treatment works of pollutants which would cause interference with or obstruction to the operation of publicly owned treatment works, damage to such works, and the prevention of the discharge of pollutants therefrom which are inadequately treated.

(7) In adopting treatment standards, the council shall give consideration to providing for processes to which wastewater shall be subjected in a publicly owned wastewater treatment works in order to make such wastewater suitable for subsequent use.

(8) In adopting regulations pertaining to the disposal of domestic and industrial liquid wastes, the council shall give consideration to the minimum amount of biochemical oxygen demand, suspended solids, or equivalent in the case of industrial wastewaters, which must be removed from the wastewaters and the degree of disinfection necessary to meet water quality standards with respect to construction, installation, change of, alterations in, or additions to any wastewater treatment works or disposal systems, including issuance of permits and proper abandonment, and requirements necessary for proper operation and maintenance thereof.

(9)(a) The council shall adopt and promulgate rules and regulations for controlling mineral exploration holes and mineral production and injection wells. The rules and regulations shall

include standards for the construction, operation, and abandonment of such holes and wells. The standards shall protect the public health and welfare and air, land, water, and subsurface resources so as to control, minimize, and eliminate hazards to humans, animals, and the environment. Consideration shall be given to:

(i) Area conditions such as suitability of location, geologic formations, topography, industry, agriculture, population density, wildlife, fish and other aquatic life, sites of archeological and historical importance, mineral, land, and water resources, and the existing economic activities of the area including, but not limited to, agriculture, recreation, tourism, and industry;

(ii) A site-specific evaluation of the geologic and hydrologic suitability of the site and the injection, disposal, and production zones;

(iii) The quality of the existing ground water, the effects of exemption of the aquifer from any existing water quality standards, and requirements for restoration of the aquifer;

(iv) Standards for design and use of production facilities, which shall include, but not be limited to, all wells, pumping equipment, surface structures, and associated land required for operation of injection or production wells; and

(v) Conditions required for closure, abandonment, or restoration of mineral exploration holes, injection and production wells, and production facilities in order to protect the public health and welfare and air, land, water, and subsurface resources.

(b) The council shall establish fees for regulated activities and facilities and for permits for such activities and facilities. The fees shall be sufficient but shall not exceed the amount necessary to pay the department for the direct and indirect costs of evaluating, processing, and monitoring during and after operation of regulated facilities or performance of regulated activities.

(c) With respect to mineral production wells, the council shall adopt and promulgate rules and regulations which require restoration of air, land, water, and subsurface resources and require mineral production well permit applications to include a restoration plan for the air, land, water, and subsurface resources affected.

Such rules and regulations may provide for issuance of a research and development permit which authorizes construction and operation of a pilot plant by the permittee for the purpose of demonstrating the permittee's ability to inject and restore in a manner which meets the standards required by this subsection and the rules and regulations.

The rules and regulations adopted and promulgated may also provide for issuance of a commercial permit after a finding

by the department that the injection and restoration procedures authorized by the research and development permit have been successful in demonstrating the applicant's ability to inject and restore in a manner which meets the standards required by this subsection and the rules and regulations.

(d) For the purpose of this subsection, unless the context otherwise requires, restoration shall mean the employment, during and after an activity, of procedures reasonably designed to control, minimize, and eliminate hazards to humans, animals, and the environment, to protect the public health and welfare and air, land, water, and subsurface resources, and to return each resource to a quality of use consistent with the uses for which the resource was suitable prior to the activity.

(10) In adopting livestock waste control regulations, the council shall consider the discharge of livestock wastes into the waters of the state or onto land not owned by the livestock operator, conditions under which permits for such operations may be issued, including design, location, and proper management of such facilities, protection of ground water from such operations, and revocation, modification, or suspension of such permits for cause and all requirements of the Livestock Waste Management Act.

(11) In adopting regulations for the issuance of permits under the National Pollutant Discharge Elimination System created by the Clean Water Act, as amended, 33 U.S.C. 1251 et seq., the council shall consider when such permits shall be required and exemptions, application and filing requirements, terms and conditions affecting such permits, notice and public participation, duration and review of such permits, and monitoring, recording, and reporting under the system.

(12) The council shall adopt and promulgate rules and regulations for air pollution control which shall include:

(a) A construction permit program which requires the owner or operator of an air contaminant source to obtain a permit prior to construction;

(b) An operating permit program consistent with requirements of the Clean Air Act, as amended, 42 U.S.C. 7401 et seq., and an operating permit program for minor sources of air pollution, which programs shall require permits for both new and existing sources;

(c) Provisions for operating permits to be issued after public notice, to be terminated, modified, or revoked for cause, and to be modified to incorporate new requirements;

(d) Provisions for applications to be on forms provided by the department and to contain information necessary to make a determination on the appropriateness of issuance or denial. The department shall make a completeness determination in a timely fashion and after such determination shall act on the application within time limits set by the council. Applications for operating permits shall include provisions for certification of

compliance by the applicant;

(e) Requirements for operating permits which may include such conditions as necessary to protect public health and welfare, including, but not limited to (i) monitoring and reporting requirements on all sources subject to the permit, (ii) payment of annual fees sufficient to pay the reasonable direct and indirect costs of developing and administering the air quality permit program, (iii) retention of records, (iv) compliance with all air quality standards, (v) a permit term of no more than five years from date of issuance, (vi) any applicable schedule of compliance leading to compliance with air quality regulations, (vii) site access to the department for inspection of the facility and records, (viii) emission limits or control technology requirements, (ix) periodic compliance certification, and (x) other conditions necessary to carry out the purposes of the Environmental Protection Act. For purposes of this subsection, control technology shall mean a design, equipment, a work practice, an operational standard which may include a requirement for operator training or certification, or any combination thereof;

(f) Classification of air quality control regions;

(g) Standards for air quality that may be established based upon protection of public health and welfare, emission limitations established by the United States Environmental Protection Agency, and maximum achievable control technology standards for sources of toxic air pollutants. For purposes of this subdivision, maximum achievable control technology standards shall mean an emission limit or control technology standard which requires the maximum degree of emission reduction that the council, taking into consideration the cost of achieving such emission reduction, any health and environmental impacts not related to air quality, and energy requirements, determines is achievable for new or existing sources in the category or subcategory to which the standard applies through application of measures, processes, methods, systems, or techniques, including, but not limited to, measures which accomplish one or a combination of the following:

(i) Reduce the volume of or eliminate emissions of the pollutants through process changes, substitution of materials, or other modifications;

(ii) Enclose systems or processes to eliminate emissions; or

(iii) Collect, capture, or treat the pollutants when released from a process, stack, storage, or fugitive emission point;

(h) Restrictions on open burning and fugitive emissions;

(i) Provisions for issuance of general operating permits, after public notice, for sources with similar operating conditions and for revoking such general authority to specific

permittees;

(j) Provisions for implementation of the sulfur dioxide allowance system of the Clean Air Act, as amended, 42 U.S.C. 7401 et seq., through the operating permit program;

(k) A provision that operating permits will not be issued if the Environmental Protection Agency objects in a timely manner;

(l) Provisions for periodic reporting of emissions;

(m) Limitations on emissions from process operations, fuel-burning equipment, and incinerator emissions and such other restrictions on emissions as are necessary to protect the public health and welfare;

(n) Time schedules for compliance;

(o) Requirements for owner or operator testing and monitoring of emissions;

(p) Control technology requirements when it is not feasible to prescribe or enforce an emission standard; and

(q) Procedures and definitions necessary to carry out payment of the annual emission fee set in section 81-1505.04.

(13)(a) In adopting regulations for hazardous waste management, the council shall give consideration to generation of hazardous wastes, labeling practices, containers used, treatment, storage, collection, transportation including a manifest system, processing, resource recovery, and disposal of hazardous wastes. It shall consider the permitting, licensing, design and construction, and development and operational plans for hazardous waste treatment, storage, and disposal facilities, and conditions for licensing or permitting of hazardous waste treatment, storage, and disposal areas. It shall consider modification, suspension, or revocation of such licenses and permits, including requirements for waste analysis, site improvements, fire prevention, safety, security, restricted access, and covering and handling of hazardous liquids and materials. Licenses and permits for hazardous waste, treatment, storage, and disposal facilities shall not be issued until certification by the State Fire Marshal as to fire prevention and fire safety has been received by the department. The council shall further consider the need at treatment, storage, or disposal facilities for required equipment, communications and alarms, personnel training, and contingency plans for any emergencies that might arise and for a coordinator during such emergencies.

In addition the council shall give consideration to (i) ground water monitoring, (ii) use and management of containers and tanks, (iii) surface impoundments, (iv) waste piles, (v) land treatment, (vi) incinerators, (vii) chemical or biological treatment, (viii) landfills including the surveying thereof, and (ix) special requirements for ignitable, reactive, or incompatible wastes.

In considering closure and postclosure of hazardous waste treatment, storage, or disposal facilities, the council

shall consider regulations that would result in the owner or operator closing his or her facility so as to minimize the need for future maintenance, and to control, minimize, or eliminate, to the extent necessary to protect humans, animals, and the environment, postclosure escape of hazardous waste, hazardous waste constituents, and leachate to the ground water or surface waters, and to control, minimize, or eliminate, to the extent necessary to protect humans, animals, and the environment, waste decomposition to the atmosphere. In considering corrective action for hazardous waste treatment, storage, or disposal facilities, the council shall consider regulations that would require the owner or operator, or any previous owner or operator with actual knowledge of the presence of hazardous waste at the facility, to undertake corrective action or such other response measures necessary to protect human health or the environment for all releases of hazardous waste or hazardous constituents from any treatment, storage, or disposal facility or any solid waste management unit at such facility regardless of the time at which waste was placed in such unit.

Such regulations adopted pursuant to this subsection shall in all respects comply with the Environmental Protection Act and the Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6901 et seq.

(b) In adopting regulations for hazardous waste management, the council shall consider, in addition to criteria in subdivision (a) of this subsection, establishing criteria for (i) identifying hazardous waste including extraction procedures, toxicity, persistence, and degradability in nature, potential for accumulation in tissue, flammability or ignitability, corrosiveness, reactivity, and generation of pressure through decomposition, heat, or other means, and other hazardous characteristics, (ii) listing all materials it deems hazardous and which should be subject to regulation, and (iii) locating treatment, storage, or disposal facilities for such wastes. In adopting criteria for flammability and ignitability of wastes pursuant to subdivision (b)(i) of this subsection, no regulation shall be adopted without the approval of the State Fire Marshal.

(c) In adopting regulations for hazardous waste management, the council shall establish a schedule of fees to be paid to the director by licensees or permittees operating hazardous waste processing facilities or disposal areas on the basis of a monetary value per cubic foot or per pound of the hazardous wastes, sufficient but not exceeding the amount necessary to reimburse the department for the costs of monitoring such facilities or areas during and after operation of such facilities or areas. The licensees may assess a cost against persons using the facilities or areas. The director shall remit any money collected from fees paid to him or her to the State Treasurer who shall credit the entire amount thereof to the General Fund.

(d) In adopting regulations for solid waste disposal, the council shall consider storage, collection, transportation, processing, resource recovery, and disposal of solid waste, developmental and operational plans for solid waste disposal areas, conditions for permitting of solid waste disposal areas, modification, suspension, or revocation of such permits, regulations of operations of disposal areas, including site improvements, fire prevention, ground water protection, safety and restricted access, handling of liquid and hazardous materials, insect and rodent control, salvage operations, and the methods of disposing of accumulations of junk outside of solid waste disposal areas. Such regulations shall in all respects comply with the Environmental Protection Act, the Integrated Solid Waste Management Act, and the Resource Conservation and Recovery Act, as amended, 42 U.S.C. 6901 et seq.

(14) In adopting regulations governing discharges or emissions of oil and other hazardous materials into the waters, in the air, or upon the land of the state, the council shall consider the requirements of the Integrated Solid Waste Management Act, methods for prevention of such discharges or emissions, and the responsibility of the discharger or emitter for cleanup, toxicity, degradability, and dispersal characteristics of the substance.

(15) In adopting regulations governing composting and composting sites, the council shall give consideration to:

(a) Approval of a proposed site by the local governing body, including the zoning authority, if any, prior to issuance of a permit by the department;

(b) Issuance of permits by the department for such composting operations, with conditions if necessary;

(c) Submission of construction and operational plans by the applicant for a permit to the department, with approval of such plans before issuance of such permit;

(d) A term of five years for such permits, which shall not be transferable;

(e) Renewal of permits if the operation has been in substantial compliance with composting regulations adopted pursuant to this subsection, permit conditions, and operational plans;

(f) Review by the department of materials to be composted, including chemical analysis when found by the department to be necessary;

(g) Inspections of such compost sites at least semiannually followed by ratings, with a copy of such ratings to be given to the site management. Operations out of compliance with composting regulations, permit conditions, or operational plans shall be given a reasonable time for voluntary compliance, and failure to do so within the specified time shall result in a hearing after notice is given, at which time the owner or operator shall appear and show cause why his or her permit should

not be revoked;

(h) Special permits of the department for demonstration projects not to exceed six months;

(i) Exemptions from permits of the department; and

(j) The Integrated Solid Waste Management Act.

(16) Any person operating or responsible for the operation of air, water, or land contaminant sources of any class for which the rules and regulations of the council require reporting shall make reports containing information as may be required by the department concerning quality and quantity of discharges and emissions, location, size, and height of contaminant outlets, processes employed, fuels used, and the nature and time periods or duration of discharges and emissions, and such other information as is relevant to air, water, or land pollution and is available.

(17) Prior to adopting, amending, or repealing standards and classifications of air, water, and land quality and rules and regulations under the Integrated Solid Waste Management Act or the Livestock Waste Management Act, the council shall, after due notice, conduct public hearings thereon. Notice of public hearings shall specify the waters or the area of the state for which standards of air, water, or land are sought to be adopted, amended, or repealed and the time, date, and place of such hearing. Such hearing shall be held in the general area to be affected by such standards. Copies of such notice shall be:

(a) Published at least twice in a newspaper regularly published or circulated in a county or counties bordering or through which flow the waters or the atmosphere of which is affected, or the particular portion of land which is affected, for which standards are sought to be adopted. The first date of publication shall not be more than thirty days nor less than twenty days before the date fixed for such hearing; and

(b) Mailed at least twenty days before such hearing to such persons and political subdivisions as the council has reason to believe may be affected by the proposed standards.

(18) Standards of quality of the air, water, or land of the state and rules and regulations adopted under the Integrated Solid Waste Management Act or the Livestock Waste Management Act or any amendment or repeal of such standards or rules and regulations shall become effective upon adoption by the council and filing in the office of the Secretary of State. In adopting standards of air, water, and land quality or making any amendment thereof, the council shall specify a reasonable time for persons discharging wastes into the air, water, or land of the state to comply with such standards and upon the expiration of any such period of time may revoke or modify any permit previously issued which authorizes the discharge of wastes into the air, water, or land of this state which results in reducing the quality of such air, water, or land below the standards established therefor by the council.

(19) All standards of quality of air, water, or land and all rules and regulations adopted pursuant to law by the council prior to May 29, 1981, and applicable to specified air, water, or land are hereby approved and adopted as standards of quality of and rules and regulations for such air, water, or land.

(20) In addition to such standards as are heretofore authorized, the council shall adopt and promulgate rules and regulations to set standards of performance, effluent standards, pretreatment standards, treatment standards, toxic pollutant standards and limitations, effluent limitations, effluent prohibitions, and quantitative limitations or concentrations which shall in all respects conform with and meet the requirements of the National Pollutant Discharge Elimination System in the Clean Water Act, as amended, 33 U.S.C. 1251 et seq.

(21)(a) The council shall adopt and promulgate rules and regulations requiring all new or renewal permit or license applicants regulated under the Environmental Protection Act, the Integrated Solid Waste Management Act, or the Livestock Waste Management Act to establish proof of financial responsibility by providing funds in the event of abandonment, default, or other inability of the permittee or licensee to meet the requirements of its permit or license or other conditions imposed by the department pursuant to the acts. The council may exempt classes of permittees or licensees from the requirements of this subdivision when a finding is made that such exemption will not result in a significant risk to the public health and welfare.

(b) Proof of financial responsibility shall include any of the following made payable to or held in trust for the benefit of the state and approved by the department:

(i) A surety bond executed by the applicant and a corporate surety licensed to do business in this state;

(ii) A deposit of cash, negotiable bonds of the United States or the state, negotiable certificates of deposit, or an irrevocable letter of credit of any bank or other savings institution organized or transacting business in the United States in an amount or which has a market value equal to or greater than the amount of the bonds required for the bonded area under the same terms and conditions upon which surety bonds are deposited;

(iii) An established escrow account; or

(iv) A bond of the applicant without separate surety upon a satisfactory demonstration to the director that such applicant has the financial means sufficient to self-bond pursuant to bonding requirements adopted by the council consistent with the purposes of this subdivision.

