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July 24, 2001

40-8968

By Hand Delivery

Mr. Kenneth R. Hooks
Project Manager
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Two White Flint North
11545 Rockville Pike
Mail Stop T-8A33
Rockville, MD 20852

Re: Hydro Resources, Inc.'s Church Rock Section 17 Restoration Action Plan, SUA-1580

Dear Mr. Hooks:

Following up on our discussion this afternoon, enclosed for NRC Staff review are two (2) copies of Hydro Resources, Inc.'s ("HRI") Church Rock Section 17 Restoration Action Plan ("RAP"). A copy of this letter and enclosed RAP has been served on each of the parties to the pending adjudicatory proceeding concerning SUA-1580, which is entitled *In the Matter of Hydro Resources, Inc.,* Dkt. No. 40-8968-ML.

Of course, should you have any questions or concerns about the RAP, do not hesitate to contact me at the above number, or Mark Pelizza, President of HRI, at (972) 219-3337.

Thank you for your consideration of this matter.

Respectfully,

David C. Lashway

David C. Lashway

Enclosure
cc: Mark Pelizza
Anthony J. Thompson

NMSS01 Public

Hydro Resources, Inc.

CHURCH ROCK SECTION 17
RESTORATION ACTION PLAN

License No: SUA-1580

July 23, 2001

Hydro Resources, Inc.

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SUMMARY

July 23, 2001

HRI CROWNPOINT URANIUM PROJECT
Financial Assurance Plan for Churchrock Section 17
Summary

Category	Project Total	Contingency/ Profit 15%	Contingency/ Profit 25%
Groundwater Restoration	$4,089,818	$613,473	
Groundwater Stability Analysis	$56,000	$8,400	
Well Plugging	$251,045	$37,657	
Wellfield D & D	$52,250		$13,062
Surface Reclamation	$7,153		$1,788
Totals	$4,456,265	$659,529	$14,851
Contingency/Profit			$674,380
Total Surety Proposed			$5,130,645

CONTENTS

CHURCH ROCK SECTION 17 - RESTORATION ACTION PLAN

A. INTRODUCTION

The following summarizes the Restoration Action Plan for the Crownpoint Uranium Project Churchrock Section 17 location[1] ("RAP-17"). Shown in Attachment A-1, the estimate puts the costs of restoration by an independent contractor at $5,130,565 over a three year period which is based on the conservative assumption that all reclamation activities are postponed until the end of the mine life with the resulting liabilities accumulated until the end. The Section 17 site is an extension of the Section 8 orebody and will be mined in sequence. There will be overlap in the mining and reclamation of the Section 17/Section 8 locations and the annual surety review completed pursuant to LC 9.5 will necessarily accommodate this overlap. For example, restoration will become completed in one area of Section 8 (and the surety amount reduced) during the same review period that new mining is undertaken in a portion of Section 17 (and the surety amount increased). The RAP-17 assumptions and resulting cost calculations are based on the project being a stand alone one. Because the overall surety amount will be a function of the amount of completed restoration vs. new production at both sites, a surety-funding schedule[2] is impossible to project at this time and will not be included in this report.

Consistent with the overlapping nature of the two mine plans, the RAP-17 budget projects redundant periods of management personnel costs during stability monitoring and decontamination and decommissioning ("D&D")[3]. In the event that mining and groundwater restoration were completed in Section 17, then Section 17 is where the final stability monitoring and D&D management costs would be realized[4]. At this time HRI will leave the redundant costs estimate in both the RAP for Section 8 and RAP-17 to serve as further contingency.

The RAP encompasses the full cycle activities necessary to:

- Restore the groundwater at the Churchrock Section 17 site to levels consistent with those described in License[5] Condition 9.3 and the COP[6].
- Complete a six-month stabilization period during which the chemistry of the groundwater remains constant.
- Complete the plugging and abandonment ("P&A) of all wells.

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[1] See COP Figure 1.1-3

[2] See Churchrock Section 8/Crownpoint Process Plant Restoration Action Plan, Nov. 17, 2000, § F.

[3] I.e. since Section 8 and Section 17 activities will overlap there will only be one final stability/D & D period at the end of groundwater restoration activities for the two. See Attachment E-2-1.

[4] I.e. Section 8 stability and D & D will be managed by the same personnel that are providing oversight of groundwater restoration in Section 17.

[5] The "License" that is referenced throughout this RAP-17 means the U.S. Nuclear Regulatory Commission Materials License SUA-1580.

[6] The "COP" referenced throughout this RAP means the Crownpoint Uranium Project Consolidated Operations Plan, Revision 2.0, August 15, 1997.

- Surface reclamation, decommission and obtain release for unrestricted use of the surface and revegetation of restored well fields. When accomplished, the land is returned to its original premining use.

There will be no costs associated with radiological decontamination of buildings, process vessels, satellites, and auxiliary structures at the Section 17 location because the site will serve as wellfield only and feed the Section 8 satellite (I.e. there will be no buildings, process vessels, satellites, and auxiliary structures at the Section 17 location).

The RAP-17 has been compiled with the absence of actual development in the field that would normally be used as justification for the basic assumptions. The greatest potential for inaccuracy that may result from the absence of real information is in the mine area, where actual drilling will reveal details in the nature of the ore and mine zone. Additionally, there may be other differences in the reclamation costs that will result once "as built" conditions are realized.

The sequence of mining activity and the resulting schedule for production and restoration may also differ from what the RAP-17 budget reflects. Based on HRI's ability to obtain economic uranium sales contracts, production rates and the overall groundwater restoration schedule may be more or less than what is expected.

The results of the requisite restoration demonstration for Section 8 described in LC 10.28 and COP 10.4.4 may have a significant effect on groundwater restoration costs. An increase or decrease in demonstrated pore volume requirements will have a proportional effect on groundwater restoration costs.

HRI's submittal presented herein employs assumptions that are based on best professional judgment given the data that is currently available. It is a fact that the detail of the RAP-17 budget model exceeds the ability to predict precise field conditions. Necessarily, the accuracy of the budget assumptions will improve as operations proceed. The annual review required by LC 9.5 would provide the iterative format by which NRC can continually update the surety amount that results from the newly available information.

B. SURITY BOND FORMAT

See the Churchrock Section 8/Crownpoint Process Plant Restoration Action Plan, Nov. 17, 2000, Section B for the Surety Bond format

C. STANDBY TRUST AGREEMENT

See the Churchrock Section 8/Crownpoint Process Plant Restoration Action Plan, Nov. 17, 2000, Section C for the Standby Trust format.

D. CONSOLIDATION OF STATE, EPA AND NRC SURITY INSTRUMENTS

In addition to being crafted to comply with the NRC criteria, HRI's proposed Performance Guarantee Bond is designed to address the New Mexico Environmental Department's (NMED's) restoration and reclamation requirements, and U.S. Environmental Protection Agency (USEPA) Underground Injection Control Criteria. These multi-compliant sureties will require multi-agency concurrence. The Bond examples shown in Appendix A are designed to be consistent with 10 CFR Part 40, Appendix A, Criterion 9 (Financial Criteria) which clearly allows for consolidation of State and Federal financial or surety arrangements established to meet restoration, reclamation, and decommissioning costs provided that "the portion of the surety which covers the decommissioning and reclamation of the mill, mill tailings site and associated areas is clearly identified and committed for use in accomplishing these activities." Absent a mill or tailings, essentially all of the process facility, wellfield, and ancillary components of the operations would be subject to the decommissioning requirements of both the State of New Mexico and/or U.S. Environmental Protection Agency and the NRC.

E. COST DETAILS FOR RESTORATION AND RECLAMATION ACTIVITIES

1. Introduction

RAP-17 contains details concerning cost basis figures and assumptions, calculations and/or methodologies used in deriving cost estimates, references, for the full cycle groundwater restoration, well plugging and abandonment, surface decommissioning and reclamation, closure and ultimate license termination. This information is designed to be descriptive enough for the NRC staff to determine the acceptability of HRI's proposed cost figures, and is based on an independent contractor performing the decommissioning and reclamation work[7] in accordance with 10 CFR Part 40, Appendix A, Criterion 9. HRI reviewed Appendix E of the NRC's draft "Standard Review Plan for In Situ Leach Uranium Extraction License Applications" (NUREG-1 569, dated October 1997), and Section 4 of the NRC's "Technical Position on Financial Assurances for Reclamation, Decommissioning, and Long-Term Surveillance and Control of Uranium Recovery Facilities" (dated October 1988) for examples of acceptable "levels of detail" for cost estimates pertaining to this surety plan.

HRI used two different budget formats to present the closure costs estimates in RAP -17. Costs for groundwater restoration (2) were estimated over time as an operational budget. Final decommissioning costs including analytical stability, plugging and abandonment, wellfield decommissioning and surface reclamation (3-8) were budgeted on a lump sum basis. In both formats HRI developed the cost estimate from the bottom – up using the best available cost estimate or quote for the individual component (s) that were considered. HRI also called on the operation management resources of URI, Inc., the sister company who is the oldest[8] uranium in situ leaching company in the United States.

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[7] Costs have been estimated using standard budgetary techniques as would be done by a independent contractor. In addition, HRI has included a subtotal category entitled "contractor profit" that included 15% of the total cost for groundwater restoration, groundwater stability analysis, well plugging and equipment removal and 25% of the total cost for wellfield D & D, building D & D, and surface reclamation.

[8] URI, Inc. is a wholly owned subsidiary of Uranium Resources, Inc. the parent to HRI, Inc. The firm has been in the business of in situ leach uranium recovery since 1977.

2. Groundwater Restoration

2.1. Introduction

In addition to the regulatory guidance provided by NRC, HRI used historic and ongoing company experience with similar groundwater restoration operations in developing its budget model. Groundwater restoration costs are presented as a monthly restoration budget with cumulative total costs. This is an appropriate budget interval because ongoing operational cost such as labor, electricity, reagents, replacement equipment etc. are paid out of cash on a monthly basis. The duration of the restoration cost expenditure was based on the processing and circulation of 9 pore volumes of groundwater as required by license condition 9.5 surety requirement. Surety will be maintained at this level until the number of pore volumes required to restore the ground water quality of a production scale wellfield has been demonstrated as stated in COP Section 10.4.4.

The COP that was submitted in support of the HRI's License contemplated a number of methods for liquid waste treatment and disposal during ground water restoration. The costs that are presented in this budget assume the most conservative liquid waste treatment and disposal option; reverse osmosis treatment ("RO") and brine concentration ("BC"). It is conservative because it is authorized by the current license (other options would require additional licensing steps) and it is the most costly option. If HRI is to pursue one of the other treatment/disposal options described in the COP Revision 2.0 and it is approved in a future licensing action, then HRI will adjust the surety budget accordingly during the annual update review.

RO and BC will be used to treat water during production operations and be used for groundwater restoration conducted in the pilot demonstration and during concurrent restoration that will be ongoing with production activities. Because the cost of restoration equipment such as wellfield pumps, ponds, the RO unit, the BC unit, laboratory equipment, trucks, and field equipment must be incurred for production process operations, they are assumed to be operational capital and are not included as capital requirements in any of the RAP budget lines. NRC will be able to verify the availability of the restoration equipment during routine inspections.

The budget model described in this RAP used 712,913,000 gallons of water to size duration of the restoration program against the projected nominal equipment capacity. Rows 21-42 of the restoration budget is a monthly calculation of water treatment capacity that has been cumulated over the term of restoration and compared with the required nine pore volumes of treated water. It is nominal equipment design capacity that is needed to process the requisite gallonage that justifies the length (and cost) of groundwater restoration operations.

2.2. Reverse Osmosis Equipment Description

Reverse osmosis is a water treatment process whereby the majority of dissolved "ions" are filtered from the wastewater, and concentrated into a smaller concentrated brine volume. The resulting product water typically meets, or exceeds drinking water standards, and during restoration activities, is reinjected back into the wellfield further diluting the underground mining

solutions toward baseline quality. For the purpose of this budget model, the concentrated brine stream, representing 20% of the feed volume will be disposed by brine concentration (a form of distillation).

Osmosis is a natural process that occurs in all living cells. With an appropriate semi-permeable membrane as a barrier to solutions of differing concentrations, naturally occurring osmotic pressure forces pure water from the dilute solution to pass through the membrane, and dilute the more concentrated solution. This process will continue until equilibrium exists between the two solutions.

Reverse osmosis (R.O.) is a reversal of the natural osmotic process. By confining a concentrated solution against a semi permeable membrane, and applying a reverse pressure on the concentrate greater than the naturally occurring osmotic pressure, water will move across the membrane ("product water"), and out of the original concentrate, resulting in an even more concentrated solution ("brine"). The membrane rejects the passage of the majority of the dissolved solids while permitting the passage of water.

Post-mining solutions from a depleted mine area will be treated with an anti-scalent which is the only chemical pretreatment budgeted. The solution may next be bulk-filtered across sand filters to remove all solids greater than 30 microns. Cartridge filters will then filter out the remaining solids greater than 1 micron. The solution at this point is ready for the reverse osmosis process. To achieve reverse osmotic purification, the pretreated solution is pressurized and directed to the first step of a two-stage reverse osmosis process. Approximately 60 percent of the total feed volume will be converted to product water in the first stage. The brine water of the first stage will then act as the feed for the second stage, which yields an overall product to brine ratio of 4:1. The brine generated will be further treated and reduced by brine concentration.

The RO unit was sized to operate at a nominal[9] capacity of 580 gallons per minute. This design rate has been utilized by URI at similar ISL facilities with excellent results. Additionally, the sizing is optimal because it will allow concurrent restoration to proceed at approximately the same rate production wellfields are depleted. (I.e. with mining and restoration going on concurrently restoration and mining will proceed at similar rates).

RO treatment operating and maintenance costs are included within the O & M budget in Attachment E-2-1.

2.3. Brine Concentrator Equipment Description

A brine concentrator will be used for final reduction of liquid waste. The RO reject stream will be treated with a vertical tube, falling film vapor compressor evaporator followed by a

[9] RAP-17's nominal capacity is an estimate. HRI will deal with capacity variances that result from equipment efficiency or downtime by increasing or decreasing the equipment size and possibly adjusting surge capacity. For example, if actual operating results indicate that R.O. equipment downtime is 5% then increasing the equipment design capacity from 580 gpm to 610 gpm would allow the average throughput to remain the same. At this stage it is impossible for HRI to anticipate and adjust for every operational variable that may arise in the future.

steam driven rotary drum dryer to achieve zero liquid discharge (dry solids). The solids will be bulk stored and shipped to an 11.e.2-byproduct facility for disposal.

Brine concentration is a process that can process a waste stream into deionized water and solid slurry. Electrical utilities in the Four Corners area, and paper, and pulp companies have employed this technology for decades to handle their waste streams. The principle behind the process is based on the ideal Carnot cycle where an initial fixed volume of concentrated brine is heated to boiling temperature. The steam vapor created is mechanically compressed; resulting in a secondary steam vapor whose temperature is elevated (15-20 degrees) by the work energy used during compression. Distilled water is condensed from the secondary steam vapor onto internal heat exchangers. The heat loss during condensation is transferred to the circulating brine on the opposite side of the heat exchanger. The brine's temperature is raised, maintaining the internal boiling environment. This source of heat sustains the creation of primary steam used to feed the compressor. The cycle is continuous so long as energy is added at the compressor stage. The electrical power used in compressing, and elevating the temperature of the primary steam vapor produces distilled product water. The resultant hyper-concentrated brine allows solid precipitate in the form of common salts as determined by the solution's limits for solubility. Typically, for each 100 gallons of waste brine treated, 98 gallons of distilled water and 2 gallon of slurry solids are formed.

The BC was sized to accommodate the anticipated brine that the RO will produce.

BC costs are included within the O & M budget in Attachment E-2-1.

2.4. Pore Volumes and Flair

Restoration equipment capacity design coupled with timing of the restoration operations budgeted herein is a function of the quantity of water that will be processed during restoration that is calculated in this RAP by using the pore volume unit of measure. The term "pore volume" (PV) is a term of convenience that has been conceived by the ISL industry to describe the quantity of free water in the pores of a given volume of rock. The units are provided in gallons. PV's provides a unit of reference that a miner can use to describe the amount of circulation that is needed to leach an ore body, or describe the times water must be flowed through a quantity of depleted ore to achieve restoration. PV's provide a way that a miner can take small-scale studies, such as studies in the laboratory, and scale these studies up to field level or to compare pilot scale studies[10] to commercial scale. Hence they provide a miner with an important technique for calculating ISL project economics and restoration costs.

PV's are calculated by determining the three dimensional volume of the rock (that is also the ore zone) and multiplying this number by the percent pore space. HRI used the "ore area" method to determine pore volumes[11], where the extent of ore of given grade within a mine unit is

[10] I.e. such as the Section 9 Pilot. See FEIS p. 4-37.

