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February 27, 2002

CERTIFIED MAIL 70001670001340348141
RETURN RECIEPT REQUESTED

Melvyn Leach
Chief, Fuel Cycle Licensing Branch
Division of Fuel Cycle Safety and Safeguards
U.S. Nuclear Regulatory Commission
Mail Stop T-8A33
Washington, DC 20555

Subject: Amendments to the License Application
License No.: SUA-1548 Docket No.: 40-8964
Smith Ranch Facility

Dear Mr. Leach:

Rio Algom Mining LLC is submitting amendments to the License Application for the above referenced Source Material License. These amendments include a replacement of all pages in Chapter 6 because of changes resulting from the review of the Wellfield #1 Restoration Plan and correction of page numbers. Appendix L, the Wellfield #1 Restoration Plan, will be added to Volume V of the Application. Also, the Table of Contents has been revised to reflect the changes to Chapter 6 and the addition of Appendix L.

If you have any questions, please call me at (405) 858-4807.

Sincerely,

William Paul Goranson, P.E.
Manager, Radiation Safety, Regulatory
Compliance and Licensing

Enclosures

CC: John Lusher, NRC
Marvin Freeman, RAM
Bill Ferdinand, RAM
John Cash, RAM
John McCarthy, RAM

NMSS01 Public

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CHAPTER 6
RECLAMATION PLAN

The objective of the reclamation plan is to return the affected surface and groundwater to conditions such that they are suitable for all uses for which they were suitable prior to mining. The methods to achieve this objective for both the affected groundwater and the surface are described in the following sections.

6.1 Groundwater Restoration

6.1.1. Water Quality Criteria

To achieve the objective stated above, the primary goal of the restoration program is to return the condition and quality of the affected groundwater in a mined area to background (baseline) or better. In the event the primary goal cannot reasonably be achieved, the condition and quality of the affected groundwater will at a minimum be returned to the pre-mining use suitability category (Reference: LQD Rules and Regulations, Chapter XXI, Section 3 (d) (I)).

For the purposes of this application, the use categories are those established by the Wyoming Department of Environmental Quality, Water Quality Division. The final level of water quality attained during restoration is related to criteria based on the pre-mining baseline data from that wellfield, the applicable Use Suitability Category and the available technology and economics. Baseline as defined for this project shall be the mean of the pre-mining baseline data, taking into account the variability between sample

results (baseline mean plus or minus tolerance limits, as defined in Section 5.1.2, after outlier removal).

6.1.2 Restoration Criteria

The restoration criteria for the groundwater in a mining unit is based on the mining unit production-injection wellfield as a whole, on a parameter by parameter basis. All parameters are to be returned to as close to baseline as is reasonably achievable. Restoration target values shall be established for all parameters affected by the mining process. The restoration target values for the mining units shall be the mean of the pre-mining values. If during restoration, the average concentration of a parameter in the designated production area wells of a mining unit is not reduced to the target value within a reasonable time, a report describing the restoration method used, predicted results of additional restoration activities, and an evaluation of the impact, if any, that the higher concentration has on the groundwater quality and future use of the water will be prepared and submitted to the applicable regulatory agencies.

6.1.3 Restoration Method

The primary restoration technique is a combination of groundwater sweep, chemical treatment, and clean water injection. Groundwater sweep involves withdrawing water from selected production and injection wells which draws uncontaminated natural groundwater through the leached area displacing the leach solutions. Chemical treatment involves addition of approved water treatment chemicals to waters injected into the wellfield to re-stabilize the host formation. Clean water injection involves the injection of a

better quality of "clean" water in selected wells within the production area while pumping other production and/or injection wells which again displaces the leach solutions with the better quality water. The source of the clean water may be from an EDR or RO type unit, water produced from a mining unit that is in a more advanced state of restoration, water being exchanged with a new mining unit, or a combination of these sources. Water withdrawn from the production zone during restoration will first be processed through an ion exchange unit to recover the uranium, then will be treated and reused in the project, treated and discharged under the existing NPDES permit, or routed to a holding pond for future treatment and/or disposal.

It is expected that an average of about six pore volumes of water will have to be displaced to achieve restoration of a mining unit. During restoration of the initial mining units, it is expected that near the midpoint of the process a chemical reductant will be added to approximately one pore volume of clean water injection to accelerate stabilization of trace metals.

Chemical reductants are beneficial because several of the metals, which are solubilized during the leaching process, are known to form stable insoluble compounds, primarily as sulfides. Primary among such metals is uranium, which occurs at the site because of the naturally occurring reduced state of the ore body. The introduction of a chemical reductant into the mine zone at the end of mining phase is designed to expedite the return of the zone to its natural conditions and to return as many of the solubilized metals to their original insoluble state as possible. By effecting this partial restoration directly within the formation (in-situ), the external impact of groundwater restoration is

minimized.

The chemical reductant would be added above ground to the clean water stream being injected into selected wells. Based on the historical success reported by other ISL uranium mining companies, the reductant would be a sulfur compound such as gaseous hydrogen sulfide (H_2S) or dilute solutions of sodium hydrosulfide (NaHS) or sodium sulfide (Na_2S). If RAMC should desire to utilize any reductant other than these three sulfur compounds, WDEQ approval will be obtained prior to use. Dissolved metal compounds that are precipitated by such reductants include those of arsenic, molybdenum, selenium, uranium, and vanadium. All of these may be present in concentrations above baseline levels at the conclusion of mining.

The reductant would be introduced during the midst of the restoration process because the introduction of sulfur and sodium increases the total dissolved solids (TDS) level of the injected fluid. once the reducing conditions are re-established, an oxygen free clean water can be injected to effect the final reduction in TDS.

If gaseous hydrogen sulfide is chosen for use, a program for its safe handling would be prepared and submitted to the appropriate agency prior to its use.

6.1.4 Restoration Sampling

When sampling results indicate that restoration has been achieved, the designated production area wells will be sampled and analyzed for the full suite of parameters listed in Table 5-1 as Suite A.

Unless otherwise requested and approved by the applicable regulatory agencies, the production area wells in a mining unit to be sampled for determining restoration and stability shall be wells used for collecting pre-mining baseline data for that unit. If the data confirm restoration is complete this will initiate the stability demonstration period. In the stability demonstration period the full suite assays will be repeated for those same wells at approximately the six month and one year periods. Between these periods the wells will be sampled at six week intervals with the samples analyzed for a short list of key parameters developed for that specific mining unit. The short list of key parameters will be submitted to and approved by WDEQ/LQD in advance of its use. This sampling plan will provide for a minimum of nine samples within a one year period to demonstrate restoration success. It is anticipated that stability sampling will be terminated after one year, only if the monitored parameters do not exhibit a strongly increasing concentration trend. Sampling should continue on the previously prescribed schedule if an increasing concentration trend is exhibited.

When the sampling data indicate that the mining unit aquifer has been restored and stabilized, a report documenting this will be filed with the appropriate regulatory agencies along with a request for certification of restoration. Plugging of wells and surface reclamation of the mining unit will commence after receipt of restoration certification.

During restoration, sampling of monitor wells for that mining unit will continue at the same frequency and for the same parameters as during mining. However, during stability monitoring the monitor well sampling frequency will be reduced to only once every two

months and the sampling will be terminated at the end of the stability demonstration period.

6.1.5 Well Plugging Procedures

Wells no longer needed for operations or restoration and stability demonstration will be plugged in accordance with the guidelines and requirements established by the Wyoming Department of Environmental Quality. The pumps and tubing will be removed from the wells and each well will be filled from total depth to within five feet of the surface with a WDEQ approved abandonment mud or a cement slurry. Typically, a dual plug procedure will be used, whereby a cement plug will be set using a slurry of a weight of no less than 12 lb/gal into the bottom of the well which will extend across and 50 feet above the first overlying aquitard. The remaining portion of the well will be plugged using a bentonite/water slurry with a mud weight of no less than 9.5 lb/gal. A 10-foot top plug of cement slurry will be set 3 feet below the surface to seal the well at the surface, and prevent surface water intrusion into the well. The casing will then be cut off a minimum of two feet below the surface and a cement plug will be placed at the top of the casing. The area will then be backfilled, smoothed to blend with the natural terrain, and reclaimed per the approved surface reclamation plan.

6.2 Surface Reclamation and Decommissioning

6.2.1 Introduction

All lands disturbed by the mining project will be returned to their pre-mining land use of livestock grazing and wildlife habitat unless an alternative use is justified and is approved by the state and the landowner, i.e. the rancher desires to retain

roads or buildings. The objectives of the surface reclamation effort is to return the disturbed lands to production capacity of equal to or better than that existing prior to mining. The soils, vegetation and radiological baseline data will be used as a guide in evaluating final reclamation.

An exception to the above will be the reclamation of any surface disturbance created by RAMC on Glenrock Coal Company's reclaimed surfaces within RAMC's permit boundary (T35N, R75W; Sections 13, 18 and 24). Specifically, if disturbed by RAMC, RAMC will reclaim these previously reclaimed areas to coal standards as specified in Glenrock Coal Company's Permit to Mine No. 291.

6.2.2 Surface Disturbance

The primary surface disturbances associated with solution mining are the sites for the recovery plant and evaporation ponds. Surface disturbances also occur during the well drilling program, pipeline installations, road construction. These disturbances, however, involve relatively small areas or have very short-term impacts.

The recovery plant is located within the Bill Smith Mine site (WDEQ Permit No. 304C), therefore plant construction did not create any new disturbance areas. Disturbances associated with the evaporation ponds, ion exchange satellites and field header buildings, will be for the life of those activities and topsoil will be stripped from the areas prior to construction. Disturbance associated with drilling and pipeline installation are limited, and are reclaimed and reseeded as soon as weather conditions permit. Vegetation will normally be reestablished over these areas within two years. Disturbance for access roads is

also limited as a network of roads is already in place to most wellfield areas and throughout the project area.

The on-site solid waste landfill site will be closed in a manner that is consistent closure requirements for Construction/Demolition Landfills provided in the WDEQ Solid and Hazardous Waste Rules and Regulations. All current and closed disposal cells located onsite have been or will be closed with six (6)-inch evenly compacted soil cover and a 3 feet of loose soil cover. Any newly constructed solid waste disposal landfill will be closed in a similar manner as the existing landfill.

6.2.3. Topsoil Handling and Replacement

For any construction, soil will be removed and salvaged. The soil disturbances caused by the mining operation will be kept to a minimum especially in areas of steep terrain. No new surface disturbance was required for the recovery plant as the facility is located in the site used for the Bill Smith Mine. Topsoil from the mine site was stockpiled and the piles have been seeded with a cover crop to control erosion. Topsoil from future disturbance areas such as evaporation ponds, will be removed and stockpiled. The stockpiles will be located, shaped, seeded with a cover crop and crimp mulched to minimize loss to erosion. Topsoil signs will also be placed on each topsoil stockpile.

Within the wellfields, topsoil from the A and E horizons , or in areas where the A and E horizons are less than 4 to 6 inches, no less than the top 4 to 6 inches of soil will be removed and stockpiled from new access roads to the headerhouses and from any other roads that will be used during production that are not considered light use roads. The depth of the A and E horizons may

be determined using drill pits adjacent to the areas to be stripped. To demonstrate that appropriate care was taken in stripping topsoil, a record of the depth stripped will be maintained at the site and included in the annual report. Topsoil from well header building sites will also be stockpiled as discussed above. If unanticipated high traffic roadways are developed, the topsoil on such roadways would be subject to the same program of removal, stockpiling, seeding and mulching to control erosion. For areas where only limited temporary disturbance occurs, such as for well sites and pipeline construction, the topsoil will be bladed to one side and then re-spread over the area as soon as construction is completed. These areas will be stubble mulched as soon as practical. If topsoil stockpiling or re-topsoiling of an area is completed in the winter or spring, a stubble crop of oats will normally be planted with the final grass seed mix or a long-term cover seed mix planted in the stubble in the fall. The long term cover crop seed mix is discussed in Section 6.2.4. The long-term cover grass mix will be used to protect topsoil stockpiles and/or re-topsoiled areas which are expected to remain in place for longer than one (1) year prior to final seeding. These practices which were tested and proven effective in the pilot programs, provide the needed protection for the topsoil and minimize losses to wind and water erosion. Topsoil is not placed in draws or areas where it will erode into drainages. If necessary, a containment barrier is constructed to ensure the topsoil will not erode into drainages.

Additional measures taken to protect the topsoil in the wellfield areas is to restrict normal traffic to designated roads and keep required traffic in other areas of the wellfield to a minimum. Disturbed areas in a wellfield not needed for normal access are

seeded with a cover crop as soon as practical to minimize erosion.

After contouring for final reclamation has been completed, the remaining access roads or hard packed areas will be ripped prior to topsoiling. Topsoil will then be spread evenly over the disturbed areas and will be seeded with a cover crop of oats. Final contouring will blend with the natural terrain and will establish drainage and eliminate depressions that would accumulate water.

6.2.4. Revegetation Practices

During mining operations the topsoil stockpiles, and as much as practical of the disturbed wellfield and pond areas will be seeded with a cover crop to minimize wind and water erosion. After topsoiling for the final reclamation, an area will normally be seeded with oats to establish a stubble crop, then reseeded with grasses the next growing season using the following mix of pure live seed:

	lbs./acre
western wheat grass (Rosana)	3.0
Streambank wheatgrass	3.0
canby bluegrass	1.0
Sheep Fescue(Covar)	2.0
Indian rice grass	2.0
Yellow blossom Sweet Clover	0.5
winterfat	2.0
Lupine (candatus)	1.0
Total	14.5

Note: Quantity to be doubled for broadcast seeding for all species except Streambank wheatgrass and Yellow sweetclover

Alternate Species, if any of the species listed above are not available, are as follows:

prairie junegrass	0.5
green needlegrass	2.0
Blue Flax	1.0
Other Lupines	1.0
scarlet globe mallow	1.0
prairie sandreed	2.0

Reseeding is normally accomplished by broadcasting seeding or drilling with seeding completed before May 1 or after October 15, during the year in which the topsoil is replaced. The area is then harrowed or raked.

Vegetation in larger reclaimed areas is protected from livestock grazing by fencing the livestock out until the newly established plant community is capable of maintaining itself under normal management practices. No major attempt is made to exclude wildlife; type III livestock fencing is used. (see figure 6-1)

Periodic inspections of the newly reclaimed areas is made within the first two growing seasons to check and record the success and progress of the reseeded plant community. Data collected during these inspections are used to determine when the reseeded areas are ready to sustain controlled livestock grazing and for the final evaluation of reclamation success.

Criteria for determining the success of the reclamation efforts include 1) post-mining vegetation cover and production equal to that on an appropriate comparison area, 2) species composition and diversity capable of supporting the planned post-mining use, and 3) a reclaimed vegetation community able to sustain grazing pressure at a rate equal to that of the surrounding native areas. All of the above is achieved for a

period of two consecutive years prior to full bond release.

Livestock grazing is critical to full bond release, however, unrestricted grazing at the wrong time could ruin revegetation efforts. Therefore, the determination of when and how domestic livestock grazing will be introduced on the revegetated areas is mutually agreed upon by RAMC, the Land Quality Division, and the landowner or land managing agency. The grazing plan agreed upon will include aspects of controlled grazing practices such as timed grazing, as well as limited and well distributed livestock numbers, so that newly reclaimed areas are not over-utilized. The limited and controlled amount of grazing may occur during the two consecutive years of evaluation prior to full bond release, but are timed so that vegetation production data are not compromised by the grazing. Production estimates on the newly revegetated areas are made using livestock exclosures, which also will assure that grazing practices will not compromise the annual biomass evaluation.

An extended reference area has been established which includes the primary vegetation types to be disturbed. The purpose of this area is to establish a reference area as a source of quantitative data to be used for comparative purposes at the time of final bond release. The location of this site(s) was mutually agreed upon by WDEQ-LQD and RAMC.

6.2.5 Site Decontamination and Decommissioning

When groundwater restoration in the final mining unit is completed, decommissioning of the recovery plant site and the remaining evaporation ponds will be initiated. In decommissioning

the recovery plant, the process equipment will be dismantled and sold to another licensed facility, or decontaminated in accordance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" - September, 198411 published by U.S. NRC. Materials that cannot be decontaminated to an acceptable level will be disposed in an NRC approved facility. After decontamination, materials that will not be reused or that have no resale value, such as building foundations, will be buried on-site.

The plant site will be contoured to blend with the natural terrain, surveyed to ensure gamma radiation levels are within acceptable limits, topsoiled, and reseeded per the approved reclamation plan.

After all liquids in an evaporation pond have evaporated or been disposed in a licensed facility, the precipitated solids and the pond liner will be removed and disposed in a licensed facility. The area will then be contoured to blend with the natural terrain, surveyed to ensure gamma levels are not exceeded, then topsoiled and reseeded per the approved plan.
Gamma surveys are also conducted during the decommissioning of each mining unit. Material identified during the gamma surveys as having contamination levels requiring disposal in a licensed facility will be removed, packaged (if applicable), and shipped to an NRC approved facility for disposal.

6.2.6 Final Contouring

Recontouring of land where surface disturbance has taken place

will restore it to a surface configuration that will blend in with the natural terrain and will be consistent with the post mining land use. Since no major changes in the topography will result from the proposed mining operation, a final contour map is not included in the application.

6.2.7 Reclamation Cost Estimate

A detailed reclamation cost estimate has been prepared for all aspects of the project for the period of 1999 to 2000 as part of the proposed bond in June 1999. The attached tables describing the bond calculations represents only the most current version for review within the context of this license/permit application. The bond and detail amounts will be updated by Rio Algom and reviewed by the WDEQ and NRC on an annual basis.

The estimate includes the cost for reclaiming the existing disturbances such as the Bill Smith mine area and pilot ISL Q-Sand and O-Sand facilities, as well as proposed commercial scale facilities. The estimate includes a one-year forward estimate required by WDEQ for forecasted disturbances as well as a five-year forward estimate to cover all potential disturbances within the term of the NRC license. A 15 percent overall contingency has been applied to the total cost estimate, which is in 1997 dollars. The estimate is updated on an annual basis and submitted to the WDEQ in the annual report. The updated estimate is also provided to the NRC for their review. The reclamation cost estimate is summarized in Table 6-1, and is detailed in Appendices 1 through 11. Table 6-1 is taken from the reclamation bond estimate for the 2001-2002 surety estimate. This estimate will be revised annually through the Annual Report to WDEQ/LQD and according to the surety

update requirements in License Condition 9.5 of the facilities Source Material License SUA-1548, and the annual update of that surety will substitute for any changes to this application. As a result, changes in surety will not necessitate a change in the Permit or License Application. A list of key details and assumptions used in the reclamation estimate is provided as Table 6-2.

6.2.8 Reclamation Bonding

A reclamation bond will be maintained with the Wyoming Department of Environmental Quality - Land Quality Division, in the amount of the final approved reclamation cost estimate. In 1999, Rio Algom Mining Corp. currently maintains a self-bond in the amount of $8.029 million to cover existing liabilities at the Smith Ranch project. The surety mechanism used for the commercial estimate, which includes the existing liabilities, may either be a parental guaranty or letter of credit. RAMC follows WDEQ and NRC guidelines when securing either the parental guaranty or letter of credit.

6.2.8.1 Estimates for Groundwater Restoration

RAMC performed modeling and evaluation of wellfield restoration plans and cost estimates for the commercial wellfields. That work used both Q-sand pilot restoration information as a calibration of the wellfield model and used that information to conduct both hydrological and geochemical modeling. The methodology, results and conclusions from that modeling were provided to WDEQ/LQD in a report submitted on December 13, 1999. A copy of that report is included as Appendix K of this application. Based on the results

of that work, RAMC developed a new methodology for developing the size of the Affected Pore Volume, (Section 7 of Appendix 1 of this Chapter).