(c) The director shall determine the amount of the bond, deposit, or escrow account which shall be reasonable and sufficient so the department may, if the permittee or licensee is unable or unwilling to do so and in the event of forfeiture of

the bond or other financial responsibility methods, arrange to rectify any improper management technique committed during the term of the permit or license and assure the performance of duties and responsibilities required by the permit or license pursuant to law, rules, and regulations.

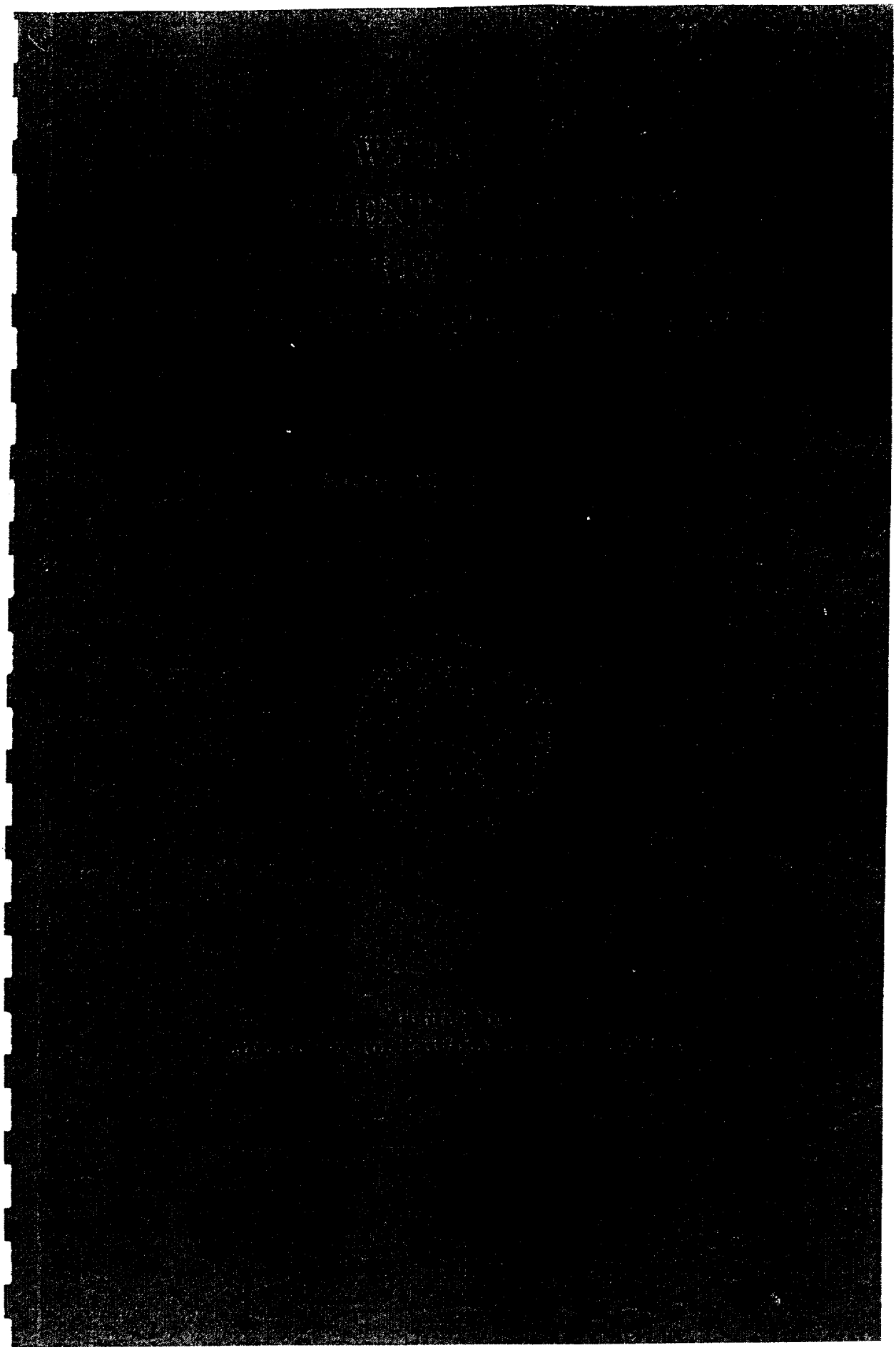
(d) In determining the amount of the bond or other method of financial responsibility, the director shall consider the requirements of the permit or license or any conditions specified by the department, the probable difficulty of completing the requirements of such permit, license, or conditions due to such factors as topography, geology of the site, and hydrology, and the prior history of environmental activities of the applicant.

This subsection shall apply to hazardous waste treatment, storage, or disposal facilities which have received interim status.

(22) The council shall adopt and promulgate rules and regulations no more stringent than the provisions of section 1453 et seq. of the federal Safe Drinking Water Act for public water supply system source water assessment programs.

The council may adopt and promulgate rules and regulations to implement a source water petition program no more stringent than section 1454 et seq. of the federal Safe Drinking Water Act.

Source:
Laws 1971, LB 939, § 5; Laws 1972, LB 1435, § 4;
Laws 1973, LB 538, § 2; Laws 1974, LB 1029, § 3;
Laws 1979, LB 342, § 2; Laws 1980, LB 853, § 3;
Laws 1981, LB 216, § 3; Laws 1983, LB 356, § 5;
Laws 1984, LB 1078, § 3; Laws 1986, LB 1008, § 2;
Laws 1992, LB 1257, § 79; Laws 1993, LB 623, § 3;
Laws 1994, LB 570, § 7; Laws 1994, LB 1031, § 1;
Laws 1997, LB 517, § 25; Laws 1998, LB 1209, § 21;
Laws 1999, LB 784, § 1.
Effective date August 28, 1999.



CHAPTER 11
ENVIRONMENTAL QUALITY

ARTICLE 1
GENERAL PROVISIONS

35-11-101. Short title.

This act shall be known and may be cited as the "Wyoming Environmental Quality Act".

35-11-102. Policy and purpose.

Whereas pollution of the air, water and land of this state will imperil public health and welfare, create public or private nuisances, be harmful to wildlife, fish and aquatic life, and impair domestic, agricultural, industrial, recreational and other beneficial uses; it is hereby declared to be the policy and purpose of this act to enable the state to prevent, reduce and eliminate pollution; to preserve, and enhance the air, water and reclaim the land of Wyoming; to plan the development, use, reclamation, preservation and enhancement of the air, land and water resources of the state; to preserve and exercise the primary responsibilities and rights of the state of Wyoming; to retain for the state the control over its air, land and water and to secure cooperation between agencies of the state, agencies of other states, interstate agencies, and the federal government in carrying out these objectives.

35-11-103. Definitions.

(a) For the purpose of this act, unless the context otherwise requires:

(i) "Department" means the department of environmental quality established by this act;

(ii) "Council" means the environmental quality council established by this act;

(iii) "Director" means the director of the department of environmental quality;

(iv) "Board" means one (1) or more of the advisory boards in each division of air, land, or water quality;

(v) "Administrator" means the administrator of each division of the department;

(vi) "Person" means an individual, partnership, firm, association, joint venture, public or private corporation, trust,

estate, commission, board, public or private institution, utility, cooperative, municipality or any other political subdivision of the state, or any interstate body or any other legal entity;

(vii) "Aggrieved party" means any person named or admitted as a party or properly seeking or entitled as of right to be admitted as a party to any proceeding under this act because of damages that person may sustain or be claiming because of his unique position in any proceeding held under this act;

(viii) "Interstate agency" means an agency of two (2) or more states established by or pursuant to an agreement or compact approved by the United States Congress or any other agency of two (2) or more states, having substantial powers or duties pertaining to the control of air, land or water pollution;

(ix) "Municipality" means a city, town, county, district, association or other public body;

(x) "Nonpoint source" means any source of pollution other than a point source. For purposes of W.S. 16-1-201 through 16-1-207 only, nonpoint source includes leaking underground storage tanks as defined by W.S. 35-11-1415(a)(ix) and aboveground storage tanks as defined by W.S. 35-11-1415(a)(xi);

(xi) "Point source" means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel or other floating craft, from which pollutants are or may be discharged;

(xii) The singular includes the plural, the plural the singular, and the masculine and feminine or neuter, when consistent with the intent of this act and necessary to effect its purpose;

(xiii) "This act" means W.S. 35-11-101 through 35-11-403, 35-11-405, 35-11-406, 35-11-408 through 35-11-1106, 35-11-1414 through 35-11-1428, 35-11-1601 through 35-11-1613, 35-11-1701 and 35-11-1801 through 35-11-1803.

(b) Specific definitions applying to air quality:

(i) "Air contaminant" means odorous material, dust, fumes, mist, smoke, other particulate matter, vapor, gas or any combination of the foregoing, but shall not include steam or water vapor;

(ii) "Air pollution" means the presence in the outdoor atmosphere of one (1) or more air contaminants in such quantities and duration which may be injurious to human health or welfare, animal or plant life, or property, or unreasonably interferes with the enjoyment of life or property;

(iii) "Clean Air Act" means the federal Clean Air Act of 1977, as amended by P.L. 101-549;

(iv) "Emission" means a release into the outdoor atmosphere of air contaminants;

(v) "Operating permit program" means the permitting program authorized by W.S. 35-11-203 through 35-11-212 implementing a state plan pursuant to the 1990 amendments to the Clean Air Act;

(vi) "Stationary source" means any building, structure, facility or installation which emits or may emit any air contaminant.

(c) Specific definitions applying to water quality:

(i) "Pollution" means contamination or other alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity or odor of the waters or any discharge of any acid or toxic material, chemical or chemical compound, whether it be liquid, gaseous, solid, radioactive or other substance, including wastes, into any waters of the state which creates a nuisance or renders any waters harmful, detrimental or injurious to public health, safety or welfare, to domestic, commercial, industrial, agricultural, recreational or other legitimate beneficial uses, or to livestock, wildlife or aquatic life, or which degrades the water for its intended use, or adversely affects the environment. This term does not mean water, gas or other material which is injected into a well to facilitate production of oil, or gas or water, derived in association with oil or gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the state, and if the state determines that such injection or disposal well will not result in the degradation of ground or surface or water resources;

(ii) "Wastes" means sewage, industrial waste and all other liquid, gaseous, solid, radioactive, or other substances which may pollute any waters of the state;

(iii) "Sewerage system" means pipelines, conduits, storm sewers, pumping stations, force mains, and all other constructions, devices, appurtenances and facilities used for collecting or conducting wastes to an ultimate point for treatment or disposal;

(iv) "Treatment works" means any plant or other works used for the purpose of treating, stabilizing or holding wastes;

(v) "Disposal system" means a system for disposing of wastes, either by surface or underground methods, including sewerage systems, treatment works, disposal wells, and absorption fields;

(vi) "Waters of the state" means all surface and groundwater, including waters associated with wetlands, within Wyoming;

(vii) "Discharge" means any addition of any pollution or wastes to any waters of the state;

(viii) "Public water supply" means a system for the provision to the public of water for human consumption through pipes or constructed conveyances, if such system has at least fifteen (15) service connections or regularly serves at least twenty-five (25) individuals. Public water supply shall include:

(A) Any collection, treatment, storage and distribution facility under control of the operator of the facility and used primarily in connection with the system; and

(B) Any collection or pretreatment storage facilities not under the control of the operator which are used primarily in connection with the system.

(ix) "Small wastewater system" means any sewerage system, disposal system or treatment works having simple hydrologic and engineering needs which is intended for wastes originating from a single residential unit serving no more than four (4) families or which distributes two thousand (2,000) gallons or less of domestic sewage per day;

(x) "Wetlands" means those areas in Wyoming having all three (3) essential characteristics:

(A) Hydrophytic vegetation;

(B) Hydric soils; and

(C) Wetland hydrology.

(xi) "Compensatory mitigation" means replacement, substitution or enhancement of ecological functions and wetland values to offset anticipated losses of those values caused by filling, draining or otherwise damaging a wetland;

(xii) "Ecological function" means the ability of an area to support vegetation and fish and wildlife populations, recharge aquifers, stabilize base flows, attenuate flooding, trap sediment and remove or transform nutrients and other pollutants;

(xiii) "Mitigation" means all actions to avoid, minimize, restore and compensate for ecological functions or wetland values lost;

(xiv) "Natural wetlands" means those wetlands that occur independently of human manipulation of the landscape;

(xv) "Man-made wetlands" means those wetlands that are created intentionally or occur incidental to human activities, and includes any enhancement made to an existing wetland which increases its function or value;

(xvi) "Wetland value" means those socially significant attributes of wetlands such as uniqueness, heritage, recreation, aesthetics and a variety of economic values;

(xvii) "Community water system" means a public water supply that has at least fifteen (15) service connections used year-round by residents or that regularly provides water to at least twenty-five (25) residents year-round, including, but not limited to, municipalities and water districts;

(xviii) "Nontransient noncommunity water system" means a public water supply which is not a community water system and which regularly provides service to at least twenty-five (25) of the same persons for more than six (6) months of the year where those persons are not full-time residents, including, but not limited to, schools, factories and office buildings;

(xix) "Credible data" means scientifically valid chemical, physical and biological monitoring data collected under an accepted sampling and analysis plan, including quality control, quality assurance procedures and available historical data.

(d) Specific definitions applying to solid waste management:

(i) "Solid waste" means garbage, and other discarded solid materials, materials, including solid waste materials resulting from industrial, commercial, and agricultural operations, and from community activities, but, unless disposed of at a solid waste management facility, does not include:

(A) Solids or dissolved material in domestic sewerage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows or other common water pollutants;

(B) Liquids, solids, sludges or dissolved constituents which are collected or separated in process units for recycling, recovery or reuse including the recovery of energy, within a continuous or batch manufacturing or refining process; or

(C) Agricultural materials which are recycled in the production of agricultural commodities.

(ii) "Solid waste management facility" means any facility for the transfer, treatment, processing, storage or disposal of solid waste, but does not include:

(A) Lands or facilities subject to the permitting requirements of article 3 of this act;

(B) Facilities which would have been subject to the permitting requirements of article 3 of this act if constructed after July 1, 1973;

(C) Any facility described under W.S. 30-5-104(d)(vi)(A) or (B);

(D) Lands and facilities subject to the permitting requirements of article 2, 3 or 4 of this act used solely for the management of wastes generated within the boundary of the permitted facility or mine operation by the facility or mine owner or operator or from a mine mouth electric power plant or coal drier;

(E) Lands and facilities owned by a person engaged in farming or ranching and used to dispose of solid waste generated incidental to his farming and ranching operations; or

(F) Transport vehicles, storage containers and treatment of the waste in containers.

(iii) "Cost effective" means the selection of alternative responses taking into account total short-term and long-term costs of those responses including the costs of operation and maintenance for the entire activity, the presence of naturally occurring hazardous or toxic substances, current or potential uses of the natural resources impacted;

(iv) "Commercial solid waste management facility" means any facility receiving a monthly average greater than five hundred (500) short tons per day of unprocessed household refuse or mixed household and industrial refuse for management or disposal;

(v) "Commercial radioactive waste management facility" means any facility used or intended to be used to receive for disposal, storage, reprocessing or treatment, any amount of radioactive wastes which are generated by any person other than the facility owner or operator, or which are generated at a location other than the location of the facility, but does not include:

(A) Uranium mill tailings facilities licensed by the United

States Nuclear Regulatory Commission which receive in situ leaching uranium mining by-product materials or are specifically authorized by the department on a limited basis to receive small quantities of wastes defined in section 11e(2) of the Atomic Energy Act of 1954 (42 U.S.C. § 2014(e)(2)) which were generated by persons other than the facility owner or operator or which were generated at a location other than the location of the facility, or both; and

(B) Facilities used for the temporary storage of radioactive wastes generated by the facility owner or operator, including facilities for the temporary storage of naturally occurring radioactive materials generated during the course of oil or natural gas exploration or production, provided the storage of radioactive wastes is in compliance with applicable state and federal law; and

(C) Permitted solid waste disposal facilities which are authorized by the director to receive small quantities of radioactive wastes containing only naturally occurring radioactive materials, or which receive radioactive materials that have been exempted from regulation under section 10 of the Low-Level Radioactive Waste Policy Amendments Act of 1985 (42 U.S.C. § 2021i), or both if found by the department not to threaten human health and the environment; and

(D) Federally owned facilities used exclusively for the storage, reprocessing or treatment of spent reactor fuel;

(E) Facilities licensed by the United States nuclear regulatory commission whose sole purpose is to receive in situ leaching uranium mining by-product materials as defined in section 11(e)(2) of the Atomic Energy Act of 1954 (42 U.S.C. § 2014(e)(2)).