[11] Different operators have used different methods to determine the volume of the ore zone. For example, some use the "pattern method" where pattern dimensions are used to determine the area of the ore and then the area is multiplied by screen thickness to determine the volume of rock in the five spot. The pore volume of the five spot is

outlined and digitized to provide the ore area[12]. This area is then multiplied by the average ore thickness to provide the three dimensional volume of the ore that is to be leached. This volume is converted to a PV by multiplying the ore volume by the percent porosity and then converting to the units of measurement (i.e. gallons). Table 1 below shows the PV calculation for the Churchrock Section 17 location that was used as the assumption in the budget model[13].

Table 1 – Churchrock Section 17 Pore Volume Calculation

ZONE	Area (ft2)	Tk (ft)	Vol (ft3)	Por	gal/ft3	PV (gal)	H-PIF	V-PIF	CPV (gal)	9 X CPV
D	123,023	7.5	922,673	0.25	7.48	1,725,398	1.5	1.3	3,364,525	30,280,727
UUPC	22,665	8.5	192,653	0.25	7.48	360,260	1.5	1.3	702,507	6,322,566
UPC	113,140	7.3	825,922	0.25	7.48	1,544,474	1.5	1.3	3,011,725	27,105,521
LPC	50,751	8	406,008	0.25	7.48	759,235	1.5	1.3	1,480,508	13,324,574
UA	36,220	5.6	202,832	0.25	7.48	379,296	1.5	1.3	739,627	6,656,642
LA	161,163	8.2	1,321,537	0.25	7.48	2,471,273	1.5	1.3	4,818,983	43,370,849
UB	160,090	9.1	1,456,819	0.25	7.48	2,724,252	1.5	1.3	5,312,290	47,810,614
LUB	186,430	8.5	1,584,655	0.25	7.48	2,963,305	1.5	1.3	5,778,444	52,006,000
LB	175,981	10.6	1,865,399	0.25	7.48	3,488,295	1.5	1.3	6,802,176	61,219,584
UC	181,120	9.1	1,648,192	0.25	7.48	3,082,119	1.5	1.3	6,010,132	54,091,189
ULC	107,214	6.8	729,055	0.25	7.48	1,363,333	1.5	1.3	2,658,500	23,926,498
LC	169,010	6.5	1,098,565	0.25	7.48	2,054,317	1.5	1.3	4,005,917	36,053,255
UD	142,694	8.6	1,227,168	0.25	7.48	2,294,805	1.5	1.3	4,474,870	40,273,826
MD	75,350	11.2	843,920	0.25	7.48	1,578,130	1.5	1.3	3,077,354	27,696,189
LD	170,394	11.2	1,908,413	0.25	7.48	3,568,732	1.5	1.3	6,959,027	62,631,245
UE	265,391	10.2	2,706,988	0.25	7.48	5,062,068	1.5	1.3	9,871,032	88,839,292
LE	361,312	7.7	2,782,102	0.25	7.48	5,202,531	1.5	1.3	10,144,936	91,304,428
TOTALS	2,501,948		21,722,900			40,621,823			79,212,556	712,913,000

Explanation of Headings:

Area - Area of cut off grade mineralization.
Tk - Thickness of cut off grade mineralization.
Por - Estimated porosity of the rock.
PV - Straight pore volume without any correction.
H-PIF - Horizontal pore volume increase factor.
V-PIF - Vertical pore volume increase factor.
CPV - Corrected pore Volume.

"Flare" factors or pore volume increase factors are multipliers that are commonly used by the ISL industry to account for leach solution outside of the specific boundaries of the calculated

calculated by multiplying the volume of rock by the percent porosity and then converting to the units of measurement (i.e. gallons). The total PV of a mine unit is calculated by adding all the five spot patterns in the mine unit. This method works well for existing ISL operations where the ore had been fully delineated and wellfield installed such as the existing projects in Wyoming.

[12] Future wellfield patterns will be constructed within the ore that is economic at the time. Patterns will be a subset of the overall "ore area".

[13] Testimony of April Lafferty, May 23, 2001 ¶ 21, Lafferty states that HRI does not use site specific data. As tabulated above HRI data is site specific and is based on a zone by zone analysis of the area and thickness of the ore body based on information derived from exploration geophysical logs. This type of analysis is far more detailed than the general method suggested by Lafferty where she uses the area within the monitor well ring and concludes that an additional 13 months or 25% more time would be required to conduct groundwater restoration. Lafferty's analysis would have an operator post surety for the reclamation of water that has not even been affected by leaching.

ore PV and are generally accepted increases[14] that should be recognized in cost estimates. HRI uses pore volume increase factors of 1.5 for horizontal and 1.3 for vertical[15]. Horizontal increase is calculated by multiplying the measured or mapped area of the ore, in plan, and multiplying the actual area by 1.5. This yields the affected horizontal area. Likewise, vertical increase is calculated by multiplying the measures average thickness of the ore by 1.3. This yields the affected vertical area. Multiplying the affected horizontal times the affected vertical by porosity provides the affected pore volume for the surety cost estimation. This number is in turn multiplied by 9 to determine water treatment and disposal volumes that are entered into the model to calculate costs. The 1.5 for horizontal and 1.3 for vertical pore volume increase factors have been calculated by URI engineers based on operating experience at other restoration demonstrations and commercial operations and have been adequate for monitoring and reporting restoration progress at other operations. During the Churchrock restoration demonstration that is described in LC 10.28, HRI will use these factors to measure the number of pore volumes that are processed during restoration.

The methods utilized in the RAP to calculate pore volume and adjusted pore volumes are consistent with the methods used for the Mobil Section 9 Pilot in New Mexico, which in turn were the basis for the NRC evaluation in the FEIS, and are consistent with the methods used by HRI throughout the CUP licensing process, and for HRI's submittals during the Subpart L hearing. HRI methods to calculate pore volume and adjusted pore volumes, and the factors that were used were not generic or arbitrary, but rather were consistently proposed, evaluated, litigated and applied throughout the NRC licensing process and this Subpart L proceeding.

HRI presented the NRC with the Summary Report for the Section 9 In Situ Leach Pilot[16] as a part of the License Application support materials because the Pilot was a substantial field demonstration, and provided empirical results[17], for the ISL development that is proposed for the CUP. This Report was a compilation of the information from Mobil Oil Company's files and records that were developed when the Pilot was conducted. HRI utilized actual pattern dimensions and the actual number of gallons processed during the restoration to compile the summary report.

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[14] Flare outside of the ore zone is the norm. In the subsurface water moves in a radial pattern from injector to extractor in its path across the target ore. By choosing patterns carefully flair is minimized. However, as an expected component of ISL mining the flair factors are included in the bonding calculation as a deliberate cost contingency. There is a limit on acceptable flair; the horizontal monitor wells. If fluid is detected in the horizontal monitor wells it is no longer simply flair but then becomes an excursion. An excursion requires immediate corrective action to draw it back to the mine zone or the bonding must be increased to compensate for the increase in restoration cost. (See L.C. 10.13 which requires a bond increase if corrective action is not completed in 60 days)

[15] Combined pore volume increase factor is 1.95.

[16] See Pelizza Affidavit January 19, 2001, Attachment 1.

[17] The Section 9 Pilot data provide actual ore zone dimensions and gallons processed so that actual pore volume can be processed. ENDAUM witness Lafferty Testimony May, 23 2001 ¶ 14 specifically recognizes the importance of knowing the quantity of water removed from the formation in calculating pore volumes ".... if the flair factor were increased, the number of pore volumes required should be decreased. This scenario may be true only if the total gallons of impacted groundwater where known." The value of the Section 9 Pilot, or any demonstration, is that it provides *known* variables to the equation that allows pore volume increase factors to be assigned. Given similar mining technology and geology, the pore volume increase factors from a demonstration, such as the Section 9 Pilot, can be applied to an analogous site such as the Churchrock Section 17 location.

The cumulative restoration analyses in Attachment C of the Summary Report show that 59,173,469 gallons during restoration of the Section 9 Pilot, which equated to 16.7 adjusted pore volumes. Table 2 shows how the adjusted pore volume was calculated using the pattern area, screen thickness, porosity, a horizontal pore volume increase factor of 1.5, and a vertical pore volume increase factor of 1.3. The methods of pore volume analysis utilized in the Summary Report form the foundation of the NRC impact evaluation in Section 4.3.1 of the FEIS which ultimately resulted in the staff determination that 9 pore volumes would be required for surety calculations[18]. It is important that HRI continue to use the previously evaluated pore volume increase factors in the RAP, and in future restoration analyses for the NRC, so that can projected and actual performance and costs can be measured consistently.

Table 2 – Section 9 Pore Volume Calculation

ZONE	Pattern Area (ft2)	Tk (ft)	Vol (ft3)	Por	gal/ft3	PV (gal)	H-PIF	V-PIF	CPV (gal)	Gallons Processed	CPV Processed
Single	40,488	24	971,712	0.25	7.48	1,817,101	1.5	1.3	3,543,347	59,173,469	16.69

Explanation of Headings:

Area - Area of cut off grade mineralization.
Tk - Thickness of cut off grade mineralization.
Por - Estimated porosity of the rock.
PV - Straight pore volume without any correction.
H-PIF - Horizontal pore volume increase factor.
V-PIF - Vertical pore volume increase factor.
CPV - Corrected pore Volume.

HRI has presented similar pore volume estimates during the license application review process. Specifically, in response to NRC Request for Further Information, Question 59, August 15, 1996, pertaining to Ground water Consumption, HRI supplied NRC with a pore volume calculation for the Churchrock Section 8 site that was similar to the one presented in the RAP Section 2.a[19][20]. Consistent with the methodology used throughout the Crownpoint Project Licensing process, HRI utilized the ore body outline, not pattern dimensions, to determine the affected surface area and used a horizontal increase factor of 1.5. These were the same values utilized by NRC to conduct the evaluation of water consumption in the FEIS[21]. HRI's proposed pore volume increase factors are consistent with those, which had been systematically evaluated in the FEIS[22]. The FEIS has been found to be adequate for the purpose of licensing the Crownpoint Uranium Project.[23]

In summary, HRI correctly used the same methods to calculate adjusted pore volumes in the RAP cost estimate because they were like those that NRC reviewed in HRI submittals, that

[18] See FEIS p. 4-40
[19] Based on professional judgment, HRI increased the estimated porosity from .21 in Q/59 to .25 in the RAP. This resulted in a more conservative estimate in the RAP. All other factors are the same.
[20] See RAI Q1/59.
[21] See FEIS pp. 4-57 through 4-60.
[22] FEIS p. 4-122 used a combined horizontal and vertical pore volume increase factor of 1.95. I.e 1.3 (HDF) x 1.5 (VDF) = 1.95.
[23] See COMMISSION CLI-01-04.

NRC used in the FEIS impact evaluation, and that was placed into evidence by the HRI in the course of the Subpart L hearing process.

As an additional test for reasonableness of HRI's cost estimate, Table 3 below compares important project variables for PRI's Highland Uranium Project in Wyoming[24] against similar project variables for HRI's Churchrock project[25]. Table 3 brings into context the comparative size, and corresponding scope of reclamation, of the two projects. In this table the actual surety amount for PRI are shown against the proposed surety amount from this RAP-17. Reviewing the data in Table 2 in the context of number of wells, acres of wellfield pattern, years of operation and throughput[26], and number of satellite locations, the PRI Highland project exceeds the size of the HRI Churchrock project by a significant amount. The PRI Highland adjusted pore volume is about three to four times greater than that estimated by HRI for the Churchrock site[27]. In the comparative measures of $/acre wellfield, or $/pound produced, HRI proposed surety amount exceeds that of PRI. In the comparative measures of water process cost in $/ m gal., HRI's proposed surety amount is slightly less than PRI[28]. It is also worthy to note that HRI estimated Comparative PV size (mm gal.) /acre wellfield is much greater that PRI, most likely because HRI use of pore volume increase factors is conservative when used in combination with the ore outline volume assumptions.

Table 3 – Comparison of Key Project Variables and Reclamation Costs

Project Variables	PRI[29]	HRI Section 17
Number of wells (all)	~4141	~276
Acres of wellfield patterns	~189	~28[30]
Years of operation	13	4.5
Cumulative production (mm lbs. U_3O_8)	~13	~3
Nominal throughput (gallon per minute)	9000	4000
Number of satellites	3[31]	0
Number of pore volume's used in surety estimate	6	9
Size of adjusted restoration volume (billion gallons)	~2.71	~.713
Comparative PV size (mm gal.) /acre wellfield	14.3	25.5
Restoration estimate (~mm $)	$21.12	$5.1
Comparative $/acre wellfield	$111,751	$182,142
Comparative $/pound produced	$1.63	$1.70
Comparative process cost $/ m gal.	$7.79	$7.19

[24] See Testimony of April Lafferty, May 23, 2001 ¶ 11.

[25] Mr. Ingle Testimony of December 19, 2000, p. 31 states "there is considerable relevant and analogous uranium ISL restoration experience in Wyoming to draw from to develop credible cost estimates".

[26] Throughput needs to be viewed together with years of operation. While the Highland per minute throughput is ~ 2 times Churchrock, operations have been conducted for many more years. Therefore, more mining has been conducted by PRI at the Highland site than is reflected in the design process capacity.

[27] As stated in 5 above, it is anticipated that if HRI was to use wellfield patterns rather that ore boundary areas then the pore volume and adjusted pore volumes would be smaller and more proportional to PRI when compared to well field pattern acreage.

[28] Dr. Abitz Testimony dated May 23, 2001 continues to describe reasons to use unit groundwater costs from the Fernald site. It is more appropriate to use a similar NRC licensed ISL facility.

[29] Actual from information provided by PRI staff.

[30] Estimated from COP 2.0, Figure 1.4-8.

[31] PRI costs include the D & D of the also include the mother plant.

2.5. Treatment of Mine Workings

Mine workings will not affect groundwater restoration volumes.[32] Aside from the reduced restoration requirements in the mine workings described in the paragraph below, the quantity of water that will be processed during restoration of the mine workings will be less than the volumes produced during restoration of native undisturbed ground given the following factors:

- Porosity used in native (unmined) formation sand is 25 percent
- Restoration pore volumes in native formation is 9
- Porosity in mine workings is 1
- Restoration pore volumes in mine workings is 1.

The interaction of lixiviant with rock matrix in the mined sandstone should requires additional flushing during restoration as compared to the mine workings, which contain only water. Also, as described below, the baseline water quality of the mine workings is considerably worse than that of the native formation sandstone at some distance from the mine tunnels. Thus nine pore volumes of restoration is shown for native formation sandstone and one pore volume for the mine workings.

In the case of mine workings, the water quality target during restoration operations will be changed because conventional mining processes have both chemically affected the mine water and mechanically altered the host rock. In fact, historic conventional mining activities have resulted in considerably more extensive mechanical degradation (through excavation) of the formation sand than would occur from the proposed in situ leach activities. Geochemically, oxidation due to dewatering and mine ventilation has resulted in pre-in situ mining water quality which is similar to the projected leach solution (see Table 4 below). Therefore, the restoration target will be higher for the mine workings than for the native formation and less restoration will be required. Additionally, since the rock matrix has been removed in the existing mine workings, the expected water/rock geochemical interaction during restoration will be eliminated, or at least virtually eliminated, and only a single pore volume of water will require extraction and/or processing. Given the nature of the restoration target goal and the lack of natural rock to equilibrate with restoration water, the one pore volume assumption is reasonable.

Because one pore volume is a reasonable assumption for restoration in the workings, and the porosity is 100 percent, the total volume of water that will be extracted and/or processed from the workings is approximately 2.9 million cubic feet or 22 million gallons (the same volume as the workings). This same volume of formation sandstone, if it had not been dewatered and excavated by conventional mining at 25 percent porosity and nine pore volumes of restoration would be approximately 45 million gallons. Using a horizontal pore volume increase factor of 1.5 and a vertical pore volume increase factor of 1.3 will increase the quantity of water used in the restoration cost estimate to 96.52 million gallons or more than four times what would be used if the workings were broken out separately.

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[32] See FEIS p. 4-57.

HRI's estimate in the Table 1 Churchrock Section 17 Pore Volume Calculation will treat the mine workings as natural rock. The workings will be subject to the same pore volume increase factor and 9 pore volumes of circulation will be used. For the reason stated above, this will give a greater quantity of water for restoration purposes and result in a higher cost estimate than if the workings were broken out and treated separately.

2.6. Ground Water Quality

Once the economic recovery limit of a mine area is reached, lixiviant injection is stopped, and the affected ground water is treated (restored) to return the quality of water to regulatory standards. The Churchrock Section 17 location is different that the adjacent Churchrock Section 8 location in that it has already been subject to conventional underground mining (See 2.5 above). This has affected water quality in the mine zone as most notably seen in Total Dissolved Solids.[33] As shown in Table 4 below, TDS in the Section 17 portion of the Westwater Canyon Aquifer ("OCR" samples below) exceeds those found in the adjacent Section 8 portion of the Westwater Canyon Aquifer. In fact, TDS in the mine zone more closely represents that found in HRI core leach studies and the nearby Teton Pilot test. The uranium values in the in the Section 17 portion of the Westwater Canyon Aquifer ("OCR" samples below) exceed[34] the .44 mg/l 10CFR Part 20 secondary restoration goal[35] in three of four sample locations as compared to the uranium values in the in the Section 8 portion of the Westwater Canyon Aquifer ("CR" samples below) exceed[36] the .44 mg/l 10CFR Part 20 secondary restoration goal in two of four sample locations. In both cases these uranium values would be treated as baseline[37]. In the case of Section 8 the uranium is naturally occurring because of the proximity of the uranium orebody. In the case of Section 17 the current water quality (both dissolved solids and radionuclides) is the result of conventional uranium mining which falls outside the Commissions authority[38] and in future ISL would be treated as baseline.