Figure 7-1 is derived from Figure 3-16 in "Evaluation and Simulation of Wellfield Restoration at the RAMC Smith Ranch Facility" dated October 29, 1999 (Appendix K). This document was submitted to the Wyoming DEQ - Land Quality Division with a letter dated December 13, 1999 for review. In that document, RAMC proposes a methodology developed through hydraulic and geochemical modeling that uses the geometry of the wellfield to estimate a Flare Factor. In this case, the number of perimeter injection wells are counted, the surface area of the wellfield pattern is measured using a wellfield map, a ratio is developed of the # of perimeter injection wells to the surface area of the wellfield patterns. That ratio is located on the horizontal axis of figure 7-1. From that intercept, a vertical line is projected to intersect the curve. At that intersection, a horizontal line is projected to intercept the vertical axis. The estimated flare factor is derived from that intercept. The curve shown on Figure 7-1 has been validated using modeling for flare factors of 1.5 and higher, but it had not been verified for Flare Factors lower than 1.5. As a result, for bonding purposes only, RAMC will not use a Flare Factor lower than 1.5 for estimating the predicted costs for groundwater restoration.

The proposed groundwater restoration costs in Section 7 of the Appendix to this Chapter, uses the new methodology with the constraints agreed to at the May 11, 2000 meeting between LQD and RAMC.

6.2.8.2 Validation of Groundwater Restoration Estimates

The costs that are related to the restoration of groundwater to meet the primary and secondary goals are primarily dependent upon the volume of water to be treated. The estimates are currently derived using historical data from the Q-Sand Pilot Project and groundwater modeling to develop expected geochemical and hydrological trends to derive a estimated volume of water to be treated.

Although RAMC is confident that the volume estimates are conservative, it is reasonable to acknowledge that model and actual results could differ significantly. As a result of that acknowledgement, upon completion of restoration of the first wellfield, RAMC will compare expected to actual restoration results and adjust treatment volumes if necessary. This comparison will include the appropriateness of continuing the use of Figure 7-1 for estimating flare factor design, the use of pilot studies to predict actual commercial wellfield restoration performance, and the use of conservative constituents for driving restoration modeling. This comparison will be performed on all restoration constituents listed on the restoration tables for the appropriate wellfield. This comparison will be provided in the restoration completion report for the first wellfield.

Table-6-1

WDEQ/NRC RECLAMATION SURETY
SMITH RANCH, CONVERSE COUNTY, WYOMING
RIO ALGOM MINING CORP.

2001-2002 PROPOSED WDEQ/LQD BOND

	WORK UNIT	ONE YEAR FORWARD WDEQ/LQD & NRC 2001-2002 BOND AMOUNT
	Ion Exchange Plant[1] (NRC Related Activity)	
1.1	Building	40,116
1.2	Tankage and Vessels	39,913
1.3	Piping	12,924
1.4	Pumps	6,094
1.5	Electrical	9,470
1.6	Foundations	48,588
1.7	Plant Site	2,058
1.8	Access Road	1,054
1.9	SUB-TOTAL	160,217
	Central Processing Plant (NRC Related Activity)	
2.1	Buildings	57,548
2.2	Tankage and Vessels	60,246
2.3	Piping	10,846
2.4	Pumps	10,965
2.5	Electrical	19,682
2.6	Foundations	70,019
	SUB-TOTAL	229,306
	Dryer Area (NRC Related Activity)	
3.1	Buildings	16,222
3.2	Equipment	14,739
3.3	Foundations	16,802
	SUB-TOTAL	47,763
	Existing Facilities	
4.1	Buildings[2] (NRC Related Activity)	95,635
4.2	Structures[3] (NRC Related Activity)	17,963
4.3	Pilot Plant Equipment (NRC Related Activity)	22,620
4.4	Foundations[2] (NRC Related Activity)	139,333
4.5	Site Reclamation[2]	178,287
4.6	O-Sand Pilot (NRC Related Activity)	41,435
4.7	Q-Sand Pilot (NRC Related Activity)	N/A

	WORK UNIT	ONE YEAR FORWARD WDEQ/LQD & NRC 2001-2002 BOND AMOUNT
4.8	Mine Water Treatment Ponds	19,878
	SUB-TOTAL	515,151
	Unit Header Site & Wellfields[4] (NRC Related Activity)	
5.1	Buildings	79,463
5.2	Header Piping	140,306
5.3	Secondary Electrical	135,073
5.4	Wells-Totals	540,292
5.5	Monitor Wells-Total	73,515
5.6	Site Reclamation	52,275
	SUB-TOTAL	1,020,924
	Associated Structures	
6.1	#1 Trunkline (5,000 ft ea) (NRC Related Activity)	52,108
6.2	#2 Trunkline (10,000 ft ea) (NRC Related Activity)	104,216
6.3	Radium Settling Ponds (NRC Related Activity)	70,077
6.4a	Plugging & Aband. Disposal Well #1 (NRC Related Activity)	77,735
6.4b	Plugging & Aband. Disposal Well #2 (NRC Related Activity)	77,735
6.5	Sand Mining Area	13,173
6.6	Land Fill	1,500
6.7	Fire Protection System	11,623
	SUB-TOTAL	408,167
	Groundwater Reclamation & RO Units (NRC Related Activity)	
7.1	Restoration	3,605,272
	Health Physics and Radiation Surveys (NRC Related Activity)	
8.1	Monitoring	168,470
	Whole Trucking (Remaining Fractional Units) (NRC Related Activity)	
9.1	Contaminated Trucking	523
9.2	Non-contaminated Trucking	157

WORK UNIT	ONE YEAR FORWARD WDEQ/LQD & NRC 2001-2002 BOND AMOUNT
10.1 Delineation Hole Reclamation	129,953
SUB-TOTAL OF ALL ABOVE	6,285,903
Overhead and Profit at 10%	628,590
Contingency at 15%	942,855
SUB-TOTAL OF ALL ABOVE	7,857,348
Inflation - 10.42% (4/97 CPI-160.2 through 4/01 CPI-176.9)	818,736
TOTAL (in 2001$)	8,676,084
Proposed Bonding	8,676,084

(1) Represents the construction of one (1) satellite during 1997-1998

(2) Incorporates new office annex building.

(3) Incorporates additional surface disturbances (10.46 acres) from commercial construction activities along with new items including fencing, water wells, and fuel storage area.

(4) Represents 1 year forward of 513 patterns to be restored.

TABLE 6-2

LIST OF KEY DETAILS AND ASSUMPTIONS USED IN THE SMITH RANCH BOND ESTIMATE

1. The landfill for non-contaminated materials is the municipal landfill located in Casper, Wyoming. The landfill may be reached by an approximate 80 mile route through Douglas, WY, crossing the Platte River Bridge in Glenrock, WY.
2. The licensed disposal area for contaminated materials is Rio Algom's Quivira tailings facility, Ambrosia Lake, New Mexico, located approximately 800 miles to the south of the Smith Ranch project. This project is licensed by NRC Source Material License SUA-1473, which has been amended to allow the acceptance of byproduct materials from other licensees, including Smith Ranch.
3. All hourly labor costs are "loaded" costs and include a benefits burden.
4. All hourly equipment costs are loaded to include the operator, as well as a benefits burden.

5. References used for equipment rental rates, productivity, wages, etc. are as follows:

Equipment Rental Rates

- Russell Forgey Construction Co. - Casper, WY
  (307) 472-2173, Gail Beloon (out of business)
- Petro Engineering & Construction, Inc. - Casper, WY
  (307) 234-6221, Mark Steinle - Project Manager

CY Transport - Casper, WY

(307) 266-1667 (Out of business)

- Tri-State Trucking Company

Labor Rates

- Previous RAMC correspondence with WDEQ on 304C Annual Reports
- Northwinds of Wyoming, Inc.

  (307) 358-6550, Buck Underwood - President
- Automation Electronics - Casper, WY

  (307) 234-9311, Byron Stamm - President

General (Update references to new edition)

- Richardson's Process Plant Construction Estimating Standards, 1987; Richardson Engineering Service, Inc., San Marcos, California.
- Means Site Work Cost Data, 1987; Construction Consultants and Publishers, Kingston, Maine.

6. Aquifer restoration of the "O" sand pilot will occur with the restoration of the first "O" sand commercial wellfield.

(is this still true?)

7. Building removal costs have all been factored from the actual cost and time involved in dismantlement and removal of a large building located at the 304C open pit mine area in 1988. An average cost of approximately $\$3.50/ft^2$ is derived when 10% for profit and overhead is added to the overall cost of the building reclamation,

then divided by the number of square feet of the building area. For example, the Appendix 1 building reclamation cost would amount to approximately $3.45 /ft2 if 10% for profit and overhead is added to the $36,174 total cost ($39,791), then divided by the 11,550 ft2 of building area. Appendix 2 building costs are $3.48/ft2 Appendix 3 - $3.55/ft2, and Appendix 4 - $3.63/ft2.

8. The basis for calculation of groundwater restoration costs is provided in Table 7.1, 7.2, and 7.3 of Appendix 7.

9. It has been assumed that 90% of all contaminated materials and equipment can be decontaminated to levels acceptable for unrestricted use or disposal. The exceptions to this are the yellowcake dryers, fluid ends of pumps, pond sludges and liners, and 3 inch diameter or smaller piping.

10. Decommissioning volumes for the tanks, vessels and other process equipment are based on actual engineered sizes planned for installation (see individual tables).

11. Wellfield patterns will be drilled approximately one year in advance of their proposed operation. Surface piping and pumps are not installed in the wells until the year of operation. In other words, the one year forward estimate in the Summary Table 61 includes the costs for plugging and abandoning 144 wellfield patterns, but no

costs are included for surface equipment or aquifer restoration.

12. For groundwater restoration, the following liabilities are assumed:

for any year, present liability is the sum of:

- patterns operating
- patterns depleted, awaiting restoration
- patterns in restoration
- patterns in stability

for any year, forward liability for the next year is:

new patterns placed in service during the next year less patterns completing stabilization during the next year

13. The initial IX plant will be located in the existing building adjacent to the central processing plant. The second IX satellite plant, planned for Section 27, will be placed in operation during the five-year forward period.

14. Surface reclamation costs (topsoil replacement and revegetation) are included in Appendix 4, Existing Disturbance, for the initial IX plant (Appendix 1), central processing plant (Appendix 2), and the dryer building (Appendix 3), as these are all existing buildings.

15. The tractor/trailer used for hauling non-contaminated materials is of a flatbed type with an attached crane, with load limit of 47,000#. The tractor/trailer used for hauling contaminated materials will typically be a closed van-type, with a load limit of 40,000#.

16. Increased Disposal Capacity for Restoration Bonding Amount: In a letter dated May 8, 1998 to WDEQ/LQD, RAMC committed to increasing the bonding amount for Permit #633 to reflect the installation of additional disposal capacity required for restoration. This commitment is a response to the first round comments for TFN 3 6/142 dated October 22, 1997. The comment was 0.3(c) regarding the water balance through the plant to include 6,000 gpm of production, the resulting bleed, and the ability to handle 1,000 gpm of restoration flow. The resulting water balance would be approximately 300 gpm of required wastewater disposal capacity. The current disposal well is permitted to accept a maximum average flow of 150 gpm. As RAMC receives approval to inject into Wellfield #3, the plant flow capacity will reach 6,000 gpm. In order to remain within the schedule presented in the mine plan, RAMC is currently evaluating methods of increasing disposal capacity to facilitate the restoration schedule. The additional disposal capacity can be in the form of a second waste disposal well, additional evaporation ponds, land application, discharge through the NPDES permit, or a combination of some or all of these methods. WDEQ requested that RAMC provide additional bonding to cover the costs of the additional disposal capacity. As a

result, the bonding will be increased by $1,000,000 to reflect the requirement to install a second waste disposal well or evaporation ponds to handle the additional water flows resulting from combined production and restoration operations. With the installation of the 2nd Waste Disposal Well at the Smith Ranch Facility, this increase has been eliminated from the surety estimate.

Appendices - SURETY BOND DETAIL

This section presents the support details for the summary totals included in Table 6-1. Within this part, the bond detail is divided into ten (10) sections that encompass the mining activities at the Smith Ranch facility. These 10 divisions match each of the summary sections that are presented in Table 6-1.

These bond division areas include; ion exchange plants, central processing plant, dryer area, existing facilities, header sites and wellfields, associated structures, groundwater reclamation and RO Units, whole trucking, and delineation hole reclamation. The cost basis for these calculations are from contractor quotes. These quotes are presented in "Part III - Cost Basis".

(NRC Related Activity)

Appendix 1

ION EXCHANGE PLANT RECLAMATION COSTS

Cost Summary

ITEM	COSTS ($97)
1.1 Building	**40,116**
1.2 Tankage and Vessels	**39,913**
1.3 Piping	**13,224**
1.4 Pumps	**6,094**
1.5 Electrical	**9,470**
1.6 Foundations	**48,588**
1.7 Plant Site	**2,058**
1.8 Access Road	**1,054**
Total Cost	**160,517**

1.1 Building

Calculation Basis: 70 Ft. x 165 Ft. with 23 Ft. Eave
Floor Area = 11,550 Ft^2
Skin Area = 10,810 Ft^2

A. Washdown Building - 6 Days:
Wash 10,810 Ft^2 @ 1 Gal/Ft^2 = 10,818 Gal
Wash 10,810 Ft^2 @ 450 Ft^2/Man-Day = 24 Man-Days
= 6 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hr x 48 Hr =$ 3,536
- Travel = $73.66/Hr x 6 Day x 1 Hr/Day =$ 442
- Eq. Rental = 4 - Pressure Washers @ $ 8.71/ Hr
  $ 34.84/Hr x 48 Hr =$ 1,672
- Materials = Soap @ $1.09/BBL
  10,810 Gal x BBL x $1.09/BBL =$ 281
  42 Gal
- Dispose of Fluid @ $0.11/BBL
  10,810 Gal x BBL x $0.11/BBL =$ 28
  42 Gal

Sub-total =$ 5,959

B. Dismantle and Load - 15 Days:

11,550 Ft^2 @ 100 Ft^2/Man-Day = 115.5 Man-Days
= 15.0 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  2 - Welders @ $ 19.35/Hr
  2 - Operators @ $ 17.71/Hr
  4 – Laborers @ $ 13.02/Hr
  $147.78/Hr x 120 Hr =$ 17,734

- Travel = $147.78/Hr x 15 Days x 1 Hr/Day =$ 2,217

- Eq. Rental =2 - 20 Ton Cranes @ $37.39/Hr
  2 - Welders/Torches @ $10.90/Hr
  $96.58/Hr x 120 Hr =$ 11,590

Sub-total =$ 31,541

C. Haul and Dispose - On-Site Land Fill:
Building = 235,000# = 5 Truck Loads** @ 47,000#
- Haul = 5 Trucks x 8 Hrs/Truck x $65.39/Hr = $ 2,616
- Dispose = Cost Included in Section 6.5
  ** 5 Trucks required to move building in 1988

Building Total =***$ 40,116***

1.2 Tankage and Vessels

Basis: See Table 1.1

A. Decontaminate - 0 Days: (Assume No Decontamination)

B. Remove and Load - 11 Days:

- Labor Crew = 1 - Foreman @ $21.58/Hr*
  1 - Operator @ $17.71/Hr
  2 - Laborers @ $13.02/Hr
  $65.33/Hr x 88 Hr =$ 5,749

- Travel = $65.33/Hr x 11 Days x 1 Hr/Day =$ 719

- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  $37.39/Hr x 88 Hr =$ 3,290

* This foreman will also supervise1.2 C.

Sub-total =$ 9,758

C. Dismantle, Cut, or Crush - 11 Days:

Cut Steel @ 30 Ft.^{3}/Man-Day @ 631.4 Ft^3 = 21 Man-Day
Crush FRP @ 60 Ft.^{3}/Man-Day @ 240.5 Ft^3 = 4 Man-Day

- Labor Crew =1 - Foreman@ Foreman supervises both 1.2 (B) & (C)
  2 - Welders @ $19.35/Hr
  2 - Laborers @ $13.02/Hr
  $64.74/Hr x 88 Hr =$ 5,697

- Travel = $64.74/Hr x 11 Days x 1 Hr/Day =$ 712

- Eq. Rental = 1 - D8N Dozer @ $117.71/Hr for 4 Days
  $117.71/Hr x 32 Hr =$ 3,767
  2 - Welders/Torches @ $ 10.90/Hr
  $ 21.80/Hr x 88 Hr =$ 1,918

Sub-total =$ 12,094

D. Haul and Dispose - Licensed (NRC SUA - #1473) Site:

100% of Contaminated Service = 835.4 Ft.^{3} @ 198,380#
Total = 30.9 Cu.Yd. @ 198,380# = 5 Truck Loads @ 40,000#

- Haul = 5 Truck x 800 Mile x $3.27/Mile =$ 13,080
- Dispose = 198,380# = 99.1 tons
  @ $50/ton disposal cost =$ 4,955

E. Haul and Dispose - On-Site Land Fill:
100% of Non-Contaminated Service = 36.5 Ft^3 @ 2,320#
Total = 1.4 Cu.Yd. @ 2,230# = 0.05 Truck Loads @ 47,000#

- Haul = 0.05 Trucks x 8 Hrs/Truck x $65.39/Hr =$ 26
- Dispose = Cost Included in Section 6.5

Tankage and Vessel Total =***$39,913***

1.3 Piping

Basis: See Table 1.2

A. Remove, Cut or Crush and Load - 5 Days:
PVC & Poly - 2,800 Ft @ 140 Ft/Man-Day = 20 Man-Day
= 5 Crew-Day
Steel - 1,100 Ft @ 110 Ft/Man-Day = 10 Man-Day
= 5 Crew-Day

- Labor Crew =

1 - Foreman	@ $ 21.58/Hr	
2 - Welders	@ $ 19.35/Hr	
1 - Operator	@ $ 17.71/Hr	
4 - Laborers	@ $ 13.02/Hr	
	$130.07/Hr x 40 Hr	=$ 5,503

- Travel = $130.07/Hr x 5 Days x 1 Hr/Day =$ 650

- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  2 - Welders/Torches @ $10.90/Hr
  $59.19/Hr x 40 Hr =$ 2,368

Sub-total =$ 8,521

B. Decontaminate - 0 Days: =$ 0

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:
100% Piping = 886.7 Ft^3 @ 52,080#
Total = 32.8 Cu.Yd. @ 52,080# = 1.3 Truck Load @ 40,000#

- Haul = 1.3 Truck x 800 Mile x $3.27/Mile =$ 3,401
- Dispose = 52,080# = 26.04 tons
  @ $50/ton disposal cost =$ 1,302

Piping Total =***$ 13,224***

1.4 Pumps

Basis: See Table 1.3

A. Removal and Loading - 6 Days:
21 Pumps @ 2 Pumps/Man-Day = 10.5 Man-Days
= 6.0 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  1 - Operator @ $17.71/Hr
  2 - Laborers @ $13.02/Hr
  $65.33/Hr x 48 Hrs =$ 3,136

- Travel = $65.33/Hr x 6 Days x 1 Hr/Day =$ 392

- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  $37.39/Hr x 48 Hrs =$ 1,795

Sub-total =$ 5,323

B. Haul and Dispose - Licensed (NRC SUA #1473) Site:
Contaminated Pumps = 77.9 Ft.^{3} @ 5,700#
Total = 2.9 Cu. Yd. @ 5,700# = 0.2 Truck Loads @ 40,000#

- Haul = 0.2 Truck x 800 Mile x $3.27/Mile =$ 523
- Dispose = 5,700# = 2.85 tons
  @ $50/ton disposal cost =$ 143

C. Haul and Dispose - On-Site Land Fill:
Non-Contaminated Motors = 69.9 Ft^3 @ 8,445#
Non-Contaminated Pumps = 2 Ft^3 @ 100#
Total = 71.9 Ft.^{3} @ 8,545# = 0.2 Truck Loads @ 47,000#

- Haul = 0.2 Trucks x 8 Hrs/Truck x $65.39/Hr =$ 105
- Dispose = Cost Included in Section 6.5

Pump Total =***$ 6,094***

1.5 Electrical

A. Remove, Cut and Load - 5 Days:

- Labor Crew = 1 - Journeyman Elect. @ $ 34.88/Hr
  2 - Helpers @ $ 30.51/Hr
  1 - Welder @ $ 19.35/Hr
  1 - Operator @ $ 17.71/Hr
  $132.96/Hr x 40 Hr =$ 5,318

- Elec. Travel = $95.90/Hr x 5 Days x 2 Hr/Day =$ 959
  + $0.54/Mile x 5 Days x 120 Mile/Day =$ 324

- Travel = $37.06/Hr x 5 Days x 1 Hr/Day =$ 185

- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  1 - Truck @ $12.26/Hr*
  1 - Welder/Torch @ $10.90/Hr
  $60.55/Hr x 40 Hr =$ 2,422

Sub-total =$ 9,208

B. Haul and Dispose - On-Site Land Fill:

MCC = 11.75 Ft. x 1.25 Ft. x 7.5 Ft. = 110.2 Ft.^{3} @ 4,550#
Cable = 110.2 Ft.^{3} x 0.5 = 55.1 Ft.^{3} @ 18,400# (@ 40% Voids)
Total = 165.1 Ft.^{3} @ 22,950#
= 6.1 Cu. Yd. @ 22,950# = 0.5 Truck Loads @ 47,000#

- Haul = 0.5 Trucks x 8 Hrs/Truck x $65.39/Hr =$ 262
- Dispose = Cost Included in Section 6.5

Electrical Total =***$ 9,470***

1.6 Foundation

A. Decontaminate Slab - 3 Days:
11,550 Ft^2 @ 1,000 Ft^3/Man-Day = 11.6 Man-Days
= 3.0 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hr x 24 Hr =$ 1,768

- Travel = $73.66/Hr x 3 Days x 1 Hr/Day =$ 221

- Eq. Rental = Hand Tools @ $10.90/Hr
  (Brooms, Squeegee) $10.90/Hr x 24 Hr =$ 262

- 10% HCl = 2 Gal/Ft^2 x 11,550 Ft^2
  = 23,100 Gal.