(vi) "Long term remediation and monitoring trust" means a trust account established within the trust and agency fund to provide funding for perpetual monitoring, maintenance and remediation of any commercial radioactive waste management facility. The adequacy of the initial and subsequent funding, including the quality of any bond or letter of credit, shall be determined jointly by the director, the insurance commissioner and the attorney general. Expenditures from the trust shall be only for commercial radioactive waste regulation, monitoring and remediation;

(vii) "Hazardous waste" means any liquid, solid, semisolid or contained gaseous waste or combination of those wastes which because of quantity, concentration or physical, chemical or infectious characteristics may cause or significantly contribute to detrimental human health effects, or pose a substantial present or potential hazard to human health or the environment. Only those materials listed as hazardous wastes by the United States environmental protection agency's hazardous waste management regulations or which exhibit a hazardous waste characteristic specified by the

environmental protection agency shall be considered hazardous wastes. Hazardous waste does not include those hazardous wastes exempted under the Resource Conservation and Recovery Act, P.L. 94-580, or under the United States environmental protection agency's hazardous waste management regulations for the period that they remain exempted by congressional or administrative action.

(e) Specific definitions for land quality:

(i) "Reclamation" means the process of reclaiming an area of land affected by mining to use for grazing, agricultural, recreational, wildlife purposes, or any other purpose of equal or greater value. The process may require contouring, terracing, grading, resoiling, revegetation, compaction and stabilization, settling ponds, water impoundments, diversion ditches, and other water treatment facilities in order to eliminate water diminution to the extent that existing water sources are adversely affected, pollution, soil and wind erosion, or flooding resulting from mining or any other activity to accomplish the reclamation of the land affected to a useful purpose;

(ii) "Minerals" means coal, clay, stone, sand, gravel, bentonite, scoria, rock, pumice, limestone, ballast rock, uranium, gypsum, feldspar, copper ore, iron ore, oil shale, trona, and any other material removed from the earth for reuse or further processing;

(iii) "Contouring" means grading or backfilling and grading the land affected and reclaiming it to the proposed future use with adequate provisions for drainage. Depressions to accumulate water are not allowed except if approved as part of the reclamation plan;

(iv) "Overburden" means all of the earth and other materials which lie above the mineral deposit and also means such earth and other materials disturbed from their natural state in the process of mining, or mining from exposed natural deposits;

(v) "Underground mining" means the mining of minerals by man-made excavation underneath the surface of the earth;

(vi) "Pit" means a tract of land from which overburden has been or is being removed for the purpose of surface mining or mining from an exposed natural deposit;

(vii) "Adjacent lands" means all lands within one-half mile of the proposed permit area;

(viii) "Operation" means all of the activities, equipment, premises, facilities, structures, roads, rights-of-way, waste and refuse areas excluding uranium mill tailings and mill facilities,

within the Nuclear Regulatory Commission license area, storage and processing areas, and shipping areas used in the process of excavating or removing overburden and minerals from the affected land or for removing overburden for the purpose of determining the location, quality or quantity of a natural mineral deposit or for the reclamation of affected lands;

(ix) "Operator" means any person, as defined in this act, engaged in mining, either as a principal who is or becomes the owner of minerals as a result of mining, or who acts as an agent or independent contractor on behalf of such principal in the conduct of mining operations;

(x) "Surface mining" means the mining of minerals by removing the overburden lying above natural deposits thereof and mining directly from the natural deposits thereby exposed, including strip, open pit, dredging, quarrying, surface leaching, and related activities;

(xi) "Mining permit" means certification by the director that the affected land described may be mined for minerals by a licensed operator in compliance with an approved mining plan and reclamation plan. No mining may be commenced or conducted on land for which there is not in effect a valid mining permit. A mining permit shall remain valid and in force from the date of its issuance until the termination of all mining and reclamation operations, except as otherwise provided in this act;

(xii) "Spoil pile" means the overburden or any reject minerals as piled or deposited by surface or underground mining;

(xiii) "A license to mine for minerals" means the certification from the administrator that the licensee has the right to conduct mining operations on the subject lands in compliance with this act; for which a valid permit exists; that he has deposited a bond conditioned on his faithful fulfillment of the requirements thereof; and that upon investigation the administrator has determined that the licensed mining operation is within the purposes of this act;

(xiv) "Topsoil" means soil on the surface prior to mining that will support plant life;

(xv) "Exploration by dozing" means the removal of overburden by trenching with a bulldozer or other earth moving equipment to expose possible indications of mineralization;

(xvi) "Affected land" means the area of land from which overburden is removed, or upon which overburden, development waste rock or refuse is deposited, or both, including access roads, haul

roads, mineral stockpiles, mill tailings excluding uranium mill tailings, and mill facilities, within the Nuclear Regulatory Commission license area, impoundment basins excluding uranium mill tailings impoundments, and all other lands whose natural state has been or will be disturbed as a result of the operations;

(xvii) "Refuse" means all waste material directly connected with mining including overburden, reject mineral or mill tailings excluding uranium mill tailings, which have passed through a processing plant prior to deposition on affected land;

(xviii) "Alluvial valley floors" means the unconsolidated stream laid deposits holding streams where water availability is sufficient for subirrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits;

(xix) "Prime farmland" shall have the same meaning as that previously prescribed by the United States secretary of agriculture on the basis of such factors as moisture availability, temperature regime, chemical balance, permeability, surface layer composition, susceptibility to flooding and erosion characteristics, and which historically have been used for intensive agricultural purposes, and as published in the federal register; and

(xx) "Surface coal mining operation" means:

(A) Activities conducted on the surface of lands in connection with a surface coal mine or with the surface impacts incident to an underground coal mine as provided in Section 516 of P.L. 95-87 [30 U.S.C. § 1266]. These activities include excavation for the purpose of obtaining coal including common methods as contour, strip, auger, mountaintop removal, box cut, open pit and area mining, the use of explosives and blasting, and in situ distillation or retorting, leaching or other chemical or physical processing, and the cleaning, concentrating or other processing or preparation, and the loading of coal; and

(B) The areas upon which these activities occur or where these activities disturb the land surface. These areas shall also include any adjacent land the use of which is incidental to any of these activities, all lands affected by the construction of new roads or the improvement or use of existing roads to gain access to the site of these activities and for haulage, and excavations, workings, impoundments, dams, ventilation shafts, entry ways, refuse banks, dumps, stockpiles, overburden piles, spoil banks, culm banks, tailings, holes or depressions, repair areas, storage areas,

processing areas, shipping areas and other areas upon which are sited structures, facilities or other property or materials on the surface, resulting from or incident to these activities.

(xxi) "Steep slope surface coal mining operation" means a surface coal mining operation where mining occurs along the contour of a steep slope generally exceeding twenty (20) degrees and which, because of the steepness of the terrain, requires special spoil handling procedures;

(xxii) "Complete application" under W.S. 35-11-406(e) means that the application contains all the essential and necessary elements and is acceptable for further review for substance and compliance with the provisions of this chapter;

(xxiii) "Interim mine stabilization" means a temporary cessation of mining operation within the terms of a valid permit to mine;

(xxiv) "Deficiency" means an omission or lack of sufficient information serious enough to preclude correction or compliance by stipulation in the approved permit to be issued by the director;

(xxv) "Imminent or continuous threat" means, with respect to the coal mine subsidence mitigation program, physical data which shows an immediate significant threat of damage from mine subsidence or insurance claim records which support progressive and continuous mine subsidence loss damage to structure;

(xxvi) "Fish and wildlife habitat" means land dedicated wholly or partially to the production, protection or management of species of fish or wildlife;

(xxvii) "Grazingland" includes rangelands and forestlands where the indigenous native vegetation is actively managed for grazing, browsing, occasional hay production, and occasional use by wildlife;

(xxviii) Repealed by Laws 1994, ch. 87, § 2.

(xxix) Repealed by Laws 1994, ch. 87, § 2.

(xxx) Repealed by Laws 1994, ch. 87, § 2.

(f) Specific definitions applying to in situ mining are:

(i) "Best practicable technology" means a technology based process justifiable in terms of existing performance and achievability in relation to health and safety which minimizes, to the extent safe and practicable, disturbances and adverse impacts of

the operation on human or animal life, fish, wildlife, plant life and related environmental values;

(ii) "Excursion" means any unwanted and unauthorized movement of recovery fluid out of the production zone as a result of in situ mining activities;

(iii) "Groundwater restoration" means the condition achieved when the quality of all groundwater affected by the injection of recovery fluids is returned to a quality of use equal to or better than, and consistent with the uses for which the water was suitable prior to the operation by employing the best practicable technology;

(iv) "In situ mining" means a method of in-place surface mining in which limited quantities of overburden are disturbed to install a conduit or well and the mineral is mined by injecting or recovering a liquid, solid, sludge or gas that causes the leaching, dissolution, gasification, liquefaction or extraction of the mineral. In situ mining does not include the primary or enhanced recovery of naturally occurring oil and gas or any related process regulated by the Wyoming oil and gas conservation commission;

(v) "Production zone" means the geologic interval into which recovery fluids are to be injected or extracted;

(vi) "Reclamation" includes groundwater restoration;

(vii) "Recovery fluid" means any material which flows or moves, whether semi-solid, liquid, sludge, gas or other form or state, used to dissolve, leach, gasify or extract a mineral;

(viii) "Research and development testing" means conducting research and development activities to indicate mineability or workability of and develop reclamation techniques for an in situ operation.

(g) Specific definitions applying to voluntary remediation, real property remediation account and innocent owners:

(i) "Adjacent" means property contiguous to an eligible site, and contiguous or noncontiguous property onto or under which contaminants are known to have migrated from such site;

(ii) "Certificate of completion" means a certificate issued by the director stating that all remediation requirements for a site have been successfully implemented or satisfied. The certificate of completion shall incorporate any required institutional and engineering controls for future use of the site, which may include deed restrictions recorded by the site owner. A certificate of completion may be conditioned upon the duty to perform any continuing

requirements specified in a remedy agreement;

(iii) "Contaminant" means any chemical, material, substance or waste:

(A) Which is regulated under any applicable federal, state or local law or regulation;

(B) Which is classified as hazardous or toxic under federal, state or local law or regulation; or

(C) To which exposure is regulated under federal, state or local law or regulation.

(iv) "Covenant not to sue" means a written pledge issued by the director stating that the state shall not sue the person or any subsequent owner concerning contaminants and liability addressed by a remedy agreement. A covenant not to sue may be conditioned upon the duty to perform any continuing requirements specified in a remedy agreement;

(v) "Engineering controls" means measures, such as capping, containment, slurry walls, extraction wells or treatment methods that are capable of managing environmental and health risks by reducing contamination levels or limiting exposure pathways;

(vi) "Governmental entity" shall have the following meaning as determined by the location of an eligible site. For the purposes of this definition, city shall include both first class cities and towns:

(A) The city, for a site located entirely within the boundary of that city;

(B) Both the city and county, for a site located partially within that city or within the extraterritorial boundary of a city;

(C) The county, for a site located outside the boundary of a city and outside the extraterritorial boundary of the city; or

(D) The federal land management agency, for a site located on lands managed by that federal agency.

(vii) "Institutional controls" means restrictions on the use of a site, including deed notices, voluntary deed restrictions or other conditions, covenants or restrictions imposed by the property owner and filed with the county clerk, use control areas, and zoning regulations or restrictions;

(viii) "No further action letter" means a letter issued by the

director stating that the department has determined that no further remediation is required on the site;

(ix) "Remediation" means all actions necessary to assess, test, investigate or characterize a site, and to clean up, remove, treat, or in any other way address any contaminants that are on, in or under a site or adjacent property to prevent, minimize or mitigate harm to human health or the environment;

(x) "Site" means a parcel of real property;

(xi) "Use control area" means an area designated by a governmental entity or entities for the purpose of controlling current and future property uses.

35-11-104. Department of environmental quality created.

There is created a department within the executive branch entitled "The State Department of Environmental Quality" as provided in W.S. 9-2-2013.

35-11-105. Divisions enumerated.

(a) The department shall consist of the following divisions:

(i) Air quality division;

(ii) Water quality division;

(iii) Land quality division;

(iv) Solid and hazardous waste management division;

(v) Abandoned mine land division;

(vi) Industrial siting division.

35-11-106. Powers, duties, functions and regulatory authority.

(a) All powers, duties, functions and regulatory authority vested in the state office of industrial siting administration are transferred to the department, as of April 1, 1992. The performance of such acts or functions by the industrial siting division of the department shall have the same effect as if done by the former state office of industrial siting administration as referred to or designated by law, contract or other document. The reference or designation to the former state office of industrial siting administration shall now apply to the industrial siting division of the department. The industrial siting council shall retain all powers, duties, functions and regulatory authority but shall be

(D) Affect natural hazard lands in which these operations could substantially endanger life and property; these lands to include areas subject to frequent flooding and areas of unstable geology.

(c) Prior to designating any land areas as unsuitable for surface coal mining operations, the administrator shall prepare a detailed statement on:

(i) The potential coal resources of the area;

(ii) The demand for coal resources; and

(iii) The impact of this designation on the environment, economy and supply of coal.

(d) The above process will include proper notice, opportunities for public and agency participation including land use planning bodies and a public hearing prior to designation or redesignation, pursuant to this section.

(e) Any designation shall not prevent the mineral exploration pursuant to this act of any area so designated.

(f) The requirements of this section shall not apply to lands on which surface coal mining operations were being conducted on August 3, 1977 or under a permit issued pursuant to this act, or where substantial legal and financial commitments in these operations were in existence prior to January 4, 1977.

(g) This section shall not become effective until approval of a state program pursuant to P.L. 95-87.

(h) This section shall operate independently of all other sections of the act except as to the application of the Wyoming Administrative Procedure Act.

35-11-426. In situ mineral mining permits and testing licenses.

(a) Any person desiring to engage in situ mineral mining or research and development testing is governed by this act.

(b) All provisions of this act applicable to a surface coal mining operation, as defined in W.S. 35-11-103(e)(xx), shall apply to coal in situ operations, regardless of whether such operations are connected with existing surface or underground coal mines, including research and development testing licenses, in addition to the requirements of W.S. 35-11-427 through 35-11-436.

35-11-427. In situ mining permit; permit required; authority of land quality division exclusive.

Application for an in situ mining permit shall be made to the director. The director shall designate the land quality administrator as his representative on all matters concerning the application and all communications concerning review of and final action on the application for land, air and water quality divisions and solid waste management. Nothing herein shall be construed to limit the authority of the director on making the final decision on the permit application. No in situ mining operation shall be commenced or conducted unless a valid mining permit has been issued to the operator. Construction and completion of wells may be authorized prior to issuance of a mining permit or a research and development license pursuant to W.S. 35-11-404(g).

35-11-428. In situ mining permit; requirements for application; contents of application.

(a) Application for an in situ mining permit shall meet the requirements of W.S. 35-11-406(a)(i) through (vi) and (viii) through (xiv), and shall contain a description of the proposed permit area including the following information relating to the applicable in situ technology:

(i) Soils, vegetation, wildlife and surface hydrologic information consistent with the extent and nature of the proposed surface disturbance including descriptions of the soil, indigenous wildlife, natural gamma radiation background for lands to be impacted by radioactive materials, the vegetative cover, meteorological information and a description of any surface water and adjudicated water rights within the proposed permit area or on adjacent lands;

(ii) Geologic and groundwater hydrologic information including:

(A) A description of the general geology including geochemistry and lithology of the permit area;

(B) A characterization of the production zone and aquifers that may be affected including applicable hydrologic and water chemistry data to describe the projected effects of the mining activities.

(iii) A mine plan and a reclamation plan containing the information required by W.S. 35-11-406(b)(ii), (iv) and (viii) through (xix) and:

(A) A description of the mining techniques;

(B) A statement of the past, present and proposed postreclamation use of the land, groundwater and surface water;

(C) A site facility description of the typical design criteria relevant to environmental protection;

(D) A contour map which locates proposed equipment, facilities and appurtenances necessary to insure environmental protection;

(E) An assessment of impact to water resources on adjacent lands that may reasonably be expected and the steps that will be taken to mitigate the impact;

(F) Plans and procedures for environmental surveillance and excursion detection, prevention and control programs;

(G) Procedures for land reclamation including preparation procedures, proposed seeding lists and methods, drainage reestablishment details, post-mining contour map, methods to be used to conduct post-mining radiological evaluations and the methods for mitigating any significant subsidence which may occur as a result of the mining operation;

(H) Procedures for groundwater restoration; and

(J) Estimated costs of reclamation computed in accordance with established engineering principles.