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[33] The groundwater data that has been collected to date is not intended to replace the more detailed characterization that is required by L.C. 10.21 & L.C. 10.22 before injection begins. The existing information does provide a picture of the quality of groundwater in the mineralized portion of the Westwater Canyon Aquifer at the Churchrock Section 17 & Section 8 sites.

[34] See Dr. Abitz Testimony dated May 23, 2001, ¶10.

[35] FEIS p. 4-27.

[36] Table I of Dr. Abitz Testimony dated May 23, 2001 omits the baseline data for baseline well CR-8, and mistakenly describes CR3 as ore zone well when it is actually completed in the Recapture Formation. Using this incorrect data he concludes "Perhaps Mr. Pelizza thinks that the high uranium levels measured in the *post-underground mining* waters associated with the Old Church Rock Mine in Section 17 are part of the *pre-mining conditions* at Section 8. Clearly, higher uranium concentrations measured at the Old Church Rock Mine workings are not indicative of pre-mining conditions below Section 8." The sample data from CR-6 AND CR-8 (both Section 8 Westwater Canyon baseline wells) provide strong evidence that throughout the Churchrock mineralized zone, uranium concentrations may exceed the .44 mg/l 10CFR Part 20 secondary restoration goal. All four of the Section 8 Westwater Canyon baseline wells exceed the EPA primary drinking standard. Contrary to Abitz at ¶10, Churchrock ore zone water quality is more limited due to radionuclide values than the Fernald example.

[37] The natural radionuclide mineralization in uranium ore zones limits the baseline water's use as drinking water and contrary to Dr. Abitz in his Testimony dated May 23, 2001, ¶8 & 9 baseline restoration standards not EPA drinking water limits would prevail.

[38] Letter dated January 17, 2001 from Richard Meserve to Paul Gorenson states: "You raise the point that the Commission's decision could impact efforts to dewater a conventional mine (activities in which water is treated to

Table 4 - Comparison of Total Dissolved Solids (TDS) in Waters from Various Locations and Leach Tests in the Churchrock Area

Location or Test *	Sands *	Date of Analysis	Uranium (mg/l)	TDS (mg/l)
OCR Shaft	BB / WC	Sept, 1993	3.07	1,300
OCR Gravel Shaft	Westwater Canyon	Sept, 1993	.041	1,070
OCR VH #1	BB / WC	Sept, 1993	3.55	1,290
OCR VH #2	Westwater Canyon	Sept, 1993	3.41	1,320
CR-3	Westwater Canyon	13 Sample Avg.	0.064	359
CR-5	Westwater Canyon	12 Sample Avg.	0.017	339
CR-6	Westwater Canyon	12 Sample Avg.	0.474	384
CR-8	Westwater Canyon	6 Sample Avg.	6.63	397
CR Core Leach #1 (1)	Westwater Canyon	Sept, 1988	19.2	1,695
CR Core Leach #2 (1)	Westwater Canyon	Feb, 1988	40.9	970
Teton Pilot Test (1,2)	Westwater Canyon	June, 1980	84	976

Footnotes:

* Abbreviations: OCR = Old Churchrock; CR = Churchrock; VH = Vent Hole; BB = Brushy Basin; WC = Westwater Canyon;

(1) Water samples taken near end of leaching and prior to restoration.
(2) Water samples taken near end of leaching and prior to restoration at the Teton pilot test on the Mancos property near HRI's Churchrock project.

LC 9.14 States: "Prior to injection of lixiviant, the licensee shall obtain all necessary permits and licenses from the appropriate regulatory authorities". At the Section 17 location this provision requires that HRI acquire an Underground Injection Control Permit through either the

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remove uranium so that it may be discharged under a Clean Water Act National Pollutant Discharge Elimination Standards [NPDES] permit). The Commission's decision to treat all waste streams associated with ISL activities as 11 e.(2) byproduct material does not impact conventional mine dewatering for the, purposes of mining. Although the Commission has comprehensive regulatory authority over waste derived from uranium and thorium extraction activities, that authority does not extend to uranium mining. See Kerr-McGee v. NRC 903 F.2d 1, 7 (D.C. Cir. 1990). The Commission continues to believe that, although ISL activities are frequently referred to as mining, they are not mining in the conventional sense, but instead represent extraction of source material from an ore body in a fashion that is in many respects akin to processing. This fact is the fundamental basis for NRC regulation of ISL facilities. Consequently, wastes from dewatering a conventional mine, although perhaps being processed in the same manner as restoration waters at an ISL facility, are not subject to NRC regulation because they are a function of mining, not an aspect of the processing of ore for the express purpose of the extraction source material. I See International Uranium Corporation (USA), 51 NRC at 15-16."

USEPA or Agreement State and an Aquifer Exemption[39]. Aquifer Exemption is a regulatory devise of the USEPA that is used to designate aquifers or portions of aquifers that would normally qualify as an underground source of drinking water as "exempt" because they are mineralized and producible of minerals in commercial quantities. HRI has not acquired either of these authorizations or the Section 17 location at this time but will be required to do so by NRC and USEPA before operations begin.[40]

2.6. Groundwater Restoration Budget Line Item Assumptions

HRI used historic and ongoing company experience with similar ISL uranium recovery and groundwater restoration operations in developing its budget model. For example because URI, HRI's sister company is currently reclaiming two other commercial ISL mines, HRI drew on this experience to aid in sizing labor requirements, maintenance needs and other cost categories that may not be apparent to someone without similar "hands on" experience. Unit labor costs are the same as what was provided to NRC as part of the license review of the overall project.[41] In addition HRI used actual costs estimates from the region for utilities, and other materials that will be used in reclamation.

The assumptions that were used in the groundwater restoration budget (See Attachment E-2-1) are as follows:

Salaries

For the purpose of the Financial Assurance Plan, HRI assumed employment of technical professionals whose expertise is needed on a limited basis during the restoration mode.

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[39] 40 CFR 146.4 states: "An aquifer or a portion thereof which meets the criteria for an "underground source of drinking water" in § 146.3 may be determined under 40 CFR 144.8 to be an "exempted aquifer" if it meets the following criteria:

(a) It does not currently serve as a source of drinking water; and

(b) It cannot now and will not in the future serve as a source of drinking water because:

(1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

(4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse;..."

[40] Dr. Abitz Testimony dated May 23, 2001, Footnote 3 states that HRI does not have a valid aquifer exemption for the Churchrock Section 8 location because it was reversed by the 10th Circuit Court. In fact the Court determined that for the Churchrock Section 8 location a jurisdictional dispute existed, and that until the dispute was resolved that EPA not the State of New Mexico has jurisdiction over issuance of *UIC permits*. The *Aquifer Exemption* for the Churchrock Section 8 location (or any location) is issued by USEPA and the Section 8 Aquifer Exemption has not been withdrawn by USEPA. It appears that Dr. Abitz is confusing the Aquifer Exemption with the UIC Permit. Additionally, nothing in the Courts decision cast doubt on factual determinations with regard to the State's UIC Permit or the EPA Aquifer Exemption.

[41] See RAI Q1/8 - Feb. 19, 1996.

Anticipated positions are listed in the Restoration Budget rows 1-15. However, to justify their full time status and utilize their time on the job, it is assumed that they are required to provide a multitude of services, i.e., every employee will be wearing multiple hats. As such, individual job descriptions are difficult. For example, in the restoration mode, a qualified geologist will be required to verify the configuration of restoration patterns to assure efficient results. While this task requires unique geological expertise, the time commitment by the geologist to this task may only be several hours per week. Therefore, to maximize the use of the geologist time, he or she will be assigned to many other tasks for which he or she will be qualified such as lab analyst, well sampler, and plant operator. HRI also plans to maintain several other technical disciplines on staff such as radiation safety specialist, and engineers. In the restoration mode they will also perform their primary function and a number of secondary roles.

Reflecting the very broad nature of each full time employee's job at the CUP during the restoration mode, the following is a summary of each position that is budgeted in the Financial Assurance Plan. Anticipated salaries that were used in the budget are within Attachment E-2-4.

Operations Manager. In Charge of all aspects of day-to-day activities and planning for Crownpoint Uranium Project D & D. Responsible for interface with accounting services including coding and approval of all invoices, monthly cost analysis, restoration report generation, and employee relation responsibilities.

Environmental Manager. Responsible for the radiation health and safety, environmental compliance and quality assurance program at the Crownpoint Uranium Project. Supervise the Radiation Safety Officers to ensure that all radiation safety; environmental compliance and permitting/licensing programs will be conducted in a responsible manner and in compliance with all applicable regulations and permit/license conditions. Serve as Company liaison with regulatory agencies over the term of the restoration activity.

Radiation Safety Officer. Responsible for compliance with all USNRC, and MSHA rules and regulations at the CUP. Also responsible for assistance with laboratory analysis, vehicle safety, reporting and public information.

Chemist. Responsible for maintaining day to day analytical services including operational and environmental. In this capacity the chemist will assure that proper chemical parameters are reported to operations for the water treatment processes. He will be responsible for performing analysis of all routine environmental samples such as monitor wells.

Senior Geologist. Responsible for evaluation of logs and other well data and its interpretation as it pertains to restoration activities. Performs all monitor well sampling duties and when possible, helps with wellfield construction as well as Smeal pump hoist operation. Duties include drafting and ACAD operator for mapping needs. Provides weekend call-out and rotating operator duties as needed.

Wellfield Foreman. Responsible for Wellfield operation and construction as it pertains to restoration. Helps with monitor well sampling and backup pump hoist operator.

Wages-Direct

Electrician. Responsible for performing day to day electrical maintenance and repair services. Performs restoration operator duties on a rotating basis.

Plant Operator. Performs restoration operator duties on a regular basis. This would include the operations of all water treatment equipment including the reverse osmosis unit and brine concentrator.

Truck driver. Provides CDL driver duties. Will serve as backhoe operator and have operator duties on a rotating basis.

Wellfield Operator. Perform wellfield restoration operator duties on a regular basis and rotations with the Plant Operator.

Pump Hoist Operator. Responsible for the running of pumps in and out of the hole as required by restoration activities. Other duties include the operation of the backhoe and labor necessary for field construction.

Insurance-Workman's Compensation

Estimate based on projected compensation expenses and prevailing rates.

Payroll Taxes

Estimate based on projected compensation expenses and prevailing rates.

Medical Insurance

Estimate based on headcount and historic premium rates.

401K Contributions

The 401(k) Contribution cost codes represent HRI-funded contributions under the 401(k) – the retirement savings plan for HRI employees. The 401 (k) Contribution portion is made concurrent with each bi-weekly payroll period as a component of each eligible employee's total compensation.

Telephone/Telegraph

Estimated average costs of regular telephone service, cellular telephone service, and fax line service and internet line service at all CUP locations.

Postage/Freight

Estimated average cost of all types of mail service.

Copy Equipment

Estimate average cost for operation of all types of copy and fax equipment at all CUP locations.

Other Equipment & Rental

This covers the rental of equipment and miscellaneous equipment average costs. As applied in these estimates, it would include office machine rental, water machines for potable water, etc.

Office Supplies

Estimated average costs of office supplies such as paper, pens, etc.

Office Equipment Maintenance

Estimate average cost for maintenance for all types of office equipment at all CUP locations.

Data Processing

Estimated average cost for outside data processing.

Maps

Estimated average cost of plotting and reproducing maps for routine operations and reports.

Drafting & Printing

Estimated average for outside computer automated drawing services for report preparation.

Transportation - Air & Car

Estimated average for airplane tickets and auto rental.

Meals

Estimated average for travel related meals.

Misc. Travel Expense

Estimated average for travel related expenses such as hotels.

Env-Depreciable Equipment

Replacement equipment and calibration costs. This would include survey and sample equipment and routine calibration and service.

Env-Operational Analyses

This cost code is reserved for outside analysis

Environmental – Miscellaneous

As the name suggests, any environmental related item not specifically addressed in the other codes 090 through 098. Miscellaneous items may include sample bottles, filters, reagents, calibration, etc.

Safety

This is for costs associated with safety supplies for the employees. Items charged to this cost code would include safety boots, safety glasses, potable water, protective gloves, safety goggles etc.

Backhoe

All backhoe rental and maintenance such as oil changes, and repairs would be charged to this account

Misc. Chemicals

The major charge to this cost code during restoration is anti-scalent for the RO.

Utilities - Electric, Wellfield

Calculated electrical cost for operating the pumps and other equipment in the wellfield. The basis for these costs is shown in Attachment E-2-2.

Utilities - Electric, Brine Concentrator

Calculated electrical cost for operating the brine concentrator. The basis for these costs is shown in Attachment E-2-2.

Utilities - Electric, Plant and RO

Calculated electrical cost for operating the plant, reverse osmosis unit, and other office lighting and electrical needs. The basis for these costs is shown in Attachment E-2-2.

Submersible Pumps

Estimated average maintenance and replacement costs for submersible pumps that are used in extraction wells.

Submersible Motors

Estimated average maintenance and replacement costs for submersible pump electric motors that are used in extraction wells.

Field Piping & Valves

Estimated average maintenance and replacement costs for the various fittings, valves, glues etc. that is used in wellfield operations.

Meters

Estimated average maintenance and replacement costs for wellfield meters.

Misc. Field

The major charge to this cost code during restoration is PPE, rags, solvents and other miscellaneous field needs.

Handtools

Estimated average handtool replacement costs

Plant Piping & Valves

Estimated average maintenance and replacement costs for the various fittings, valves, glues etc. that is used in plant operations.

Plant Brine Concentrator Inst.

A cost code to charge anticipated brine concentrator instrument replacement.

Pumps

Estimated average maintenance and replacement costs for pumps that are used in the water treatment plant.

Plant Electrical

Estimated average electrical maintenance and replacement costs for water treatment plant operations.

Filters

Estimated average filter and filter media replacement costs and maintenance costs for filtration equipment for water treatment plant operations.

Evaporation Ponds

A cost code to charge anticipated maintenance costs for pond liner repairs and maintenance.

Roads

A cost code to charge anticipated maintenance costs for road maintenance.

Gas, Oil, and Grease

Equipment fuel costs and lubrication.

Disposal - BC Solids

Ongoing operational cost of disposing salt residue from brine concentrator. The basis for these costs is shown in Attachment E-2-2.

RO Unit

A cost code to charge anticipated reverse osmosis unit repair, maintenance and instrument replacement.

Lab Supplies

Estimated average costs of analytical laboratory supplies such as reagents, filters, glassware, etc.

RO Membrane

Average replacement costs of reverse osmosis unit membranes. The basis for these costs is shown in Attachment E-2-2.

Field Equip. Repairs & Maint.

A cost code to charge anticipated maintenance costs for large field equipment such as the pump host equipment, generators, and trucks.

Vehicle Repairs & Maint.

A cost code to charge anticipated maintenance costs for road vehicles such as pick up trucks and company autos.

Vehicles – Pickups

The estimated average cost for the major repair of a company pickup truck.

Vehicles - Tractors & Trucks

The estimated average cost for the major repair of a large trucks or trailers.

Vehicles - Automobiles

The estimated average cost for the major repair of a company car.

The total cost for groundwater restoration and post restoration management is projected to be $4,089,818.