Make-Up from 20° Be HCl Stock @ $0.55/Gal
Require 288 Gal. Stock per 1,000 Gal. - 10%

23,100 gal x 0.288 x $0.55/Gal =$ 3,659

- Dispose of Fluid @ $0.11/BBL
  23,100 Gal x BBL / 42 Gal x $0.11/BBL =$ 61

Sub-total =$ 5,971

B. Break and Remove 25% of Slab - 10 Days:
11,550 Ft^2 x 0.25 = 2,888 Ft^2
2,888 Ft^2 @ 37.5 Ft^2/Hr = 77 Hrs

- Labor Crew = 1 - Operator @ $17.71/Hr
  17.71/Hr x 77 Hrs =$ 1,364

- Travel = $17.71/Hr x 10 Days x 1 Hr/Day =$ 177

- Eq. Rental = 1 - Pavement Breaker @ $31.33/Hr
  $31.33/Hr x 77 Hrs =$ 2,412
  1 - Cat 980C Loader @ $92.64/Hr
  $92.64/Hr x 40 Hrs =$ 3,706

Sub-total =$ 7,659

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:

$$\text{Concrete} = \frac{2{,}888\ \text{Ft}^2 \times 8\ \text{In}}{12\ \text{In/Ft}} = 1925\ \text{Ft}^3\ \text{Set}$$

= 377,365# @ 196# Ft^3
= 3,209 Ft^3 Loose (40% voids)

Total = 11.9 Cu.Yd. @ 377,365# = 9.4 Truck Loads @ 40,000#

- Haul = 9.4 Truck x 800 Miles x $3.27/Mile =$ 24,590
- Dispose = 377,365# = 188.7 tons
  @ $50/ton disposal cost =$ 9,435

D. Bury Area w/2 Ft Cover:
- Materials = 856 Cu.Yd. Cover @ $1.09/Cu.Yd. =$ 933

Foundation Total =***$ 48,588***

1.7 Plant Site

Basis: 200 Ft. x 300 Ft. = 60,000 $Ft.^2$ = 1.4 Acres

A. Rip and Contour:
- Basis: See Table 1.4
- Rip and Contour @ $166.68/Acre =$ 233

B. Topsoil Placement:
Replace 6 in. Topsoil = 60,000 $Ft.^2$ x 0.5 = 30,000 $Ft.^3$ = 1,111 Cu.Yd.
- Topsoil Placement @ $1.09/Cu.Yd. =$ 1,211

C. Revegetate:

• Grade and Contour Topsoil	@ $ 87.19/Acre x 1.4 Acre	=$ 122
• Seedbed Prep. (Disc. + Harrow)	@ $ 21.80/Acre x 1.4 Acre	=$ 31
• Mulch (Drill + Seed + Mow)	@ $ 49/Acre x 1.4 Acre	=$ 69
• Drill Seed and Fertilize (Drill + Seed + Fertilizer)	@ $163/Acre x 1.4 Acre	=$ 228
• Revegetation Contingency (All items excluding grading)	@ $233.80/Acre* x 0.7 Acre	=$ 164

*Assume only 50% of acreage requires reseeding

Sub-total =$ 614

Plant Site Total =***$ 2,058***

1.8 Access Road

Basis: Gravel Road = 21 Ft. x 1320 Ft. = 27,720 Ft.^{2} = 0.6 Acres

A. Rip and Contour:
- Basis: See Table 1.4
- Rip and Contour @ $166.68/Acre =$ 233

B. Topsoil Placement:
Replace 6 in. Topsoil = 27,720 Ft.^{2} x 0.5 = 13,860 Ft.^{3} = 513 Cu.Yd

- Topsoil Placement @ $1.09/Cu.Yd. =$ 559

C. Revegetate:

• Grade and Contour	@ $ 87.19/Acre x 0.6 Acre	=$ 52
• Seedbed Prep. (Disc. + Harrow)	@ $ 21.80/Acre x 0.6 Acre	=$ 13
• Mulch (Drill + Seed + Mow)	@ $ 49/Acre x 0.6 Acre	=$ 29
• Drill Seed and Fertilize (Drill + Seed + Fertilizer)	@ $163/Acre x 0.6 Acre	=$ 98
• Revegetation Contingency (All items excluding grading)	@ $233.80/Acre* x 0.3 Acre	=$ 70

Sub-total =$ 262

*Assume only 50% of acreage requires reseeding

Access Road =***$ 1,054***

TABLE 1.4
IX PLANT
SCARIFY (RIP) COMPACTED SURFACE

Equipment = Cat. 140G Motor Grader @ $65.39/Hr - Complete
Speed = 3.9 mph (2nd gear)
Width = 9 Ft/Pass

$$\text{Productivity} = 3.9\ \frac{\text{Mile}}{\text{Hr}} \times 5280\ \frac{\text{Ft}}{\text{Mile}} \times 9\ \frac{\text{Ft}}{\text{Pass}} \times 0.83\ \text{Eff.}$$

$$= 153{,}822\ \frac{\text{Ft}^2}{\text{Hr}}$$

$$= 3.53\ \frac{\text{Acre}}{\text{Hr}}$$

$$\$/\text{Acre} = \frac{\$65.39}{\text{Hr}} \times \frac{\text{Hr}}{3.53\ \text{Acre}} = \frac{\$18.52}{\text{Acre}}$$

From Above - Ripping @ $166.68/Acre Allows for 9 Passes

(NRC Related Activity)

APPENDIX 2
CENTRAL PROCESSING PLANT RECLAMATION COSTS

Cost Summary

ITEM	COSTS ($97)
2.1 Building	**57,548**
2.2 Tankage and Vessels	**60,246**
2.3 Piping	**10,846**
2.4 Pumps	**10,965**
2.5 Electrical	**19,682**
2.6 Foundations	**69,719**
Total Cost	**229,006**

2.1 Building

Basis: 100 Ft. x 165 Ft. with 30 Ft. Eave
Floor Area = 16,500 Ft^2
Skin Area = 15,900 Ft^2

A. Washdown Building - 9 days:

Wash 15,900 Ft^2 @ 1 Gal/Ft^2 = 15,900 Gal
Wash 15,900 Ft^2 @ 450 Ft^2/Man-Day = 35 Man-Days
= 9 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hr x 72 Hr = $ 5,303

- Travel = $73.66/Hr x 9 Days x 1 Hr/Day = $ 663

- Eq. Rental = 4 - Pressure Washers @ $ 8.71/Hr
  $ 34.84/Hr x 80 Hr = $ 2,787

- Materials = Soap @ $1.09/BBL
  15,900 Gal x BBL / 42 Gal x $1.09/BBL = $ 413

- Dispose of Fluid @ $0.11/BBL
  15,900 Gal x BBL / 42 Gal x $0.11/BBL = $ 42

Sub-total = $ 9,208

B. Dismantle and Load - 21 Days:

Dismantle and Load @ 100 Ft^2/Man-Day
16,500 Ft^2 @ 100 Ft^2/Man-Day = 165 Man-Days = 168 Man-Days
= 21 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  2 - Welders @ $ 19.35/Hr
  2 - Operators @$ 17.71/Hr
  4 - Laborers @$ 13.02/Hr
  $147.78/Hr x 168 Hr = $24,827
- Travel = $147.78 Hrs x 21 Days x 1 Hr/Day = $ 3,103
- Eq. Rental = 2 - 20 Ton Cranes @ $ 37.39/Hr
  2 - Welders/Torches @ $ 10.90/Hr
  $ 96.58/Hr x 168 Hr = $16,225

Sub-total = $44,155

C. Haul and Dispose - On-Site Land Fill:
Building = 376,000# = 8 Truck Loads* @ 47,000#

- Haul = 8 Trucks x 8 Hrs/Truck x $65.39/Hr = $ 4,185
- Dispose = See Appendix 6.5

Building Total = ***$ 57,548***

2.2 Tankage and Vessels

Basis: See Table 2.1

A. Decontaminate - 0 Days: = $ 0

B. Remove and Load - 19 Days:
- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Operator @ $ 17.71/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 65.33/Hr x 152 Hr = $ 9,930
- Travel = $65.33/Hr x 19 Days x 1 Hr/Day = $ 1,241
- Eq. Rental = 1 - 20 Ton Crane @ $ 37.39/Hr
  $ 37.39/Hr x 152 Hrs = $ 5,683

Sub-total = $ 16,854

C. Dismantle, Cut, or Crush - 19 Days:

Cut Steel @ 30 Ft^3/Man-Day @ 518.5 Ft^3 = 17 Man-Days
Crush FRP @ 60 Ft^3/Man-Day @ 111.4 Ft^3 = 19 Man-Days

- Labor Crew = 1 - Foreman @ $ Foreman Supervises both 2.2(A) & (B)
  1 - Welder @ $ 19.35/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 45.39/Hr x 152 Hrs = $ 6,899

- Travel = $45.39/Hr x 19 Days x 1 Hr/Day = $ 862

- Eq. Rental = 1 - D8N Dozer @ $117.71/Hr
  1 - Welder/Torch @ $ 10.90/Hr
  $128.61/Hr x 152 Hrs = $ 19,549

Sub-total = $ 27,310

D. Haul and Dispose - Licensed (NRC SUA #1473) Site:
100% of Contaminated Service = 1236.7 $Ft.^3$ @ 172,420#
Total = 45.8 Cu.Yd. @ 172,420# = 4.3 Truckloads @ 40,000#

- Haul = 4.3 Trucks x 800 Mile x $3.27/Mile = $ 11,249
- Dispose = 172,420# = 86.2 tons
  @ $50/ton disposal cost = $ 4,310

E. Haul and Dispose - On-Site Land Fill:
100% of Non-Contaminated Service = 393.2 Ft^3 @ 45,010#
Total = 14.6 Cu.Yd. @ 45,010# = 1 Truckloads @ 47,000#

- Haul = 1 Truck x 8 Hrs/Truck x $65.39/Hr = $ 523

- Dispose = See Appendix 6.5

Tankage and Vessel Total = ***$ 60,246***

2.3 Piping

Basis: See Table 2.2

A. Remove, Cut or Crush and Load - 9 days:

PVC and Poly @ 140 Ft/Man-Day @ 5,000 Ft = 36 Man-Days
= 9 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Operator @ $ 17.71/Hr
  4 - Laborers @ $ 13.02/Hr
  $ 91.37/Hr x 72 Hr = $ 6,579
- Travel = $91.37/Hr x 9 Days x 1 Hr/Day = $ 822
- Eq. Rental = 1 - 20 Ton Crane @ $ 37.39/Hr
  $ 37.39/Hr x 72 Hr = $ 2,692

Sub-total = $ 10,093

B. Decontaminate - 0 Days: = $ 0

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:

100% Pipe = 244 Ft.^{3} @ 9,136#
Total = 9 Cu. Yd. @ 9,136# = 0.2 Truckloads @ 40,000#

- Haul = 0.2 Trucks x 800 Mile x $3.27/Mile = $ 523
- Dispose = 9,136# = 4.6 tons
  @ $50/ton disposal cost = $ 230

Piping Total = ***$ 10,846***

2.4 Pumps

Basis: See Table 2.3

A. Removal and Loading - 11 Days:

2 Pumps/Man-Day @ 43 Pumps = 21.5 Man-Days
= 11.0 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  1 - Operator @ $17.71/Hr
  2 - Laborers @ $13.02/Hr
  $65.33/Hr x 88 Hr = $ 5,749
- Travel = $65.33/Hr x 11 Days x 1 Hr/Day = $ 719
- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  $37.39/Hr x 88 Hr = $ 3,290

Sub-total = $ 9,758

B. Haul and Dispose - Licensed (NRC SUA #1473) Site:

100% Contaminated = 164.3 Ft.^{3} @ 10,612#

Total = 6.1 Cu. Yd. @ 10,612# = 0.3 Truck Load @ 40,000#

- Haul = 0.3 Truck x 800 Mile x $3.27/Mile = $ 785
- Dispose = 10,612# = 5.3 tons
  @ $50/ton disposal cost = $ 265

C. Haul and Dispose - On-Site Land Fill:

100% Non-Contaminated = 106.5 Ft.^{3} @ 10,723#

Total = 3.9 Cu. Yd. @ 10,723# = 0.3 Truck Load @ 47,000#

- Haul = 0.3 Truck x 8 Hrs/Truck x $65.39/Hr = $ 157
- Dispose = See Appendix 6.5

Pump Total = ***$ 10,965***

2.5 Electrical

A. Remove, Cut and Load - 10 Days:

- Labor Crew = 1 - Journeyman Elect. @ $ 34.88/Hr
  2 - Helpers @ $ 30.51/Hr
  1 - Welder @ $ 19.35/Hr
  1 - Operator @ $ 17.71/Hr
  $132.96/Hr x 80 Hr = $ 10,637
- Elec. Travel = $132.96/Hr x 10 Days x 2 Hr/Day = $ 2,659
  + $0.54/Mile x 10 Days x 120 Mile/Day = $ 648
- Other Travel = $37.06/Hr x 10 Days x 1 Hr/Day = $ 371
- Eq. Rental = 1 - 20 Ton Crane @ $ 37.39/Hr
  1 - Truck @ $ 12.26/Hr
  1 - Welder/Torch @ $ 10.90/Hr
  $ 60.55/Hr x 80 Hr = $ 4,844

Sub-total = $ 19,159

B. Haul and Dispose - On-Site Land Fill:

MCC#1 = 11.75 Ft. x 1.25 Ft. x 7.5 Ft. = 110.2 Ft.^{3} @ 4,550#

MCC#2 = 11.75 Ft. x 1.25 Ft. x 7.5 Ft. = 110.2 Ft.^{3} @ 4,550#

Cable = 220.4 Ft.^{3} x 0.5* = 110.2 Ft.^{3} @ 36,700#

(555#/Ft.^{3} @ 40% Void = 333#/Ft^2)

Total = 330.6 Ft.^{3} @ 45,800#

= 12.2 Cu. Yd. @ 45,800# = 1 Truck @ 47,000#

- Haul = 1 Truck x 8 Hrs/Truck x $65.39/Hr = $ 523
- Dispose = See Appendix 6.5

* Cable Volume = 1/2 MCC Volume

Electrical Total = ***$ 19,682***

2.6 Foundation

A. Decontaminate Slab - 5 Days:

16,500 Ft^2 @ 1000 Ft^2/Man-Day = 17 Man-Days
= 5 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  4 - Laborers @ $ 13.02/Hr
  $ 73.66/Hr x 40 Hr = $ 2,646
- Travel = $73.66/Hr x 5 Days x 1 Hr/Day = $ 368
- Eq. Rental = Hand Tools @ $ 10.90/Hr
  (Broom, Squeegee) $ 10.90/Hr x 40 Hr = $ 436
- 10% HCl = 2 Gal/Ft^2 x 16,500 Ft^2
  = 33,000 Gal.

make-up from 20° Be HCl Stock @ $0.508/Gal
Require 288 Gal. Stock per 1,000 Gal. - 10%

33,000 x 0.288 x $0.55/Gal = $ 5,227

- Dispose of Fluid @ $0.11/BBL
  33,000 Gal x $\frac{\text{BBL}}{42 \text{ Gal}}$ x $0.11/BBL = $ 86

Sub-total = $ 8,763

B. Break and Remove 25% of Slab - 14 Days:

16,500 Ft^2 x 0.25 = 4,125 Ft^2
4,125 Ft^2 @ 37.5 Ft^2/Hr = 110 Hrs

- Labor Crew = 1 - Operator @ $ 17.71/Hr
  $ 17.71/Hr x 110 Hrs = $ 1,948
- Travel = $17.71/Hr x 14 Days x 1 Hr/Day = $ 248
- Eq. Rental = 1 - Pavement Breaker @ $ 31.33/Hr
  $ 31.33/Hr x 110 Hrs = $ 3,446
  1- Cat 980C Loader @ $ 92.64/Hr
  $ 92.64/Hr x 56 Hrs = $ 5,188

Sub-total = $ 10,830

C. Haul and Dispose - Licensed (NRC SUA #1743) Site:

Concrete = 4,125 Ft^2 x $\frac{8 \text{ In.}}{12 \text{ In/Ft}}$ = 2,750 Ft^3 Set

= 539,000# @ 196#/Ft^3

= 4,583 Ft^3 Loose (40% Voids)

Total = 170 Cu.Yd. @ 539,000# = 13.5 Truckloads @ 40,000#

- Haul = 13.5 Truckloads x 800 Miles x $3.27/Mile = $ 35,316
- Dispose = 539,000# = 269.5 tons @ $50/ton disposal cost = $ 13,475

D. Bury Area with 2 Ft. Cover:

- Material = 1,225 Cu.Yd. Cover @ $1.09/Cu.Yd. = $ 1,335

Foundation Total = ***$69,719***

(NRC Related Activity)

APPENDIX 3
DRYER AREA RECLAMATION COSTS
Cost Summary

ITEM	COSTS ($97)
3.1 Building	**16,222**
3.2 Equipment	**14,739**
3.3 Foundations	**16,802**
Total Cost	**47,763**

3.1 Building

Basis: 100 Ft. x 35 Ft. with 30 Ft. Eave
Floor Area = 3,500 Ft^2
Skin Area = 8,100 Ft^2

A. Washdown Building - 0 Days = $ 0

B. Dismantle and Load - 5 Days:
3500 Ft^2 @ 100 Ft^2/Man-Day = 35 Man-Days
= 5 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  2 - Welders @ $ 19.35/Hr
  2 - Operators @ $ 17.71/Hr
  4 - Laborers @ $ 13.02/Hr
  $147.78/Hr x 40 Hr = $ 5,911
- Travel = $147.78/Hr x 5 Days x 1 Hr/Day = $ 739
- Eq. Rental = 2 - 20 Ton Cranes @ $37.39/Hr
  2 - Welder/Torch @ $10.90/Hr
  $96.58/Hr x 40 Hr = $ 3,863

Sub-total = $ 10,513

C. Haul and Dispose - Licensed (NRC SUA - #1473) Site:
Buildings = 71,212#* = 1.8 Truck Loads @ 40,000#
- Haul = 1.8 Trucks x 800 Mile x $3.27/Mile = $ 4,709
- Dispose = 40,000# = 20 tons
  @ $50/ton disposal cost = $ 1,000

*5 Trucks x 47,000#/Truck x $\frac{3500\ Ft^2}{11550\ Ft^2}$ = 71,212#

Building Total = ***$ 16,222***

3.2 Equipment

Basis: See Table 3.1

A. Remove and Load - 7 Days:

- Labor Crew = 1 - Foreman @ $21.58/Hr
  1 - Operator @ $17.71/Hr
  4 - Laborers @ $13.02/Hr
  91.37/Hr x 56 Hrs = $ 5,117
- Travel = $91.37/Hr x 7 Days x 1 Hr/Day = $ 640
- Eq. Rental = 1 - 20 Ton Crane @ $37.39/Hr
  $37.39/Hr x 56 Hrs = $ 2,094

Sub-total = $ 7,851

B. Dismantle and Cut - 7 Days:

Cut Steel @ 30 Ft^3/Man-Day @ 198.6 Ft^3 = 7 Man-Days

- Labor Crew = 1 - Foreman @ $ Foreman supervises 3.2(A) & (B)
  1 - Welders @ $19.35/Hr
  $19.35/Hr x 56 Hr = $ 1,084
- Travel = $19.35/Hr x 7 Days x 1 Hr/Day = $ 135
- Eq. Rental = 1 - Welder/Torch @ $10.90/Hr
  $10.90/Hr x 56 Hr = $ 610

Sub-total = $ 1,829

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:

100% of Contaminated = 183.6 $Ft.^3$ @ 53,800#
Total = 6.8 Cu. Yd. @ 53,800# = 1.4 Truck Loads @ 40,000#

- Haul = 1.4 Truck x 800 Mile x $3.27/Mile = $ 3,662
- Dispose = 53,800# = 26.9 tons
  @ $50/ton disposal cost = $ 1,345

D. Haul and Dispose - Land Fill:

100% Non-Contaminated = 15 $Ft.^3$ @ 4,400#
Total = 0.6 Cu. Yd. @ 4,400# = 0.1 Truck Loads @ 47,000#

- Haul = 0.1 Truck x 8 Hrs/Truck x $65.39/Hr = $ 52
- Dispose = See Appendix 6.5

Equipment Total = ***$14,739***

3.3 Foundation

A. Decontaminate Slab - 2 Day:

3500 Ft^2 @ 1000 Ft^2/Man-Day Twice = 7 Man-Days
= 2 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hr x 16 Hrs = $ 1,179
- Travel = $73.66/Hr x 2 Days x 1 Hr/Day = $ 147
- Eq. Rental = Hand Tools @ $10.90/Hr
  (Broom, Squeegee) $10.90/Hr x 16 Hrs = $ 174
- 10% HCl = 2 Gal/Ft^2 x 3500 Ft^2 x 2
  = 14,000 Gal.