35-11-429. In situ mining permit; contents of permit.

(a) Every permit shall:

(i) Require the operator to give verbal notice of an excursion to the administrator as soon as practical after the excursion is confirmed, followed by reasonable written notice;

(ii) Authorize the administrator to terminate or modify the mining operation if an excursion cannot be controlled or mitigated within the constraints specified in the permit;

(iii) Authorize the council upon the recommendation of the director to modify water quality criteria used for groundwater restoration when information made available after issuance of the permit warrants a modification;

(iv) Prohibit any significant change in mining technique, method of operation, recovery fluid used, mining and reclamation plans or other activities that would jeopardize reclamation or protection of any waters of the state unless a permit revision has

been approved by the director pursuant to this act;

(v) Contain other conditions and requirements established by the director to employ the best practicable technology in carrying out this act.

35-11-430. Duties of in situ mining operator; records; annual report.

(a) The operator shall submit an annual report containing the general categories of environmental protection and reclamation information pursuant to W.S. 35-11-411.

(b) The operator shall maintain records at the mine site of all information resulting from monitoring activities required in the permit. The records shall state:

(i) The date, place, time and method of sampling and the personnel responsible for sampling;

(ii) The date on which analysis was performed and the personnel who performed the analysis;

(iii) Analytical techniques used; and

(iv) The results of the analysis.

35-11-431. Research and development license; renewal; application.

(a) A special license to conduct research and development testing may be issued by the administrator for a one (1) year period without a permit and may be renewed annually. An application for a research and development testing license shall be accompanied by a fee of twenty-five dollars ($25.00) and shall include:

(i) The information required by W.S. 35-11-406(a)(i) through (vi), (viii) and (x);

(ii) A description of the nature and scope of the testing activity, of general groundwater hydrology and general geology including the production zone;

(iii) A statement of the present and proposed postreclamation use of the land;

(iv) A reclamation plan which includes the method for groundwater restoration, a statement of the type of vegetation and manner of proposed revegetation or other surface treatment of the affected area and an estimate of the costs of reclamation;

(v) A timetable for the accomplishment of the reclamation plan;

(vi) All requirements of W.S. 35-11-406(j) and (k); and

(vii) Such other information as the administrator deems necessary or as good faith compliance with the provisions of this act requires.

35-11-432. Research and development license; grounds for denial; appeal.

The administrator may deny the special license to conduct research and development testing if he believes the application violates the purpose of this act. The decision of the administrator may be appealed through the director to the council.

35-11-433. Research and development license; bond required; release or forfeiture; review of license.

(a) If a special license to conduct research and development testing is granted, the administrator shall require the licensee to provide a bond in an amount necessary to insure complete reclamation.

(b) A bond posted under the terms of this section shall be released upon completion of the reclamation program and an inspection by the administrator. Failure to comply with this act shall result in forfeiture of the bond.

35-11-434. Research and development license; notice of incomplete application; when application deemed complete.

The administrator shall notify an applicant within ninety (90) days of submission of the application whether or not it is complete. If an application is incomplete, the administrator shall state in writing to the applicant the additional substantive information required.

35-11-435. Records to be filed on completion; abandoned drill holes.

(a) Upon completion of reclamation and abandonment by the operator, the operator shall record with the state engineer's office the location and nature of aquifers that have been affected by the in situ operation.

(b) Any abandoned drill hole shall be subject to the provisions of W.S. 35-11-404.

35-11-436. Existing in situ mining permits.

STATE OF WYOMING
OFFICE OF THE GOVERNOR

JIM GERINGER
GOVERNOR

STAT
CHEYENNE,

June 10, 1999

NRC Commissioners
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852

Dear Commissioners:

On August 26,1998, the Nuclear Regulatory Commission (NRC) conducted a public mee in Casper, Wyoming to solicit public comment on the NRC initiative to revise the regulat framework for the licensing of uranium and thorium operations. This meeting was held in Cas as four of the in situ leach (ISL) mines and seven Title II mill sites regulated by the NRC are loc in Wyoming. These operations, as well as the employment and the revenue they generate, are v important to Wyoming and the small communities where the workers reside.

During the NRC August 1998 meeting, the Wyoming Department of Environmental Qua (WDEQ) expressed strong belief that ISL wellfields were adequately regulated by the Stat Wyoming. The WDEQ also indicated that proposed regulations being considered were duplicat with existing state regulations and therefore not needed.

The Wyoming Mining Association (WMA) stressed that proposed rulemaking to fur involve NRC in the regulation of ISL wellfields was not needed since mining at ISL wellfield sufficiently regulated by existing EPA Underground Injection Control (UIC) regulations. Wyoming the UIC regulations are administered by the (WDEQ) through the Wyom Environmental Quality Act and detailed WDEQ Land Quality Division (LQD) regulations wh specifically regulate in situ mining.

With the continuing efforts by NRC to increase the regulation of ISL wellfields in proposed Part 41 regulations, it is apparent that NRC has not accepted the input from the Stat Wyoming or the WMA. Moreover, it appears that the NRC is trying to impose even greater fed regulations and associated costs on an activity that has been, and will continue to be, adequat regulated by the State.

I would, therefore, stress my concern that the continued dual jurisdiction of ISL wellfiel by the NRC causes an unneeded burden, not only to the companies involved, but also to the NR itself and the WDEQ. One of the precepts of most environmental regulation is to allow the stat to assume primacy of the program. This precept recognizes inherent state sovereignty, allows t states to construct a program that best fits that state, and ensures the operator only has to answer one, all the while ensuring that federal program requirements are met. In this case, the State Wyoming has effectively regulated all aspects of uranium mining for decades without th involvement of the NRC.

I request that NRC relinquish all jurisdiction over ISL wellfields, as these mining operation are more than adequately regulated by the State.

We don't need duplication. The NRC, like many other agencies, has a very large worklo How much more effective to focus those efforts on other areas needing attention than to duplicat efforts that are currently being handled by the State. Most importantly, removing the NRC fro involvement in ISL wellfields will not adversely impact any environmental or safety consideratio of the mining process, as those concerns are adequately covered by the State of Wyoming.

Best regards,

Jim Geringer
Governor

JG:DH:ct
cc: Wyoming Congressional Delegation

The State
of Wyoming

Department of Environmental Quality

Jim Geringer, Governor

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

ADMIN/OUTREACH	ABANDONED MINES	AIR QUALITY	INDUSTRIAL SITING	LAND QUALITY	SOLID & HAZ. WASTE
(307) 777-7758	(307) 777-6145	(307) 777-7391	(307) 777-7369	(307) 777-7756	(307) 777-7752
FAX 777-3610	FAX 777-6462	FAX 777-5616	FAX 777-8937	FAX 777-5864	FAX 777-5973

October 26, 2000

Mr. Mark Haisfield
US Nuclear Regulatory Commission
Division of Industrial and Medical Nuclear Safety
Office of Material Safety and Safeguards, T9-C24
Washington, DC 20555

Dear Mr. Haisfield:

This correspondence is in response to your letter dated September 11, 2000 which requests comments on the NRC D Plan "Domestic Licensing of Uranium and Thorium Recovery Facilities" -- 10 CFR Part 41. In regards to the N promulgate regulations specifically directed at uranium mining at ISL (In Situ Leach) wellfields, Governor Ger submitted the State of Wyoming's concerns in a letter to the NRC Commissioners, dated June 10, 1999. In that lette such proposed regulations were duplicative with Wyoming mining regulations and existing EPA Underground Injectic regulations administered by the state, and that the proposed enhanced dual jurisdiction will cause an increased and unn the companies involved, the NRC, and the WDEQ. These same concerns were voiced by my agency during the public Casper on August 26, 1998.

Our position has not changed on this issue. In fact, given the continual decline in the price of uranium since NRC's Augi (the price has fallen from approximately $12 per pound to less than $7.50), one Wyoming ISL producer has perman production operations, while another has substantially reduced production, discontinued any further development, and force accordingly, our previous comments are even more pertinent. The remaining ISL producer has also substant production level and reduced its workforce to try to survive the depressed market. Indeed, the current price cannot supp mining in the U.S. The remaining producers are still in business only because of higher priced contracts that will soo these circumstances, any additional regulations and costs, without a corresponding increase in environmental protection and safety, is not what this industry, or state, needs.

The NRC should not pursue regulations for mining at ISL wellfields, but should put forth efforts to determine how to dea industry faced with a difficult economic future. Given the much reduced size of this
industry, the economic pressures it faces, and the fact that the few operators remaining will be required to pay for the de proposed new NRC regulations, the entire rulemaking process seems unjustifiable at best.

Best regards,

Dennis Hemmer
Director

cc: NRC Commissioners
Honorable Richard Meserve, Chairman

CHAPTER XI

NONCOAL

IN SITU MINING

Section 1. Definitions.

(a) "Background" means, for the purposes of in situ mining, the constituents or parameters and the concentrations or measurements which describe water quality and water quality variability prior to the injection of recovery fluid.

(b) "Injection well" means, for the purposes of in situ mining, a well or conduit through which recovery fluid is introduced into the subsurface.

(c) "License area" means, with respect to an In Situ Research and Development License, an area described in the license application within which all affected land and water is contained.

(d) "Receiving strata" means, for the purposes of in situ mining, the geologic unit within which the production zone is contained.

(e) "Recovery well" means, for the purposes of in situ mining, a well or conduit through which a recovery fluid, mineral, or product is produced from the subsurface.

(f) "Uses for which the water was suitable" means, with respect to in situ mining, those uses of the premining groundwater which are or could have reasonably been developed considering established water quality standards and the premining groundwater quality conditions. Such uses shall include, but are not limited to, municipal and domestic drinking water, industrial, agricultural and wildlife uses.

(g) "Well field area" means, for the purposes of in situ mining, the surface area containing injection and recovery wells. This area may be all or a portion of the entire area proposed for the injection and production of recovery fluid throughout the life of the mine.

Section 2. General Requirements.

(a) In addition to the requirements of this Chapter, Chapter I, Chapter II, Section 1., Section 2.(a)(i)(A) and (J) and Section 2.(b)(iii)(E), Chapter III, Section 2. (excepting Subsections (b)(ii) and (iii), (c)(iv), (h) and with respect to (k)(i), reclamation shall be completed within two (2) years following groundwater restoration), and Chapter VII of these regulations shall apply to in situ mining operations. Applicable sections of Chapters VIII and IX, Water Quality Division Rules and Regulations shall also apply to in situ mining operations.

(b) No in situ mining operation shall commence or be conducted unless a valid mining permit or license has been issued to the operator from the Department. Applications for an In Situ Mining Permit or Research and Development License shall be filed with the Administrator of the Land Quality Division. The applicant shall file six (6) copies of the application and the Administrator of the Land Quality

Division shall forward three (3) copies for filing with the Administrator of the Water Quality Division. Applications shall be in a format required by the Department.

(c) The Land Quality Division and Water Quality Division shall review the in situ mining permit or license application and determine its suitability for publication in accordance with W.S. 35-11-406. A single permit shall be issued by the Director upon the recommendations of the Administrators of the Land Quality Division and Water Quality Division. A single license shall be issued by the Administrator of the Land Quality Division upon concurrent approval of the Administrator of the Water Quality Division.

(d) Operators having an in situ mining permit or license issued before the effective date of these regulations shall, by no later than May 25, 1980, present evidence demonstrating compliance with the requirements of W.S. 35-11-426 through W.S. 35-11-436. The Administrator shall review such evidence and shall advise the operator in writing of such additional information or procedures necessary to satisfy the provisions of this chapter and of W.S. 35-11-426 through W.S. 35-11-436.

(e) The operator shall verbally report any confirmed excursion to the Administrator within 24 hours, and shall submit within seven (7) days thereafter a written report to the Administrators of the Land Quality Division and the Water Quality Division detailing the procedures for mitigating or controlling the excursion. The Administrator of the Land Quality Division may after consultation with the Director and Administrator of the Water Quality Division, terminate or modify the mining operation if an excursion is not controlled within 60 days following the confirmation of the excursion. An excursion is controlled when the movement of recovery fluid out of the production zone and into unauthorized areas has ceased.

(f) All wells and drill holes resulting from in situ mining operations shall be abandoned in accordance with Chapter XIV of these regulations and W.S. 35-11-404.

Section 3. Permit Applications.

All applications for an in situ mining permit shall contain:

(a) All information and materials required pursuant to W.S. 35-11-406(a)(i) through (vi), (viii) through (xiii) and (xv), and W.S. 35-11-406(b)(x) through (xii); and:

(b) A description of the land, geology and groundwater hydrology consistent with the extent and nature of the proposed surface disturbance and applicable in situ technology including:

(i) The past, present, and proposed post-reclamation use of the land, groundwater and surface water.

(ii) A soil survey which maps and describes the general distribution of the soils within the permit area. A detailed soil survey and associated laboratory analysis may be required for soils on the affected lands.

(iii) A description of the nature and depth of the topsoil that will be removed from proposed affected land prior to disturbance by mining activities.

(iv) A survey of vegetative cover, productivity and species diversity on the proposed affected land determined by scientifically acceptable sampling procedures.

(v) A list of the indigenous vertebrate species by common and scientific names observed within the proposed permit area. Habitats for endangered species and important habitats and migration routes for other wildlife shall be identified and described. Surface waters supporting fish that may be affected by the operation shall be sampled for benthic invertebrates and periphytons.

(vi) A description of climatic conditions of the site in accordance with the requirements of Section 2.(a)(i)(C) and (D), Chapter II of these regulations.

(vii) The name, description and map of all surface waters within the permit area and on adjacent lands. A list and mapping of all adjudicated and permitted surface water and groundwater rights within and adjacent to the permit area shall be provided.

(viii) A description of the geology including maps, cross-sections and supporting geologist, drillers and geophysical logs which identifies: formations and aquifers, geologic features that could influence aquifer properties and the areal and stratigraphic position of the production zone in relation to other geologic features.

(ix) A geochemical description of the receiving strata and any aquifers that may be affected by the injection of recovery fluid.

(x) Locations and present owners of all water wells in use within the permit area and on adjacent lands, including a description of well completion data, producing interval(s), and variations in water level to the extent such information is available in the public records and from a reasonable inspection of the property. The Administrator shall require a mapping of all wells within and adjacent to the permit area.

(xi) A tabulation of all abandoned wells and drill holes, giving location, depth, type of use, condition of casing, plugging procedures and date of completion for each well or drill hole within the permit area and on adjacent lands to the extent such information is available in public records and from a reasonable inspection of the property.

(xii) A groundwater potentiometric surface contour map for each aquifer that may be affected by the mining process.

(xiii) Aquifer characteristics for the water saturated portions of the receiving strata and aquifers which may be affected by the mining process, which may include, but is not limited to, aquifer thickness, velocity and direction of groundwater movement, storage coefficients or specific yields, transmissivity or hydraulic conductivity and the direction(s) of preferred flow under hydraulic stress in the saturated zones of the receiving strata. The extent of hydraulic connection between the receiving strata and overlying and underlying aquifers, and the hydraulic characteristics of any influencing boundaries in or near the proposed well field area(s) shall be determined and described.

(xiv) Tabulated water quality analyses for samples collected from all groundwaters which may

be affected by the proposed operation. Sampling to characterize the premining groundwater quality and its variability shall be conducted in accordance with established Department guidelines.

(c) A mining plan containing all information required by W.S. 35-11-406(b)(viii), (xiii), (xiv), and (xvi) and consistent with the applicable in situ technology:

(i) A description of the proposed method of operation, including injection pressures, injection rate and type of recovery fluid to be used.

(ii) Contour map(s) which accurately locate and identify the permit area and show the location of any public highways, dwellings, utilities and easements within the permit area and adjacent lands in relation to all proposed affected lands and proposed activities associated with the operation including, but not limited to: plant site, chemical storage areas, well-field areas, monitor wells, roads, temporary and permanent drainage diversions, impoundments, stockpiles for topsoil, ore product and waste, and all processing facilities.

(iii) A map(s) which shows the proposed sequence for mining and reclamation.

(iv) The procedures utilized to verify that the injection and recovery wells are in communication with monitor wells completed in the receiving strata and employed for the purpose of detecting excursions.

(v) The procedure(s) to insure that the installation of recovery, injection, and monitor wells will not result in hydraulic communication between the production zone and overlying stratigraphic horizons.

(vi) A schedule and procedures to check for mechanical integrity of injection wells prior to injection and at a minimum of every five (5) years of use.

(vii) The procedure(s) used to protect the topsoil from excessive compaction, degradation, and wind and water erosion where stockpiling of topsoil is necessary.