ATTACHMENT E-2-1
GROUNDWATER RESTORATION BUDGET

CHURCHROCK SECTION 17 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

Rev. July 23, 2001

	Period (Sect. 8 Overlap)	5/5	6/5	7/5	8/5	9/5	10/5	11/5	12/5	1/6	2/6	3/6	4/6
	Period (Stand Alone)	1/1	2/1	3/1	4/1	5/1	6/1	7/1	8/1	9/1	10/1	11/1	12/1
1	***Management and Accounting***												
	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
	nt Personnel												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
6	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
7	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	***Wellfield Personnel***												
10	Foreman	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	***Engineering & Geologic Personnel***												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	***Total Employees***	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	***Operations Statistics***												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	712,913,000	687,133,400	663,017,000	637,237,400	612,289,400	586,509,800	561,561,800	535,782,200	510,002,600	485,054,600	459,275,000	434,327,000
36	Beginning PV	9	8.83	8.66	8.49	8.32	8.14	7.98	7.80	7.63	7.46	7.28	7.12
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.17	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
39	Cumulative Gallons Processed	25,779,600	49,896,000	75,675,600	100,623,600	126,403,200	151,351,200	177,130,800	202,910,400	227,858,400	253,638,000	278,586,000	304,365,600
40	Cumulative PV Processed	0.17	0.34	0.51	0.68	0.86	1.02	1.20	1.37	1.54	1.72	1.88	2.06
41	Remaining Gallons to Process	687,133,400	663,017,000	637,237,400	612,289,400	586,509,800	561,561,800	535,782,200	510,002,600	485,054,600	459,275,000	434,327,000	408,547,400
42	Remaining PV to Process	8.83	8.66	8.49	8.32	8.14	7.98	7.80	7.63	7.46	7.28	7.12	6.94
43	***ESTIMATED COST DETAIL***												
44													
45	Description	GW Restoration Operations									GW Restoration Operations		
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmans Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
60	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
61	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Soilds	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228
99	Cumulative Total	$130,228	$260,457	$390,685	$520,914	$651,142	$781,370	$911,599	$1,041,827	$1,172,056	$1,302,284	$1,432,512	$1,562,741
100	Period Days	31	29	31	30	31	30	31	31	30	31	30	31

CHURCHROCK SECTION 17 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

Rev. July 23, 2001

	Period (Sect. 8 Overlap)	5/6	6/6	7/6	8/6	9/6	10/6	11/6	12/6	1/7	2/7	3/7	4/7
	Period (Stand Alone)	1/2	2/2	3/2	4/2	5/2	6/2	7/2	8/2	9/2	10/2	11/2	12/2
1	***Management and Accounting***												
	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
	t Personnel												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
6	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
7	Electrician	1	1	1	1	1	1	1	1	1	1	1	1
8	Plant Operator	1	1	1	1	1	1	1	1	1	1	1	1
9	***Wellfield Personnel***												
10	Foreman	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1	1	1	1	1	1	1	1
12	Wellfield Operators	1	1	1	1	1	1	1	1	1	1	1	1
13	Pump Hoist Operators	1	1	1	1	1	1	1	1	1	1	1	1
14	***Engineering & Geologic Personnel***												
15	Senior Geologist	1	1	1	1	1	1	1	1	1	1	1	1
16													
17	***Total Employees***	11	11	11	11	11	11	11	11	11	11	11	11
18													
19	***Operations Statistics***												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580	580	580	580	580	580	580	580
22	GPM RO Product	464	464	464	464	464	464	464	464	464	464	464	464
23	GPM RO Reject	116	116	116	116	116	116	116	116	116	116	116	116
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200	25,891,200	25,056,000	25,891,200	25,056,000	25,891,200
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960	20,712,960	20,044,800	20,712,960	20,044,800	20,712,960
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240	5,178,240	5,011,200	5,178,240	5,011,200	5,178,240
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125	125	125	125	125	125	125	125
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5	113.5
30	GPM Brine	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000	5,580,000	5,400,000	5,580,000	5,400,000	5,580,000
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640	5,066,640	4,903,200	5,066,640	4,903,200	5,066,640
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600	108,000	111,600	111,600	108,000	111,600	108,000	111,600
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	408,547,400	382,767,800	358,651,400	332,871,800	307,923,800	282,144,200	257,196,200	231,416,600	205,637,000	180,689,000	154,909,400	129,961,400
36	Beginning PV	6.94	6.77	6.60	6.43	6.26	6.09	5.92	5.74	5.57	5.40	5.22	5.06
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600	25,779,600	24,948,000	25,779,600	24,948,000	25,779,600
38	PV Processed Month	0.17	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
39	Cumulative Gallons Processed	330,145,200	354,261,600	380,041,200	404,989,200	430,768,800	455,716,800	481,496,400	507,276,000	532,224,000	558,003,600	582,951,600	608,731,200
40	Cumulative PV Processed	2.23	2.40	2.57	2.74	2.91	3.08	3.26	3.43	3.60	3.78	3.94	4.12
41	Remaining Gallons to Process	382,767,800	358,651,400	332,871,800	307,923,800	282,144,200	257,196,200	231,416,600	205,637,000	180,689,000	154,909,400	129,961,400	104,181,800
42	Remaining PV to Process	6.77	6.60	6.43	6.26	6.09	5.92	5.74	5.57	5.40	5.22	5.06	4.88
43	***ESTIMATED COST DETAIL***												
44													
45	Description	GW Restoration Operations											
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250	$32,250
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487	$10,487
49	Insurance-Workmans Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368	$1,368
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992	$2,992
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274	$4,274
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068	$1,068
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250	$1,250
54	Postage/Freight	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
55	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
	Office Supplies	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
59	Data Processing	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
60	Maps	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
61	Drafting & Printing	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850	$850
63	Meals & Entertainment	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
68	Safety	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
69	Backhoe Maintenance	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450	$2,450
71	Utilities - Electric, Wellfield	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053	$12,053
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850	$32,850
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896	$5,896
74	Submersible Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
75	Submersible Motors	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
76	Field Piping & Valves	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400	$400
77	Meters	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
78	Misc. Field	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
79	Handtools	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
80	Plant Piping & Valves	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
82	Pumps	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
83	Plant Electrical	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100
85	Evaporation Ponds	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
86	Roads	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150	$1,150
88	Disposal - B.C. Solids	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541	$6,541
89	RO Unit	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
90	Lab Supplies	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550	$550
94	Vehicles - Pickups	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
96	Vehicles - Automobiles	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
97													
98	Monthly Total	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228	$130,228
99	Cumulative Total	$1,692,969	$1,823,198	$1,953,426	$2,083,654	$2,213,883	$2,344,111	$2,474,340	$2,604,568	$2,734,796	$2,865,025	$2,995,253	$3,125,482
100	Period Days	31	29	31	30	31	30	31	31	30	31	30	31

CHURCHROCK SECTION 17 GROUNDWATER RESTORATION AND DECOMMISSIONING COSTS
COSTS ASSOCIATED WITH RO AND BRINE CONCENTRATION OPERATION AND MAINTENANCE

Rev. July 23, 2001

	Period (Sect. 8 Overlap)	5/7	8/7	9/7	10/7	11/7	12/7	1/8	2/8	3/8	4/8	5/8	6/8
	Period (Stand Alone)	1/3	2/3	3/3	4/3	5/3	6/3	7/3	8/3	9/3	10/3	11/3	12/3
1	***Management and Accounting***												
	Operations Manager	1	1	1	1	1	1	1	1	1	1	1	1
	Environmental Manager	1	1	1	1	1	1	1	1	1	1	1	1
	t Personnel												
	Radiation Officer	1	1	1	1	1	1	1	1	1	1	1	1
6	Chemist	1	1	1	1	1	1	1	1	1	1	1	1
7	Electrician	1	1	1	1	1							
8	Plant Operator	1	1	1	1	1							
9	***Wellfield Personnel***												
10	Foreman	1	1	1	1	1	1	1	1	1	1	1	1
11	Truck Driver	1	1	1	1	1							
12	Wellfield Operators	1	1	1	1	1							
13	Pump Hoist Operators	1	1	1	1	1							
14	***Engineering & Geologic Personnel***												
15	Senior Geologist	1	1	1	1	1							
16													
17	***Total Employees***	11	11	11	11	11	5	5	5	5	5	5	5
18													
19	***Operations Statistics***												
20	Reverse Osmosis Treatment												
21	GPM RO Capacity	580	580	580	580	580							
22	GPM RO Product	464	464	464	464	464							
23	GPM RO Reject	116	116	116	116	116							
24	MM Gals, RO Processed - Month	25,891,200	24,220,800	25,891,200	25,056,000	25,891,200							
25	MM Gals, RO Permiate - Month	20,712,960	19,376,640	20,712,960	20,044,800	20,712,960							
26	MM Gals, RO Reject - Month	5,178,240	4,844,160	5,178,240	5,011,200	5,178,240							
27	Brine Concentration												
28	GPM BC Capacity	125	125	125	125	125							
29	GPM Distillate	113.5	113.5	113.5	113.5	113.5							
30	GPM Brine	2.5	2.5	2.5	2.5	2.5							
31	MM Gals, BC Capacity - Month	5,580,000	5,220,000	5,580,000	5,400,000	5,580,000							
32	MM Gals, Distillate - Month	5,066,640	4,739,760	5,066,640	4,903,200	5,066,640							
33	MM Gals, Brine - Month	111,600	104,400	111,600	108,000	111,600							
34	Process Results												
35	Beginning Gallons (9 PV Eq.)	104,181,800	78,402,200	54,285,800	28,506,200	3,558,200							
36	Beginning PV	4.88	4.71	4.54	4.37	4.20							
37	Gallons Processes Month	25,779,600	24,116,400	25,779,600	24,948,000	25,779,600							
38	PV Processed Month	0.17	0.16	0.17	0.17	0.17							
39	Cumulative Gallons Processed	634,510,800	658,627,200	684,406,800	709,354,800	735,134,400							
40	Cumulative PV Processed	4.29	4.46	4.63	4.80	4.97							
41	Remaining Gallons to Process	78,402,200	54,285,800	28,506,200	3,558,200	-22,221,400							
42	Remaining PV to Process	4.71	4.54	4.37	4.20	4.03							
43	***ESTIMATED COST DETAIL***												
44													
45	Description	GW Restoration Operations					Final Decontamination, Decomissioning and Reclamation						
46													
47	Salaries-Direct	$32,250	$32,250	$32,250	$32,250	$32,250	$27,417	$27,417	$27,417	$27,417	$27,417	$27,417	$27,417
48	Wages-Direct	$10,487	$10,487	$10,487	$10,487	$10,487	$0	$0	$0	$0	$0	$0	$0
49	Insurance-Workmans Compensation	$1,368	$1,368	$1,368	$1,368	$1,368	900	900	900	900	900	900	900
50	Payroll Taxes	$2,992	$2,992	$2,992	$2,992	$2,992	4200	4200	4200	4200	4200	4200	4200
51	Medical Insurance	$4,274	$4,274	$4,274	$4,274	$4,274	4000	4000	4000	4000	4000	4000	4000
52	401K Contributions	$1,068	$1,068	$1,068	$1,068	$1,068	4000	4000	4000	4000	4000	4000	4000
53	Telephone/Telegraph	$1,250	$1,250	$1,250	$1,250	$1,250	$950	$950	$950	$950	$950	$950	$950
54	Postage/Freight	$150	$150	$150	$150	$150	$175	$175	$175	$175	$175	$175	$175
	Copy Equipment	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
	Other Equipment & Rental	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
	Office Supplies	$250	$250	$250	$250	$250	$150	$150	$150	$150	$150	$150	$150
	Office Equipment Maintenance	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50	$50
59	Data Processing	$150	$150	$150	$150	$150							
60	Maps	$50	$50	$50	$50	$50					$1,000	$1,000	$1,000
61	Drafting & Printing	$50	$50	$50	$50	$50					$2,500	$2,500	$2,500
62	Transportation - Air & Car	$850	$850	$850	$850	$850	$300	$300	$300	$300	$300	$300	$300
63	Meals & Entertainment	$200	$200	$200	$200	$200	$300	$300	$300	$300	$300	$300	$300
64	Misc. Travel Expense	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
65	Env-Depreciable Equipment	$100	$100	$100	$100	$100							
66	Env-Operational Analyses	$2,000	$2,000	$2,000	$2,000	$2,000							
67	Environmental - Miscellaneous	$200	$200	$200	$200	$200							
68	Safety	$250	$250	$250	$250	$250							
69	Backhoe Maintenance	$700	$700	$700	$700	$700							
70	Misc. Chemicals	$2,450	$2,450	$2,450	$2,450	$2,450							
71	Utilities - Electric, Wellfield	$12,053	$12,053	$12,053	$12,053	$12,053							
72	Utilities - Electric, Brine Concentrator	$32,850	$32,850	$32,850	$32,850	$32,850							
73	Utilities - Electric, Plant and RO	$5,896	$5,896	$5,896	$5,896	$5,896							
74	Submersible Pumps	$500	$500	$500	$500	$500							
75	Submersible Motors	$500	$500	$500	$500	$500							
76	Field Piping & Valves	$400	$400	$400	$400	$400							
77	Meters	$50	$50	$50	$50	$50							
78	Misc. Field	$100	$100	$100	$100	$100							
79	Handtools	$100	$100	$100	$100	$100							
80	Plant Piping & Valves	$200	$200	$200	$200	$200							
81	Plant Brine Conc Inst.	$50	$50	$50	$50	$50							
82	Pumps	$500	$500	$500	$500	$500							
83	Plant Electrical	$100	$100	$100	$100	$100							
84	Filters	$1,100	$1,100	$1,100	$1,100	$1,100							
85	Evaporation Ponds	$50	$50	$50	$50	$50							
86	Roads	$100	$100	$100	$100	$100							
87	Gas, Oil, Grease	$1,150	$1,150	$1,150	$1,150	$1,150							
88	Disposal - B.C. Solids	$6,541	$6,541	$6,541	$6,541	$6,541							
89	RO Unit	$250	$250	$250	$250	$250							
90	Lab Supplies	$100	$100	$100	$100	$100							
91	RO Membrane	$3,000	$3,000	$3,000	$3,000	$3,000							
92	Field Equip. Repairs & Maint.	$150	$150	$150	$150	$150							
93	Vehicle Repairs & Maint.	$550	$550	$550	$550	$550							
94	Vehicles - Pickups	$500	$500	$500	$500	$500							
95	Vehicles - Tractors & Trucks	$1,000	$1,000	$1,000	$1,000	$1,000							
96	Vehicles - Automobiles	$500	$500	$500	$500	$500							
97													
98	Monthly Total	$130,228	$130,228	$130,228	$130,228	$130,228	$43,242	$43,242	$43,242	$43,242	$46,742	$46,742	$46,742
99	Cumulative Total	$3,255,710	$3,385,938	$3,516,167	$3,646,395	$3,776,624	$3,819,866	$3,863,108	$3,906,350	$3,949,592	$3,996,334	$4,043,076	$4,089,818
100	Period Days	31	29	31	30	31	31	30	31	31	30	31	30

D & D COSTS ARE ITEMIZED ON A TASK BASIS

July 23, 2001

ATTACHMENT E-2-2
BUDGET CACULATION AND BACKUP

Labor Rates
Electrical Usage
Solid Production

LABOR SUMMARIES

Rev. March 16, 2001

		Number	Hourly Rate	Yearly Salary	Annual	Monthly
	Management and Accounting					
Salaried	Operations Manager	1	-	$120,000	$120,000	$10,000
Salaried	Environmental Manager	1	-	$105,000	$105,000	$8,750
Salaried	Accounting Manager			$105,000	$105,000	$8,750
Salaried	Accountant		-	$65,000	$65,000	$5,417
	Plant Personnel					
Salaried	Plant Superintendent		-	$85,000	$85,000	$7,083
Salaried	Plant Engineer		-	$45,000	$45,000	$3,750
Salaried	Radiation Officer	1	-	$30,000	$30,000	$2,500
Salaried	Chemist	1	-	$46,000	$46,000	$3,833
Salaried	Plant Foreman		-	$28,000	$28,000	$2,333
Salaried	Maintenance Foreman		-	$28,000	$28,000	$2,333
Wage	Lab Technicans		$9.62	-	$20,010	$1,667
Wage	Secretary		$9.62	-	$20,010	$1,667
Wage	Electrician	1	$14.43	-	$30,014	$2,501
Wage	Apprentice Electrican		$12.01	-	$24,981	$2,082
Wage	Plant Operator	1	$11.54	-	$24,003	$2,000
Wage	Assistance Plant Operator		$11.54	-	$24,003	$2,000
Wage	Dryer Operator		$11.54	-	$24,003	$2,000
Wage	Maintenance		$11.54	-	$24,003	$2,000
	Wellfield Personnel					
Salaried	Wellfield Superintendent		-	$41,200	$41,200	$3,433
Salaried	Drilling Engineer		-	$40,500	$40,500	$3,375
Salaried	Foreman	1	-	$28,000	$28,000	$2,333
Wage	Truck Driver	1	$11.54	-	$24,003	$2,000
Wage	Electrician		$14.43	-	$30,014	$2,501
Salaried	Data Entry Clerk		-	$20,000	$20,000	$1,667
Wage	Secretary			$20,000	$20,000	$1,667
Wage	Logger		$12.01	-	$24,981	$2,082
Wage	Wellfield Operators	1	$11.50	-	$23,920	$1,993
Wage	Assistant Wellfield Operator		$11.50	-	$23,920	$1,993
Wage	Balancer		$11.50	-	$23,920	$1,993
Wage	Environmental Sampler		$11.50	-	$23,920	$1,993
Wage	Pump Hoist Operators	1	$11.50	-	$23,920	$1,993
Wage	Backhoe Operator		$10.49	-	$21,819	$1,818
Wage	Maintenance		$11.50	-	$23,920	$1,993
Wage	Casing Crew		$11.50	-	$23,920	$1,993
	Engineering & Geologic Personnel					
Salaried	Chief Engineer		-	$66,000	$66,000	$5,500
Salaried	RESERVOIR ENGINEER		-	$60,000	$60,000	$5,000
Salaried	Senior Geologist	1	-	$58,000	$58,000	$4,833
Salaried	Geologist		-	$48,800	$48,800	$4,067
Salaried	Logging Supervisor		-	$35,000	$35,000	$2,917
Wage	Secretary			$20,000	$20,000	$1,667
Wage	Surveyor		$12.02	-	$25,002	$2,083
Wage	Assistant Surveyor		$12.02	-	$25,002	$2,083
Wage	Logger		$10.49	-	$21,819	$1,818

COST SUMMARY TABLE					
	KW	Hrs/month	$/KW	Cost/month	Cost/year
WELL FIELD					
Submersible pumps	7.44				
30 extractors	223.2	720	0.075	$ 12,053	$ 144,633.60
PLANT					
Sand Filter Pump	17	720	0.075	$ 918	
RO Feed Pump	51	720	0.075	$ 2,754	
Injection Pump	33	720	0.075	$ 1,782	
RO Heater Pump	3.5	72	0.075	$ 19	
RO Wash pump	10	24	0.075	$ 18	
RO Heater	75	72	0.075	$ 405	
				$ 5,896	$ 70,750.80
		TOTAL		$ 17,949	$ 215,384.40

CHURCHROCK
WF/RO ELECTRIC
REQUIREMENTS/COST

ASSUMPTIONS

1	Well depth	660 ft	
2	Pump depth	500 ft	
3	Static water level	250 ft.	
4	Pipe line length	3600 ft.	
5	Number of extraction wells		20
6	number of injection wells		30
7	Flow rate per extraction well	30 gpm	
8	Flow rate per injection well.	30 gpm	
9	Electrical cost.	$.075/KWH	
10	Tank elevation	20 ft.	