Make-Up from 20° Be HCl Stock @ $0.55/Gal
Require 288 Gal. Stock per 1,000 Gal. - 10%

14,000 x 0.288 x $0.55/Gal = $ 2,218

- Dispose of Fluid @ $0.11/BBL
  14,000 Gal x BBL/42 Gal x $0.11/BBL = $ 37

Sub-Total = $ 3,755

B. Break and Remove 25% of Slab - 3 Day:

3500 Ft^2 x 0.25 = 875 Ft^2
875 Ft^2 @ 37.5 Ft^2/Hr = 23 Hrs

- Labor Crew = 1 - Operator @ $17.71/Hr
  $17.71/Hr x 23 Hrs = $ 407
- Travel = $17.71/Hr x 3 Days x 1Hr/Day = $ 53
- Eq. Rental = 1 - Pavement Breaker @ $31.33/Hr
  $31.33/Hr x 24 Hrs = $ 752

  1- Cat 980C Loader @ $92.64/Hr
  $92.64/Hr x 12 Hr = $ 1,112

Sub-total = $ 2,324

C. Haul and Dispose - Licensed (NRC SUA #1743) Site:

Concrete = 875 Ft^2 x 8 In / 12 In/Ft = 583 Ft^3 Set
= 114,268# @ 196#/Ft^3
= 972 Ft^3 Loose (40% Voids)

Total = 36 Cu.Yd. @ 114,268# = 2.9 Truckloads @ 40,000#

- Haul = 2.9 Truck x 800 Mile x $3.27/Mile = $ 7,586
- Dispose = 114,268# = 57.1 tons @ $50/ton disposal cost = $ 2,855

D. Bury Area with 2 Ft Cover:

- Materials = 259 Cu.Yd. Cover @ $1.09/Cu.Yd. = $ 282

Foundation Total = ***$ 16,802***

(NRC & WDEQ/LQD Related Activity)

APPENDIX 4

EXISTING FACILITIES RECLAMATION COSTS

Cost Summary

ITEM	COSTS ($97)
4.1 Buildings	**95,635**
4.2 Structures	**14,067**
4.3 Pilot Plant Equipment	**21,266**
4.4 Foundation	**139,333**
4.5 Site Reclamation	**105,785**
4.6 O-Sand Pilot	**41,435**
4.7 Q-Sand Pilot	**N.A.**
4.8Mine Water Trt Ponds	**19,878**
Total Cost	**410,244**

4.1 Buildings

Basis: Floor Area = 33,248 Ft^2
Skin Area = 22,828 Ft^2 (13 Ft Eave)

1 @ 200 Ft. x 60 Ft. = 12,000 Ft^2 (Pilot ISL Building)
0 @ 70 Ft. x 48 Ft. - Demolished & Removed Sept. 1991
1 @ 70 Ft. x 68 Ft. = 4,760 Ft^2 (Existing Office Building)
1 @ 48 Ft. x 24 Ft. = 1,152 Ft^2 (Storage Building)
1 @ 24 Ft. x 24 Ft. = 576 Ft^2 (Water Treatment Plant)
1 @ 40 Ft x 120 Ft. = 4,826 Ft^2 (Shop Building)
1 @ Building = 9,934 Ft^2 (New Office Annex Building)

A. Washdown Building - 8 Days

22,828 Ft^2 @ 1 Gal/Ft^2 = 22,828 Gal
22,828 Ft^2 @ 450 Ft^2/Man = 51 Man-Days
= 13 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  4 - Laborers @ $ 13.02/Hr
  $ 73.66/Hr x 104 Hr = $ 7,661
- Travel = $73.66/Hr x 13 Days x 1 Hr/Day = $ 958
- Eq. Rental = 4 - Pressure Washers @ $ 8.71/Hr
  $ 34.84/Hr x 104 Hr = $ 3,623
- Materials = Soap @ $1.09/BBL
  22,828 Gal x BBL / 42 Gal x $1.09/BBL = $ 592
- Dispose of Fluid @ $0.11/BBL

22,828 Gal x $\frac{\text{BBL}}{42\text{ Gal}}$ x \$0.11/BBL	=	\$ 60
Sub-total	=	\$ 12,894

B. Dismantle and Load - 24 Days:

33,248 Ft^2 @ 100 Ft^2/Man-Day = 332 Man-Days
= 42 Crew-Days

- Labor Crew = 1 - Foreman @ \$ 21.58/Hr
  2 - Welders @ \$ 19.35/Hr
  2 - Operators @ \$ 17.71/Hr
  4 - Laborers @ \$ 13.02/Hr
  \$147.78/Hr x 336 Hrs = \$ 49,654
- Travel = \$147.78/Hr x 42 Days x 1 Hr/Day = \$ 6,207
- Eq. Rental = 2 - 20 Ton Cranes @ \$37.39/Hr
  2- Welder/Torches @ \$10.90/Hr
  \$96.58/Hr x 336 Hrs = \$ 32,450

Sub-total	=	\$ 88,311

C. Haul and Dispose - On-Site Land Fill:

Buildings = 676,800# = 14 Truck Loads* @ 47,000#

- Haul = 14 Trucks x 8 Hrs/Truck x \$65.39/Hr = \$ 7,324
- Dispose = See Appendix 6.5

* 5 Trucks x $\frac{18{,}488\text{ Ft.}^2}{11{,}550\text{ Ft.}^2}$ = 14 Trucks

Buildings Total	=	***\$ 95,635***

4.2 Structures

A. Plug Shaft - Completed in 1994	=	$ 0
B. Plug Venthole		
• Backfill 335 ft. of hole (270 c.y. @ $1.09/yd)	=	$ 270
• Backhoe 16 hrs @ $27.25/hr	=	$ 436
• Steel plate and rebar	=	$ 300
• Cement - 10 c.y. @ $76/c.y. delivered	=	$ 760
• 40 man hours @ $13.02/hr	=	$ 521
• Dirt cover - 100 c.y. @ $1.09/c.y.	=	$ 109
Sub-total	=	$ 2,396

C. Mine Water Treatment Ponds

See Section 4.8

D. Evaporation Ponds

Total Area = 200 Ft. x 100 Ft. = 20,000 Ft.^{2} = 0.5 Acres

• Total = 0.5 Acres x $\frac{\$65,392^*}{5 \text{ Acres}}$	=	$ 6,539

* See Section 6 - part 6.2 for the cost on a 5 acre basis

E. Headframe Removal

• Dismantle - Completed in 1991	=	$ 0
• Haul & Dispose - Completed in 1993	=	$ 0

F. Fencing (includes delineation posts)

Facility Fence - 5900 ft
Wellfield #1 - 6600 ft
Wellfield #3 - 7500 ft
20000 ft

• Cost to remove fencing = $0.15/ft[1]	=	$ 3,000

[1] Cost per linear foot based on Third Party Cost Quote dated 6/11/99

G. Water Wells

- Water wells (2) are 5 inch diameter wells with depth of 750 feet.
- Cost Basis - $285/well ($7705 per 27 wells, see "Section 5.4 - Wells") = $ 570

H. Fuel Area

- Size - 15 ft x 25 ft = 375 Ft^2.
  375 Ft^2 @ 37.5 Ft^2/Hr = 10 Hrs
- Labor Crew = 1 - Operators @ $ 17.71/Hr
  $ 17.71/Hr x 10 Hrs = $ 177
- Travel = $17.71/Hr x 2 Days x 1 Hr/Day = $ 35
- Eq. Rental = 1- Pavement Breaker @ $31.33/Hr
  $31.33/Hr x 10 hrs = $ 313

  1- Cat 980C Loader @ 92.64/Hr
  $96.58/Hr x 5 hr = $ 483

Sub-total = $ 1008

Structures Total = ***$ 14,067***

4.3 Pilot Plant Equipment

A. Tanks:
15 Tanks
- Total = 15 Tanks x $55,926* / 51 Tanks = $ 15,095

B. Piping:
1500 Ft. @ 6" Dia. or Less
- Total = 1500 Ft. x $10,616* / 5,000 Ft. = $ 3,185

C. Pumps:
12 Pumps
- Total = 12 Pumps x $10,700* / 43 Pumps = $ 2,986

* Reference Section 2 - parts 2.2, 2.3 & 2.4

Pilot Plant Total = ***$ 21,266***

4.4 Foundation

A. Decontaminate Slab - 5 Days:

33,248 Ft^2 @ 1000 Ft^2/Man-Day = 33.2 Man-Days
= 8.3 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  4 - Laborers @ $ 13.02/Hr
  $ 73.66/Hr x 66.4 Hrs = $ 4,891
- Travel = $73.66/Hr x 9 Days x 1 Hr/Day = $ 663
- Eq. Rental = Hand Tools @ $10.90/Hr
  (Brooms, Squeegee) @ $10.90 /Hr x 66.4 Hrs = $ 724
- 10% HCl = 2 Gal/Ft^2 x 33,248 $Ft.^2$
  = 66,496 Gal.

Make-Up from 20° Be HCl Stock @ $0.55/Gal
Require 288 Gal. Stock per 1,000 Gal. - 10%

66,496 x 0.288 x $0.55/Gal = $ 10,532

- Dispose of Fluid @ $0.11/BBL
  66,496 Gal x BBL / 42 Gal x $0.11 BBL = $ 174

Sub-total = $ 16,984

B. Break and Remove 25% of Slab - 28 Days:

33,248 Ft^2 x 0.25 = 8,312 Ft^2
8,312 Ft^2 @ 37.5 Ft^2/Hr = 221 Hrs

- Labor Crew = 1 - Operator @ $17.71/Hr
  $17.71/Hr x 221 Hrs = $ 3,914
- Travel = $17.71/Hr x 28 Days x 1 Hr/Day = $ 496
- Eq. Rental = 1 - Pavement Breaker @ $31.33/Hr
  $31.33/Hr x 221 Hrs = $ 6,923

  1 - Cat 980C Loader @ $92.64/Hr
  $92.64/Hr x 111 Hrs = $ 10,283

Sub-total = $ 21,616

C. Haul and Dispose - Licensed (NRC SUA #1743) Site:

Concrete = 8,312 Ft^2 x $\frac{8 \text{ In.}}{12 \text{ In/Ft}}$ = 5,541 Ft^3 Set

= 1,086,101# @ 196#/Ft^3

= 9,235 Ft^3 Loose(40% Voids)

Total = 342 Cu.Yd. @ 1,086,101# = 27.1 Truckloads @ 40,000#

• Haul = 27.1 Truckloads x 800 Miles x $3.27/Mile	=	$70,894
• Dispose = 1,086,101# = 543.1 tons @ $50/ton disposal cost	=	$27,155

D. Bury Area with 2 Ft Cover:

• Materials = 2,462 Cu. Yd. Cover @ $1.09/Cu. Yd.	=	$ 2,684
Foundation Total	=	***$139,333***

4.5 Site Reclamation

Basis: 59.53 Acres = 2,593,126 $Ft.^2$

A. Rip & Contour:

• Rip & Contour @ $166.68/Acre x 59.53 Acre	=	$ 9,922

B. Topsoil Placement:

Replace 8 In.* Topsoil = 1,728,750 $Ft.^3$ = 64,028 Cu.Yd.

• Topsoil @ $1.09/Cu. Yd.	=	$69,789

* 8 In. Topsoil Removed in Previous Years

C. Revegetate:

• Grade and Contour @ $87.19/Acre x 59.53 Acre	=	$ 5,190
• Seedbed Prep. (Disc. + Harrow) @ $ 21.80/Acre x 59.53 Acre	=	$ 1,298
• Mulch (Drill + Seed + Mow) @ $ 49/Acre x 59.53 Acre	=	$ 2,917
• Drill Seed and Fertilize (Drill + Seed + Fertilizer)@ $163/Acre x 59.53 Acre	=	$ 9,703
• Revegetation Contingency* @ $234/Acre x 29.77 Acre (All items excluding grading)	=	$ 6,966

* Assume only 50% of acreage requires reseeding

Sub-total	=	$ 26,074
Site Reclamation Total	=	***$105,785***

4.6 O-Sand Pilot

A. Surface Reclamation:
Basis = 6 Patterns

• Total = 6 Patterns x $\frac{\$16,669^*}{10 \text{ Patterns}}$	=	$ 10,001

* Reference Section 5 - Summary Table Cost Per Pattern

B. Groundwater Restoration:
Basis = 6 Patterns

• Total = 6 Patterns x $\frac{\$5,239^*}{\text{Pattern}}$	=	$ 31,434

* Reference Appendix #7

Sub-Total	=	$ 41,435

4.7 Q-Sand Pilot

Basis - 6 Patterns

• Building - Removed in 1992	=	$ 0
• Plug & Abandon 10 Wells - Completed in 1992	=	$ 0
• Reclaim Surface = To Be Completed With WF1 Operations	=	$ 0
Sub-total	=	$ 0

4.8 Mine Water Treatment Ponds

A. Burial In-Place
- Settled solids to Pond 3 for Burial In-Place

D8N Dozer - 40 Hrs @ $117.71/Hr	=	$ 4,708

- Backfill and Contour Settling Ponds

D8N Dozer - 120 Hrs @ $117.71/Hr	=	$14,125
Motor Grader - 16 Hrs @ $65.34/Hr	=	1,045
Sub-total	=	$19,878
Mine Water Treatment Total	=	***$19,878***

(NRC & WDEQ/LQD Related Activity)

APPENDIX 5

UNIT HEADER SITE AND ASSOCIATED WELLFIELD RECLAMATION COSTS

Cost Summary

ITEM	Cost ($97) per 10 Patterns	Cost ($97) 374 Patterns 1999-2000
5.1 Buildings	**1,549**	**57,932**
5.2 Header Piping	**2,735**	**102,289**
5.3 Secondary Electrical	**2,633**	**98,474**
5.4 Wells-Total	**10,532**	**393,897**
5.5 Monitor Wells - Total	**1,450**	**54,230**
5.6 Site Reclamation	**1,019**	**37,111**
Total Cost	**19,918**	**743,933**

5.1 Building

Basis: 12 Ft. x 24 Ft. with 10 Ft. Eave
Floor Area = 288 Ft^2
Skin Area = 720 Ft^2

A. Washdown Building - 1 Day:
Wash 720 Ft^2 @ 1 Gal/Ft^2 = 720 Gal
Wash 720 Ft^2 @ 450 Ft^2/Man-Day = 1.6 Man-Days
= 0.8 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 47.62/Hr x 8 Hr = $ 381
- Travel = $47.62/Hr x 1 Day x 1 Hr/Day = $ 48
- Eq. Rental = 2 - Pressure Washers @ $ 8.71/Hr
  $ 17.42/Hr x 8 Hr = $ 139
- Materials = Soap @ $1.09/BBL
  720 Gal x BBL / 42 Gal x $1.09/BBL = $ 19
- Dispose of Fluid @ $0.11/BBL
  720 Gal x BBL / 42 Gal x $0.11/BBL = $ 2

Sub-total = $ 589

B. Dismantle and Load - 1 Day:

Dismantle and Load @ 100 Ft^2/Man-Day
288 Ft^2 @ 100 Ft^2/Man-Day = 2.9 Man-Day
= 1.0 Crew-Day

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Welders @ $ 19.35/Hr
  2 - Laborers @ $ 13.02/Hr
  $66.97/Hr x 8 Hr =$ 536
- Travel = $66.97/Hr x 1 Day x 1 Hr/Day =$ 67
- Eq. Rental = 1 - Backhoe @ $ 27.25/Hr
  1 - Welder/Torch @ $ 10.90/Hr
  $ 38.15/Hr x 8 Hr =$ 305

Sub-total =$ 908

C. Haul and Dispose - On-Site Land Fill:

Building = 4,700# = 0.1 Truck Loads* @ 47,000#

- Haul = 0.1 Truck x 8 Hrs/Truck x $65.39/Hr =$ 52
- Dispose = See Appendix 6.5

* 5 Truck x $\frac{288\ Ft.^2}{11{,}550\ Ft.^2}$ = 0.1 Trucks

Sub-total =$ 52

Building Total =***$ 1,549***

5.2 Header Piping

Basis: 2000 Ft. - 1¼" Piping Buried @6 Ft.
Trench = 6 Ft. x 2 Ft. = 45 Cu. Yd./100 Ft.
Excavation = 26 Cu. Yd./Hr (Case 580 Backhoe - 24 in. Bucket)

A. Open Trenches - 5 Days:

$$(2000\ Ft.) \times \left(\frac{45\ Cu.\ Yd.}{100\ Ft.}\right) \times \left(\frac{\ \ Hr.\ \ }{26\ Cu.\ Yd.}\right) = 35\ Hrs$$

- Eq. Rental = 1 - Backhoe @ $ 27.25/Hr
  $ 27.25/Hr x 40 Hr =$1,090

B. Remove, Cut and Load - 2.5 Days:
Trenches Opened at 400 Ft/Man-Day
Piping = 2000 Ft @ 400 Ft/Man-Day = 5 Man-Days
= 2.5 Crew-Days

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 47.62/Hr x 20 Hr =$ 952
- Travel = $47.62 x 3 Days x 1 Hr/Day =$ 143
- Eq. Rental = 2 - Chainsaws @ $2.40/Hr
  $4.8/Hr x 20 Hrs =$ 96

Sub-total =$ 1,191

C. Backfill Trenches - 2 Day:
Backfill @ 2.5 Time Excavation Rate or
Backfill @ 26 $\frac{\text{Cu.Yd.}}{\text{Hr}}$ x 2.5 = 65 Cu.Yd./Hr

$$(2000\ \text{Ft}) \times \left(\frac{45\ \text{Cu.Yd.}}{100\ \text{Ft}}\right) \times \left(\frac{\text{Hr}}{65\ \text{Cu.Yd.}}\right) = 13.8\ \text{Hrs or 14 hours}$$

- Eq. Rental = 1 - Backhoe@ $ 27.25/Hr
  $ 27.25/Hr x 14 Hrs =$ 382

D. Haul and Dispose - Licensed (NRC SUA #1473) Site:
1 1/4" Poly Pipe = 43 #/100 Ft. = 2,000 Ft. x 0.43#/Ft. = 860#

$$\text{Volume} = \frac{2{,}000\ \text{Ft} \times (43\ \#/100\ \text{Ft.})}{62.4\ \frac{\#}{\text{Ft.}^3} \times 0.6} = 23\ \text{Ft.}^3$$