(viii) A subsidence analysis, using established geotechnical principles, which estimates based upon the proposed mining operation the effect of subsidence upon the land surface and overlying groundwater aquifers. Subsidence shall be planned and controlled to the extent that the values and uses of the surface land resources and the groundwater aquifers will not be degraded.

(ix) Completion details for all monitor wells and a detailed description of the typical proposed well completion for injection and recovery wells.

(x) A description of and design plan for all impoundments and, for impoundments containing wastes, a leakage monitoring plan. For impoundments holding toxic or acid-forming material, contingency plans to control unanticipated leakage shall be provided.

(xi) A description of all temporary and permanent surface water diversions in accordance with the requirements of Chapter III, Section 2.(e) and (f), of these regulations.

(xii) The composition of all known and anticipated wastes and procedures for their disposal.

(xiii) Procedures for insuring that all acid-forming, or toxic materials or other materials constituting a fire, health or safety hazard encountered during or created by the mining process are promptly treated, confined or disposed of in a manner designed to prevent pollution of surface water or groundwater, degradation of soils and vegetation, or threat to human or animal health and safety.

(xiv) A description of chemical reactions that may occur during mining as a result of recovery fluid injection.

(xv) Details of a program to monitor the quantity and quality of waters that may be affected by the operation from premining through release of bond, including a description of procedures and time schedules used to confirm excursions.

(xvi) A description of measures employed to prevent an excursion, and contingency plans to be implemented in the event of an excursion.

(xvii) An assessment of impacts that may reasonably be expected as a result of the mining operation to water resources and water rights inside the permit area and on adjacent lands, and the steps that will be taken to mitigate these impacts.

(xviii) Description of the mitigating measures used during mining to minimize disruption of important habitats and migration routes of wildlife.

(d) A reclamation plan containing all information required by W.S. 35-11-406(b)(ii), (iv), (xv), (xix), and consistent with the applicable in situ technology:

(i) The information necessary to demonstrate that the operation will return all affected groundwater, including affected groundwater within the production zone, receiving strata, and any other areas, to a condition such that its quality of use is equal to or better than, and consistent with, the uses for which the water was suitable prior to the operation by employing the best practicable technology. Such a demonstration shall be made by showing that through the employment of the best practicable technology, as defined in W.S. 35-11-103(f)(i):

(A) The condition and quality of all affected groundwater will be returned to background or better, or:

(B) The requirements of Section 3.(d)(i)(A) cannot be achieved. In this event the condition and quality of all affected groundwater will at a minimum be returned to a quality of use equal to and consistent with uses for which the water was suitable prior to the commencement of the operation.

(ii) In accordance with paragraph (i) of this subsection, the condition of groundwater restoration and the proposed procedures to achieve such restoration.

(iii) A contour map showing the approximate post-reclamation surface contours for

affected lands and the immediate surrounding areas if the operation will substantially alter the premining contours.

(iv) Procedures for reestablishing any surface drainage that may be disrupted by the mining operation.

(v) Procedures for the reclamation of any temporary diversion ditches or impoundments.

(vi) Procedures for permanently disposing of any toxic or acid-forming materials.

(vii) Procedures for removing and disposing of structures used in conjunction with the mining operation.

(viii) Procedures for mitigating or controlling the effects of subsidence.

(ix) Procedures for ground surface preparation, depth of topsoil replacement, erosion control and water conservation practices.

(x) Procedures for revegetation so as to return the affected lands to the proposed post-mining land use in accordance with Chapter III, Section 2.(d).

(xi) A proposed time schedule for achieving reclamation.

(xii) The estimated cost of reclamation as computed in accordance with established engineering principles, including, but not limited to:

(A) Cost of removing and disposing of structures.

(B) Cost of topsoiling and reseeding all affected lands.

(C) Cost of facilities, materials, and chemical used for groundwater restoration.

(D) Cost of capping, plugging and sealing of all wells.

Section 4. Annual Report. In situ mining operators shall submit annual reports containing all information required by W.S. 35-11-411; and:

(a) A map(s) showing the location of all wells installed in conjunction with the mining activity and showing all areas where:

(i) Groundwater restoration has been achieved, is actively taking place and is expected to commence during the next year.

(ii) Mining is expected to commence during the next year.

(b) The total quantity of recovery fluid injected and the total quantity of recovery fluid extracted during the

reporting period for each well-field area including a description of how these quantities were determined.

(c) Monitoring program results pursuant to Section 3.(c)(xv) of this Chapter, including a map and description of all excursions, their location and extent, that occurred during the reporting period. Completion details shall be included for all monitor wells installed during the previous year.

(d) An updated potentiometric surface map(s) for all aquifer(s) that are or may be affected by the mining operation.

(e) Supporting data sufficient to demonstrate groundwater restoration in accordance with Section 3.(d)(ii) of this Chapter.

Section 5. Research and Development License Application. An application for a Research and Development Testing License shall contain all information required by W.S. 35-11-431; and shall:

(a) Demonstrate that the operation is designed to:

(i) Evaluate mineability or workability of a mineral deposit using in situ mining techniques.

(ii) Affect the land surface, surface waters and groundwater of the State to the minimum extent necessary.

(iii) Provide premining, operational and post-mining data, information and experience that will be used for developing reclamation techniques for in situ mining.

(b) Contain a general description of the land, geology and groundwater hydrology for the proposed license area including:

(i) The land use, vegetation, and topsoil characteristics of the affected lands.

(ii) Location and name of surface waters and adjudicated water rights inside and within 1/2 mile of the license areas.

(iii) Locations and present owners of all wells inside and within one-half (1/2) mile of the license area to include information concerning plugging and well completion and producing interval(s) to the extent such information is available in the public record or by a reasonable inspection of the property.

(iv) Groundwater quality data and potentiometric surface elevations for aquifers that may be affected by the proposed operation.

Section 6. Prohibitions. Permittees and licensees shall not inject recovery fluid into any zone or interval other than that described in the approved permit or license.

Section 7. Maintenance of Records and Chemical Analysis. The operator shall maintain records

at the mine site in accordance with W.S. 35-11-430(b) and all chemical analysis submitted to the Administrator in accordance with a valid permit or license shall include:

(a) A description of reference for the procedures and methods used for sample collection, preservation, analysis and quality control.

(b) The name, address, and telephone number of the laboratory performing the analyses, the job identification number and the date the analyses were performed.

Section 8. Confidential Records. Information submitted to satisfy the requirements of this Chapter may be held confidential pursuant to W.S. 35-11-1101.

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND QUALITY DIVISION
GUIDELINE NO. 4

In-situ MINING

This document is a guideline only. Its contents are not to be interpreted by applicants, operators, or LQD staff as mandatory. Its preparation is the result of numerous requests from applicants and operators for guidance in preparation of a comprehensive application or amendment. If an operator wishes to pursue other alternatives, they are encouraged to discuss these alternatives with the LQD staff.

This guideline is intended to be comprehensive and all headings may not apply to all operators. A table of contents is provided to direct the applicant to the appropriate topic for individual permitting needs.

TABLE OF CONTENTS

I. INTRODUCTION

The guideline follows the following format:

Part I: Introduction

Part II: Adjudication File

Part III: Research & Development License - Supportive Information

Part IV: Commercial Scale Permit - Supportive Information

A. Supporting Documents

Prior to resource inventory or development of an in-situ application, the applicant should review the following documents which can be obtained from the Land Quality Division upon request:

1. Wyoming Environmental Quality Act (as amended).
2. Land Quality Division Rules and Regulations.
3. Water Quality Division Rules and Regulations.
4. Land Quality Division Guidelines:
   - No. 1 Soil and Overburden
   - No. 2 Vegetation
   - No. 3 Parameters for Determining Soil Suitability
   - No. 5 Wildlife
   - No. 6 Organization and topic outline for an Application for a Permit to Mine or an Amendment
   - No. 6A Format and General Content Guideline for Permit Applications, Amendments and Revisions for Coal Mining Operations
   - No. 8 Hydrology
   - No. 10 Fencing
   - No. 11 Cultural Resources
   - No. 15 Alternate Sediment Control

B. Application Format

A single application (consisting of 3 copies, 4 copies if BLM surface or mineral) for a permit to mine or a research and development testing license should be submitted to the Administrator of the Land Quality Division. It should consist of two sections.

The first section of the application is the adjudication file, containing the "Permit to Mine" and "License to Mine" forms, bonds notification, receipts, consent forms, and Appendices A through C. The adjudication file should be submitted in a loose form and not be bound.

The second section of the application contains supporting information. Data for this section should be submitted in loose leaf 3 ring binders to allow easy substitution of pages for revisions or additions. It should be printed on 8½ x 11 inch paper with standard margins and page numbers on all pages. The paper should be about 20 pound quality. All figures and tables larger than 8½ x 11 inch paper should be folded to fit into the application and should be physically attached to the appropriate location in the application. All figures and tables should be numbered and referenced in the text. The Land Quality Division and the Water Quality Division will concurrently review the application and a single permit or license will be granted upon the approval of both administrators of the two divisions.

C. Definitions for Purpose of the Guideline.

1. "Aquifer". A zone, stratum, or a group of stata that store and transmit water in sufficient quantities for a specific use.

1a. "Aquitard". A layer of low permeability that can store groundwater and also transmit it slowly from one aquifer to another.

1b. "Confined Aquifer". An aquifer that is overlain by a confining bed, where the hydrostatic pressure at the top of the aquifer is greater than atmospheric pressure.

1c. "Unconfined Aquifer". An aquifer in which there are no confining beds between the zone of saturation and the surface, where the hydrostatic pressure at the top of the saturated zone is equal to atmospheric pressure.

2. "Area of Review". The area for which information and analyses will be submitted as part of a groundwater pollution control permit application, and reviewed for issuance of a permit; the extent of the area will never be less than an area within a one-quarter (¼) mile radius of the discharge site. The area of review may coincide with a permit area and adjacent lands, or may be determined by use of a mathematical model and formula which have been developed to describe groundwater hydraulics and flow. (Reference Water Quality Division Rules and Regulations, Chapter IX for the formula). The "area of review" definition applies only to groundwater pollution control permit applications.

3. "Background". The constituents or parameters and the concentrations or measurements which describe water quality and quantity variability prior to subsurface discharge, may also be called baseline.

4. "Best Practicable Technology, (BPT)". A technology based process determined by WDEQ as justifiable in terms of existing performance and achievability (in relation to health and safety) which minimizes, to the extent safe and practicable, disturbances and adverse impacts of the operation on human or animal life, fish, wildlife, plant life and related environmental values.

5. "Excursion". Any unwanted and unauthorized movement of recovery fluid (or associated by-products from underground coal gasification operations) out of the production zone as a result of in-situ mining activities.

6. "Groundwater Restoration". The condition achieved when the quality of all groundwater affected by the injection of recovery fluids is returned to a quality of use equal to or better than, and consistent with the uses for which the water was suitable prior to the operation by employing the best practicable technology.

7. "Injection Well". A well or conduit through which recovery fluid is introduced into the subsurface.

8. "In-situ Mining". A method of in-place subsurface mining in which limited quantities of overburden are disturbed to install a conduit or well, and the mineral is mined by injecting and recovering a liquid, solid, sludge, or gas that causes the leaching, dissolution, gasification, liquefaction or extraction of the mineral. In-situ mining does not include the primary or enhanced recovery of naturally occurring oil and gas or any related process regulated by the Wyoming Oil and Gas Commission.

9. "License Area". An area described in the license application within which all affected land and water is contained.

10. "Monitor Well". A well constructed or utilized to measure static water levels and/or to obtain liquid, solid, or gaseous analytical samples or other physical data that would be used for controlling the operation or to indicate potential circumstances that could affect the environment.

11. "Potentiometric Surface". The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full head.

12. "Production Zone". The geologic interval into which recovery fluids are to be injected or extracted.

13. "Recovery Fluid". Any material which flows or moves, whether semisolid, liquid, sludge, gas or other form or state, used to dissolve, leach, gasify or extract a mineral (the term is the same as lixiviant).

14. "Recovery Well". A well or conduit through which a recovery fluid, mineral or product is produced from the subsurface.

15. "Research and Development Testing". Conducting research and development activities to indicate mineability or workability of, and develop reclamation techniques for, an in-situ operation.

16. "Subsidence". The measurable lowering of a portion of the surface or substrata.

17. "Surface Affected Area". The acreage which requires seeding for reclamation purposes and includes disturbances associated with roads.

18. "Trend Well". A well or wells between the well field area and the monitoring wells used for pre-excursion problem area detection.

19. "UCL or Upper Control Limit". The maximum concentration of a chemical parameter in groundwater that can be attributed to natural geochemical fluctuations and analytical variability. Upper control limits are defined statistically from baseline sampling and agreed upon by the administrator and the operator prior to mining initiation.

20. "Well Field Area". The surface area containing injection and recovery wells. This area may be all or a portion of the entire area proposed for the injection and production of recovery fluid throughout the life of the mine.

II. ADJUDICATION FILE - Permit to Mine (In-situ) and Research & Development License (In-situ)

The adjudication file is required for all applications and should be submitted in triplicate to the Division.

A. Form 1 UIC (Underground Injection Control) Mine Application or Form 5 R&D License, In-situ.

These forms contain a list of information to be included in the adjudication file. An original corporate seal is required on this form.

Below are listed the potential legal entities (applicants), with instructions on who can execute the documents associated with the application.

1. Corporations (closed or publicly held)

The corporation and the president should sign all documents unless certified evidence is included to show that the position signing can bind the corporation.

2. Partnership

The partnership is the applicant, but all partners must sign the documents.

3. Joint Venture

Same as partnership.

4. Limited Partnership

The limited partnership itself is the applicant. Each general partner (not the limited partners, they are only investors) must sign the documents.

B. Form 3 License to Mine Application (Not necessary for a R&D License)

An original corporate seal is required.

C. Reclamation Bonds

The following are acceptable types of bonds:

1. Corporate Surety Bond

This bond must be executed on the State of Wyoming form. It must be an original execution and be accompanied by a Power of Attorney for the Surety's Attorney-in-Fact. It is wise to investigate with surety companies the time necessary to process a surety bond. The bond must be approved by the Attorney General's Office and the LQD prior to approval of the application.

2. Federally Insured, Automatically Renewable Certificates of Deposit

These must be made out solely to the Wyoming Department of Environmental Quality - Land Quality Division. Interest is payable to the purchaser.

3. Government Backed Securities

ex: Treasury Bills

4. Self-Bond

See Chapter XII of the Land Quality Rules and Regulations for details on this type of bond.

5. Cash - U.S. Dollars

If a personal or company check is submitted as cash bond, three weeks waiting is required to assure that the check will be paid by the bank. The application cannot be approved until the check has cleared the bank. To avoid any delay in approval, a certified or cashier's check should be used.

6. Letters of Credit

See Chapter XX of the Land Quality Coal Rules and Regulations or Chapter XII of the Land Quality Noncoal Rules and Regulations on details on this type of bond.

D. Surface Owner Consent and Right of Entry

There is no item on the Form 5 to document Surface Owner Consent but Consent and Right-of-Entry are required for Coal R&D Licensing.

Form 8 - Surface Owner Consent Form is required of all surface owners since generally a lease agreement or other legal document does not specifically state that the surface owner has seen and viewed the mine plan.

E. Certificate of Public Liability (Applicable only to Coal In-situ Permit or License)

1. An original certificate with a notarized signature is required.

2. A rider must be attached requiring the insurance company to notify the LQD whenever substantive changes occur or the policy is cancelled or is not renewed.

F. Appendix "A" (For lands within the Permit or R&D License area. Applicable to both In-situ Permit & R&D Licenses)

1. List of names and last known addresses of:

   a. Owners of record of the surface rights within Permit or R&D License area.

   b. Owners of record of the mineral rights within Permit or R&D License area.

2. Maps showing locations of ownership in 1.a. and 1.b. above.

G. Appendix "B" (for lands adjacent to Permit or R&D License area)

1. List of names and last known addresses of: a. Owners of record of surface rights of lands immediately adjacent to the proposed Permit or R&D License area, b. Any other persons having a valid legal estate of record within one-half (½) mile of the Permit or R&D License area such as water rights and rights-of-way owners, etc.

   List of names and last known addresses of owners of record of coal immediately adjacent to the proposed Permit or R&D License area. (Applicable only to coal permit or license.)