WELL FIELD

A. Total head requirements

Friction loss

		psi	feet
1	Pipe line friction loss.		
	600 gpm in 6" SDR 17 polyethlene pipe.	40	92.4
2	Elevation change between plant and WF	0	0
3	Tank elevation	8.7	20
4	Well lift to surface	173	400
5	Well tubing loss	5	11.6
	Total submersible head requirements.	226.7	524

B. Submersible pump requirements

Grundfos model 25S75-39DS 7.5 hp

(see attachment)

	Amps
Run amps for this pump @ 31.8 gpm @ 562 ft. of head is:	8.58
Full load current:	10.9
Amperage used for electrical useage:	11
Total Wellfield amperage is 30@ 11 amps.	330

$$KW = \frac{1.73 * I * E * PF}{1000}$$

KW = (1.73*11*460*.85)/1000

KW = 7.44

Cost per well per year = 7.44 kw*8760hrs*$.0875/kw

Cost per well per year = $4,888.00

Total cost(30 ext) per year $ 146,642.00

PLANT

A. Injection Pump

1 Injection rate 435 gpm

2 Injection pressure 100 psi

$$WHP = \frac{Q * TDH * SG}{3960}$$

$$WHP = \frac{435 * 100*2.31*1}{3960}$$

WHP = 25

BHP = WHP/Eff

BHP = 25/.75

BHP = 33

$$Amps = \frac{BHP * 746}{1.73*E*Eff *PF}$$

$$Amps = \frac{33*746}{1.73*460*.75*.85}$$

Amps= 48

$$KW = \frac{I*E}{1000}$$

$$KW = \frac{48*460}{1000}$$

KW = 22

B. Sandfilter Feed Pump

BHP 25

$$Amps = \frac{BHP * 746}{1.73*E*Eff *PF}$$

$$Amps = \frac{25*746}{1.73*460*.75*.85}$$

Amps= 36

$$KW = \frac{I*E}{1000}$$

$$KW = \frac{36*460}{1000}$$

KW = 17

C. RO Feed Pump

BHP 75

$$\text{Amps} = \frac{\text{BHP} * 746}{1.73 * E * \text{Eff} * \text{PF}}$$

$$\text{Amps} = \frac{75 * 746}{1.73 * 460 * .75 * .85}$$

Amps= 110

$$\text{KW} = \frac{I * E}{1000}$$

$$\text{KW} = \frac{110 * 460}{1000}$$

KW = 51

D. RO Heater Feed pump

BHP 5

$$\text{Amps} = \frac{\text{BHP} * 746}{1.73*E*Eff*PF}$$

$$\text{Amps} = \frac{5*746}{1.73*460*.75*.85}$$

Amps= 7.5

$$\text{KW} = \frac{I*E}{1000}$$

$$\text{KW} = \frac{7.5*460}{1000}$$

KW = 3.5

E. RO Wash Pump

BHP 15

$$\text{Amps} = \frac{\text{BHP} * 746}{1.73*E*Eff*PF}$$

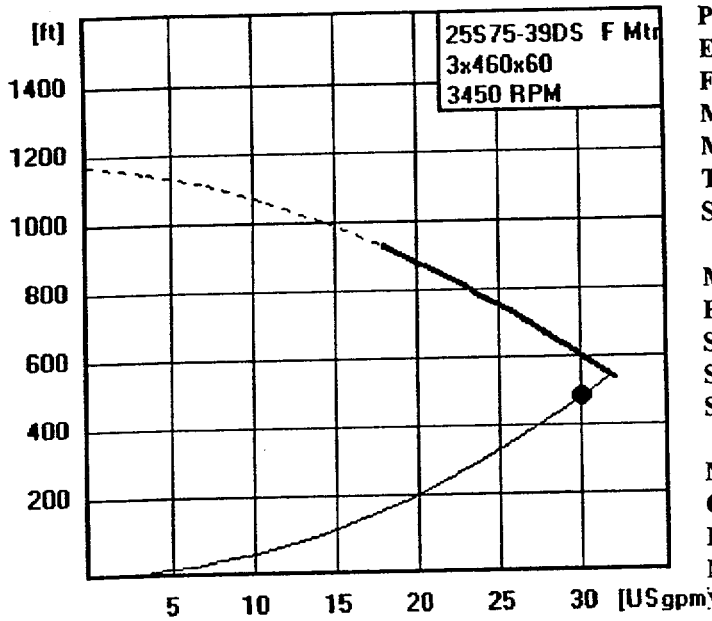
$$\text{Amps} = \frac{15*746}{1.73*460*.75*.85}$$

Amps= 22

$$\text{KW} = \frac{I*E}{1000}$$

$$\text{KW} = \frac{22*460}{1000}$$

KW = 10



Power at Calc.Duty	8.58	hp
Eff. at Calc. Duty	53	%
Fluid Temp.	59	°F
Max.Op.Press.(at 45°F)		psi
Max.Gen.Press.	1180.2	ft
Temp.Range	32/86	°F
Suction Velocity		ft/s
Motor Power	7.5	hp
Full Load Current	10.9	A
Start Curr.Ratio (DOL)	65	
Service factor current	12.3	A
Service Factor	1.15	
Min.Well Dia.	4	"
Outlet Connection	1 ½	"
Length	66.8	"
Net Weight	168	lb
Variant Code	None	
Product Number	05113639F	

Required Duty	30.0 USgpm at 500.0 ft
Calc.Duty	31.8 USgpm at 562.1 ft

Pos.1.1 - 25S75-39DS F Mtr

	$	3106.00 x 1
Total	**$**	**3106.00**

25S75-39DS F Mtr/7.5hp/31.8gpm@562.1 ft. of head/8.58 amps/ 53% eff.
25S75-39DS G Mtr/7.5hp/31.8 gpm@562.1 ft. of head/8.58 amps/53% eff
40S75-21 F Mtr/7.5hp/30.8 gpm@508.7 ft. of head/? amps/? eff

Calculation of BC Solids Produced

Flow (g/min)	580
Flow (l/min)	2,195
Flow (l/d)	3,161,232
Solids (g/l)	4
Solids (g/d)	12,644,928
Solids (g/mo)	384,616,560
Solids (kg/mo)	384,617
Solids (lb/mo)	174,429
Solids (yd3/mo)*	87
Solids (ft3/mo)	2,355
Unit disposal cost ($/ft3)	$2.78
Monthly disposal cost ($)	**$6,541**

*1 yd3 ~ 1 ton

ATTACHMENT E-2-4
QUOTES AND PRICES

BC vendor specs
Electrical rates

IONICS

RCC Resources Conservation Company

3006 Northup Way
Bellevue, WA 98004-1407

Phone: 425 828-2400 x 1306
Fax: 425 828-0526

September 13, 2000
RCC No. 00-3218

Mark S. Pelizza
HRI, Inc.
12750 Merit Drive
Suite 720, LB 12
Dallas TX 75251
VIA FAX 972-387-7779

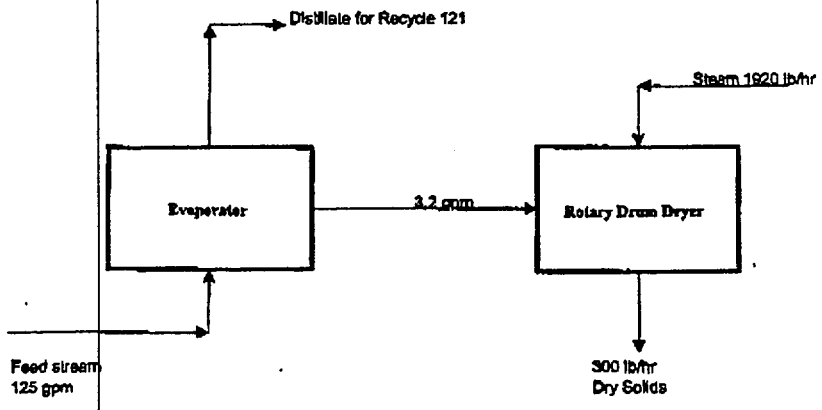
Subject: Brine Concentrator for Uranium Recovery Project, McKinley County, NM

Dear Mr. Pelizza,

RCC has reviewed your request for a Brine Concentrator System for the above project and as discussed with RCC's Process Director, Bob Solomon. RCC would recommend a vertical tube, falling film vapor compression (MVR) evaporator (BC) followed by a steam driven rotary drum dryer to achieve zero liquid discharge (dry solids).

A chemistry of approximately 4800 mg/l TDS was provided as feed to the evaporator/drum dryer system. RCC has assumed a concentration factor of 40 can be achieved in the evaporator thereby reducing the feed stream of 125 gpm to 3.2 gpm. The 3.2 gpm concentrated evaporator blowdown will be sent to a rotary drum dryer for solids generation and zero liquid discharge.

Ionics RCC Zero Liquid Discharge System



The offer includes all necessary vessels, pumps, ducts, valves, controls, instrumentation and motors. It is designed to process 100 gpm of the specified wastewater and recovers about 97 percent of that volume as high purity distillate for recycle/reuse. The recovered distillate would contain less than 10 mg/l of total solids, excluding volatile species. The remaining 3.2 gpm concentrate will be sent to the drum dryer.

The proposed evaporator is a vertical tube, falling film, vapor compression unit similar in design to about 80 other RCC systems operating in this country and around the world. The first installations were put on-line in 1974 and continue today to perform as originally required and designed. Many of those units are treating wastewater, which are essentially identical to your requirement.

The composition of the wastewater to be processed is such that sparingly soluble species (e.g., calcium sulfate and silica) will precipitate as it is concentrated. This situation is typical in almost all cases where RCC units are employed and necessitates employing RCC's proprietary seed slurry process to avoid scaling and fouling of heat transfer surfaces. This design feature is incorporated into the proposed system

The feed is pumped to the agitated feed tank where the pH is adjusted to 5-6 using sulfuric acid. The feed tank provides sufficient residence time for complete mixing before the feed is pumped through the heat exchanger. The feed is heated in the heat exchanger to near boiling by recovering the distillate's sensible heat. The hot feed then passes through the deaerator where carbon dioxide (CO_2) and other non-condensibles are stripped before the feed enters the evaporator sump.

The brine from the sump is continuously recirculated to the top of the vertical heat-transfer tubes where it flows through an RCC patented distributor inserted into the top of each heat transfer tube and falls as a thin film inside the tubes. A portion of the thin film is vaporized. In a vapor compression thermodynamic cycle the vapor is compressed and introduced into the shell side of the vertical tube bundle. The temperature difference between the vapor and the brine film causes the vapor to release its heat of condensation to the falling brine and to condense on the outside of the tubes as distilled water. This distillate is collected at the bottom of the condenser and flows to the distillate tank through a pipe handling both liquid and steam. The steam phase is vented to the deaerator and to the atmosphere to remove non-condensibles and maintain proper system operating pressure. The hot distillate is pumped through the heat exchanger where it gives up its sensible heat to the feed. From this point, the distillate is available for use.

A portion of the concentrated brine is continuously withdrawn from the sump for discharge to the dryer feed tank. The rate of discharge is controlled to maintain proper solids composition in the sump brine.

The concentrated waste blowdown is collected in the dryer feed tank (by others) and is transferred to the rotary drum dryer. A Bufflovak atmospheric double drum dryer is used to crystallizer the slurry being discharged from the Brine Concentrator. This drum dryer crystallizer is most versatile and widely applied to dry many food, chemical and pharmaceutical materials of widely varying densities and viscosity's: dilute solutions, heavy liquids, or pasty

materials. They are also effective for heavy sludge's which become saturated and deposit salts. The movable drum permits complete control of film thickness producing the crystals. In operation, the slurry is fed to the crystallizer through the pendulum feed system and over/across steam heated rotating drums. The feed is evenly distributed upon the drums and dries before being scraped by a double doctor blade. Solids fall from the blades directly into a dumpster for disposal. Steam pressure and temperature control capacity. The device has been in use for many years and is featured in Perry's Chemical Engineers Handbook.

Process vapor from the dryer is vented to atmosphere; supply steam is condensed and returned to the condensate system. The "dry" solids are discharged from the system and hauled away.

The following is preliminary performance data for the evaporator/crystallizer system.

Feed TDS, mg/l	4,769
Evaporator Feed Flow, gpm	125
Distillate Flow, gpm	121
Distillate Quality, mg/l (excluding volatiles)	<10
Evaporator Blowdown, gpm	3.2
Evaporator Electrical Energy, kw	600
Startup Steam (for 24 hours), lb/hr	1200
Rotary Dryer Feed Flow, gpm	3.2
Dryer Prime Steam req'd.,lb/h	1900
Dryer Electrical Energy, kw	20
Dryer Solids Produced, lb/hr.(dry basis)	300
Plot Plan Required, ft.	60 x 60 x 70 h

A suggested scope of work by RCC and by others for the proposed system is as follows:

RCC Scope of Work:

- Perform process design and prepare Process Flow Diagram (PFD),
- Perform system design and prepare P&ID, General Arrangement, and Electrical One-Line drawings,
- Specify and supply the Brine Concentrator/Crystallizer equipment including:

Equipment	Quantity	Material (or Similar)
Evaporator Vessel	1	Titanium/316L SS
Recirculation Ducts	1 set	316L SS
Steam Ducts	1 set	316L SS
Vapor Compressor & Motor	1	CI/SS
Plate & Frame Heat Exchanger	1	Titanium Plates
Deaerator w/Packing	1	317L SS
Recirculation Pump & Motor	1	Cd4MCu
Feed Pump & Motor	1	316 SS
Feed Tank	1	FRP
Feed Tank Mixer & Motor	1	316L SS
Seed/Waste Tank	1	316L SS

Seed/Waste Tank Mixer	1	6% Mo SS
Seed/Waste Tank Pump & Motor	1	Cd4MCu
Distillate Pump & Motor	1	316 SS
Distillate Tank	1	316L SS
Acid Pump & Motor	2	Alloy 20
AND		
Rotary Drum Dryer	1	Cr. Plated CI
Feed Pump & Motor	1	Cd4MCu
Condensate Tank	1	316 SS
Condensate Pump & Motor	1	316 SS
Control System (PLC type)	1	AB
Field Instruments	1 lot	Various
Control Valves	1 lot	Various

- Provide Operations & Maintenance Manuals.

Scope of Work by Others:

- Design and provide foundations, process and utility interfaces, waste disposal system, electrical equipment (including MCC and medium voltage switchgear), and insulation,
- Erect the system and provide interconnecting piping, manual valves and pipe supports,
- Perform checkout, startup and operation,

A price for equipment design and supply of the proposed system is as follows, FOB site. Delivery can be made in 48 weeks following notification to proceed.

125 gpm Brine Concentrator System with a 3.2 gpm rotary drum dryer to achieve zero liquid discharge: $1,700,000

Installation is estimated to be $800,000 including foundations and building Installation based on components installed on site although some components can be skid mounted at additional costs.

The operation of the proposed system will require approximately four (4) hours per shift. General duties will involve routine monitoring with plant walk-through and simple bench chemical (e.g., pH) tests.

RCC estimates approximately one man-month of supervision, construction support, training, startup and acceptance is required to support this project. RCC offers this on a time and material basis for $85.00 per hour plus travel and per diem expenses.

RCC appreciates your inquiry and would be pleased to provide additional information and answer any questions you may have. Please feel free to contact me at (425) 828-2400, x1306 or by fax at (425) 828-0526 or by email at joeb@ionicsrcc.com.

Very truly yours,
RESOURCES CONSERVATION COMPANY

Joe Bostjancic
Sales Manager

PUBLIC SERVICE COMPANY OF NEW MEXICO
ELECTRIC SERVICES

EFFECTIVE ON ALL BILLS RENDERED ON OR AFTER DECEMBER 30, 1999

SCHEDULE 5B: INDUSTRIAL POWER SERVICE--TIME-OF-USE LARGE SERVICE FOR MINING CUSTOMERS ≥ 10,000 KW MINIMUM AT 115 KV AND 69KV

APPLICABILITY: The rates on this schedule are available to a retail mining customer who contracts for a definite capacity commensurate with the customer's normal requirements but in no case less than 10,000 kW of capacity and who takes service directly from PNM's transmission system at 115 kV and the Company's primary distribution voltage of 69kV.