Total = 0.9 Cu. Yd. @ 860# = 0.02 Truck Loads @ 40,000#

- Haul = 0.02 Trucks x 800 Mile x $3.27/Mile =$ 52
- Dispose = 860# = 0.4 tons
  @ $50/ton disposal cost =$ 20

Header Piping Total =***$2,735***

5.3 Secondary Electrical

Basis: Remove 2,000 ft - #10 AWG, Power Cable
Remove Pole and Motor Starters

A. Remove Tray Cable - 1 Day:

- Labor Crew = 1 - Journeyman @ $ 34.88/Hr
  1 - Helper @ $ 30.51/Hr
  $ 65.39/Hr x 8 Hr =$ 523
- Travel = $65.39/Hr x 1 Day x 2 Hr/Day =$ 131
  + $0.54/Mile x 1 Day x 120 Mile/Day =$ 65
- Eq. Rental = 1 - Truck @ $12.26/Hr
  $12.26/Hr x 8 Hr =$ 98

Sub-total =$ 817

B. Remove Motor Starters - 1 Day:

- Labor Crew = 1 - Journeyman @ $ 34.88/Hr
  1 - Helper @ $ 30.51/Hr
  $ 65.39/Hr x 8 Hr =$ 523
- Travel = $65.39/Hr x 1 Day x 2 Hr/Day =$ 131
  + $0.54/Mile x 1 Day x 120 Mile/Day =$ 65
- Eq. Rental = 1 - Truck @ $12.26/Hr
  $12.26/Hr x 8 Hr =$ 98

Sub-total =$ 817

C. Disconnect Power Cable from Pole - 0.5 Days:

- Labor Crew = 1 - Journeyman @ $ 34.88/Hr
  1 - Helper @ $ 30.51/Hr
  $ 65.39/Hr x 4 Hr =$ 262
- Travel = $65.39/Hr x 0.5 Day x 2 Hr/Day =$ 65
  + $0.54/Mile x 0.5 Day x 120 Mile/Day =$ 32
- Eq. Rental = 1 - Bucket Truck @ $ 37.36/Hr
  1 - Truck @ $ 12.26/Hr
  $ 49.62/Hr x 4 Hr =$ 198

Sub-total =$ 557

D. Remove Pole - 0.5 Day:

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Operator @ $ 17.71/Hr
  1 - Laborer @ $ 13.02/Hr
  $ 52.31/Hr x 4 Hr =$ 209

- Travel = $52.31/Hr x 1 Day x 1 Hr/Day =$ 52

- Eq. Rental = 1 - 20 Ton Crane @ $ 37.39/Hr
  $ 37.39/Hr x 4 Hr =$ 150

Sub-total =$ 411

E. Haul and Dispose - On-Site Land Fill:

Cable = $\frac{3.14 \times (0.5)^2 \times 2{,}000}{4 \times 144 \times 0.6}$ = 4.5 Ft.^{3} @ 1499# (555#/Ft.^{3} @ 40% Void)

Motor Starter =
$\frac{10 \times (24\text{in.} \times 10\text{in.} \times 8\text{in.})}{1728}$ = 11.1 Ft.^{3} @260# (@ 26# Each)

Pole = 1 Ft. Diam. x 35 Ft. = 27.5 Ft.^{3} @ 825# (@ 30#/Ft^3)

Total = 43.1 Ft.^{3} @ 2,585#
= 1.6 Cu. Yd. @ 2,585# = 0.06 Trucks @ 47,000#

- Haul = 0.06 Trucks x 8 Hr/Truck x $65.39/Hr = $ 31

- Dispose = See Appendix 6.5

Secondary Electrical Total = ***$ 2,633***

5.4 Wells

Basis: 27 Wells per 10 Patterns
5 in. Casing, 750 Ft. TD
Pumps and Tubing Set @ 550 Ft.

A. Pull Pumps and Tubing - 2 Days:

10 Pumps @ 5 Pumps/Crew-Day = 2 Days

- Eq. Rental = 1 - Pulling Unit w/2-Man Crew @ $32.70/Hr
  $32.70/Hr x 16 Hrs = $ 523

B. Plug and Abandon - 4.5 Days:

27 Wells @ 6 Wells/Crew-Day = 4.5 Days
10 - Sack Cement/Well
800# - 'Shur-Gel'/Well

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Operator @ $ 17.71/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 65.33/Hr x 36 Hrs = $ 2,352

- Travel = $65.33 x 5 Days x 1 Hr/Day = $ 327

- Eq. Rental = 1 - Backhoe @ $ 27.25/Hr
  1 - 6000# Forklift @ $ 13.12/Hr*
  2 - Skid Tanks @ $ 2.40/Hr
  $ 45.17/Hr x 36 Hrs = $ 1,626

* $1927/Month @ 160 Hr/Month x 1.899 (CPI inflator) = $13.12/Hr

- Materials - 270 - Sacks Cement @ $ 5.45/each
  21,600 - # 'Shur Gel' @ $ 16.34/100#
  $ 5,001 = $ 5,001

Sub-total = $ 9,306

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:

Pumps = 10 x 5 In. Dia. x 8 Ft. Long = 10.9 Ft.^{3}
@ 850# (@ 85# Each)

Tubing = 27 x $\frac{550 \text{ Ft x } 43\#/100 \text{ Ft.}}{62.4 \#/\text{Ft.}^3 \text{ x } 0.6}$ = 170.6 Ft.^{3} @ 6386#

Total = 181.5 Ft.^{3} @ 7,236#
= 6.7 Cu. Yd. @ 7,236# = 0.2 Trucks @ 40,000#

- Haul = 0.2 Truck x 800 Mile x $3.27/Mile = $ 523
- Dispose = 7,236# = 3.6 tons
  @ $50/ton disposal cost = $ 180

Wells Total = ***$10,532***

5.5 Monitor Wells

Basis: 3.21 Per 10 Patterns
5 in. Casing, 750 Ft. T.D.
Pumps and Tubing Set @ 550 Ft.

A. Pull Pumps and Tubing - 1 Day:
3.21 Pumps @ 5 Pumps/Crew-Day = 1 Day

- Eq. Rental = 1 - Pulling Unit w/2-Man Crew @ $ 32.70/Hr
  $ 32.70/Hr x 8 Hrs = $ 262

B. Plug and Abandon - 0.5 Days:
3.21 Wells @ 6 Wells/Crew-Day = 0.5 Crew-Days
10 Sacks Cement/Well
200# 'Shur-Gel'/Well

- Labor Crew = 1 - Foreman @ $ 21.58/Hr
  1 - Operator @ $ 19.35/Hr
  2 - Laborers @ $ 13.02/Hr
  $ 66.97/Hr x 4 Hrs = $ 268
- Travel = $66.97/Hr x 1 Day x 1 Hr/Day = $ 67
- Eq. Rental = 1 - Backhoe @ $ 27.25/Hr
  1 - 6000# Forklift @ $ 13.12/Hr
  2 - Skid Tanks @ $ 2.40/Hr
  $ 45.17/Hrs x 4 Hrs = $ 181
- Materials - 32 Sacks Cement @ $ 5.45/each
  2,568 - # 'Shur Gel' @ $ 16.34/100#
  $ 594 = $ 594

Sub-total = $ 1,110

C. Haul and Dispose - Licensed (NRC SUA #1473) Site:
Pumps = 3.21 @ 5 In. Dia. x 8 Ft. Long = 3.5 Ft.^{3} @273#
(83# Each)

Tubing = 3.21 x 550 Ft x 43#/100 Ft. / 62.4 #/Ft.^{3} x 0.6 = 20.3 Ft.^{3} @759#

Total = 23.8 Ft.^{3} @ 1032#
= 0.8 Cu. Yd. @ 1032# = 0.03 Truck @ 40,000#

- Haul = 0.03 Truck x 800 Mile x $3.27/Mile = $ 78

Monitor Well Total = ***$ 1,450***

5.6 Site Reclamation

Basis: Revegetate 2.3 Acres (500 Ft. x 200 Ft.)
Replace 10 Cu.Yd. Topsoil (540 Ft.^{2} x 6 In.) @ Building Pad

A. Topsoil Placement:

• 10 Cu.Yd. @ 1.09/Cu.Yd.	=	$ 11

B. Revegetate:

• Grade and Contour Topsoil @ $ 87.19/Acre x 2.3 Acres	=	$ 201
• Seedbed Prep. (Disc. + Harrow) @ $ 21.80/Acre x 2.3 Acres	=	$ 50
• Mulch (Drill + Seed + Mow) @ $ 49/Acre x 2.3 Acres	=	$ 113
• Drill Seed and Fertilize (Drill + Seed + Fertilizer) @ $163/Acre x 2.3 Acres	=	$ 375
• Revegetation Contingency* @ $234/Acre x 1.15 Acres (All items excluding grading)	=	$ 269
Sub-total	=	$ 1,019

* Assume only 50% of acreage requires reseeding

Site Reclamation Total	=	*$1,030*

(NRC & WDEQ/LQD Related Activity)

APPENDIX 6
ASSOCIATED STRUCTURES RECLAMATION COSTS

Cost Summary

ITEM	COSTS ($97)
6.1 Trunkline #1 (5000 ft)	**52,108**
6.2 Trunkline #2 (10000 ft)	**104,216**
6.3 Radium Settling Ponds	**70,077**
6.4 P/A Disposal Well	**77,735**
6.5 Sand Mining Area	**13,173**
6.6 Land Fill	**1,500**
Total Cost	**318,809**

6.1 Trunkline

Basis: 2 - 16 in. Trunklines Buried @6 Ft.

Length	=	5,000 Ft.
Trench	=	6 Ft. x 4 Ft. = 89 Cu. Yd./100 Ft
Excavation	=	150 Cu. Yd. / Hr (Cat. 225 1.25 Cu. Yd. Bucket)

A. Open Trench - 4 Days:

(5000 Ft.) x (89 Cu. Yd. / 100 Ft.) x (Hr. / 150 Cu. Yd.) = 30 Hrs - Round to 32 Hrs

- Eq. Rental = 1 - Cat. 225 Trackhoe @ $112.26/Hr
  $112.26/Hr x 32 Hr = $ 3,592

B. Remove, Cut and Load - 18 Days:

2 - 5000 Ft Trunklines @ 140 Ft/Man-Day = 71.4 Man-Day
= 18 Crew-Day

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hrs x 144 Hr = $ 10,607
- Travel = $73.66/Hr x 18 Days x 1 Hr/Day = $ 1,326
- Eq. Rental = 2 - Backhoe @ $27.25/Hr
  2 - Chainsaw @ $ 2.40/Hr
  $59.30/Hr x 144 Hr = $ 8,539

Sub-total = $ 20,472

C. Backfill Trench - 5 Days:

Backfill @ 65 Cu.Yd./Hr Per Backhoe or
Backfill @ 130 Cu.Yd./Hr with 2 Backhoes

$$(5000 \text{ Ft.}) \times \frac{(89 \text{ Cu. Yd.})}{100 \text{ Ft.}} \frac{(\quad \text{Hr.})}{130 \text{ Cu. Yd.}} = 34 \text{ Hrs}$$

- Eq. Rental = 2 - Backhoes @ $ 27.25/Hr
  $ 54.50/Hr x 40 Hrs = $ 2,180

D. Decontaminate - 0 Days: = $ 0

E. Haul and Dispose - Licensed (NRC SUA #1473) Site:

100% of Pipe = 2 x 5,000 Ft. x 28.27#/Ft = 282,700#

$$= \frac{282{,}700\#}{62.4\#/\text{Ft.}^3 \times 0.6} = 7551 \text{ Ft.}^3$$

Total = 279.7 Cu. Yd. @ 282,700# = 7.1 Truckloads @ 40,000#

- Haul = 7.1 Trucks x 800 Mile x $3.27/Mile = $ 18,574
- Dispose = 282,700# = 141.4 tons
  @ $50/ton disposal cost = $ 7,070

F. Haul & Dispose - Land Fill: = $ 0

G. Surface Reclamation:

4 Ft. x 5000 Ft. = 20,000 Ft.^{2} = 0.5 Acres

- Grade and Contour @ $ 87.19/Acre x 0.5 Acre = $ 43
- Seedbed Prep.
  (Disc. + Harrow) @ $ 21.80/Acre x 0.5 Acre = $ 11
- Mulch (Drill + Seed + Mow) @ $ 49/Acre x 0.5 Acre = $ 25
- Drill Seed and Fertilize
  (Drill + Seed + Fertilizer)@ $163/Acre x 0.5 Acre = $ 82
- Revegetation Contingency* @ $234/Acre x 0.25 Acre = $ 59
  (All items excluding grading)

* Assume only 50% of acreage requires reseeding

Sub-total = $ 220

Trunkline Total = ***$52,108***

6.2 Trunkline #2

Cost for 5000 ft line is $52,108. Truckline #2 is 10,000 ft.
@ $52,108 x 2 = $104,216

6.3 Radium Settling Ponds

Basis: 2 Ponds
9 Ft. Deep Below Grade plus 3 Ft. Freeboard Above Grade
Bottom = 180 Ft. x 360 Ft. (Per Pond)
Top = 252 Ft. x 432 Ft. (Per Pond)
Liner = 106,000 Ft^2 x 30 MIL (Per Pond)
Solids = 200 $Ft.^3$/Yr (Both Ponds)

A. Remove Solids and Liner - 8 Days:
Liner = 2 Ponds x 106,000 $Ft.^2$ x 0.03 In/12 = 530 $Ft.^3$
= 33,072# @ 62.4#/Ft^3
= 883 Ft^3 @ 40% Voids

Solids = 200 ft3/yr = 200 $Ft.^3$/Yr Yr #1 - 1998
= 800 $Ft.^3$ In Yr #5 - 2002

Remove @ 55 Gal/Man-Hr or 60 Ft^3/Man-Day

Yr #5 = 1683 Ft^3 @ 60 Ft^3/Man-Day = 28 Man-Days
= 7 Crew-Days

- Labor Crew = 1 - Foreman @ $21.58/Hr
  4 - Laborers @ $13.02/Hr
  $73.66/Hr x 56 Hrs = $ 4,125
- Travel = $73.66/Hr x 7 Days x 1 Hr/Day = $ 516
- Eq. Rental = 2 - Backhoes @ $27.25/Hr
  $54.50/Hr x 56 Hr = $ 3,052

Sub-total = $ 7,693

B. Backfill Ponds - 27 Days:

Volume @ Grade = 180 Ft x 360 Ft x 9 Ft = 583,200 Ft^3
+ 27 Ft x 180 Ft x 9 Ft = 43,740 Ft^3
+ 27 fT X 360 fT X 9 Ft = 87,480 Ft^3
714,420 Ft^3 (Per Pond)

Total Volume = 714,420 Ft^3/Pond x 2 Ponds = 1,428,840 Ft^3 = 52,920 Cu.Yd.

Backfill @ 250 Cu.Yd./Hr = 212 Hrs

- Eq. Rental = 1 - D8N Dozer @ $117.71/Hr
  1- Grader @ $ 65.39/Hr
  $183.10/Hr x 212 Hr = $ 38,817

C. Replace 6 In. Topsoil:

2 Ponds x 0.5 Ft. x 252 Ft. x 432 Ft. = 108,864 $Ft.^3$ = 4032 Cu. Yd.

- Topsoil = 4032 Cu. Yd x $1.09/Cu. Yd. = $ 4,395

D. Revegetate:

2 Ponds x 252 Ft. x 432 Ft. = 217,728 $Ft.^2$ = 5 Acres

- Grade and Contour @ $ 87.19/Acre x 5 Acre = $ 436
- Seedbed Prep.
  (Disc. + Harrow) @ $ 21.80/Acre x 5 Acre = $ 109
- Mulch (Drill + Seed + Mow) @ $ 49/Acre x 5 Acre = $ 245
- Drill Seed and Fertilize
  (Drill + Seed + Fertilizer)@ $163/Acre x 5 Acre = $ 817
- Revegetation Contingency* @ $234/Acre x 2.5 Acre = $ 585
  (All items excluding grading)

Assume only 50% of acreage requires reseeding

Sub-total	=	$ 2,192

E. Haul and Dispose - Licensed (NRC SUA #1473) Site:

Solids = 800 $Ft.^3$ @ 154,400# (60% @ 280#/$Ft.^3$ + 40% @ 62.4#/$Ft.^3$ = 193#/Ft^3)

Liner = 883 $Ft.^3$ @ 33,072# (62.4#/$Ft.^3$ @ 40% Voids)

Total = 1683 $Ft.^3$ @ 187,472#

62.3 Cu. Yd. @ 187,472# = 4.7 Truckloads @ 40,000#

- Haul = 4.7 Trucks x 800 Mile x $3.27/Mile = $ 12,295
- Dispose = 187,472# = 93.7 tons @ $50/ton disposal cost = $ 4,685

Radium Settling Pond Total = ***$ 70,077***

6.4 Plugging and Abandoning A Deep Disposal Well

Oilfield Workover Unit, 6 Days @ $1,634.85/Day	= $ 9,809
Circulating Pump & Tank, 2 Days @ $545/Day	= $ 1,090
Power Swivel, 1 Day @ $436/Day	= $ 436
Water Hauling & Water, 3 Days @ $354/Day	= $ 1,062
Frac Tank Rental	= $ 109
Slickline Services, 2 Days @ $599/Day	= $ 1,198
2 - 7/8 Inch "R" Nipple	= $ 1,417
Mud Materials	= $ 545
2 - 7/8 Inch Tubing Rental, 8610' @ $0.54/Ft-Day	= $ 2,325
Rental Tubing Inspection, 278 Jnts @ $10.90/Jnt	= $ 3,030
Cement & Services, 3 Squeeze Jobs @ 4374 each	= $ 13,122
Squeeze Manifold, Retainer, Swivel, Setting Tool @ $1,820/Squeeze Job	= $ 5,460
Cement & Services, 2 Stabilizers & Surface Plugs	= $ 4,711
Welder, Dirtwork & Roustabouts	= $ 13,624
Trucking	= $ 2,725
Supervision, 8 Days @ $545/Day	= $ 4,360
Miscellaneous, Contingencies, & Sales Tax (10% Above)	= $ 6,502
Sub-Total	= $ 71,525
Year 1991 &1992 CPI Escalation	= $ 6,210
Sub-Total ($1997)	= $ 77,735

Plug and Abandoning Disposal Well = ***$ 77,735***

6.5 Reclamation of Sand Mining Area

10 acres of disturbed area on sand outcrop

Grade and contour @ $ 87.19/acre x 10 Acre	= $ 872
Replace 6 inch topsoil = 217,800 ft.^{3} = 8,067 Cu.Yd. topsoil = $1.09/Cu.Yd.	= $ 8,793
Seedbed Prep. (Disc. + Harrow) @ $ 21.80/acre x 10 Acre	= $ 218
Mulch (Drill + Seed + Mow) @ $ 49/acre x 10 Acre	= $ 490
Drill Seed and Fertilizer @ $163/acre x 10 Acre	= $ 1,630
Revegetation Contingency* (All items excluding grading) @ $234/acre x 5 Acre	= $ 1,170

Assume only 50% of acreage requires reseeding

Sand Mining Area Total = ***$ 13,173***

6.6 Land Fill

Basis: Depth = 6 Ft. total with 4 Ft. active strg. plus 2 ft. cover.
Bottom = 30 Ft. x 70 Ft. = 2,100 Ft.^{2}
Top = 54 Ft. x 94 Ft. = 5,076 Ft.^{2}
Grade = 66 Ft. x 106 Ft. = 6,996 Ft.^{2}

4 Ft. Active Strg. Volume = 30 Ft. x 70 Ft. x 4 Ft. = 8,400 Ft.^{3}
+ 12 Ft. x 30 Ft. x 4 Ft = 1,440 Ft.^{3}
+ 12 Ft. x 70 Ft. x 4 Ft. = 3,360 Ft.^{3}
13,200 Ft.^{3}

2 Ft. Cover Volume = 54 Ft. x 94 Ft. x 2 Ft. = 10,152 Ft.^{3}
+ 6 Ft. x 54 Ft. x 2 Ft. = 648 Ft.^{3}
+ 6 Ft. x 94 Ft. x 2 Ft. = 1,128 Ft.^{3}
11,928 Ft.^{3}

Total Volume = 13,200 Ft.^{3} + 11,928 Ft.^{3} = 25,120 Ft.^{3} = 931 Cu.Yd.