2. Maps showing the locations of the ownership in 1. and 2. above.

H. Appendix "C" Tabulation of Lands

1. Lands in the permit area are to be tabulated on LQD Forms C-1 and C-2 and signed by the applicant. The separate tabulations are as follows:

   a. Tabulation of lands in the proposed Permit or R&D License area by legal subdivision, section, township, range, county, and municipal corporation, if any, and number of acres for each entry listed. If a bearing and distance description is used, it must be presented in either quadrant bearings or azimuths with horizontal distances. The number of acres in each bearing and distance description must be listed.

   b. Separate tabulation of lands in the proposed Permit or R&D License area where no right to mine is claimed with the number of acres for each entry.

c. Tabulation of lands which are located within other Permit or R&D License areas in the state, and a copy of the agreement with the other permittee(s), licensee(s).

2. An original U.S. Geological Survey topographic map, clearly outlining and identifying the lands within the proposed Permit or R&D License area. Photo copies or other similar copies are not acceptable unless prior approval is obtained from the Land Quality Division.

I. Appendix "D"

See No. III of this Guideline

J. Appendix "E"

It is suggested that the applicant compose an Appendix "E" for the R&D License application although it is only required for coal ventures.

A map or maps with the boundary of the proposed Permit area or R&D License area and adjacent area clearly outlined and identified should be submitted that shows:

1. Lands to be affected over the life of the mine.

2. Drainage area within and surrounding the proposed permit area.

3. Location and names, where known, of all existing roads, railroads, public or private rights-of-way and easements, utility lines, pipelines, buildings, lakes, streams, creeks, springs and other surface water courses, oil wells, gas wells, and water wells.

4. Outline of the probable limits of all areas previously disturbed or to be disturbed by underground or surface mining, whether active or inactive, within or adjacent to the proposed permit area.

5. For operations which began prior to November 25, 1990, a map distinguishing operational mining units.

6. Ownership and use of all buildings on or adjacent to the permit area.

7. Political boundaries of special districts such as water, police, fire, conservation; public and private parks; cemeteries; Indian burial grounds; areas mentioned in Chapter XII, Section 1(a)(v)(A) and (B) of the Land Quality Coal Rules and Regulations as applicable.

K. Statement of Compliance (Applicable to Coal Applications)

1. List all notices of violation incurred by the applicant for any U.S. surface coal mine operated during the three years prior to the date of the application.

2. State whether the applicant or entities controlled by or under control with the applicant have had any mining permit suspended or revoked in the last five years. If so, describe the proceedings and identify the regulatory authority.

3. List all licenses, permits and approvals needed to conduct the operation. Include information about what you need to do to comply with requirements for all permits not yet obtained.

4. List your Mine Safety and Health Administration (MSHA) number.

5. Provide copies of all DEQ and State Engineer permits and approvals, or list the identification numbers.

6. State whether the proposed area to be mined is within an area designated, or being studied for designation as unsuitable for surface coal mining. Also state whether the permit or license area is within an area where mining is prohibited.

L. Identification of Interests (Applicable only to Coal Applications)

1. List all owners of record of the property to be mined:

   a. legal and equitable owners
   b. leaseholders
   c. purchasers of record under a real estate contract

2. If the applicant or any surface or mineral owner is a corporation or partnership, list the name and address of every:

   a. officer
   b. partner
   c. director
   d. principal
   e. resident agent

3. List the names and addresses of all principal shareholders of the applicant. (over 5%)

4. List the names of all surface coal mines operated by the applicant or principal shareholders during the preceding five years.

5. List all current, pending (including this application) and previous U.S. surface coal mining permits held by the applicant, partner, or principal shareholder subsequent to 1970. Include the regulatory authority.

6. Provide a statement of all lands, interests in land, options, or pending bids made by the applicant for lands contiguous to the permit area.

M. Proof of Publication (Applicable to Form 1 Applications and Coal R&D Licenses)

Land Quality Division will provide publication notice format. Publication and notification

is not to begin until written consent from the Land Quality Division has been received by the applicant.

N. Proof of Filing (Applicable to Form 1 applications & Coal R&D Licenses)

Submit an original, signed affidavit of filing from appropriate county courthouse just prior to start of publication.

O. Proof of Notification (Applicable to Form 1 and Form 5 R&D)*

Applies to all owners of record of the surface and mineral rights within the Permit or R&D License area; owners of record of surface rights of adjacent lands; and all persons within one-half (½) mile having a valid legal estate of record. The notice must be sent within five (5) days after the publication to all above owners of record. The original certified mail receipts (the white post office form PS3800) must be submitted to LQD for validation. The receipts must be affixed to 8 x 10 sheets and placed in either alphabetic order or in the exact same order as the names listed in Appendix A, B, and the water rights owners listed in Appendix D6 who are within ½ mile of the Permit or R&D License area.

* Non-coal Form R&D License requires mailing a letter of notice and provide proof of mailing, but publication is not required.

III. RESEARCH AND DEVELOPMENT TESTING LICENSE - Supportive Information

A. Introduction

The following format assumed the operator will eventually apply for a commercial in-situ permit, and that the Research and Development License will be used to justify future techniques proposed for mining and reclamation.

The Research and Development License application should precisely describe all non-research aspects of the operation, as requested in Parts III.B. through D. Part III.E. is reserved for the research project; a detailed outline of the proposed research is requested. During the experiments, accurate records of the experiments should be kept by the operator. Previous research that a commercial scale permit is based on should be thoroughly discussed and/or referenced in the permit document (see part IV of this document).

Background data collection, Part III.B., should emphasize the site-specific environment of the License Area. Information should be provided to demonstrate that areas outside the License Area will not be affected by the operation.

B. Contents of Appendix D

1. Appendix D-1, Past and Present Land Use of the Area
2. Appendix D-3, Archaeological and Paleontological Resources of the Area
3. Appendix D-4, Climatology

   Climatological data from the past year should be obtained from the National Oceanic and Atmospheric Administration station nearest to the license area.

4. Appendix D-5, Geologic Assessment

a. The regional geology should be briefly described using referenced and published information.

b. The geology in the License Area should be described using geologic cross-sections and should be confirmed with geophysical logs and field investigation. A 1 acre well field may be described with one north/south and one east/west trending section. Guideline 8 (Part IV.A.1. and Part IV.A.5.d.) should be referenced for the information and the level of detail suggested for the cross-sections. The production zone and confining zones should be identified on the cross-sections. When applicable, the depositional environment should be discussed.

5. Appendix D-6, Hydrology

Methods to identify the groundwater system within the license area of review and reporting procedures are described below.

a. Potentiometric surfaces

Potentiometric surfaces with sufficient data points to spatially define affected aquifers should be submitted. The potentiometric surfaces should be superimposed on topographic maps of sufficient scale for analysis. Wells used in developing the potentiometric surface map should all be located and identified on the map with the particular water elevation and date of observation at each well shown.

b. Baseline groundwater quality

1. Determining regional baseline groundwater quality

Regional groundwater quality should be defined for the license area. Regional groundwater quality data should be collected for a sufficient length of time to identify any important spatial and time variant properties of the affected aquifers, to show the pre-mining hydrogeochemistry of the area, and to identify existing or anticipated impacts of adjacent mines on the groundwater quality within the license area. Generally a minimum of 4 samples per well taken quarterly over a one year time period is necessary (Table 1). Consultation with the appropriate regulatory authorities is recommended prior to beginning the program. A representative number of samples should be collected for each affected aquifer. The number of samples necessary to define groundwater quality varies with the area to be studied. More samples will be necessary for partially confined aquifers and for shallow, water table aquifers which may react more quickly to seasonal changes and to surface affects. The reliability of the data should be evaluated as part of the data gathering program.

2. Determining baseline groundwater quality per mining unit

The importance of properly defining the baseline groundwater quality for individual mining units cannot be overemphasized. The method for detecting excursions and the extent to which aquifers must be reclaimed are dependent on well characterized mining unit aquifers. Table 1 includes baseline monitoring frequency, density, parameters, and QA/QC recommendations and should be referenced during the discussion of this section.

All monitoring wells per mining unit should be sampled four times (minimum of 2 weeks between samplings) during baseline characterization. The first monitor well sampling should include analyses for parameters listed in Appendix 1, parts III and IV of Guideline No. 8.

Wellfield wells (injection and production) should be sampled four times (minimum of 2 weeks between samplings) during baseline characterization at a recommended density of 1 well per 3 acres of mining unit. The first and second sampling events should include analyses for all Guideline 8, Appendix 1, parts III and IV parameters. The third and fourth sampling events can be analyzed for a reduced list of parameters as defined by the results of the previous samplings (e.g., if certain elements are not detected during the first and second samplings, then those elements need not be analyzed for during the third and fourth sample outings).

Upper control limits (UCLs) are used to define excursions at monitoring wells and are determined from baseline sampling results. Attachment I of this guideline includes the recommended statistical method for determining UCL values. Well field baseline values are used to determine aquifer restoration goals (see Reclamation section of this guideline, part III.D.1.g.).

TABLE 1
Minimum Baseline Sampling Recommendations for In-situ Mining Operations

Area to be Sampled	Purpose of Sampling	Frequency	Density	Parameters Sampled for	QA/QC
Regional or Permit Wide	LQD review of regional groundwater quality for initial permitting and for obtaining UIC permit	Quarterly for 1 year	1 well per mi^2 in the ore zone aquifer as a general rule	Guideline 8	1 duplicate per quarter 1 blank per quarter, and 1 standard reported from the lab per quarter
Mining Unit Monitoring Wells	To establish UCLs and To characterize the geochemical environment of the buffer zone in case major excursions alter the buffer zone such that restoration is required	4 samples taken at a minimum of 2 weeks apart	All monitoring wells	1st sampling Guideline 8 Next 3, UCL parameters only	1 duplicate, 1 standard & 1 blank for Guideline 8 parameter set only
Well Field Wells	To establish restoration goals	4 samples taken at a minimum of 2 weeks apart	1 well per 3 acres as a general rule	First 2 samplings, Guideline 8 Second 2 samplings "short list" as defined by results of previous regional or mining unit samplings	1 duplicate per outing 1 blank per outing 1 standard per outing

c. Pump tests

Generally, pump tests utilizing the Neuman-Witherspoon method of analysis or other method yielding equivalent information are recommended. Multiwell pump tests are necessary to define aquifer properties. The testing should be designed to define aquifer properties within the affected area, hydrologic boundary conditions, layering effects, directional permeability, and the vertical confinement of the production zone. Transmissivity data should be of sufficient detail to confidently identify axes of directional transmissivities in the production zone.

d. Water rights

Locations and present owners of all wells inside and within ½ mile of the license area should be included. Information concerning plugging and well completion and producing interval(s) (to the extent such information is available in the public record or by a reasonable inspection of the property) is also requested.

e. Surface water

Surface water quality and quantity should be monitored only if the surface or the alluvial water quality and quantity of the stream could be affected by the mining operations. The contributing drainage area to the license area should be mapped and its acreage identified. Any ground water/surface water interactions should be identified and discussed.

f. Abandoned drill holes

A report which identifies all known premining wells and drill holes in the license and adjacent area should be filed. To ensure proper abandonment procedures were used, plugging should be verified.

6. Appendix D-7, Soil Assessment

a. Ten acres or less disturbance

For surface disturbance of ten acres or less within the license area, at a minimum, the following soils information should be submitted:

1. A soil inventory map should be provided with soil units and surface affected lands clearly outlined.

2. Soil mapping unit and profile descriptions should be provided.

3. Quantitative estimates of all suitable topsoil as described in Guideline 1, should be made for those areas where significant disturbance will occur (i.e. building construction or wellfield leveling).

b. Disturbances greater than Ten Acres

For surface disturbances greater than ten acres within the license area, more detailed soils information should be provided including chemical analysis of soils per LQD Guideline No. 1.

7. Appendix D-8, Vegetation Inventory

a. Mapping and data collection

The area to be permitted for the R&D license should be mapped according to plant communities. The area to be affected should be delineated on this map. If the area to be affected (surface affected acreage is that which requires seeding for reclamation purposes and includes disturbances associated with roads) is less than 10 acres in size, a qualitative description of the vegetation communities is adequate. However, if the R&D will disturb more than 10 acres, quantitative sampling of the affected lands will be necessary. Parameters to be measured include % cover for each species (or life form categories), total cover and a species list. Vegetation production sampling may be required depending on the nature of the communities to be disturbed and whether production information exists for the area from other sources (Soil Conservation Service publication or adjacent permit areas). Measurements should be conducted in accordance with the current LQD Guideline No. 2.

b. Extended reference areas

A parcel of land representative of the area to be affected and scheduled to remain undisturbed during the life of the project shall be delineated for bond release evaluation purposes. This parcel of land which is usually greater than 10 acres in extent is referred to as an extended reference area (ERA). The ERA should be identified in the field in conjunction with LQD personnel prior to vegetation sampling. This area should be representative of the vegetation communities to be disturbed by the R&D operations. The ERA should also be quantitatively sampled as described above. The ERA and surface affected areas can either be sampled as a unit according to vegetation types or each can be sampled individually. A decision regarding these options should be made between LQD and the operator prior to conducting the vegetation survey.

c. Threatened or endangered plant species, noxious weeds

A survey of the area to be affected (regardless of the size of disturbance) should be conducted to note the presence of any threatened or endangered plant species, and any noxious weeds. The relative abundance of any species noted should be described.

d. Photographs

Original photographs of the vegetation communities to be disturbed as well as a view of the ERA should be included in the application.

8. Appendix D-9, Wildlife

a. Vertebrate distribution

Potential vertebrate distribution on the license area should be listed.

b. Vertebrate observations and habitat affinity

Actual vertebrate observation on the license area should be described, including information on dates, extent of field studies conducted and observations. Habitat affinity of animals on the license area, and an identification of unique habitat types or known migration routes on the area should be submitted.

c. Rare, threatened or endangered species

The occurrence of rare, threatened, or endangered species, including eagles, on or within one-half mile of the license area should be noted, along with information on surveys/literature searches conducted for presence/absence determination.

C. Minerals Extraction Plan

1. Introduction

The Research and Development License application should include the experimental techniques to be tested and a prediction of the expected results. During mining, on-site data collected should be in sufficient detail so that an analysis may be performed for the predictions made in the application. The experiments and predictions could include: performance of equipment under operating conditions, well completion, well development and boring techniques, excursion prediction and control, lixiviant chemistry, identification of best restoration methods, subsidence research, or any other research topics. The license area should be limited to the minimum acreage possible.

2. General Discussion Contents

A general discussion and description of the operation should be included which identifies the goals of the operation, the life of the project, the mineral to be mined, the mining methods, equipment to be used for mining, and any research and development activities to be tested during the operation. This discussion should indicate the areal extent of disturbance within the area. The proximity of mineral, oil, gas or other resources that could be affected by the operation should also be identified in this section.

3. Site Preparation Activities

a. Location map

A location map at 1" = 500', or more detailed, identifying all areas of surface disturbance should be submitted. The map should be superimposed on a topographic map of sufficient detail to accurately locate topsoil and spoil stockpiles, erosion and sediment control methods, support facilities, well fields, monitor wells, hydrologic control features (septic systems, diversions, evaporation ponds, culverts, etc.), roads, power and telephone lines, all waste disposal sites, and fencing or other surface control methods.

b. Topsoil removal

A description and a timetable identifying the extent of topsoil removal, the depth of removal, and the quantity of topsoil in each stockpile should be included. Any other surface disturbances, appropriate timetables, and the dimensions of other stockpiles should be described.

c. Wildlife and archeology mitigation

Mitigating measures that are to be taken to alleviate impacts to wildlife and archeology should be placed in the application. This should include measures taken to prevent wildlife use of evaporation ponds.

d. Hydrologic control features

The designs and engineering of surface water hydrologic control features should be placed within this section. Appropriate permits should be obtained from the Water Quality Division with notice of application provided to the Land Quality Division.

The applicant should consult with DEQ-WQD concerning obtaining a National Pollution Discharge Elimination System (NPDES) discharge permit.

4. Production Process and Timetables

a. Description of special fluid and chemical flow paths

Major chemical reactions or physical processes anticipated at each step in the process should be described. This section should identify the composition and average and maximum volume of fluid to be injected during operation. Special processes and reactions, such as those involved in reverse osmosis, burn initiation, or high pressure water injection should also be identified in this section. The anticipated volume and composition of waste waters or materials generated by the mining operation should be described.