Service shall be furnished at the Company's available transmission voltage of 115 kV and at the Company's distribution voltage of 69kV. Service will be furnished subject to the Company's Rules and Regulations and any subsequent revisions. These Rules and Regulations are available at the Company's office and are on file with the New Mexico Public Regulation Commission. These Rules and Regulations are a part of this Schedule as if fully written herein.

TERRITORY: All territory served by the Company in New Mexico.

TYPE OF SERVICE: The service available under this schedule shall be three-phase service delivered at the Company's available transmission voltage of 115 kV and distribution voltage of 69kV.

SERVICE WITH A CONTRACT DEMAND OF10,000 KW OR MORE:

1. The Company will provide service under this rate schedule to retail customers who contract for a demand of 10,000 kW or more and who take service from PNM's transmission system at 115 kV and distribution system at 69kV only if the customer agrees to a specified period of service under this rate schedule of not less than one year but in no event to extend past the initiation of customer choice for generation service as provided for in the Electric Utility Industry Restructuring Act of 1999. The customer must sign a facilities contract or appropriate line extension agreement for any transmission or distribution cost incurred by the Company for the customer not covered through rates on this tariff. Liquidated damages provisions will be included in the contract or line extension agreement unless otherwise agreed to by the Company.

2. All contract modifications must be in writing and executed as a supplement to the Contract.

SUBSTATION EQUIPMENT: All substation and distribution transformers, the necessary structures, voltage regulating devices, lightning arrestors, and accessory equipment required by the customer in order to utilize the Company's service at 115 kV and 69kV shall be installed, paid for, owned, operated, and maintained by the customer.

PUBLIC SERVICE COMPANY OF NEW MEXICO
ELECTRIC SERVICES

EFFECTIVE ON ALL BILLS RENDERED ON OR AFTER DECEMBER 30, 1999

SCHEDULE 5B: **INDUSTRIAL POWER SERVICE–TIME-OF-USE LARGE SERVICE FOR MINING CUSTOMERS ≥ 10,000 KW MINIMUM AT 115 KV AND 69KV** ENIK

The customer shall also provide at customer's expense suitable protective equipment and devices so as to protect Company's system and service, and other electric users, from disturbances or faults that may occur on the customer's system or equipment.

The customer shall at all times keep each of the three phases balanced as far as practicable so as not to affect service and voltage to other customers served by the Company. The customer shall not operate any equipment in a manner which will cause voltage disturbances elsewhere on the Company's system.

NET RATE PER MONTH OR PART THEREOF FOR EACH SERVICE LOCATION: The rate for electric service provided shall be the sum of A, B, C, D, and E below. On-Peak period is from 8:00am to 8:00pm Monday through Friday (60 hours per week). Off Peak period is all times other than On-Peak period (108 hours per week).

(A) CUSTOMER CHARGE: (Per Metered Account) (Includes 1st 10,000 kW of Billed Demand)	$75,100.00/Bill
(B) ON-PEAK DEMAND CHARGE: (For Billing Demand Above 10,000 kW During On-Peak Period)	$7.51/kW
(C) ENERGY CHARGE:	
For Energy Consumed During On-Peak Period:	4.4905¢/kWh
For Energy Consumed During Off-Peak Periods:	3.1000¢/kWh

PUBLIC SERVICE COMPANY OF NEW MEXICO
ELECTRIC SERVICES

EFFECTIVE ON ALL BILLS
RENDERED ON OR AFTER
DECEMBER 30, 1999

SCHEDULE 5B: INDUSTRIAL POWER SERVICE–TIME-OF-USE
LARGE SERVICE FOR MINING CUSTOMERS
≥ 10,000 KW MINIMUM AT 115 KV AND 69KV

(D) POWER FACTOR ADJUSTMENT: The above rates are based on a power factor of 90 percent or higher and the Company will supply, without additional charge, a maximum of 0.48 kvar (Reactive Kilovolt Amperes) per kW of billable demand. The monthly bill will be increased $.25 for each kvar in excess of the allowed 0.48 KVAR per kW of billable demand.

(E) SPECIAL TAX AND ASSESSMENT ADJUSTMENT: Billings under this Schedule may be increased by an amount equal to the sum of the taxes payable under the Gross Receipts and Compensating Tax Act and of all other taxes, fees, or charges (exclusive of ad valorem, state and federal income taxes) payable by the Company and levied or assessed by any governmental authority on the public utility service rendered, or on the right or privilege of rendering the service, or on any object or event incidental to the rendition of the service.

MONTHLY MINIMUM CHARGE: The monthly minimum charge under this Schedule is the On-Peak period demand charge applied to the 10,000 kW minimum demand.

DETERMINATION OF ON-PEAK PERIOD DEMAND CHARGE: The On-Peak period demand charge for any month shall be as determined by appropriate measurement as defined by the Company, but in no event shall it be less than the highest of the following: (a) the actual metered kW demand minus minimum demand; or (b) 50 percent of the highest kW demand during the preceding 11 months minus minimum demand, or (c) zero.

Metering shall normally be at customer's substation secondary voltage. The Company reserves the right to meter at the substation primary voltage level, in which event the metered kWh, kW demand, and kVAR shall be multiplied by .98 to allow for losses.

Where highly fluctuating or intermittent loads which are impractical to determine properly (such as welding machine, electric furnaces, hoists, elevators, X-rays, and the like) are in operation by the customer, the Company reserves the right to determine the billing demand by increasing the 15-minute measured maximum demand and kvar by an amount equal to 65 percent of the nameplate rated kVA capacity of the fluctuating equipment in operation by the customer.

INTERRUPTION OF SERVICE: The Company will use reasonable diligence to furnish a regular and uninterrupted supply of energy. However, interruptions or partial interruptions may occur or service may be curtailed, become irregular, or fail as a result of circumstances beyond the control of the Company, or are the results of acts of public enemies, accidents, strikes, legal processes, governmental restrictions, fuel shortages, breakdown or damages to generation,

PUBLIC SERVICE COMPANY OF NEW MEXICO
ELECTRIC SERVICES

EFFECTIVE ON ALL BILLS RENDERED ON OR AFTER DECEMBER 30, 1999

SCHEDULE 5B: INDUSTRIAL POWER SERVICE–TIME-OF-USE LARGE SERVICE FOR MINING CUSTOMERS ≥ 10,000 KW MINIMUM AT 115 KV AND 69KV

transmission, or distribution facilities of the Company, repairs or changes in the Company's generation, transmission, or distribution facilities, and in any such case the Company will not be liable for damages. Customers whose reliability requirements exceed these normally provided should advise the Company and contract for additional facilities and increased reliability as may be required. The Company will not, under any circumstances, contract to provide 100 percent reliability.

ACCESSIBILITY: Equipment used to provide electric service must be physically accessible. The metering must be installed on each service location at a point accessible to Company personnel at any time.

TERMS OF PAYMENT: All bills are net and payable within twenty (20) days, and are delinquent thirty (30) days, from the date the bill is rendered. If payment for any or all electric service rendered is not made within thirty (30) days from the date the bill is rendered, the Company shall apply an additional charge of 1.5 percent per month to the total balance in arrears, excluding gross receipts tax. Partial payment of amount due by Customer is applied first to oldest bill, including any other fees or charges assessed, if any, before any amount is applied to current bill.

LIMITATION OF RATE: Electric service under this Schedule is not available for standby service, is not available to customers served in the downtown area of Albuquerque when served by the underground network system, and shall not be resold or shared with others.

AN-274
PC Document #25409

Calculation of BC Solids Produced

Flow (g/min)	580
Flow (l/min)	2,195
Flow (l/d)	3,161,232
Solids (g/l)	4
Solids (g/d)	12,644,928
Solids (g/mo)	384,616,560
Solids (kg/mo)	384,617
Solids (lb/mo)	174,429
Solids (yd3/mo)*	87
Solids (ft3/mo)	2,355
Unit disposal cost ($/ft3)	$2.78
Monthly disposal cost ($)	**$6,541**

*1 yd3 ~ 1 ton

Analytical Stability

3.1. Introduction and Description

Restoration rates will be monitored through analysis of waters produced from the formation. A sample will be taken weekly from the composite production line and analyzed for conductivity, and uranium. These ongoing sample and analysis costs are covered within the groundwater restoration budget.

When sample data indicates that restoration is at, or near completion, each original baseline well will be sampled for the parameters listed in Table 10.4-1 of the COP and analyzed by HRI on location. If the wellfield average value for each chemical parameter is consistent with baseline quality, restoration is considered to be complete and stability sampling will begin.

Stability will be determined by three sample sets taken at two-month intervals from the original baseline wells, and analyzed for the parameters in COP Table 8.6-1. Stability analysis will be performed off location by an independent commercial laboratory.

3.2. Budget Assumptions

The stability analysis budget was developed with the assumption that sample labor is provided from the on site staff and that staff will be available six months after restoration is complete as shown in the Groundwater Restoration Budget. As stated in LC 10.21 there will be one baseline well per acre of wellfield. It is estimated that the Churchrock Section 17 wellfield will be 28 acres when fully developed.

It is estimated that a sample analysis by a commercial laboratory for the parameters shown in Table 10.4-1 of the COP will cost $120 and a sample analysis by a commercial laboratory for the parameters shown in Table 8.6-1 of the COP will cost $380.

One sample will be taken from each baseline well and analyzed for all the constituents in Table 8.6-1 of the COP before restoration begins at a cost of $10,640.

Baseline wells will be sampled once per year and analyzed for all the constituents in Table 10.4-1 of the COP during restoration at a cost of $13,440.

Following restoration, stability samples will be taken every 2 months for six months and analyzed for all the constituents in Table 8.6-1 of the COP at a cost of $31,920.

As shown in Attachment E-3-1, the total cost for restoration analytical sampling is projected to be $56,000.

July 23, 2001

ATTACHMENT E-3-1
ANALYTICAL STABILITY BUDGET

GROUND WATER RESTORATION Sampling

			Units	Sub Total	Total
Assumptions:					
	Labor from staff				
	Routine monitoring is covered in the restoration budget				
	One baseline well sampled per acre of wellfield (28)				
	One sample taken before restoration starts				
	Baseline wells sampled once per year during restoration				
	Stability samples taken every 2 months for six months				
I	**Monitoring and sampling costs**				
A.	Restoration well sampling				
	Estimated restoration period (years)		4.4		
	1	Well Sampling prior to restoration start			
		# of wells	28		
		$/sample	$380	$10,640	
	2	Restoration progress sampling			
		# of wells	28		
		$/sample	$120		
		Samples/year	1	$13,440	
B.	Stability				
		Estimated stabilization period (months)	6		
		# of wells	28		
		Sample freq. mos.	2		
		$/sample	$380		
		Total		$31,920	
Total monitoring and sampling costs					**$56,000**

July 23, 2001

ATTACHMENT E-3-2
COMMERCIAL LABORATORY RATES

TEL. 361-884-0371 P.O. BOX 2552 78403

JORDAN LABORATORIES, INCORPORATED

ANALYTICAL AND ENVIRONMENTAL CHEMISTS
CORPUS CHRISTI, TEXAS

2000
SCHEDULE OF SERVICES

CONTENTS

URANIUM AND RADIOMETRICS

Parameter/Method	Water	Soil/ Filters	Vegetation	Raw Wastes, Sludges, Etc.
Uranium - Fluorometric (ASTM D2907-83)	$12.00	$27.00	$32.00	$57.00
Radium - Total Alpha Emitting Isotopes (Std. Met. No. 7500-Ra B.)	70.00	85.00	90.00	115.00
Radium 226 (Std. Met. No. 7500-Ra C.)	53.00	68.00	73.00	98.00
Radium 228 (SW846 9320)	80.00	95.00	100.00	125.00
Gross Alpha and Beta - Combined (SW846 9310)	30.00	45.00	50.00	75.00
Lead 210 (HSL Si 76a)	73.00	88.00	93.00	118.00
Thorium 230 (Anal. Chem. 46, 12 (1974))	63.00	78.00	83.00	108.00

Other:

Uranium in Urine - Fluorometric (ASTM D2907-83)	$14.00
Uranium in Slurries and Concentrates for Settlement	80.00
Radon in Water, Gas or Air (100 cc Sample Size)	25.00
Cesium 134, 137 & Iodine 131 in Grain or Nuts (by Gamma Spec)	32.00
Naturally Occuring Radioactive Material (NORM)	
Includes Ra 226 & Ra 228	
In Water (StM 7500 RaC, SW846 9320)	133.00
In Soil or Solids (by Gamma Spectroscopy)	70.00
Alpha Spectroscopy	Ask for Quote
Gamma Spectroscopy	$60 plus $10 per Isotope

SPECIAL GROUPINGS

Mineral Analysis of Fresh Water - Includes Sodium, Potassium, Calcium, Magnesium, Chloride, Carbonate, Bicarbonate, Sulfate, Silica, Iron, Alkalinity, Hardness, Dissolved Solids, and pH $90.00

Oil Field Brine - Same as above but including Barium, Resistivity, $CaCO_3$ Stability Calculations and Stiff Diagrams $100.00

TDWR Report - Texas Dept. of Water Resources Uranium In-Situ Mining Report with Accuracy Checks and Ion Diagram - TDWR 0177 (Includes Radium 226) $380.00

TDWR Report 0678 - Same as above with abbreviated Metals list $306.00

TDWR Common Ion Report - Same as above excluding Metals, Radium 226 and Ammonium $120.00

Naturally Occuring Radioactive Material (NORM)
Includes Radium 226 and Radium 228

In Water (StM 7500 RaC, SW846 9320)	$133.00
In Soil or Solids (by Gamma Spectroscopy)	$70.00

Used Fuel Oil Specification - Includes Arsenic, Cadmium, Chromium, Lead, TOX, and Flash Point $164.00

GLYCOL ANALYSES

Benzene, Toluene, Ethyl Benzene & Xylenes (EPA 5030 & 8021)	$45.00
Chloride (StM 4500 - Cl^-B)	10.00
pH (EPA 150.1)	5.00
Water by Karl Fischer (ASTM D1744)	18.00

AMINE ANALYSES

Amine Concentration, Wt. % (by titration)	$15.00
Total Acid Gas Loading	15.00

4. Plugging and Abandonment

4.1. Introduction and Description

All production, and injection wells will be permanently plugged, and abandoned upon completion of ground water restoration and, stabilized in a manner that prevents interformational transfer of fluids. The casing will be cut off three feet from the surface and, the site disked and seeded as outlined below.

4.2. Budget Assumptions

The plugging budget was developed with the assumption that all labor is contracted. HRI will use a direct placement method of well plugging as described in the procedure shown in Attachment E-4-2. This benefit of this method is its simplicity. It has been used at ISL locations in Texas without any reported problems[42]. HRI will verify that the wells are plugged completely by calculated the volume of the cement used against the volume of the casing receiving the plug.

Cement shrinkage is estimated at 120% of the initial volume. Shown in E-4-1cement cost per yard is $100.00. For the purposes of determining labor and equipment requirements, it is estimated that 10 holes will be filled per day. Engineer/geologist supervision will be budgeted at $50,000 per year and the cement contractor will receive $100 per well. Finally a backhoe and operator rate of $37.75 per hour as described in Attachment E-6-2 was assumed.

As shown within Attachment E-4-1, the total cost for plugging is projected to be $251,045.

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[42] Dr. Abitz Testimony dated May 23, 2001¶ 16 express concern over the plugging method described by HRI yet have not provided an example where this method has proved problematic. Specifically, he suggest that the more costly method *recommended* by EPA be used, but did not even state if EPA had evaluated the direct placement method. He implied that the plugging method may not be appropriate for the high quality groundwater at the Churchrock site but does not say why. The implication in Dr. Abitz Testimony is that the direct placement method will properly plug wells but his discussion does not make sense. The direct placement method simply displaces water (~8 lb/gal) back into the aquifer by the heavier cement mixture (~14 lb/gal) that is placed from the surface.

July 23, 2001

ATTACHMENT E-4-1
PLUGGING AND ABANDONMENT BUDGET

WELL PLUGGING AND ABANDONMENT

Assumptions

1. Cement shrinkage	120%
2. Cement cost per yard	$100.00
3. Holes filled per day	10
4. Engineer/gelolgist - per year	$50,000.00
5. Backhoe & operator - per hour	$37.75
6. Contractor - per well	$100.00
7. Wellfield acreage fully developed	40 ac.