A. Open Pit - 1 Day:

Productivity = 167 $\frac{\text{Cu.Yd.}}{\text{Hr}}$ (Cat. 627E Scraper)

(931 Cu. Yd.) x ($\frac{\text{Hr}}{\text{167 Cu.Yd.}}$) = 5.6 Hrs round to 6 Hrs

- Eq. Rental = 1 - Cat. 627E Scraper @ $121/Hr

$121/Hr x 6 Hrs = $ 726

B. Backfill Non-Contaminated Material - 1 Day:

Basis: See Table 6.1

Yr. 5 Total Volume = 8448 $Ft.^3$ = 312.9 Cu.Yd.

Backfill @ 65 Cu.Yd./Hr. = 4.8 Hrs. round to 5 Hrs

- Eq. Rental = 1 - Backhoe @$27.25/Hr

$27.25/Hr x 8 Hrs = $ 218

C. Backfill to Grade - 2 Days:

Voids = 312.9 Cu.Yd. x 0.4 = 125 Cu.Yd.

Remainder of Active Strg. = 13,200 $Ft.^3$ - 8,203 $Ft.^3$
= 5,103 $Ft.^3$ = 189 Cu.Yd.

Cover = 11,928 $Ft.^3$ = 442 Cu.Yd.
Total = 756 Cu.Yd.

Backfill @ 65 Cu.Yd./Hr = 11.6 Hrs round to 12 Hrs

- Eq. Rental = 1 - Backhoe @ $27.25/Hr

$27.25/Hr x 12 Hrs = $ 327

D. Surface Reclamation:

Basis: 6996 $Ft.^2$ = 0.2 Acre

Replace 6 in. Topsoil = 6996 $Ft.^2$ x 0.5 Ft. = 3498 Ft^3 = 130 Cu.Yd.

- Topsoil Placement @ 1.09/Cu.Yd. = $ 142
- Grade and Contour @ $87.19/Acre x 0.2 Acre = $ 17
- Seedbed Prep. (Disc. + Harrow) @ $21.80/Acre x 0.2 Acre = $ 4
- Mulch (Drill + Seed + Mow) @ $49/Acre x 0.2 Acre = $ 10
- Drill Seed & Fertilize @ $163/Acre x 0.2 Acre = $ 33
- Revegetation Contingency* @ $234/Acre x 0.1 Acre (All items excluding grading) = $ 23

* Assume only 50% of acreage requires reseeding.

Sub-total = $ 229

Land Fill Total = ***$ 1,500***

TABLE 6.1
Non-Contaminated Disposal Volume

SOURCE	UNIT WEIGHT (#)	UNIT VOLUME (Ft.^{3})	YR. #1 1998 (Ft.^{3})	YR. #5 2003 (Ft.^{3})
1. IX Plant:				
A. Building	235,000	801.6*	801.6	1,603.2
B. Tankage & Vessels	2,320	36.5	0	73.0
C. Piping	0	0	0	0
D. Pumps	8,545	71.9	0	43.8
E. Electrical	22,950	165.1	0	30.2
			801.6	2,150.2
2. Central Processing Plant:				
A. Building	376,000	1,282.6*	0	1,282.6
B. Tankage & Vessels	45,010	393.2	0	393.2
C. Piping	0	0	0	0
D. Pumps	10,723	106.5	0	106.5
E. Electrical	45,800	330.6	0	330.6
			0	2,112.9
3. Dryer Area:				
A. Building	0	0	0	0
B. Equipment	4,400	15.0	0	15.0
4. Existing Facilities:				
A. Building	676,800	2,308.6	2,308.6	2,308.6
B. Structures	0	0	0	0
C. Pilot Plant Equip.	16,230	145.3	145.3	145.3
			2,453.9	2,453.9
5. Header Site & Associated Wellfield:				
A. Building	4,700	16.0*	0	742.4
B. Header Piping	0	0	0	0
C. Secondary Elect.	2,585	43.1	0	1,999.8
D. Wells - Total	0	0	0	0
E. Mon. Wells - Total	0	0	0	0
			0	2,742.2
TOTAL			3,255.5	9,474.2

*Building Unit Volume = $\frac{\text{Unit Weight}}{62.4 \times 7.83 \times 0.6}$

SECTION 7
GROUNDWATER RESTORATION COSTS
Cost Summary

ITEM	COSTS ($97)
7.1 Groundwater Restoration	$3,605,272
Total Cost	$3,605,272

7.1 Groundwater Restoration Costs

Basis: Table 7.1, Table 7.2 & Table 7.3, 7.4, 7.5 and 7.6 - Groundwater Restoration Basis

Table 7.1
Affected Pore Volume Estimate

Wellfield	Number of Perimeter Injection Wells	Measured Pattern Area (ft^2)	Perimeter Inj Wells per Unit Area	Number of Patterns	Average Open Interval (ft)	Effective Porosity	Flare Factor from Fig 7-1	Pattern Affected Pore Volume (gal/ pattern)	Wellfield Affected Pore Volume (gallons)
1	170	1115229	1.52E-004	116	18	0.27	1.7	594,146	68,920,890
3	147	1622462	9.06E-005	162	20	0.27	1.5	606,801	98,301,728
3 ext	97	782800	1.24E-004	76	14	0.27	1.5	436,839	33,199,800
4	163	1334798	1.22E-004	128	18	0.27	1.5	568,636	72,785,467
4A	142	1050576	1.35E-004	101	18	0.27	1.5	567,199	57,287,069

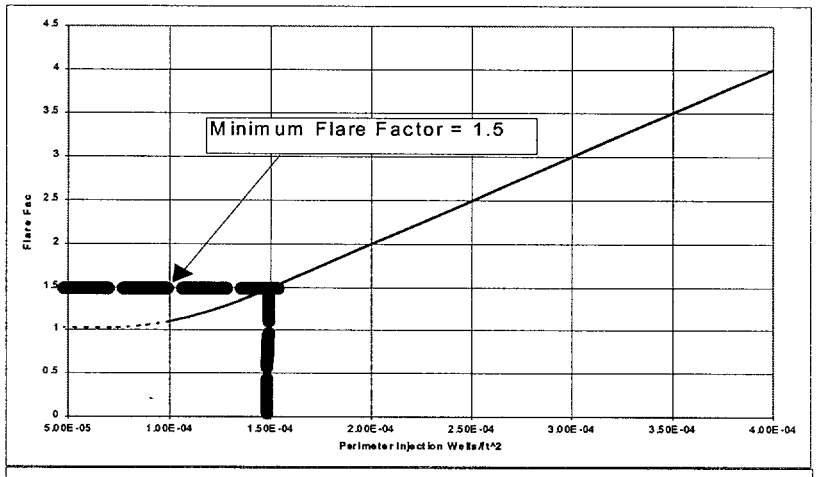

Figure 7-1. Predicted wellfield flare factor for RAMC commercial wellfields, as a function of wellfield scale

Methodology for Flare Factor Determination

Figure 7-1 is derived from Figure 3-16 in *"Evaluation and Simulation of Wellfield Restoration at the RAMC Smith Ranch Facility"* dated October 29, 1999 (provided as Appendix K of this application). This document was submitted to the Wyoming DEQ - Land Quality Division with a letter dated December 13, 1999 for review. In that document, RAMC proposes a methodology developed through hydraulic and geochemical modeling that uses the geometry of the wellfield to estimate a Flare Factor. In this case, the number of perimeter injection wells are counted, the surface area of the wellfield pattern is measured using a wellfield map, a ratio is developed of the # of perimeter injection wells to the surface area of the wellfield patterns. That ratio is located on the horizontal axis of figure 7-1 (above). From that intercept, a vertical line is projected to intersect the curve. At that intersection, a horizontal line is projected to intercept the vertical axis. The estimated flare factor is derived from that intercept.

On May 11, 2000, RAMC met with LQD to discuss the review of the document and RAMC's proposed

approach for estimating groundwater restoration costs. RAMC verified that the curve shown on Figure 7-1 had been validated using modeling for flare factors of 1.5 and higher, but it had not been verified for Flare Factors lower than 1.5. RAMC stated that for bonding purposes only, it would not use a Flare Factor lower than 1.5 for estimating the predicted costs for groundwater restoration.

Wellfield 3 ext. represents the 2nd completion within the existing patterns in Wellfield #3. That 2nd completion represents an opening of an upper interval of the patterns in Wellfield #3 which effects 76 patterns and will result in a net increase of 6 patterns.

Table 7.2
SMITH RANCH PROJECT
Mining Unit Groundwater Restoration Costs
Wellfield #1

1 APV = 68,920,890 gallons

RESTORATION COST COMPONENT		Total Gallons Treated	Operating Flow Rate GPM	Total Cost	Number of Days
1. Wellfield Pumping Costs					
a) Groundwater Sweep (no reinjection) (3 APV)	($0.118/1,000 gal.)	206,762,670	1015	$24,398	141
b) Chemical Reductant Injection (95% reinjection) (1 APV)	($0.232/1,000 gal.)	68,920,890	1015	$15,990	47
c) RO/EDR Treatment (75% reinjection) (2 APV)	($0.201/1,000 gal.)	137,841,780	1000	$27,706	96
SUBTOTAL				$68,094	284
2. Chemical Treatment Power Costs					
a) Reverse Osmosis Unit	$0.10/gpm/day ($0.07/1,000 gal.)	137,841,780	1000	$9,649	
SUBTOTAL				$9,649	
3. Chemicals					
a) Waste Water Treatment (BaCl2, Resin Elut. Chem)			600	$50,342	284
BaCl2 @ $9.00/gpm/month, Elution					
@$400/elution, Waste Water @ 2 mg/L U3O8	Elution Costs (5.2 Elutions/year * $400/ Elution)			$1,620	
500 ft3 resin, 2 lb./ft3 loading,					
Annualized Waste Water Flow; 600 gpm					
1 elution every 69 days or 5.2 elutions per year					
b) Chemical Reductant (H2S or alternative)	$1.80/gpm/day ($1.25/1,000 gal.)	68,920,890	1015	$86,151	
c) RO Chemicals (H2SO4, Antiscalents, Oxygen Scavenger)	$0.57/gpm/day ($0.40/1,000 gal.)	137,841,780	1000	$55,137	
SUBTOTAL				$193,251	
4. Repairs and Maintenance					
a) Wellfield and Waste Water Treatment	$10,000/mo	9.3	months	$93,227	
b) RO and process equipment	$5,000/mo	9.3	months	$46,613	
SUBTOTAL				$139,840	
5. Labor					
Supervisor @ $20.00 per hour		9.3	months	$29,833	
4 Operators @ $13.00 per hour		9.3	months	$77,565	
2 Maintenance @ $13.00 per hour		9.3	months	$38,782	
SUBTOTAL				$146,179	
6. Contract Laboratory Analysis					
70 Monitor Wells (140 UCL samples per year @$100)		0.8		$10,876	
Stabilization Samples					
10 Wells	- 3 complete Assays @$350			10,500	
	- 9 abbreviated assays @ $250			22,500	
SUBTOTAL				$43,876	
7. Operating Expenses					
Supplies	@$3,000/mo	9.3		27,968	
Heating	@$5,000/mo	4.7		23,307	
Vehicle Fuel	@$1,000/mo	9.3		9,323	
Office Utilities	@$1,000/mo	9.3		9,323	
SUBTOTAL				$69,920	
TOTAL OPERATING COST TO RESTORE GROUNDWATER AT FULL PRODUCTION (Nominal Mine Unit)				$670,809 (1993$)	
UNIT RESTORATION OPERATING COST			116 Patterns	$5,783 /Pattern	
	1993 -1997 inflation (CPI-U) = 160.6/143.6 =	11.84%		$79,413	
			Total	$750,222 (1997$)	

Table 7.3
SMITH RANCH PROJECT
Mining Unit Groundwater Restoration Costs
Wellfield #3

1 APV = 98301728 gallons

RESTORATION COST COMPONENT				Total Gallons Treated	Operating Flow Rate GPM	Total Cost	Number of Days
1.	Wellfield Pumping Costs						
	a)	Groundwater Sweep (no reinjection) (3 APV)	($0.118/1,000 gal.)	294,905,183	1015	$34,799	202
	b)	Chemical Reductant Injection (95% reinjection) (1 APV)	($0.232/1,000 gal.)	98,301,728	1015	$22,806	67
	c)	RO/EDR Treatment (75% reinjection) (2 APV)	($0.201/1,000 gal.)	196,603,455	1000	$39,517	137
	SUBTOTAL					$97,122	406
2.	Chemical Treatment Power Costs						
	a)	Reverse Osmosis Unit	$1.33/gpm/day ($0.92/1,000 gal.)	196,603,455	1000	$13,762	
	SUBTOTAL					$13,762	
3.	Chemicals						
	a)	Waste Water Treatment (BaCl2, Resin Elut. Chem)			600	$71,803	406
		BaCl2 @ $9.00/gpm/month, Elution					
		@$400/elution, Waste Water @ 2 mg/L U3O8	Elution Costs (5.2 Elutions/year * $400/Elution)			$2,311	
		500 ft3 resin, 2 lb./ft3 loading,					
		Annualized Waste Water Flow; 600 gpm					
		1 elution every 69 days or 5.2 elutions per year					
	b)	Chemical Reductant (H2S or alternative)	$1.80/gpm/day ($1.25/1,000 gal.)	98,301,728	1015	$122,877	
	c)	RO Chemicals (H2SO4, Antiscalents, Oxygen Scavenger)	$0.57/gpm/day ($0.40/1,000 gal.)	196,603,455	1000	$78,641	
	SUBTOTAL					$275,633	
4.	Repairs and Maintenance						
	a)	Wellfield and Waste Water Treatment	$10,000/mo	13.3	months	$132,969	
	b)	RO and process equipment	$5,000/mo	13.3	months	$66,484	
	SUBTOTAL					$199,453	
5.	Labor						
	Supervisor @ $20.00 per hour			13.3	months	$42,550	
	4 Operators @ $13.00 per hour			13.3	months	$110,630	
	2 Maintenance @ $13.00 per hour			13.3	months	$55,315	
	SUBTOTAL					$208,495	
6.	Contract Laboratory Analysis						
	70 Monitor Wells (140 UCL samples per year @$100)			1.1		$15,513	
	Stabilization Samples						
	10 Wells	- 3 complete Assays @$350				10,500	
		- 9 abbreviated assays @ $250				22,500	
	SUBTOTAL					$48,513	
7.	Operating Expenses						
	Supplies	@$3,000/mo		13.3		39,891	
	Heating	@$5,000/mo		6.6		33,242	
	Vehicle Fuel	@$1,000/mo		13.3		13,297	
	Office Utilities	@$1,000/mo		13.3		13,297	
	SUBTOTAL					$99,727	
	TOTAL OPERATING COST TO RESTORE GROUNDWATER AT FULL PRODUCTION (Nominal Mine Unit)					$942,706	(1993$)
	UNIT RESTORATION OPERATING COST			162	Patterns	$5,819	/Pattern
		1993 -1997 inflation (CPI-U) = 160.6/143.6 =	11.84%			$111,602	
					Total	$1,054,307	(1997$)

Table 7.4
SMITH RANCH PROJECT
Mining Unit Groundwater Restoration Costs
Wellfield #4

1 APV = 72,785,467 gallons

RESTORATION COST COMPONENT		Total Gallons Treated	perating low Rat GPM	Total Cost	Number of Days
1. Wellfield Pumping Costs					
a) Groundwater Sweep (no reinjection) (3 APV)	($0.118/1,000 gal.)	218,356,401	1015	$25,766	149
b) Chemical Reductant Injection (95% reinjection) (1 APV)	($0.232/1,000 gal.)	72,785,467	1015	$16,886	50
c) RO/EDR Treatment (75% reinjection) (2 APV)	($0.201/1,000 gal.)	145,570,934	1000	$29,260	101
SUBTOTAL				$71,912	300
2. Chemical Treatment Power Costs					
a) Reverse Osmosis Unit	$1.33/gpm/day ($0.92/1,000 gal.)	145,570,934	1000	$10,190	
SUBTOTAL				$10,190	
3. Chemicals					
a) Waste Water Treatment (BaCl2, Resin Elut. Chem)			600	$53,165	300
BaCl2 @ $9.00/gpm/month, Elution					
@$400/elution, Waste Water @ 2 mg/L U3O8	Elution Costs (5.2 Elutions/year * $400/ Elution)			$1,711	
500 ft3 resin, 2 lb./ft3 loading,					
Annualized Waste Water Flow; 600 gpm					
1 elution every 69 days or 5.2 elutions per year					
b) Chemical Reductant (H2S or alternative)	$1.80/gpm/day ($1.25/1,000 gal.)	72,785,467	1015	$90,982	
c) RO Chemicals (H2SO4, Antiscalents, Oxygen Scavenger)	$0.57/gpm/day ($0.40/1,000 gal.)	145,570,934	1000	$58,228	
SUBTOTAL				$204,087	
4. Repairs and Maintenance					
a) Wellfield and Waste Water Treatment	$10,000/mo	9.8	months	$98,454	
b) RO and process equipment	$5,000/mo	9.8	months	$49,227	
SUBTOTAL				$147,681	
5. Labor					
Supervisor @ $20.00 per hour		9.8	months	$31,505	
4 Operators @ $13.00 per hour		9.8	months	$81,914	
2 Maintenance @ $13.00 per hour		9.8	months	$40,957	
SUBTOTAL				$154,376	
6. Contract Laboratory Analysis					
70 Monitor Wells (140 UCL samples per year @$100)		0.8		$11,486	
Stabilization Samples					
10 Wells	- 3 complete Assays @$350			10,500	
	- 9 abbreviated assays @ $250			22,500	
SUBTOTAL				$44,486	
7. Operating Expenses					
Supplies	@$3,000/mo	9.8		29,536	
Heating	@$5,000/mo	4.9		24,614	
Vehicle Fuel	@$1,000/mo	9.8		9,845	
Office Utilities	@$1,000/mo	9.8		9,845	
SUBTOTAL				$73,841	
TOTAL OPERATING COST TO RESTORE GROUNDWATER AT FULL PRODUCTION (Nominal Mine Unit)				$706,573 (1993$)	
UNIT RESTORATION OPERATING COST			128 Patterns	$5,520 /Pattern	
	1993 -1997 inflation (CPI-U) = 160.6/143.6 = 11.84%			$83,647	
			Total	$790,220 (1997$)	

Table 7.5
SMITH RANCH PROJECT
Mining Unit Groundwater Restoration Costs
Wellfield 4A

1 APV = 57,287,069 gallons

RESTORATION COST COMPONENT			Total Gallons Treated	Operating Flow Rate GPM	Total Cost	Number of Days
1.	Wellfield Pumping Costs					
a)	Groundwater Sweep (no reinjection) (3 APV)	($0.118/1,000 gal.)	171,861,206	1015	$20,280	118
b)	Chemical Reductant Injection (95% reinjection) (1 APV)	($0.232/1,000 gal.)	57,287,069	1015	$13,291	39
c)	RO/EDR Treatment (75% reinjection) (2 APV)	($0.201/1,000 gal.)	114,574,138	1000	$23,029	80
SUBTOTAL					$56,600	236
2.	Chemical Treatment Power Costs					
a)	Reverse Osmosis Unit	$1.33/gpm/day ($0.92/1,000 gal.)	114,574,138	1000	$8,020	
SUBTOTAL					$8,020	
3.	Chemicals					
a)	Waste Water Treatment (BaCl2, Resin Elut. Chem)			600	$41,845	236
	BaCl2 @ $9.00/gpm/month, Elution					
	@$400/elution, Waste Water @ 2 mg/L U3O8	Elution Costs (5.2 Elutions/year * $400/ Elution)			$1,347	
	500 ft3 resin, 2 lb./ft3 loading,					
	Annualized Waste Water Flow; 600 gpm					
	1 elution every 69 days or 5.2 elutions per year					
b)	Chemical Reductant (H2S or alternative)	$1.80/gpm/day ($1.25/1,000 gal.)	57,287,069	1015	$71,609	
c)	RO Chemicals (H2SO4, Antiscalents, Oxygen Scavenger)	$0.57/gpm/day ($0.40/1,000 gal.)	114,574,138	1000	$45,830	
SUBTOTAL					$160,630	
4.	Repairs and Maintenance					
a)	Wellfield and Waste Water Treatment	$10,000/mo	7.7	months	$77,490	
b)	RO and process equipment	$5,000/mo	7.7	months	$38,745	
SUBTOTAL					$116,235	
5.	Labor					
Supervisor @ $20.00 per hour			7.7	months	$24,797	
4 Operators @ $13.00 per hour			7.7	months	$64,472	
2 Maintenance @ $13.00 per hour			7.7	months	$32,236	
SUBTOTAL					$121,504	
6.	Contract Laboratory Analysis					
70 Monitor Wells (140 UCL samples per year @$100)			0.6		$9,040	
Stabilization Samples						
10 Wells	- 3 complete Assays @$350				10,500	
	- 9 abbreviated assays @ $250				22,500	
SUBTOTAL					$42,040	
7.	Operating Expenses					
Supplies	@$3,000/mo		7.7		23,247	
Heating	@$5,000/mo		3.9		19,372	
Vehicle Fuel	@$1,000/mo		7.7		7,749	
Office Utilities	@$1,000/mo		7.7		7,749	
SUBTOTAL					$58,117	
TOTAL OPERATING COST TO RESTORE GROUNDWATER AT FULL PRODUCTION (Nominal Mine Unit)					$563,147 (1993$)	
UNIT RESTORATION OPERATING COST				101 Patterns	$5,576 /Pattern	
	1993 -1997 inflation (CPI-U) = 160.6/143.6 =	11.84%			$66,668	
				Total	$629,815 (1997$)	