The potential for surface spills should be discussed along with an indication of likely contaminants involved. Spill control and cleanup procedures should be outlined.

b. Surface hydraulic equipment

A map locating the typical configuration of the piping planned for the well field area, and a description of the system should be submitted. General pipe and pump specifications should be described. Typical connections between cells (for gasification projects) should be described. Winterization techniques should be discussed. This information will be used primarily for bonding purposes.

c. Production zone location

A series of geologic cross-sections (reference Part III,B.4.) along with the geophysical logs should be used to accurately locate the limits of the production zone in three dimensions.

d. Production zone confinement

Down hole injection pressures should be identified, including the maximum injection pressure. The fracture pressure of the production zone and any confining zones surrounding the production zone should be defined. Fracture information, and data received from the pump tests should identify the extent of lithologic confinement of the production zone. Areas of diminished confinement should be delineated (where known). Special techniques that may be used for production zone confinement should also be described.

e. Well completion

Well completion, development, redevelopment and drilling techniques should be described; the drilling fluid and any additives used should be identified. The methods and materials to be used for well completion, including casing type, jointing and specifications, grouting methods, and the information requested in LQD Guideline No. 8 part III, A. 5. should be

reported for production, injection, and monitor wells. Well development methods and any anticipated well redevelopment methods should be described.

f. Mechanical integrity of wells

A schedule and procedures to check the integrity of all injection and production wells should be provided. An inflatable packer pressure test is recommended for all injection and production wells. Tests procedures used to check mechanical integrity of wells must at a minimum be approved by the EPA. The test should be performed following any down-hole insertion of drilling tools. All tests are required to be repeated at least every 5 years. Results of all integrity tests should be submitted to the Land Quality Division quarterly.

5. Excursions

a. Introduction

Excursion detection, control, and cleanup procedures should be identified in this section, considering both horizontal and vertical excursions. The monitoring network should be described and parameters used to detect and confirm excursions should be identified.

b. Monitoring well network. (See also discussion under Reclamation Plan)

The monitoring well network used for excursion detection should be outlined. Wells should be installed in aquifers which show the potential for being affected above, within, and below the production zone, and should be used for identifying excursions from the production zone. Monitor well spacings should reflect directional transmissivity and other conditions identified through on-site pump tests.

The monitoring network should be superimposed on a topographic map identifying the well field area. The extent of the ore zone, faults and other hydrogeologic boundaries should be identified on the map. The application should contain a commitment to maintain the integrity of all monitoring wells to the extent possible until their removal and reclamation (see LQD Guideline No. 8, Appendix 2).

A site specific, technically sound method for emplacement of monitor wells, including but not limited to: gradient consideration, dispersivity of recovery fluids, the initial excursion recovery measures employed by the operator, the normal mining operational flare (the lateral and vertical extent of affected area under normal operating conditions), and the recoverability within the allowable regulatory time frame, as specified in Chapter XVIII, Section 2.(e) of the Land Quality Coal Rules and Regulations or Chapter XI, Section 2.(e) of the Land Quality Noncoal Rules and Regulations, should be employed. Monitor wells may be located using a groundwater flow model, or other technically justified method. Monitor well spacing

may be increased if trend wells are used. (See Attachment 1).

All wells completed in the production zone must be in hydraulic communication with the mining zone. The completed interval should include the mineralized zone. Additional wells with lesser spacing may be necessary in preferred flow path zones. It is recommended that trend wells be monitored and the data maintained on site for inspection. For trend wells, unless an excursion occurs at the monitor well ring, remedial action is not required.

The width of the buffer zone (the area between the production field and the monitor wells) should be such that the monitor wells are within the zone of control of pumping wells which would be used to control excursions. (See Attachment 2).

The operator is responsible for restoring all groundwater affected by the mining process, including the buffer zone if it has been affected. It is therefore in the operator's best interest to establish as small a buffer zone as is operationally feasible. Monitor wells should be completed in the lower portion of the first aquifer above the ore and in the upper portion of the first aquifer below the ore. Placement of these wells should be based upon knowledge of the nature and extent of the confining layer and the presence of drill holes, hydraulic gradient, and abandonment procedures utilized.

Monitor wells should have upper control limits established on a well by well basis for an R&D. A wellfield average may be used for a commercial permit with upper control limits determined using the procedures outlined in Attachment 1.

c. Frequency of monitoring UCLs during mining

Monitoring frequency is somewhat dependent on hydraulic conductivity. Sampling and analysis for UCLs should be done twice monthly and at least 10 days apart. If UCLs are exceeded (e.g. 2 or more), then the analysis should be repeated within 24 hours of receipt of analytical data. If that second sample does not indicate the UCLs have been exceeded, a third sample shall be collected within 48 hours of receipt of the second sampling data. If neither the second nor the third sample indicate the UCLs were exceeded, the first sample shall be considered in error. If confirmed by either the second or third sample, the well will be considered to be on excursion status and should be reported verbally to the agency within 24 hours. The operator should implement the recovery plan and continue monitoring. Samples will be collected and analyzed on a weekly basis until the excursion is controlled. If the excursion lasts longer than 30 days, a suite of samples should be analyzed for Guideline 8 parameters. At the time UCLs are no longer exceeded, a suite of samples should again be analyzed for Guideline 8 parameters.

d. Parameters

A parameter set should be developed for the detection of excursions. Excursion parameters are process specific. Factors that should be considered in the selection of excursion parameters include the potential of constituents to participate in reactions such as sorption, oxidation/reduction, and precipitation.

Possible excursion parameters may include the following:

For Uranium:

TDS or conductivity
Chloride
Sulfate
Bicarbonate or Total Alkalinity
Sodium

For Underground Coal Gasification:

TDS
TOC
Ammonia
Phenols
Boron
Cyanide
CO
HS
CH_4

Water level measurements should be part of any excursion monitoring program, since pressure changes due to an imbalance in injection and production rates is transmitted quickly through the aquifer system.

e. Corrective actions

The applicant should describe the actions to be implemented to correct and control an excursion event. The actions should be identified for both horizontal and vertical excursions.

Samples should be collected and analyzed on a weekly basis until the excursion is controlled.

f. Reporting procedures (See Chapter XVIII, Section 2.(e) of the Land Quality Coal Rules and Regulations or Chapter XI, Section 2.(e) of the Land Quality Noncoal Rules and Regulations.)

In the event of an excursion, the Land and Water Quality Divisions should be verbally notified within 24 hours. Written notification describing implementation of the approved plan is required within 7 days. A plan outlining appropriate corrective actions should be included within the license. Record keeping methods and responsibilities should also be described.

6. Subsidence

An estimate of the amount of subsidence and a monitoring plan should be outlined in the license application. Costs associated from backfilling subsidence areas should be included in the bond estimation. If subsidence is not a problem for the type of mining, indicate so in the application.

7. State Permits

Copies of requested approved state and federal permits associated with this application (e.g. well permits, pond construction permits, discharge permits, fish and wildlife service permits) should be placed in the license application. It is not necessary to include the documentation associated with these permits. A copy of the WQD/SEO approved pond design does not have to be included in the original license application but should be inserted later after WQD/SEO approval.

D. Reclamation Plan

1. Aquifer restoration

a. Introduction

Aquifer reclamation activities, including procedures, chemistry, facilities, equipment required and the expected final water quality should be briefly summarized. The timetables for restoration activities should be discussed.

b. Methodology

Aquifer restoration procedures should be detailed in this section. Process description and chemistry should be specifically described. The anticipated volume and composition of water generated during restoration should be identified.

Restoration water quality and water levels should be monitored and sampled at the very beginning and at the very end of restoration. Parameters to be analyzed should include the full suite as listed in LQD Guideline No. 8, Appendix 1.

c. Monitor network groundwater restoration

A specific monitoring plan for both active and stability phases of restoration should be outlined. This may have to be modified depending on excursion events during mining. An updated plan should be submitted to Land Quality Division prior to beginning groundwater restoration.

d. Stability

Wells initially selected and listed in the reclamation plan will be used to determine restoration success. Both injection and production wells should be selected. When the restoration goal is achieved, active restoration should be discontinued and a stability period of at least 6 months will begin. The end of the 6 months period is a decision making point for the DEQ, i.e., more restoration, longer stability period, or overall success.

Based on the reclamation plan and the restoration success, the restoration sampling wells should be selected for monitoring during stability. (These wells should be identified in the reclamation plan to ensure appropriate baseline information is available, however, it is recognized that some wells may need to be changed or redesignated due to mining activities).

The restoration sampling wells should be monitored during the stability period on a monthly basis for a full suite of LQD Guideline No. 8, Appendix 1 parameters except those shown to be unaffected by mining and restoration processes.

e. Evaluation of Stability Data

1. The data should be analyzed on the basis of well field averages. In no case will wells of different baseline class be averaged together.

2. The data should be examined on a parameter by parameter basis.

3. The data should be examined over time (the six month period) to identify any trends - techniques such as scatter plots, trend, regression analysis and standard statistics should be used. A determination of aquifer stability should be made upon the "trends" in the data; i.e., a stable aquifer should not exhibit rapid upward or downward trends or be oscillating back and forth over a wide range of values.

4. The data should be evaluated against baseline quality and variability to determine if the restoration goal is met - the primary restoration goal is always baseline. The secondary goal is to restore the water within class of use. The secondary goal of restoration within class of use is applicable for "problem" parameters <u>if and only if BPT has been demonstrated</u>.

Statistical methods should be used to compare the restored aquifer data with the baseline, e.g. analysis of variance and t-test. It is important to address all of the assumptions inherent in the particular statistical method

chosen. The restoration success will be evaluated on the basis of statistically equivalent populations between baseline and post-restoration data.

Potentiometric surface maps should be developed to reflect aquifer conditions at the end of the stability monitoring period. This information will be used to determine if the groundwater flow pattern is stabilizing.

Following a decision that the aquifer geochemistry is stable, data should be evaluated on a parameter by parameter basis to determine if:

- parameters have met baseline.

- parameters are above baseline but below class of use.

- parameters are above class of use.

f. Determination of Best Practicable Technology (BPT)

The following items should be discussed:

1. Type of Technology - The type of technology may be different for different circumstances.

2. Application of Technology - Has the technology been used correctly? As an example, reverse osmosis evaluation should include:

   - Number of gallons and/or pore volumes pumped
   - Number of gallons reinjected
   - Demonstration of balance of well field
   - Bleed stream split
   - Quality of water produced vs. reinjected
   - Pond capacity
   - There should be evidence that active restoration was discontinued at the appropriate timer
   - Proper maintenance and operation of equipment

3. Economics - Consider the amount it would cost to gain further reduction in parameters, (e.g., if it requires a very large expenditure for a relatively small gain in water quality). Consideration of economics only applies if parameters fall within the class of use.

NOTE: If parameters are above class of use, then further restoration may be required.

g. Determination of groundwater restoration success at the end of the stability period.

At the end of the stability period, groundwater restoration success will be determined based on the following criteria:

1. All parameters are at baseline AND the aquifer is stable, then restoration is successful.

2. All parameters are within Class of Use Standards AND the aquifer is stable AND BPT has been applied, then restoration is successful.

3. If any parameters remain above Class of Use, then restoration is Unsuccessful. Further restoration may be required in the appropriate areas.

4. If the baseline water quality is suitable for domestic use (Class I) with the use of economically reasonable treatment devices and groundwater has not been returned to a quality within the range of such devices, then restoration is Unsuccessful.

2. Surface Reclamation

a. Post-mining land use.

The proposed post-mining land use should be specified.

b. Disposal of buildings and facilities.

The plan should include procedures for disposing of buildings and other facilities.

c. Toxic materials

The procedures for permanently disposing of any toxic or acid forming materials should be provided.

d. Topography

The plan should demonstrate that surface affected lands will blend with adjacent topography and land uses and that drainages will be re-established.

e. Surface preparation

The plan should indicate any surface preparation to be undertaken before topsoiling. Topsoil replacement methods and schedules should be included. Minimum depth of topsoil replacement should be specified. Any

erosion control practices and addition of soil amendments that are planned should be indicated.

f. Revegetation

The plan for revegetation should include species to be seeded, rate of seeding, and method and time of seeding. If cover crops, mulch, fertilizer, or irrigation will be used, this should be discussed in detail including methods and timing, rates, locations, and water quality.

g. Protection of newly seed areas

The plan should include measures and specifications to be used for protecting newly revegetated areas from grazing animals.

A site maintenance plan which includes contingencies to correct weed establishment or erosional instability should be included.

3. Reclamation schedule and cost

The plan should include a schedule for reclamation and costs broken down by different types of disturbance and different phases of reclamation work. Costs should be based on reclaiming the entire affected area after the first year as if the mine were to shut down at that time and be completely reclaimed including the removal of all facilities. Cost estimates should include restoration of the anticipated affected groundwater as well as surface reclamation.

E. Research Section

1. Introduction

The research and development license is available to allow testing of new technology or tried technology in a new geologic setting. Therefore, operations under the license should identify procedures to be tested and evaluated.

The purpose of this section is to identify the research aspects of the research and development license. This section is meant to justify the areas in the license where exact mining and reclamation procedures, timetables, methods or results can only be generally described.

2. Identification and Description of Research Methods

A description of each research area proposed in the mine and reclamation plan should be written. The description should define the anticipated techniques to be tested, the expected manner of implementation of the techniques, and the expected results.

3. Records and Reporting

A plan should outline the records that will be kept by the operator to identify the procedures actually used in the research areas and to identify the dates those procedures were implemented. For example, record keeping of the chemical composition of fluids, the volumetric water balance, injection pressures and volumes, burn intervals, and other standard operating procedures should be described in an efficient technical manner. The daily logs describing normal operational procedures may be reviewed by Division personnel on site visits.

4. Disposal of Product

A plan should be outlined for disposal of any product produced by the research project.

F. Reporting Procedures

A plan for submitting technical summaries of research results and the present status of the operation should be submitted as described in the license application. At the cessation of operations, the operator should submit a final technical report of all research results, logs, procedures, conclusions, etc., to the LQD.

G. Confidential Material

Materials or record requests for confidential status will be reviewed pursuant to W.S. § 35-11-1101.

IV. SUPPORTIVE INFORMATION - Commercial Scale Permit

A. Introduction

In general, the same information as recommended for a Research and Development License is required for a Commercial Scale permit. Listed below are some additional items considered necessary. Organization of the permit document would be similar. In using Section III for a commercial scale permit substitute the word "permit" for "license". The operator may choose to take a two-tiered approach to the commercial scale permit; i.e. obtain the mine permit for a large area using more general information with commitments to provide the more specific detailed information on a mine-unit by mine-unit basis.

Approval of each mine-unit would then be necessary prior to lixiviant injection. This approach should be discussed with Land Quality Division prior to permit submittal.

B. Supportive Information in Addition to R&D License Requirements

1. Water Rights

A list and map of all adjudicated water rights inside and within three miles of the permit area boundary must be provided. The locations and present owners of all wells within three miles of the license area (including plugging techniques, well completion techniques, and producing intervals) must be provided, to the extent such information is available in the public records and from a reasonable inspection of the property.

2. Site Preparation Activities

A description and timetable identifying the extent of topsoil removal, the depth of removal, and the quantity of topsoil in each stockpile should be included. Any other surface disturbances, appropriate timetables, and the dimensions of the stockpiles should be described.

3. Groundwater Restoration

It should be clearly demonstrated that successful groundwater restoration is being achieved in early mine units before additional mine units can be mined, according to the approved mine plan. Long term monitoring may be required in already mined and restored units throughout the progression of the mine sequence, if stability has not been demonstrated.

4. Vegetation Inventory

a. Vegetation community map

A vegetation map of the entire permit area and ½ mile buffer surrounding the boundary is required. Aerial photos can be used for mapping purposes. This map should depict the distribution of plant communities, potential surface affected areas, extended reference area (ERA), sample locations and any other information pertinent to the area. The map scale should be from 1" = 400' to 1" = 700'.

b. Qualitative description

A qualitative description of each plant community should be provided in the Appendix D-8 text of the application.

c. Cover and production data collection

Vegetation information of primary importance is cover data. Therefore, quantitative sampling should include % cover for individual species (or life form categories) and % total cover. Measurements should be conducted according to the current version of LQD Guideline No. 2. Vegetation production sampling may be required depending on the nature of the communities to be disturbed. However, if existing data from other sources (Soil Conservation Service publications or adjacent permit areas) can be provided and demonstrated to be applicable to the permit area communities in question, the collection of production data may be waived.

Sampling should be conducted on the permit area or a reduced area as approved by the Administrator. Quantitative sampling should also be conducted on the native land which is designated as the ERA to be used for bond release evaluation purposes. The ERA should be undisturbed by mining/exploration activities for the life of the operation, be of sufficient size (no less than 10 acres) to include the major plant communities to be affected and be representative of their general nature. The ERA should be reviewed and approved by LQD personnel prior to vegetation sampling.

d. Sampling design

The surface affected areas and ERA can either be sampled as one unit according to vegetation types or sampled separately depending on the nature of the permit area and the in-situ operation. A decision concerning which option would be most appropriate should be made by the operator and LQD prior to initiating the vegetation sampling study.

e. Other information to be included

1. A species list including a survey for the presence of any threatened or endangered plant species.

2. Description of any areas containing noxious weeds to include the aerial extent and their relative abundance.

3. Description of tree densities or any proposed disruption of tree communities.

4. Independent shrub density studies will not be required. However, it should be indicated whether plant communities are shrub dominated (20% cover contributed by shrub and sub-shrub species).