Unit of Measure	IN		FT	CU YD	CU YD	DOLLARS EACH WELL					DOLLARS
ITEM	WELL DIAMETER	QTY	AVERAGE DEPTH	HOLE VOLUME	CEMENT REQ'D	CEMENT COST	BACKHOE	ENG/GEOL	CONTRACTOR	TOTAL PER HOLE	TOTAL SECTION 8
Injectors	6	113	900	6.5	7.9	$785.00	$30.20	$20.00	$100.00	$935.20	$105,677.60
Extractors	6	131	900	6.5	7.9	$785.00	$30.20	$20.00	$100.00	$935.20	$122,511.20
Deep Monitor	5	17	1000	5.0	6.1	$605.71	$30.20	$20.00	$100.00	$755.91	$12,850.47
Brushy Monitor	5	7	800	4.0	4.8	$484.57	$30.20	$20.00	$100.00	$634.77	$4,443.38
Dakota Monitor	5	4	700	3.5	4.2	$424.00	$30.20	$20.00	$100.00	$574.20	$2,296.79
Recapture Monitor	5	4	1100	5.6	6.7	$666.28	$30.20	$20.00	$100.00	$816.48	$3,265.92
Section 8 Total											$251,045.35

July 23, 2001

ATTACHMENT E-4-2
BACKUP INFORMATION

PLUGGING PROCEEDURE
CEMENT PRICE QUOTE
CEMENT VOLUME CALCULATION
N.M. STATE ENGINEER RULES AND REGULATIONS

URANIUM RESOURCES, INC
South Texas Operations

STANDARD OPERATING PROCEDURES & JOB DESCRIPTIONS

SUBJECT	SECTION	
PLUGGING & ABANDONMENT	SOP 87	
	DATE 7/10/2000	PAGE 1 of 4
OF CASED WELLS	STATUS Revision 0.0	

A. Introduction

Following the restoration of groundwater to restoration table values and the demonstration of stabilization, the production wells in a wellfield need to be plugged and abandoned ("P&A'd"). The method detailed here utilizes a simple but effective approach that does not require the services of a drilling rig to completely plug cased production wells from top to bottom with cement. Other benefits include efficiency and minimum commitment of technical and mechanical resources,

It is assumed that URI has received all necessary groundwater releases from the governing state agencies prior to the initiation of these procedures. The wells are plugged with a 13-lb/gallon neat cement slurry which is delivered to the well in a commercial redi-mix truck. The cement is metered down the well using a simple funnel device constructed out of a 55-gallon plastic drum and the well is filled to about 2/3 full with the cement slurry. The cement is allowed to cure for several days and is then tagged with a simple weight on a chain to ensure a competent plug. When the plug has been verified, the well casing is broken off at least three feet below surface and the balance of the hole is filled with cement slurry. The pit is then back filled and the plugging is complete.

B. Resources

The labor and material resources necessary to complete the work include the following:

1. **Engineer.** The term "Engineer" is used herein to describe any competent URI employee or contractor whose task it is to plan, oversee and execute in the field the plugging and abandonment of cased wells.
2. **Backhoe Operator.** To operate the backhoe and provide general labor support.
3. **Backhoe.** Necessary to break off the casing of the well 4 feet below surface and the back filing of the resulting trench.

4. **Measuring funnel.** Constructed by cutting off a 55 gallon plastic drum so as to allow at least 35 gallons of capacity (approximately 1/6 of a cubic yard) plus some freeboard. The bottom of the funnel is fitted with a 3 inch pipe which is long enough to keep the funnel in the casing during the filling process. (See Figure No. 1).
5. **Plug for the funnel**. The funnel plug consists of a cement or rubber plug sufficient to restrict flow through the 3 inch pipe at the bottom of the funnel which is attached to a handle long enough to allow its removal when the funnel is full of cement slurry. (See figure No. 2).
6. **Down-hole surveying equipment**. Such equipment as necessary to allow the verification of the location and competency of the plug down hole. In its simplest form, this could be a weight attached to a surveyors tape that would allow direct reading of the distance from top of casing to top of the cement plug
7. **Cement Slurry.** Adequate quantities of 13 lb/gal neat cement slurry delivered in a commercial redi mix truck with driver to fill the holes scheduled for the day. This is provided under a separate contract with a local cement company such as Alamo Cement

C. Office Preparation:

1. Identify the holes that are scheduled to be plugged.
2. Determine casing volumes from logs or other data.
3. Determine the number of 1/6-yd^3 loads, or "metered drops", necessary to fill at least 2/3 of each hole's individual casing volume. This shall be calculated by taking the casing volume, multiplying it by 0.667 and rounding up to the nearest ½ cubic yard. The number of cubic yards are then multiplied by 6 to get the number of metered drops.
4. Order the required quantity of concrete for the next day's work.

D. Bottom Plugging in the Field:

1. Locate hole in the field.

2. Engineer places the metering funnel on the hole and inserts the plug into the funnel
3. The redi-mix driver backs his cement truck up to the hole. (Figure 3).
4. Cement truck driver and the Engineer fill the funnel to the 35 gallon (1/6 yd^3) marks with 13 lb. neat slurry. (Figure 4)
5. Engineer lifts the plug, releasing the cement slurry down the hole. (Figure 5)
6. The preceding two steps are repeated until the desired quantity of cement slurry has been discharged to the hole.
7. Funnel and truck are washed down as needed with water from the truck. (Figure No. 6).
8. The engineer and cement truck move to the next hole to be plugged and repeat the process. (Figure 7).

E. Verification of Bottom Plug

1. Hole is allowed to cure for at least three days to allow cement to set up.
2. Engineer tags the top of the cement plug to verify its existence and location. Engineer records the level of the plug found in the hole.
3. Where a solid plug is found, the hole is determined to be properly bottom plugged and scheduled for final surface plugging.

F. Surface Plugging in the Field:

1. Holes that have successfully undergone the tagging exercise above have their casings broken off at least 4 feet below the surface of the ground with a backhoe. The resulting trench is about one bucket wide and about ten feet long with the hole exposed in the bottom. Figures 8 & 9).
2. The cement truck backs up to the trench and discharges the cement slurry down the exposed bore hole until the hole is filled to the bottom of the trench. When full, the truck moves to the next hole to be plugged.

3. The engineer records that the hole has been successfully surface plugged and marks it for back-filling.
4. The backhoe returns to the hole and back fills the trench, returning the ground to its original contours.
5. The hole is now completely P&A'd.

FIGURE No. 1

METERING FUNNEL

MADE FROM CUT OFF
55-GALLON PLASTIC
DRUM

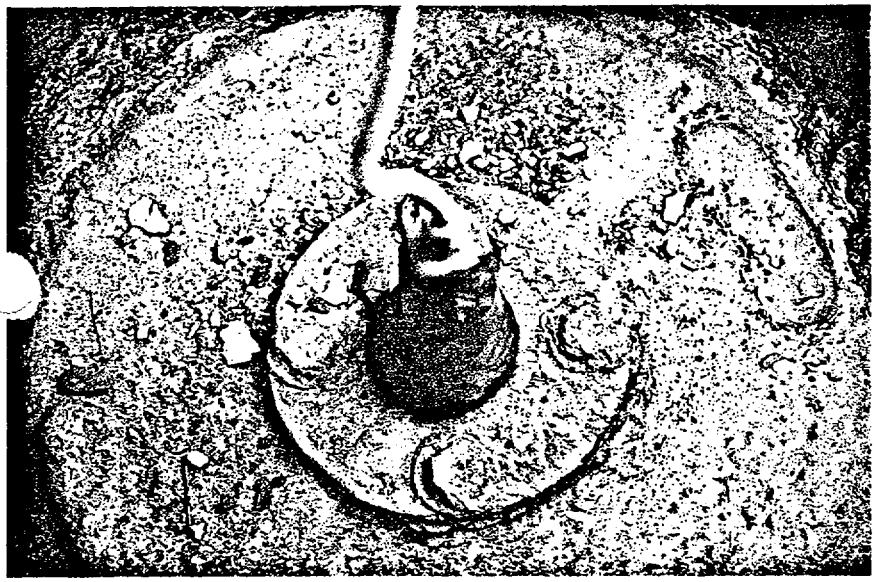


FIGURE No. 2

MANUAL PLUG
FOR METERING FUNNEL

FIGURE No. 3

CEMENT TRUCK
READY TO
FILL FUNNEL

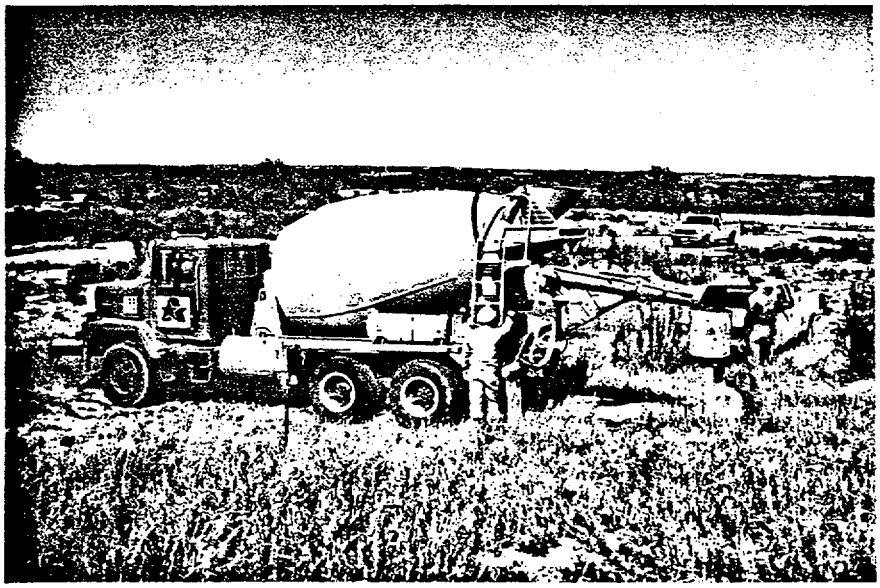


FIGURE NO. 4

FILLING FUNNEL

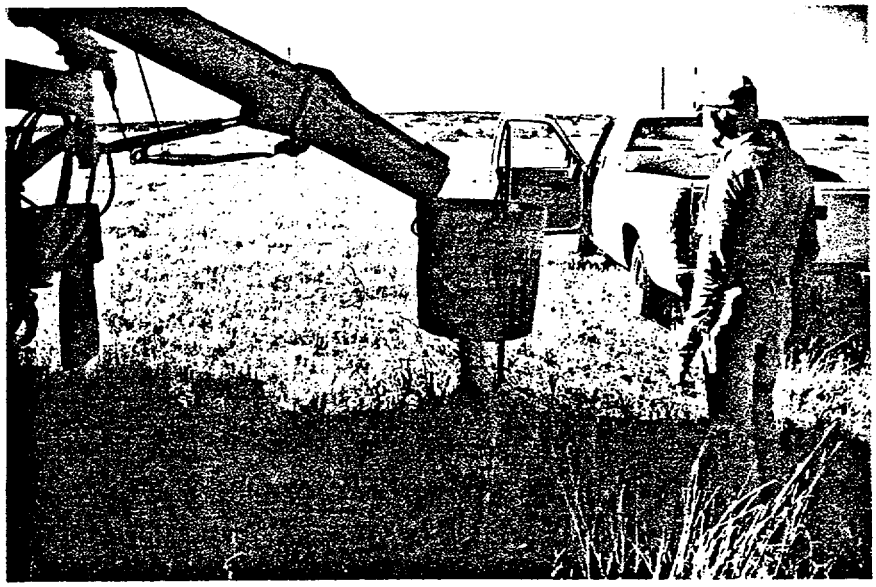


FIGURE NO. 5

FILLING STEP FINISHED
PLUG BEING PULLED
TO RELEASE CEMENT
INTO BORE HOLE

FIGURE NO. 6

WASHING FUNNEL
AFTER DONE FILLING

FIGURE No. 7

CARRYING FUNNEL
BACK TO TRUCK
FOR MOVE TO NEXT HOLE

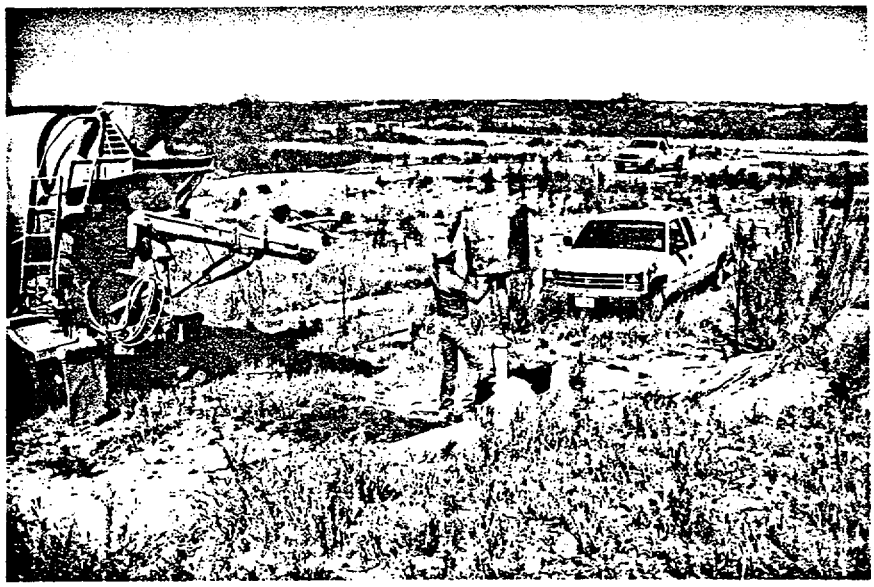
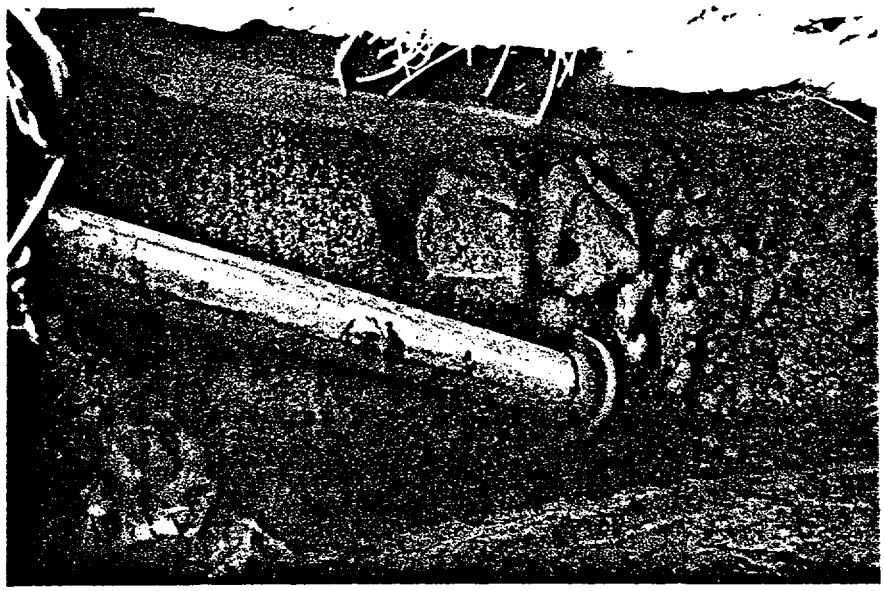


FIGURE No. 8

PIT RESULTING
FROM BACKHOE
BREAKING CASING
OFF 4 FEET BELOW
GROUND LEVEL

FIGURE No. 9

BOOTOM OF PIT
SHOWING BROKEN
CASING AND
DRILL HOLE



AMERICAN
CEMENT CORPORATION
P.O. BOX 38
ESPAÑOLA, NEW MEXICO 87532
(505) 753-6260 FAX (505) 753-8402

Via FAX
505 986-6555

October 6, 2000

HRI, Inc.
P.O. Box 777
Crownpoint, New Mexico 87313

RE: Quotation for Type I/II Portland Cement

Dear Salvador,

We are delighted to quote your cement needs as follows:

Type I/II Cement	f.o.b. Albuquerque	$83.00 less $1.00 Pd by 10th.
Truck freight	to Churchrock, NM	16.70
	Total delivered price	$99.70 less $1.00 Pd by 10th
	Per short ton (2000 lbs)	

Price should be good for all of 2001, however American Cement reserves the right to amend price on July 1, 2001 should it become necessary due to price increases. These generally do not exceed $2 or $3 per ton.

Thank you for the opportunity to quote this job. Please let me know if I can be of any further assistance.

Very truly,

Peter H. Cantrup
American Cement Corp.

MARK

$\frac{2000}{95} = 21$ $\frac{99.70}{21} = 4.75$/SACK

Salvador 10/6/00

REQUIRE SILO FOR UNLOADING.