Table 7.6
SMITH RANCH PROJECT
Mining Unit Groundwater Restoration Costs
Wellfield 3 ext

1 APV = 33,199,800 gallons

RESTORATION COST COMPONENT			Total Gallons Treated	Operating Flow Rate GPM	Total Cost	Number of Days
1.	Wellfield Pumping Costs					
a)	Groundwater Sweep (no reinjection) (3 APV)	($0.118/1,000 gal.)	99,599,401	1015	$11,753	68
b)	Chemical Reductant Injection (95% reinjection) (1 APV)	($0.232/1,000 gal.)	33,199,800	1015	$7,702	23
c)	RO/EDR Treatment (75% reinjection) (2 APV)	($0.201/1,000 gal.)	66,399,601	1000	$13,346	46
SUBTOTAL					$32,801	137
2.	Chemical Treatment Power Costs					
a)	Reverse Osmosis Unit	$1.33/gpm/day ($0.92/1,000 gal.)	66,399,601	1000	$4,648	
SUBTOTAL					$4,648	
3.	Chemicals					
a)	Waste Water Treatment (BaCl2, Resin Elut. Chem)			600	$24,250	137
	BaCl2 @ $9.00/gpm/month, Elution					
	@$400/elution, Waste Water @ 2 mg/L U3O8	Elution Costs (5.2 Elutions/year * $400/ Elution)			$781	
	500 ft3 resin, 2 lb./ft3 loading,					
	Annualized Waste Water Flow; 600 gpm					
	1 elution every 69 days or 5.2 elutions per year					
b)	Chemical Reductant (H2S or alternative)	$1.80/gpm/day ($1.25/1,000 gal.)	33,199,800	1015	$41,500	
c)	RO Chemicals (H2SO4, Antiscalents, Oxygen Scavenger)	$0.57/gpm/day ($0.40/1,000 gal.)	66,399,601	1000	$26,560	
SUBTOTAL					$93,090	
4.	Repairs and Maintenance					
a)	Wellfield and Waste Water Treatment	$10,000/mo	4.5	months	$44,908	
b)	RO and process equipment	$5,000/mo	4.5	months	$22,454	
SUBTOTAL					$67,362	
5.	Labor					
Supervisor @ $20.00 per hour			4.5	months	$14,371	
4 Operators @ $13.00 per hour			4.5	months	$37,364	
2 Maintenance @ $13.00 per hour			4.5	months	$18,682	
SUBTOTAL					$70,416	
6.	Contract Laboratory Analysis					
70 Monitor Wells (140 UCL samples per year @$100)			0.4		$5,239	
Stabilization Samples						
10 Wells	- 3 complete Assays @$350				10,500	
	- 9 abbreviated assays @ $250				22,500	
SUBTOTAL					$38,239	
7.	Operating Expenses					
Supplies	@$3,000/mo		4.5		13,472	
Heating	@$5,000/mo		2.2		11,227	
Vehicle Fuel	@$1,000/mo		4.5		4,491	
Office Utilities	@$1,000/mo		4.5		4,491	
SUBTOTAL					$33,681	
TOTAL OPERATING COST TO RESTORE GROUNDWATER AT FULL PRODUCTION (Nominal Mine Unit)					$340,238 (1997$)	
UNIT RESTORATION OPERATING COST				76 Patterns	$4,477 /Pattern	
	1993 -1997 inflation (CPI-U) = 160.6/143.6 =	11.84%			$40,279	
				Total	$380,517 (1997$)	

Costs Associated with Groundwater Restoration

Using the Affected Pore Volumes developed on Table 7.1, the detail cost for groundwater restoration is provided for each wellfield on Tables 7.2, 7.3, 7.4, and 7.5. The estimated cost for groundwater restoration is shown below on Table 7.6.

TABLE 7.6
Estimated Groundwater Restoration Costs
By Wellfield

Wellfield #	Estimated Cost ($1997)
#1	$750,413
#3	$1,054,307
#4	$790,220
#4A	$629,815
#3ext	$380,517
Total	$3,605,272

(NRC Related Activity)

APPENDIX 8
HEALTH PYSICS COSTS

Cost Summary

ITEM	COSTS ($97)
8.1 Health Physics	**168,470**
Total Cost	**168,470**

Health Physics

Basis: Year #1 - 223 Days:
See Table 8.1

- Labor Crew = 1 - RSO @ $32.70/Hr
  0.5 - RST @ $21.80/Hr
  $43.60/Hr x 1784 Hr = $ 77,782

Basis: Year #5 - 483 Days
See Table 8.1

- Labor Crew = 1 - RSO @ $32.70/Hr
  0.5 - RST @ $22.80/Hr
  $43.60/Hr x 3864 Hr = $168,470

To provide consistency with Rio Algom Mining Corp.'s U.S. Nuclear Regulatory Commission (NRC) surety, Rio Algom has elected at this time to continue to use the five (5) forward bond amount utilized for NRC purposes.

(NRC & WDEQ/LQD Related Activity)

APPENDIX 9
WHOLE TRUCKING COSTS

Cost Summary

ITEM	COSTS ($97)
9.1 Contaminated Trucking	**523**
9.2 Uncontam. Trucking	**157**
Total Cost	**680**

Contaminated Trucking - Year #1

Basis: See Table 9.1

- Haul = 0.2 Trucks x 800 Miles x $3.27/Mile = $ 523

9.2 Non-Contaminated Trucking - Year #1

Basis: See Table 9.2

- Haul = 0.5 Trucks x 8 Hrs/Truck x $65.39/Hr = $ 157

9.3 Contaminated Trucking - Year #5

Basis: See Table 9.3

- Haul = 0.2 Trucks x 800 Miles x $3.27/Mile = $ 523

9.4 Non-contaminated Trucking - Year #5

Basis: See Table 9.4

- Haul = 0.3 Trucks x 8 Hrs/Truck x $65.39/Hr = $ 157

To provide consistency with Rio Algom Mining Corp.'s U.S. Nuclear Regulatory Commission (NRC) surety, Rio Algom has elected at this time to continue to use the five (5) forward bond amount utilized for NRC purposes.

(WDEQ/LQD Related Activity)

APPENDIX 10
DELINEATION DRILLING RECLAMATION COSTS

Cost Summary

ITEM	COSTS ($97)
10.1 Delineation Drilling	**396,808**
Total Cost	**396,808**

Delineation Drilling Costs

Basis:	Delineation Holes drilled in 1998-1999	1,313
	Delineation Holes to be drilled in 1999-2000	1,600
	Total Delineation Holes to be Bond	2,913

Per hole cost for reclamation of delineation is based on bonding estimate for exploration holes under DN 236. (see attached table)

Reclamation costs per hole = $136.22/hole

Cost for plugging and abandonment: 2913 holes x $136.22/hole

Delineation Drilling Costs = ***$396,808***

Table 10.1
Reclamation Cost Estimate for Delineation Holes

1999 Reclamation Bond Estimate				
Well Abandonment and Topsoil Replacement and Re-vegetation				
I.	Assumptions			
	A.	Drill Hole Abandonment		
		of Drill holes		1
		Bentonite chips cost		$12.50
		Personnel - $/hr		$17.50
		Transportation - $/hr		$6.54
		Water truc - $/hr		$10.00
		Holes/day		5
		of Days		0
		of Hours		2
		Drill Hole Abandonment Cost		$80.58
	B.	Survey Crew Cost		
		Hours/hole		0.3
		$/hour		$75.00
		Subtotal		$22.50
		Survey Crew Cost		$22.50
II.	Equipment			
	A.	Abandonment Equipment		N/A
	ABANDONMENT COST			$103.08
Total Cost per Well or Drill Hole				$103.08
III.	Bac fill Topsoil Replacement			
	A.	Assumptions		
	1.	General		
		Affected Area/hole (ft2)		400
		Affected area/hole (acres)		0.01
		Pit area/pit (ft2)		120
		Bac fill depth		9
		Modified Pit Volume		800
		Number of wells and drill holes		1
		Topsoil Replacement Depth (ft)		0.33
		Pit Topsoil Volume (yd3)		1.47
		yd3 bac fill		29.63
		total yd3 bac fill		29.63
		Total yd3 topsoil		1.47
		Total affected area (acres)		0.01
	2.	Equipment with operator		
		Productivity bac hoe w/trailer (yd3/hr)		32.39
		$/hour		$33.24
		Total replacement costs		$31.92
IV.	Reseeding			
	1.	Equipment		
		Drill Seeder w/trailer ($/acre)		$100.00
		Subtotal Equipment Cost		$0.92
	2.	Seed		
		$/acre		$33.00
		Subtotal Seed Cost		$0.30
	Subtotal Re-Seeding Cost			$1.22
V.	Mulching Crimping			
	1.	Equipment		N/A
		Subtotal Equipment Cost		$0.00
	2.	Mulch		N/A
	Subtotal Mulching Crimping Cost			$0.00
Subtotal Reseeding Cost/hole				$1.22
TOTAL				$136.22

APPENDIX 11 - SURETY BOND SUMMARY

This section contains the cost basis that was used in the bond calculations provided within Appendices 1-10. The basis for the bond calculations are from contractor bids to perform the work with the costs then adjusted to constant 1997 dollars as requested by WDEQ/LQD. Provided in the summary table below are the initial bids in the dollars of their day and the adjustment to 1997 dollars. The individual contractor bids follow the summary table.

BID RATES FOR LABOR AND EQUIPMENT

ITEM	HOURLY BID RATE-YEAR ($/HR)	ADJUSTED 1997 DOLLARS ($/HR)
Foreman	19.80 (1993)	21.58
Certified Welder	17.75 (1993)	19.35
Operator	16.25 (1993)	17.71
Laborer	11.95 (1993)	13.02
Journeyman Electrician	32.00 (1993)	34.88
Apprentice Electrician	28.00 (1993)	30.51
20 Ton Crane (**)	34.31 (1993)	37.39
6000# Forklift (**)	12.04 (1993)	13.12
Welding/Torch (**)	10.00 (1993)	10.90
D8N Dozer (*)	108.00 (1993)	117.71
140G Blade (*)	60.00 (1993)	65.34
Pavement Breaker, Fuel/Maint	28.75 (1993)	31.33
980C Loader (*)	85.00 (1993)	92.64
235 Trackhoe (*)	103.00 (1993)	112.25
627 Scraper (*)	111.00 (1993)	120.98
Pulling Unit (*)	30.00 (1993)	32.70
Backhoe (*)	25.00 (1993)	27.25
2000 PSI Spray Washer	8.00 (1993)	8.71
Chainsaw (**)	2.20 (1993)	2.40

Note - (*) includes operator, fuel, and maintenance. Others include fuel and maintenance unless shown otherwise.. (**) bid obtained by telephone. Adjustment to 1997 dollars were made using GNP-IPD inflation rate of 8.99% [1st quarter 1993 (101.8) through 1st quarter 1997 (110.95)].

Estimate of Byproduct Material Disposal Costs

Currently, License Condition 9.5 of Source Material License SUA 1548, authorizes Rio Algom to dispose of byproduct material from the Smith Ranch Facility at the uivira Mining Company tailings pile, New Mexico. uivira Mining Corporation is a wholly owned subsidiary of Rio Algom Mining Corp.

In the 1998 Surety Review, NRC has requested that RAMC consider the disposal costs in the surety estimates. To provide an estimate for byproduct material disposal costs, RAMC will include a cost of $50/ton of material. This cost estimate is based on MC s contract with the Grace Estate, Source Material license SUA-1480, to accept their byproduct material. This cost includes labor, equipment, analysis, and allow for a profit. The estimate is to receive material at MC s site and place the material into the disposal cells. The basis of this cost is to provide funding to place the byproduct material from Smith Ranch into the tailings pile as designated by the license.

The estimated disposal costs are listed below, and the brea down of the tas s are based on the reclamation activities described in Section 6.0 of the amended March 31, 1988 License Application.

Item	ty of Waste (lbs) Section 6.0	ty of Waste (tons)	Disposal Cost (SUA-1473) (1998 dollars)
Ion Exchange Plants			
Tan age and Vessels	396,760	198.38	9,919
Piping	104,160	52.08	2,604
Pumps	11,400	5.7	285
Foundations	754,730	377.37	18,868
Sub Total			31,676
Central Processing Plant			
Tan age and Vessels	172,420	86.21	4,311
Piping	9,136	4.57	229
Pumps	10,612	5.31	266
Foundation	539,000	269.5	13,475
Sub Total			18,281
Dryer Area			
Building	71,212	35.61	1,781
Equipment	53,800	26.90	1,345
Foundations	114,268	57.13	2,857
Sub Total			5,983
Existing Facilities			
Foundations	1,086,101	543.1	27,155

Sub Total			27,155
Item	ty of Waste (lbs) Section 6.0	ty of Waste (tons)	Disposal Cost (SUA-1473) (1998 dollars)
Unit Header Sites Wellfields			
Header Piping	75,852	37.9	1,895
Wells Total	109,015	54.5	2,725
Monitor Wells Total	91,022	45.51	2,276
Sub Total			6,896
Associated Structures			
1 Trun line (5,000 ft. ea.)	282,700	141.4	7,070
2 Trun line (10,000 ft. ea.)	565,400	282.7	14,135
Radium Settling Ponds	187,472	93.74	4,687
Sub Total			25,892
Total Disposal Costs			115,883

APPENDIX L
Rio Algom Mining Corp.
Restoration Plan
Wellfield #1

1.0 Restoration Objective

The objective of the reclamation plan is to return the affected surface and groundwater to conditions such that they are suitable for all uses for which they were suitable prior to mining. To achieve this objective, the primary goal of the restoration program is to return the condition and quality of the affected groundwater in a mined area to background (baseline) or better. In the event the primary goal cannot reasonably be achieved, the condition and quality of the affected groundwater will at a minimum be returned to the pre-mining use suitability category (Reference: LQD Rules and Regulations, Chapter XXI, Section 3 (d) (I)).

For the purposes of this plan, the use categories are those established by the Wyoming Department of Environmental Quality, Water Quality Division. The final level of water quality attained during restoration is related to criteria based on the pre-mining baseline data from that wellfield, the applicable Use Suitability Category and the best practical technology (BPT) and economics. Baseline as defined for this project shall be the mean of the pre-mining baseline data, taking into account the variability between sample results (baseline mean plus or minus tolerance limits, as defined in Section 5.1.2 of the license application, after outlier removal).

2.0 Introduction

The primary restoration technique is a combination of groundwater sweep, chemical treatment, and clean water injection. Groundwater sweep involves withdrawing water from selected production and injection wells which draws uncontaminated natural groundwater through the leached area displacing the leach solutions. Chemical treatment involves addition of approved water treatment chemicals to waters injected into the wellfield to re-stabilize the host formation. Clean water injection involves the injection of a better quality of "clean" water in selected wells within the production area while pumping other production and/or injection wells which again displaces the leach solutions with the better quality water. The source of the clean water may be from an RO type unit, water produced from a wellfield that is in a more advanced state of restoration, water being exchanged with a new wellfield, or a combination of these sources. Water withdrawn from the production zone during restoration will first be processed through an ion exchange unit to recover the uranium, then will be treated and reused in the project or routed to a holding pond for disposal via Class I non-hazardous injection wells.

It is expected that an average of about six pore volumes of water will have to be displaced to achieve restoration of a wellfield. During restoration of the initial wellfields, it is expected that near the midpoint of the process a chemical reductant will be added to approximately one pore volume of clean water injection to accelerate stabilization of trace metals.

Chemical reductants are beneficial because several of the metals, which are solubilized during the leaching process, are known to form stable insoluble compounds, primarily as sulfides. Primary among such metals is uranium, which occurs at the site because of the naturally occurring reduced state of the ore body. The introduction of a chemical reductant into the mine zone at the end of mining phase is designed to expedite the return of the zone to its natural conditions and to return as many of the solubilized metals to their original insoluble state as possible. By effecting this partial restoration directly within the formation (in-situ), the external impact of groundwater restoration is minimized.

The chemical reductant would be added above ground to the clean water stream being injected into selected wells. Based on the historical success reported by other ISL uranium mining companies, the reductant would be a sulfur compound such as gaseous hydrogen sulfide or dilute solutions of sodium hydrosulfide, sodium sulfide, or sodium bisulfite. If RAMC should desire to utilize any reductant other than these three sulfur compounds, WDEQ approval will be

obtained prior to use. Dissolved metal compounds that are precipitated by such reductants include those of arsenic, molybdenum, selenium, uranium, and vanadium. All of these may be present in concentrations above baseline levels at the conclusion of mining.

The reductant would be introduced during the midst of the restoration process because the introduction of sulfur and sodium increases the total dissolved solids (TDS) level of the injected fluid. Once the reducing conditions are re-established, an oxygen free clean water can be injected to effect the final reduction in TDS.

If gaseous hydrogen sulfide is chosen for use, a program for its safe handling would be prepared and submitted to the appropriate agency prior to its use.

3.0 Restoration Flow Circuits

In Regulatory Information Summary 2000-23, the NRC has classified restoration effluents as 11e.(2) byproduct material, and no longer eligible for discharge according to the limits under 40 CFR Part 440. As a result, RAMC will combine a limited groundwater sweep process with clean water injection. As stated in Chapter 6 of the License Application, RAMC expects to meet the primary or secondary restoration goals within 6 pore volumes or less of groundwater circulation. It is expected that a combination of limited groundwater sweep and clean water injection will continue throughout the restoration process. A generalized flow circuit is presented as Figure 1.

The restoration circuit will be separate from the production circuit. Approximately 1400 GPM of wellfield solutions will be pumped from selected patterns in the wellfield undergoing restoration to the restoration water treatment facility. The produced water is treated through an ion exchange column (IX treatment) to remove any residual uranium. After IX treatment 600 GPM of the flow is returned to the wellfield for restoration. The remaining 800 GPM of the flow is sent to the reverse osmosis unit for further treatment. Using a 2 pass reverse osmosis unit, approximately 600 GPM of clean permeate is returned to the wellfield to be commingled with the 600 GPM of IX treated water and 200 GPM of brine (reject) flow is sent to disposal into Class I non-hazardous injection well. In addition, two existing, evaporation ponds may be used to handle any necessary surge capacity.

The 200 GPM flow difference between the production and injection sides of the flow circuit constitutes the groundwater sweep component. The commingled treated IX and permeate solutions constitute the clean water injection component. In order to meet the injection limits of the two Class I non-hazardous injection wells, simultaneous application of these two components creates an efficient means for meeting restoration goals and timing as well as minimizing the water to be disposed to deep well injection.

Chemical additions can occur at anytime during the restoration phase. It is anticipated that deployment of chemical reductants will occur after significant progress has been observed with respect to Total Dissolved Solids. Chemical reductants, when deployed, will be applied to the injection side of the flow circuit, immediately before injection into the production zone.