5. Pre-mining land uses of the area and grazing history should be provided.

6. If shrubs are not to be included in the reclamation seed mixtures because of a landowner's request, a letter verifying this from the

landowner should be included.

7. Original photographs of the vegetation communities to be disturbed and a view of the ERA should be included.

ATTACHMENT 1

I. DISCUSSION

A. Sampling and Analysis (S&A) Plan

In an effort to improve the consistency and quality of water-quality data submitted to the Land Quality Division, a groundwater sampling and analysis plan is recommended to be prepared and implemented as part of each research and development (R&D) and commercial scale in-situ mining permit. Although a very good discussion of an S&A plan is covered in the Resource Conservation and Recovery Act guidance document (EPA, 1986) on pages 97-128, the following points are presented to emphasize or elaborate on information provided in the RCRA guidance document. A S&A plan should include, but not be limited to, information on:

1. Sample Collection Protocol

   - Static water elevation and total depth of the well to the bottom of the completed interval should be measured to 0.1 foot and recorded in the samplers report for each water quality sampling event.

   - The sample withdrawal technique should be selected based on a consideration of the stability of the parameters of interest.

   - Procedures for evacuating each well prior to sample collection should be documented.

2. In-Situ or Field Analyses

   - The following parameters should be analyzed in the field during baseline and stability periods: pH, temperature, and conductivity.

3. Sample Preservation and Handling

   - Because many parameters are unstable after sample collection and cannot be analyzed in the field due to logistical constraints, sample preservation is recommended as stated in Guideline 8, Appendix I.

4. Chain of Custody

   - An adequate chain-of-custody program is to be described.

   - All sample containers are to have durable labels affixed to them which contain pertinent information such as time and date of sampling, well ID, and name of collector.

5. Analytical Methods

- Methods to analyze water-quality parameters should be consistent and follow EPA approved test procedures according to 40 CFR 136 (See References).

6. Field and Lab QA/QC

- Quality assurance and quality control recommendations are discussed in III,B.5.b.

- The frequency and method of standardizing or calibrating test equipment brought into the field needs to be documented; typically this equipment includes pH, and conductivity meters.

- The results of all field and lab QC samples are to be included along with the analytical reports submitted to the DEQ/LQD.

B. Selection of UCL Parameters

Excursions are detected through the use of systematic water-quality sampling at monitoring wells surrounding the active mining zone, both laterally and vertically. Available data on R&D and commercial scale in-situ mining operations indicate that certain parameters are typically good excursion indicators, while others are good only under certain geologic settings. The following parameters have been shown to be reliable excursion-detection parameters:

Parameters	Units
Conductivity	umhos/cm @ 25°C
Chloride	mg/L as Cl
Total Phenols (For UCG operations)	ug/L as total phenols

Additional parameters that have demonstrated an ability to detect excursions are as follows:

Parameters	Units
Calcium	mg/L as Ca
Sodium	mg/L as Na
Sulfate	mg/L as SO_4
Total Alkalinity	mg/L as $CaCO_3$
Total Dissolved Solids	mg/L residue @ 180°C
Total Organic Carbon (for UCG operations)	mg/L as TOC
Ammonia (for UCG operations)	mg/L as NH_3

C. Statistical Assumptions

This attachment recommends various statistical methods for analyzing water quality data bases. These methods may be sensitive to (1) significant departures from a normal

distribution, (2) serial dependence, and (3) temporal trends. A good review of this topic is found in Harris et al. (1987). In general, the skewness coefficient is a recommended test for normality; a sampling frequency no shorter than every two weeks is recommended to reduce serial dependence; and at least a two month sampling (4 samples per well) period is recommended to incorporate temporal variability into a water quality data base for UCL determination.

D. Screening the UCL Parameter Data Base for Errors and Outlier Populations

Data bases should be routinely screened through the use of (1) quality control (QC) checks and (2) checking and correcting any transcription errors. In addition to these data-screening steps, a baseline data base should be statistically evaluated for outliers.

Outliers are anomalously high or low values relative to the other values comprising a data base. An outlier can result from one or more of the following conditions:

- Transcription errors.
- Sampling errors.
- Analytical errors.
- Incorrect units of measurements.
- Natural water quality variability.
- Differences in geology within the sampled aquifer.

If the source of error responsible for an outlier is detected, then the anomalous value can possibly be corrected. However, there is often insufficient information available to evaluate an error source. The inclusion of an outlier in a data base can have a disproportionately large influence on statistical analyses of water quality data. Because there are no reliable methods for evaluating whether an outlier is due to an error or the result of natural water quality variability, a technique for discarding outliers from a data base is needed. The proposed screening technique accounts for wide variations in parameter values while still being capable of detecting outliers that fall outside of a statistically calculated interval. The following tolerance-limit formula (Loftis et al., 1987) is recommended for screening outliers from baseline data used to calculate UCL values:

$$x = k\,S \qquad \text{alpha} = 0.05,\ p = 0.99$$

where:

x = mean of observations in sample
k = tolerance limit factor
S = standard deviation of sample

The tolerance limit factor (k) is a function of sample size (n), confidence level (1 - alpha), and proportionality values (p).

Consider the following total alkalinity concentrations:

Total Alkalinity, mg/L as $CaCO_3$

Well 37	100.8	93.6	97.0	87.4	86.3
Well 38	85.3	93.0	87.2	85.5	85.1
Well 39	98.0	92.5	92.0	87.8	85.7
Well 40	76.6	80.3	66.0	86.3	73.0
Well 41	91.5	91.0	92.2	85.1	87.4
Well 42	93.0	94.5	93.8	84.9	79.4
Well 43	94.5	93.5	105.0	84.7	86.3
Well 44	92.0	94.0	94.0	85.7	89.6
Well 45	85.7	88.1	89.5	81.3	95.0
Well 46	86.6	85.5	92.2	92.0	84.2
Well 47	91.3	93.2	93.2	84.7	85.1

Step 1. There are no hard and fast rules regarding the initial selection of potential outliers. A recommended method is to visually screen the data base for anomalous values or groups of values, then subjectively identify whether these values are especially high or low relative to the other values in the data base.

Initial Outlier Estimate: 105.0, 66.0

Step 2. Calculate the tolerance interval, excluding the use of the two potential outliers (i.e., 105.0 and 66.0). See Appendix A for "k" values.

$x = 88.83$
S.D. = 5.38
$k(n = 53) = 3.094$

$x \pm k S$
$88.83 \pm (3.094 \times 5.38)$
(72.2 to 105.5)

Step 3. An evaluation of the tolerance interval indicates that the value 105.0 is marginally acceptable and therefore should be included in the baseline data base for statistical calculations.

Step 4. Recalculate the tolerance interval including the value 105.0, but excluding the value 66.0.

$x = 89.13$
S.D. = 5.77
$k(n=54) = 3.094$

$x \pm k S$
$89.13 \pm (3.094 \times 5.77)$
(71.3 to 107.0)

At an alpha = 0.05 and p = 0.99, one can assert with a degree of confidence (1 -alpha) that the proportion of the population of possible alkalinity values contained between 71.3 and 107.0 mg/L as $CaCO_3$ is at least 99 percent. The use of an alpha - 0.05 is based solely on the historical use of this alpha value for statistical evaluations of hydrology data, while the 99% proportionality value is used because it is the highest value for which k values are available.

Note: For a given sample size (n) of 100, only one value should be expected to be discarded as an outlier when it may actually be a representative value.

Step 5. At this point, the iterative process of calculating tolerance intervals for outlier detection is complete. The conclusion is that the value 66.0 is considered an outlier and will be discarded from the data base.

Note: If one or more wells have parameter values that contain a relatively large number of outliers (See Appendix E), then these wells should be treated separately as an additional baseline data base for one or more UCL parameters.

F. Calculation of UCL Values

Upper control limits are needed to detect the uncontrolled migration of contaminants outside of a well field in either a lateral or vertical direction. The use of UCLs for conservative parameters provides a reliable basis for determining when an excursion occurs.

The establishment of UCL values based on the variability of the baseline data base is recommended. The use of a baseline mean value plus three standard deviations for calculating NPDES standards was proposed by the National Academy of Science (1977) in a report to the EPA. Using parameter values that follow a normal distribution, the probability of a single observation falling beyond the boundary designated as X + 3 S.D. is 0.00135, or 0.135 percent. Such an occurrence is considered so rare that in the event the upper boundary is exceeded, the operating company is determined to be in violation of the effluent regulation. However, if different methods or laboratories are used to analyze collected water samples after the baseline data base has been established, then the calculated probability of exceeding UCL values may be less accurate.

The rationale used to evaluate the adequacy of various methods to calculate UCLs is based on two criteria:

(1) the UCL for any parameter should not be exceeded in the baseline data base after it has been screened for outliers, and (2) the UCL for any parameter should be capable of detecting an excursion event within one or two sample collections (based on a 2-week sampling interval). These criteria are based on minimizing the probability of committing a Type I and Type II error. In general, the preferred method is one that results in the highest UCL value while still being capable of detecting an excursion event.

A method that uses the baseline mean plus 5 standard deviations is the recommended method for calculating UCLs. Use of this proposed method should result in adequate excursion control, yet minimize the possibility of incorrectly placing wells in excursion status.

For situations where chloride values are very low and show little variation during baseline data collection, the LQD is willing to consider allowing the upper control limit for chloride to be set at the average baseline value plus 15 mg/L if that value is greater than the average baseline value plus five standard deviations. This option will only be considered for chloride.

G. Trend Wells

The use of trend wells has enabled in-situ operators to detect an excursive groundwater plume prior to the plume reaching excursion monitoring wells. Parameter value changes in a trend well can signal a water balance problem in the active well field that may not be otherwise evident to the operator. These wells are typically located between the injection/production wells and the monitor wells in the active well field. Water-quality analyses of samples collected from trend wells will not result in regulatory corrective action. Their use is as a preventive measure to allow greater operational control of wellfield fluids and to decrease the possibility of having to halt production to restore a much more extensive plume of mine fluids had an excursion been detected at the excursion-monitoring wells.

ATTACHMENT II

SUGGESTED PROCEDURE FOR SELECTING DISTANCE BETWEEN HORIZONTAL EXCURSION MONITORING WELLS AND AN In-situ WELL FIELD

GOALS:

1. To determine acceptable distances between an in-situ well field and its associated horizontal excursion monitoring wells.

2. To demonstrate that a theoretical excursion can be controlled at these monitoring locations within 60 days of detection using the excursion control procedures outlined in the permit.

PROCEDURE:

1. Simulate mine induced drawdown of the regional potentiometric surface using an appropriate groundwater flow model. This includes **gradient, estimated transmissivities,** estimated aquifer storage, estimated leakage (if applicable), hydrologic boundary conditions, well field size (areal extent), bleed rate including distribution of bleed rate in space and time (individual injection and production may also be simulated), expected life of well field (or, life of monitor well(s), etc.) Acceptable groundwater flow models include Theis (1935), Hantush (1960), Jacob-Hantush (1955), Neuman (1974), etc.

2. Show on a map the estimated potentiometric surface, the locations of important nodes used during simulation (injection, production, bleed, hydrologic boundaries, and selected drawdown calculation nodes). Locate horizontal monitoring wells on the map within the zone of control.

3. Verify that an excursion can be "controlled" within sixty days of detection using the excursion control procedures proposed in the permit. This verification should involve the following procedures and assumptions:

   a. Calculate the hydraulic gradient at the monitor well on excursion, at the time of the excursion. Assume it took 28 days for lixiviant to move thirty feet beyond the monitor well by the time the excursion is called. For example, using the equation for average linear velocity:

$$v = \frac{l}{t} = \frac{-K\,dh}{n\,dl}$$

Where: K = hydraulic conductivity
dh/dl = hydraulic gradient
l = distance beyond monitor well = 10 feet
t = time for lixiviant to move 10 feet past the monitor well = 28 days
n = effective porosity
v = average linear velocity

Solving for dh/dl:

$$\frac{dh}{dl} = \frac{1*t*n}{-K}$$

b. Raise head at the bleed node which is causing the simulated excursion enough to achieve the calculated gradient between the monitor well on excursion and that node.

c. Run model again using the elevated bleed rate and the estimated potentiometric surface from the first modeling run with the adjusted head value(s) calculated in the previous step. Run the model in ten or twenty day time steps for 60 days. At the end of each time step do the following:

* Obtain the hydraulic gradient at the monitor well
* Calculate the average linear velocity
* Calculate how far the excursion has traveled back towards the well field based on the time elapsed since bleed was adjusted (time steps) and the calculated velocity **OR**
* Calculate the time it would take for excursion to travel the ten feet back to the monitor well assuming the above velocity.
* Answer the questions: 1) Has the hydraulic gradient at the monitor well been reversed by the increased bleed rate at this time? 2) If so, is the present hydraulic gradient sufficient to move the contaminated water back to the monitor well in a reasonable time frame, (e.g., 100 days)?
* If the answers to both questions are "yes" then there is no need to simulate the next time step.

4. To ensure that excursion wells are not placed within the normal operational flare, the following optional steps might be taken:

* Consider two wells in a line: one production well and one injection well.
* Calculate the change in head due to each of the two wells separately at various distances from the wells (e.g. 50' intervals) using the Theis equation, for example.
* The calculation point is beyond the normal operational flare if the change in head due to the recovery well is equal to, or greater than, the change in head due to the injection well.

CONCLUSION AND RECOMMENDATION

The following is a list of recommendations relating to the use of baseline data for calculating UCLs.

1. A detailed groundwater sampling and analysis (S&A) plan should be included in each uranium mine permit application.

2. UCL parameters should be selected based on their reliability to detect an excursion event. At least three parameters are recommended to be included in each excursion monitoring program.

3. For UCL determination, a sampling frequency of 4 samples taken at a minimum of 2 weeks apart, is recommended.

4. Baseline data bases should be screened for outliers. A recommended method of outlier detection is discussed in this guideline.

5. A well (or wells) that produces anomalous water-quality data, for any UCL parameter, should be treated separately for UCL calculations.

6. The use of an empirically-derived method for calculating UCL values is proposed. The formula is: baseline mean plus 5 standard deviations, after the baseline data base has been screened for outliers.

7. The beneficial use of trend wells located between the active well field and the excursion monitoring wells is recommended. Trend well water quality data need not be submitted to the LQD.

8. A review of water-quality changes during an excursion event indicates that an excursion-status criteria could reliably be based on the exceeding of two out of three UCL parameters.

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Appendix A
Values of "k" for various sample sizes

	1 α = 0.95			1 α = 0.99		
n	0.90	0.95	0.99	0.90	0.95	0.99
2	32.019	37.674	48.430	160.193	188.491	242.300
3	8.380	9.916	12.861	18.930	22.401	29.055
4	5.369	6.370	8.299	9.398	11.150	14.527
5	4.275	5.079	6.634	6.612	7.855	10.260
6	3.712	4.414	5.775	5.337	6.345	8.301
7	3.369	4.007	5.248	4.613	5.488	7.187
8	3.136	3.732	4.891	4.147	4.936	6.468
9	2.967	3.532	4.631	3.822	4.550	5.966
10	2.839	3.379	4.433	3.582	4.265	5.594
11	2.737	3.259	4.277	3.397	4.045	5.308
12	2.655	3.162	4.150	3.250	3.870	5.079
13	2.587	3.081	4.044	3.130	3.727	4.893
14	2.529	3.012	3.955	3.029	3.608	4.737
15	2.480	2.954	3.878	2.945	3.507	4.605
16	2.437	2.903	3.812	2.872	3.421	4.492
17	2.400	2.858	3.754	2.808	3.345	4.393
18	2.366	2.819	3.702	2.753	3.279	4.307
19	2.337	2.784	3.656	2.703	3.221	4.230
20	2.310	2.752	3.615	2.659	3.168	4.161
25	2.208	2.631	3.457	2.494	2.972	3.904
30	2.140	2.549	3.350	2.385	2.841	3.733
35	2.090	2.490	3.272	2.306	2.748	3.611
40	2.052	2.445	3.213	2.247	2.677	3.518
45	2.021	2.408	3.165	2.200	2.621	3.444
50	1.996	2.379	3.126	2.162	2.576	3.385
55	1.976	2.354	3.094	2.130	2.538	3.335
60	1.958	2.333	3.066	2.103	2.506	3.293
65	1.943	2.315	3.042	2.080	2.478	3.257
70	1.929	2.299	3.021	2.060	2.454	3.225