4.0 Treatment Methods

Restoration activities will include three steps designed to optimize restoration equipment used in treating groundwater and to minimize the time necessary to treat groundwater to meet the primary and secondary restoration goals. Restoration progress will be monitored using selected wells during restoration.

4.1 Groundwater Sweep

During groundwater sweep, water is pumped without injection from the wellfield causing an influx of baseline quality water from the perimeter of the wellfield that sweeps the affected

portion of the aquifer. As water impacted by the production lixiviants is recovered through pumping, it is displaced, (swept), by groundwater containing lower ion concentrations originating from outside of the wellfield. Additionally, the over withdrawal of water creates a pressure sink inside of the wellfield that aids in reduction of the plume, or flare, of lixiviants immediately perimeter of the wellfield patterns.

The rate of groundwater sweep will be dependent upon the capacity of the wastewater disposal system and the ability of the wellfield to sustain the rate of withdrawal.

4.2 Groundwater Treatment

Simultaneous with groundwater sweep, clean water injection will be used to as a means for removing and treating groundwater impacted by uranium recovery operations. Ion exchange and reverse osmosis equipment is used. The ion exchange process will use fixed bed downflow columns located in the Central Processing Plant. The IX columns will remove the majority of the residual uranium from the recovered waters, and they will be operated in the same manner as the IX columns from the producing wellfields.

Approximately half of the water recovered from the portion of the wellfield undergoing restoration will be treated through the reverse osmosis unit located at the central processing plant. The feed into the reverse osmosis will consist of a portion of the flow discharged from the IX columns.

The purpose of the reverse osmosis unit is to perform the following actions:

- Reduce the total dissolved solids in the impacted groundwater;
- Reduce the quantity of water that must be removed from the aquifer to meet restoration limits;
- Concentrates the dissolved contaminants in a smaller volume of brine to optimize wastewater disposal capacity.

Before entering the reverse osmosis unit, the water is filtered to remove any fine solids and particulates to prevent plugging of the membranes. The water is pressurized and enters the reverse osmosis vessel and passes through the membranes. The membranes allow the water to permeate through them while the ions are concentrated in the center of the tube. The permeate, (clean water), is collected in the annulus of the vessel, and it is re-injected into the wellfield. The water containing the concentrated ions, (brine), is discharged for disposal. In a dual-pass configuration, approximately 60 - 75 percent of the feed water is recovered as permeate for re-use in the wellfield, and approximately 60 - 90 percent of the dissolved salts in the feed are collected in the brine to be handled by the wastewater disposal system.

Ion exchange and reverse osmosis are effective at removing non-redox sensitive ions from the water during restoration. However, given the nature of the depositional environment that developed the uranium ore body as described in Chapter 2 of the license application, it is necessary to return the aquifer to redox conditions similar those conditions that existed before injection operations were initiated. It is necessary to remove the oxidizing environment created during production operations. The most used method of treatment is the use of chemical reductants.

At a point in the future of the restoration operations, a chemical reductant may be added to the injection stream. The purpose of the chemical reductant is to reduce the oxidation-reduction (redox) potential of the aquifer. The addition of the reductant will lower the redox potential of the aquifer, and thereby reducing the solubility of the redox sensitive metals, of which uranium, selenium, molybdenum, and iron are significant restoration concerns.

There are various chemical reductants that can be used. In the in-situ leach uranium recovery industry, four common reductants are used: hydrogen sulfide, sodium sulfide, sodium

hydrosulfide, and sodium bisulfite. The first three reductants represent occupational safety risks with respect to chemical toxicity, but they are also the most effective chemical reductants. Before RAMC intends to deploy chemical reductants, whichever is to be used, a chemical safety program will be developed and submitted to NRC for review and approval. Upon receiving that approval, RAMC expects that only one pore volume of treatment is required to achieve the anticipated results of in-situ precipitation of the redox-sensitive metals.

4.3 Groundwater Transfer

As a result of the limited feed into the reverse osmosis unit as well as the operating costs, a method of optimizing the operation of the reverse osmosis unit is to ensure that the feed contains a relatively high concentration of ions. Additionally, this concept allows for the efficient concentration of contaminants in the brine in order to optimize the disposal well limits. To effectively manage the optimization of the treatment and disposal facilities, RAMC will be using a groundwater transfer process.

This process will be used in conjunction with the groundwater sweep and treatment processes. The concept is as follows. When a series of patterns in the wellfield undergoing restoration reach a point where the selected contaminate concentrations have been restored to a level approximately 50% of the difference between wellfield average post leach and baseline concentrations, the recovered water will be redirected to new restoration patterns and used for clean water injection. The recovered water, with higher concentrations of contaminants, from the new patterns will sent to the IX/reverse osmosis treatment facility.

5.0 Effluent Disposal

With respect to the restoration activities related to Wellfield #1, RAMC has two approved methods of wastewater disposal. The primary means of disposal are the two, approved, Class I non-hazardous injection wells that are permitted and constructed at the facility. Combined these wells have a permitted disposal rate of 300 GPM, and that limitation is factored into the flow circuit design for the restoration plan.

The second approved disposal method is the two small, evaporation ponds located near the Central Processing Plant at the facility. These ponds are double-lined ponds with a leak detection system, and they are described in Chapter 4 of the approved license application. These ponds are limited in storage and evaporative capacity, and are not considered as the primary method of wastewater disposal.

6.0 Restoration and Stability Sampling

When sampling results indicate that restoration has been achieved, the designated production area wells will be sampled and analyzed for the full suite of parameters listed in Table 5-1, of the license application (attached), as Suite A. Unless otherwise requested and approved by the applicable regulatory agencies, the production area wells in a wellfield to be sampled for determining restoration and stability shall be wells used for collecting pre-mining baseline data for that unit. If the data confirm restoration is complete this will initiate the stability demonstration period.

Prior to starting restoration operations, the designated production area wells,(see table 2) to be used for determining restoration success will be sampled and analyzed for Suite A, as listed on Table 5-1. After restoration is completed, a second series of samples from the designated production wells will be collected and analyzed using Suite A, as listed on Table 5-1. During restoration, sampling of recovery wells will be conducted as needed to measure the progress of restoration activities, but these samples will be used internally only.

In the stability demonstration period the full suite assays will be repeated for those same wells at approximately the six month and one year periods. Between these periods the wells will be sampled at six week intervals with the samples analyzed for a short list of key parameters

developed for that specific wellfield. RAMC proposes to use Suite B from Table 5.1 as the short list of key parameters. This sampling plan will provide for a minimum of nine samples within a one year period to demonstrate restoration success. It is anticipated that stability sampling will be terminated after one year, only if the monitored parameters do not exhibit a strongly increasing concentration trend. Sampling should continue on the previously prescribed schedule if an increasing concentration trend is exhibited.

When the sampling data indicate that the wellfield aquifer has been restored and stabilized, a report documenting this will be filed with the appropriate regulatory agencies along with a request for certification of restoration. Plugging of wells and surface reclamation of the wellfield will commence after receipt of restoration certification.

During restoration, sampling of monitor wells for that wellfield will continue at the same frequency and for the same parameters as during mining. However, during stability monitoring the monitor well sampling frequency will be reduced to only once every two months and the sampling will be terminated at the end of the stability demonstration period.

7.0 Restoration Criteria

The restoration criteria for the groundwater in a wellfield is based on the wellfield production-injection wellfield as a whole, on a parameter by parameter basis. All parameters are to be returned to as close to baseline as is reasonably achievable. Restoration target values shall be established for all parameters affected by the mining process. The restoration target values for the wellfields shall be the mean of the pre-mining values. If during restoration, the average concentration of a parameter in the designated production area wells of a wellfield is not reduced to the target value within a reasonable time, a report describing the restoration method used, predicted results of additional restoration activities, and an evaluation of the impact, if any, that the higher concentration has on the groundwater quality and future use of the water will be prepared and submitted to the applicable regulatory agencies.

Restoration success will be determined after the completion of the stability monitoring period. At the end of stability, all constituent concentrations will meet approved standards and will not show strong trends in groundwater deterioration as a result of ISL facilities. Upon regulatory approval of the stability monitoring results, the decommissioning of the wellfield will be started.

The restoration water quality targets for Wellfield #1 are found on Table 1, and it is based on Table F1.2 from Appendix D6 of the Wellfield #1 Baseline Data submittal.

Table 1
Smith Ranch Facility
Wellfield #1
Restoration Targets

Major Ions (mg/l)	Q-Sand Wellfield #1 Concentration
Calcium	72.213
Magnesium	17.225
Sodium	22.525
Potassium	7.269
Carb	0.1
Bicarb	228.194
Sulfate	113.187
Chloride	4.17
Ammonium	0.049
Nitrite+ Nitrate	0.122
Fluoride	0.32
Silica	17.011
TDS	334.96
Alkalinity	186.083

TRACE METALS mg/L	
Arsenic	0.001
Boron	0.1
Cadnium	0.01
Chromium	0.05
Iron	0.065
Manganese	0.022
Molybdenum	0.1
Selenium	0.001
Vanadium	0.1
Zinc	0.01

RADIOMETRIC	
Uranium--mg/L	0.065
Radium 226--pCi/L	734.074

Table 2
Smith Ranch Facility
Wellfield #1
Proposed Designated Production Area Wells

Production Zone Baseline Wells

B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
B19

TABLE 5-1
GROUNDWATER SAMPLING PROGRAM RECOMMENDATIONS

MONITORED CONSTITUENT	SAMPLE TYPE	SAMPLE FREQUENCY	DENSITY	ANALYSIS
Monitor Wells: (Perimeter Ore Zone Upper and Lower Aquifers)	Baseline	4 Samples no less than 12 days apart	All Monitor Wells	One Sample- Assay Suite A[1] Two Samples -Assay Suite B[2] One Sample - Assay Suite B plus any detects from suite A
Monitor Wells: (Perimeter Ore Zone Upper and Lower Aquifers)	Operational Monitoring	Twice Per Month (10 Days or More Between Samples)	All Monitor Wells	Assay Suite C[3]
Wellfield Wells: (Ore Zone)	Baseline	4 samples no less than 12 days apart	Ten Wells for the first 10 acres plus 1 well for each 2 acres thereafter.	Two Samples - Assay Suite A[1] Two Samples- Assay Suite B[2]

[1] Assay Suite A = Wyoming Department of Environmental Quality, Land Quality Division Guideline No. 8 - Table 1. (Dec., 1990) suite of parameters plus uranium, vanadium, radium 226, and radium 228.

[2] Assay Suite B = TDS, SO4, Cl, pH, As, Se, U, Ra-226, Ra-228, conductivity and Total Alkalinity.

[3] Assay Suite C = Cl, Conductivity, Total Alkalinity

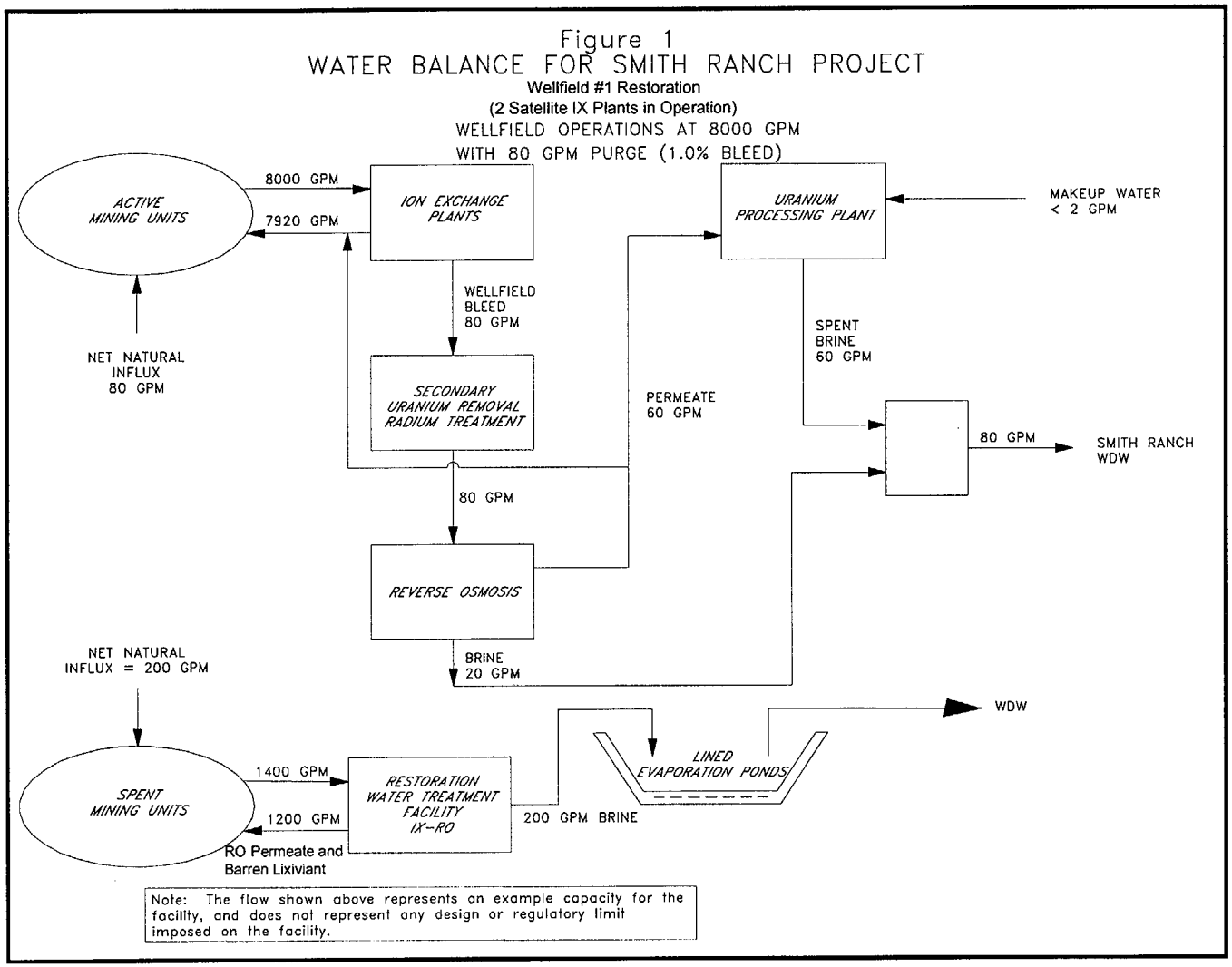
Figure 1
WATER BALANCE FOR SMITH RANCH PROJECT
Wellfield #1 Restoration
(2 Satellite IX Plants in Operation)
WELLFIELD OPERATIONS AT 8000 GPM
WITH 80 GPM PURGE (1.0% BLEED)
ACTIVE MINING UNITS
8000 GPM
7920 GPM
ION EXCHANGE PLANTS
URANIUM PROCESSING PLANT
MAKEUP WATER < 2 GPM
WELLFIELD BLEED 80 GPM
SPENT BRINE 60 GPM
NET NATURAL INFLUX 80 GPM
SECONDARY URANIUM REMOVAL RADIUM TREATMENT
PERMEATE 60 GPM
80 GPM
SMITH RANCH WDW
80 GPM
REVERSE OSMOSIS
NET NATURAL INFLUX = 200 GPM
BRINE 20 GPM
WDW
LINED EVAPORATION PONDS
SPENT MINING UNITS
1400 GPM
1200 GPM
RESTORATION WATER TREATMENT FACILITY IX-RO
200 GPM BRINE
RO Permeate and Barren Lixiviant
Note: The flow shown above represents an example capacity for the facility, and does not represent any design or regulatory limit imposed on the facility.

Figure 2
Wellfield #1 Layout

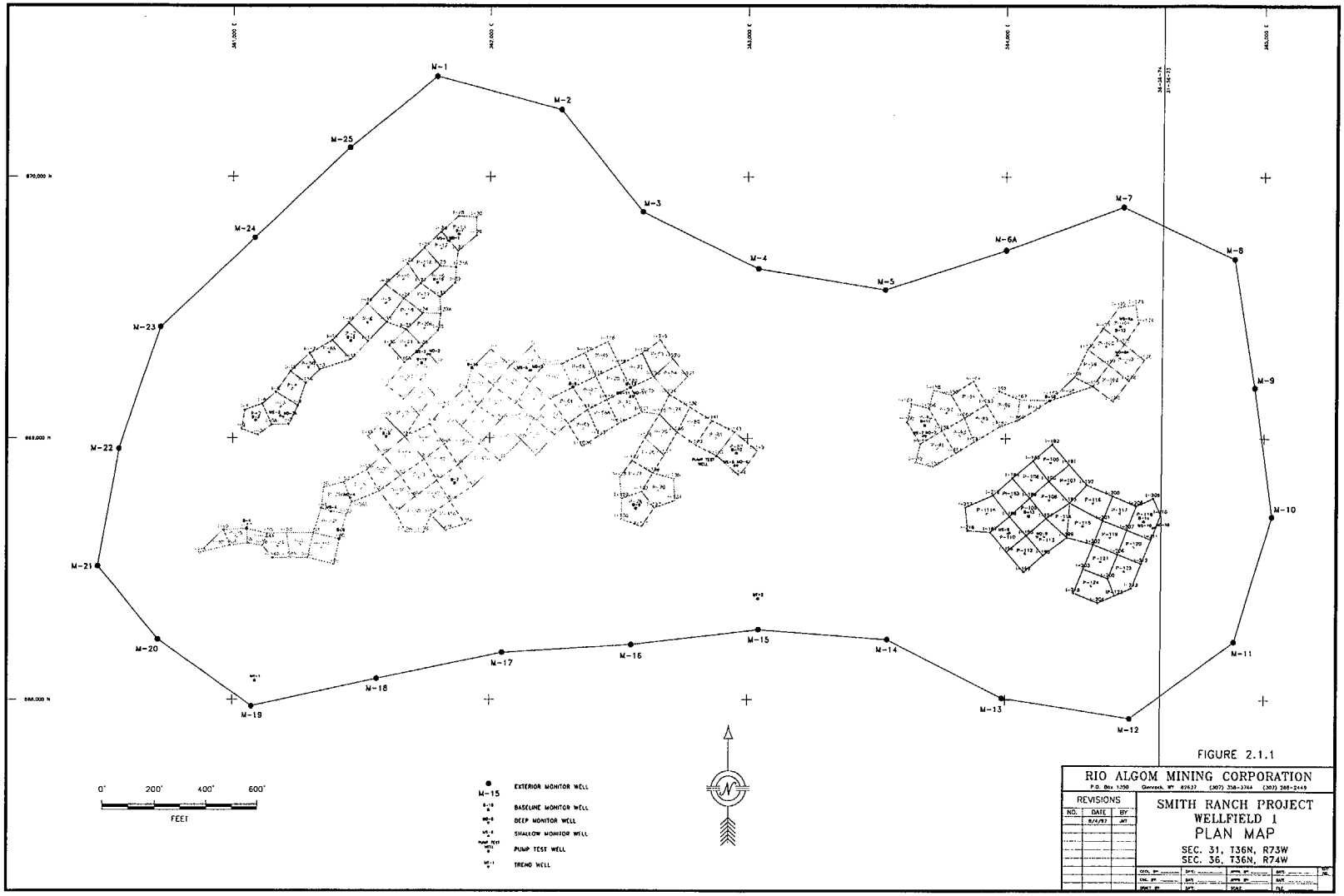

Figure 3
Restoration Timeline
Smith Ranch Facility
Wellfield #1

		Month of Operation										
Phase of Restoration	Flowrate (GPM)	1	2	3	4	5	6	7	8	9	10	11
Phase A (58 Patterns)												
Groundwater Sweep	200					50%	25%					
Cleanwater Injection	1400					50%	25%					
Chemical Reductant Addition												
Groundwater Transfer	200											
Phase B (58 Patterns)												
Groundwater Sweep	200					50%	75%					
Cleanwater Injection	1400					50%	75%					
Chemical Reductant Addition												
Groundwater Transfer	-200											
Total Flow (gal.)		4.39E+07	4.39E+07	4.39E+07	4.39E+07	4.39E+07	4.39E+07	4.39E+07	4.39E+07	4.39E+07	1.82E+07	
Cummulative Pore Volumes		0.64	1.27	1.91	2.55	3.19	3.82	4.46	5.10	5.74	6.00	