Cement Cost Worksheet

Cement Volumes (per bag)

Specific Gravity	3.15
Absolute Volume Factor (lb/ft3)	62.4
Absolute volume (lb/ft3)	196.56
Lbs per bag	94
Lbs per ton	2000
Cement volume per bag (ft3)	0.478

Water Volumes (per bag)

Specific Gravity	1.00
Pounds per gallon (lbs/gal)	8.33
Water per bag cement (gal)	6
Water weight w/ 1 bag cement (lb)	49.98
Absolute Volume Factor (lb/ft3)	62.4
Water volume (ft3)	0.80
Total volume per bag (ft3)	1.279

Cement costs

Cement cost per ton (delivered) ($)	$98.70
Cement cost per 94 lbs	$4.64
Cement/water yield per bag (ft3)	1.279
Mixed cement cost per ft3 ($)	$3.63
Mixed cement cost per yd3 ($)	$97.91

RULES AND REGULATIONS

GOVERNING DRILLING OF WELLS AND APPROPRIATION AND USE OF

GROUND WATER

IN NEW MEXICO

STATE ENGINEER
SANTA FE, NEW MEXICO

1995 EDITION

ARTICLE 4

WELL DRILLERS' LICENSING--CONSTRUCTION, REPAIR, AND PLUGGING OF WELLS

4-1. LICENSE REQUIREMENTS. Only those persons with a valid water well driller's license issued by the State Engineer may drill for underground water within a declared underground water basin. Such licenses shall not be required for the construction of a driven well; provided that the casing for such well shall not exceed two and three-eights (2⅜) inches outside diameter. A driller's license may be acquired by application to the State Engineer. The State Engineer will issue a Water Well Driller's License to any applicant who, in the opinion of the State Engineer, having due regard for the interest of the state of New Mexico in the protection of its public waters, is qualified to conduct such drilling.

4-2. APPLICATIONS--FORMS AND FEES, PERFORMANCE BOND. Application for water well drillers license must be submitted to the State Engineer in quadruplicate on forms furnished by the State Engineer. An application must be accompanied by a filing fee of fifty dollars ($50) and a performance bond in the penal sum of five thousand dollars ($5,000) in a form and with surety approved by the State Engineer. The bond will be conditioned that the applicant will comply with the laws of the state of New Mexico and the rules and regulations of the State Engineer in the drilling of water wells. The license shall be valid only so long as the bond remains in effect.

4-3. DRILLING DEFINED. Drilling, deepening, repairing, cleaning, or plugging of a well requiring the use of a well rig is "drilling" within the meaning of these rules and regulations and can only be performed by a licensed driller.

4-4. LICENSE--ACTIVITIES PERMITTED--AMENDMENT. The Water Well Driller's License will show what activities the driller named therein is authorized to perform. Provided, however, any holder of a current license may file an application to have his license amended to include other activities. Forms for this application are available in the State Engineer Office. A filing fee of five dollars ($5) must be submitted with this application.

4-5. DRILLERS' IDENTIFICATION CARD--LICENSE NUMBER AND EXPIRATION DATE ATTACHED TO WELL RIG. Each licensee when drilling in a declared underground water basin must have available for inspection upon request his pocket identification card which will be issued with the license by the State Engineer. A licensee must attach, in plain sight, to any well rig he is operating within a declared underground water basin a card showing his license number and the expiration date of the license. Such cards are issued by the State Engineer to current license holders. The licensee's name and address, in legible letters not less than one and one half (1½) inches in height, shall be conspicuously displayed on any drill rig under the licensee's control which is being operated within a declared underground water basin.

4-6. LICENSES--DURATION--RENEWALS. Licenses are granted for periods of two (2) years. A licensee may renew his license by making application to the State Engineer before the expiration of his current license. Application forms for renewals are available at the State Engineer Office and must be submitted in quadruplicate with a filing fee of twenty dollars ($20). Renewals are also granted for periods of two (2) years.

4-7. LICENSES--PERFORMANCE BOND--SURETY--CANCELLATION. If the performance bond supporting the license becomes inoperative, the licensee must immediately cease operations . Sureties must give thirty (30) days written notice to the State Engineer of an intention to cancel a bond. This notice must be by registered mail.

4-8. DRILLING--WHEN PERMISSIBLE--EMERGENCY WELL DRILLING. A licensee may drill, deepen, repair, or clean a well within a declared underground water basin only when:

a. owner of such well has a valid permit from the State Engineer for the work to be performed; or
b. the requirements of Article 2-1.1 are met. The licensee must assure himself that the statutory requirements have been met.

4-9. LICENSED DRILLERS--FILING OF OWNERSHIP OF WELL RIGS--TRANSFER OF OWNERSHIP--DESCRIPTIONS. Each licensed water well driller shall file with the State Engineer a current description of each well rig owned or controlled by him. Whenever a licensee severs his ownership or control of a well rig, he shall notify the State Engineer in writing of such severance within ten (10) days. Whenever a licensee acquires ownership or control of a rig, he shall submit to the State Engineer in quadruplicate a full description of said equipment. The licensee shall submit a photograph (side view) of the rig.

4-10. SUSPENSION OR REVOCATION OF DRILLER'S LICENSE--GROUNDS. The State Engineer may, after notice and hearing, suspend or revoke a driller's license if he finds that said driller:

a. has made a material misstatement of facts in his application for a license;
b. has made a material misstatement of facts in a well record report;
c. has violated the conditions of his license;
d. has violated any of the rules and regulations of the State Engineer;
e. has failed to submit a well record report (Article 4-11).

4-11. DRILLING RECORD--FORMS--TIME FOR FILING. The well driller shall keep a log of each well drilled, repaired, deepened, cleaned, or plugged, making a current record as the work progresses. A complete and properly executed well record, on the form provided by the State Engineer, shall be filed not later than ten (10) days after completion of the well.

4-12. SOIL FORMATION SAMPLES. The well driller shall, when so requested by the State Engineer, furnish (in sample bags supplied by the State Engineer) samples of the

formations encountered during drilling operations. The method and interval of sampling and the quantities required will be specified by the State Engineer.

4-13. WELL CONSTRUCTION. Every well shall be constructed with an opening of at least three fourths (¾) inch in diameter in the casing above ground level to allow a measuring line to be inserted between the outside casing and the pump column, in order that the water level in the well may be measured. A removable cap shall be provided for such openings.

4-13.1. CAPACITY MEASUREMENTS -- DISCHARGE PIPE -- TURNOUT -- APPROVED CAPACITY. In order that capacity measurements may be made, all pumps other than those connected directly into an underground system shall have a discharge pipe unrestricted for at least five (5) diameters in length from the flange of the pump, elbow, or other obstruction. Those connected to an underground system shall have a turnout at the well into which the entire flow can be diverted with an unrestricted pipe as above. This turnout may be equipped with a valve or removable cap. Flowing wells must be equipped with a discharge pipe as described above and a cap or valve approved by the State Engineer.

4-14. SHALLOW WELLS--CONSTRUCTION--REPAIR--PLUGGING. The State Engineer has not adopted any general specifications for the construction, repair, or plugging of non-artesian or shallow wells. Any specific requirements and provisions made by the State Engineer shall be set forth in the permit. Application for Permit to Repair is required for all repair work, cleaning, scaling, deepening, modification of casing, or other work requiring the use of a well rig. Any specific requirements or conditions governing the repair will be set out in the approval of the permit. If plugging is required (Article 2-13), shallow wells shall be plugged by filling to the ground surface or, if the casing is not to be removed, by welding a steel plate or cap to the casing.

4-15. ARTESIAN WELLS--CONSTRUCTION. The casing for artesian wells shall be inspected by the State Engineer or his representative and shall meet or exceed the specifications as set forth in 4-15.1. All casing and collars must be in good condition. A standard casing shoe shall be used in all instances. The casing shall not be perforated in a manner that would allow the commingling of water from the artesian formation with water in overlying formations.

4-15.1. CASING AND COUPLING--API TABLE OF SPECIFICATIONS. Only threaded casing shall be used. Casings and couplings shall meet minimum American Petroleum Institute (API) specifications for the following sizes:

Outside Diameter Inches	Weight With Couplings (lbs/ft)	Wall Thickness Inches	O.D. Inches	Coupling Length Inches	Threads Per Inch	Grade Of Casing
4½	9.50	0.205	5.000	5	8	F-25
5½	13.00	0.228	6.050	6¾	8	F-25

Outside Diameter Inches	Weight With Couplings (lbs/ft)	Wall Thickness Inches	O.D. Inches	Coupling Length Inches	Threads Per Inch	Grade Of Casing
6	15.00	0.238	6.625	7	8	F-25
6⅝	17.00	0.245	7.390	7¼	8	F-25
7	17.00	0.231	7.656	7¼	8	F-25
7⅝	20.00	0.250	8.500	7½	8	F-25
8⅝	24.00	0.264	9.625	7¾	8	F-25
9⅝	29.30	0.281	10.625	7¾	8	F-25
10¾	32.75	0.279	11.750	8	8	F-25
11¾	38.00	0.300	12.750	8	8	F-25
13⅜	48.00	0.330	14.375	8	8	F-25

If casing length exceeds one thousand (1,000) feet, H-grade or better shall be used for thirteen and three-eighths (13⅜) inch casing.

4-15.2. HOLE DIAMETER. In all cases the diameter of the drilled hole shall be at least two (2) inches greater than the outside diameter of the casing.

4-16. CASING--CEMENTING--TESTING. The following specifications shall govern casing, cementing, and testing: the casing shoe shall be welded to the casing to assure proper position. The casing shall be landed on a suitable casing seat in the confining formation overlying the artesian aquifer formation and sufficient oil well cement shall be used to obtain circulation to the surface. When circulation to the surface is not obtained, cement shall be placed to the surface behind the casing. Additives of pozzolanic nature may be used above the casing shoe but shall not exceed fifty per cent (50%) by volume. The addition of calcium chloride and/or gel is permissible but shall not in any case exceed two per cent (2%) each by weight. A sufficient amount of cement without additives shall be used to allow neat cement to seal the casing shoe and rise a minimum of fifty (50) feet above the shoe between the casing and the hole. Cement shall be allowed to set a minimum of forty eight (48) hours before drilling is resumed. Sealing off of the formations shall be checked by a method approved by the State Engineer or his authorized representative.

4-16.1. CEMENTING. Cementing shall be done by the pump and plug method as follows: after the casing has been run and landed, the pump shall be started and mud circulation shall be maintained for at least thirty (30) minutes with the casing raised slightly in order to equalize the mud pressure inside and outside of the casing. A heavy slurry of oil well cement and water shall be mixed and poured into the top of the casing. If additives are used in the slurry, sufficient neat cement (density fifteen (15) pounds per gallon) shall then be added to seal the casing shoe and rise a minimum of fifty (50) feet above the shoe. A casing plug of standard make shall be placed in the casing above the cement and a swedge nipple screwed onto the top of the casing and connected to the mud pump. Then a mud slurry or water shall be pumped into the casing, forcing the cement and casing plug down the casing. A measuring line shall be run behind the plug so that the driller may know its location at all times. When the plug reaches the

point desired above the bottom of the casing, the pump shall be stopped and the casing lowered to the casing seat.

4-17. CASING, CEMENTING--TESTING--APPROVAL. The casing, cementing, and testing programs shall be witnessed and approved by an authorized representative of the State Engineer.

4-18. EXCEPTION TO CASING AND CEMENTING REQUIREMENTS. In those areas of declared artesian basins where the well is drilled into the artesian aquifer, but no confining formation overlying the artesian formation is present, the foregoing requirements for casing and cementing are not applicable and may be altered by receiving written approval of the State Engineer or his representative.

4-19. ARTESIAN WELLS--REPAIR. Before repairs are commenced the well shall first be inspected by a representative of the State Engineer to determine if the condition of the well is such that it may be repaired. When leaks in the casing are found and the casing and well are otherwise in good condition, the well may be repaired by a method approved by the State Engineer. A packer or bridge plug approved by the State Engineer shall be used in all well repairs. An inspection shall be made at the completion of the work to determine if the repair was satisfactory. During each inspection, the hole shall be open to allow the entrance of equipment for well logging and leakage measurement.

4-19.1. PLUGGING. If an artesian well is to be replaced by a new well, it shall be plugged immediately following the completion of the new well. All the work shall be done under the supervision of the State Engineer or his representative, or a representative of the appropriate Artesian Conservancy District who shall designate the amount of cement to be used and the depths at which cement plugs shall be set.

4-20. TEST OR EXPLORATORY WELLS. All test or exploratory wells shall be so constructed, maintained, and operated that each water shall be confined to the aquifer in which it is encountered. All test or exploratory wells penetrating artesian aquifers shall be cased, cemented, and tested as required for the construction of artesian wells (Article 4-15 through 4-18) and the casing shall be landed in the formation underlying the deepest artesian aquifer and cemented through all known artesian aquifers. The casing, as referred to in the artesian well specifications, is designated as the water protection string by the oil industry. If conductor pipe is used, it shall not be removed until after cementing of the casing has been completed. All casing, cementing, and testing programs shall be witnessed and approved by a representative of the State Engineer.

4-20.1. SHOTHOLES--PENETRATION. Shotholes for geophysical exploration shall not penetrate closer than twenty-five (25) feet above any known artesian aquifer under confinement.

4-20.2. ABANDONMENT--PLUGGING. In the event that the test or exploratory well is to be abandoned, the State Engineer shall be notified. Such well shall be plugged in accordance with Article 4-19.1 so that the fluids will be permanently confined to the specific strata in which they were originally encountered.

4-21. MINE LODE DISCOVERY AND DRILL HOLES. Any person drilling a mine lode discovery or mine drill hole to a depth of ten (10) feet or more, who shall encounter or whose drill shall cut into a water body or water bearing strata, shall plug or otherwise construct, maintain, and operate such holes so that any water encountered is permanently confined to the aquifer in which it is found.

4-21.1. DISCOVERY REPORT--FORMS--TIME FOR FILING. Such person, within ninety (90) days from the date of the discovery, shall report to the State Engineer, on forms provided by the State Engineer, the location and depth of the hole, and the method and material used in plugging the hole. If the hole is not plugged, the report shall describe the manner in which it was constructed and is being maintained and operated. The report shall include a log of the hole which is adequate to permit a determination of whether the plugging or construction and operation and maintenance of the drill hole are satisfactory.

4-21.2. ARTESIAN WATER. If artesian water is encountered, the construction, operation, maintenance, or plugging shall be done in accordance with Articles 4-15 through Articles 4-19-1.

4-22. DEVIATIONS FROM SPECIFICATIONS--APPROVAL. Any deviations from the above described casing, cementing, and testing programs must be approved by the State Engineer.

5. Equipment Removal

There is no process equipment planned for the Section 17 site. Section 17 will be in situ wellfield only that will feed the IX satellite on the adjacent Section 8.

6. Wellfield Decommissioning

6.1. Introduction and Description

The Wellfield Decommissioning Budget includes the cost estimates for removing wellfield equipment from the Churchrock Section 17 site. All equipment used to circulate leach solution such a pumps and piping is assumed to be contaminated for the purpose of developing the budget and would be disposed in an U.S. NRC licensed waste disposal facility. All structures are considered non-contaminated and would be disposed of in a landfill.

After ground water restoration is complete, all well houses, header houses, laterals, and pipelines will be removed. The budget contemplates costs for disassembly, or demolition, loading, transportation and disposal at a NRC licensed facility[43] or to the Red Rock landfill. Any vegetation, which has been disrupted, will be disked and re-seeded.

6.2. Budget Assumptions

The Wellfield Decommissioning Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with break down, excavation, removal, loading, transportation and disposal costs.

Lateral and piping lengths were estimated from the COP schematic Figure 1.4-8. Unit cost calculations are shown in Attachment E-6-2. Well tubing decommissioning costs assumed nominal tubing lengths of 600 feet and 40 existing wells. This quantity of wells is what is needed to supply adequate water to the restoration operations. Other wellfield O & M costs are covered in the groundwater restoration budget.

The Wellfield Decommissioning Budget was developed with the assumption that all labor is contracted at a rate of $120 per day or $15 per hour. These are reasonable contract labor rates. Estimate labor time requirements are based on best professional judgment. Management will be provided from the site staff who will be available seven months after groundwater restoration is complete.

After all of the wellfield equipment is removed the entire wellfield area will be surveyed to assure that no residual contamination remains on the soil. Surveys will be conducted according to the according to the Procedure shown in Attachment E-6-2, and the hot spots are picked up and disposed of at a NRC licensed facility. The on site management described above would conduct these surveys.

Piping will be reduced in volume as indicated in the budget. Pipe volume calculations are shown in attachment E-6-2. The smaller diameter wellfield pipe and well tubing will be crushed.

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[43] For the purpose of this RAP, HRI assumed that the NRC licensed site would be the IUC White Mesa Mill near Blanding Utah. Projected unit disposal costs at the White Mesa Mill and the Red Rocks landfill are described in Attachment E-5-2.

ATTACHMENT E-6-1
WELLFIELD DECOMMISSIONING BUDGET

Section 17 Wellfield Buildings and Equipment Removal and Disposal

	Description	Unit	Total
I.	**Wellfield Piping**		
	Assumptions:		
	Total length of piping (ft)	38770	
	Labor included in per foot costs		
A.	Removal and loading		
	Wellfield piping removal unit cost ($/ft of pipe)	0.36	
	Subtotal wellfield piping removal and loading costs	$13,957	
B.	Pipe crushing		
	Number of operators	2	
	Operator hourly rate	$15	
	Feet pipe per hour	300	
	Subtotal crushing cost	$3,877	
C.	Transport and disposal costs (NRC-licensed facility)		
	Average diameter of piping (inches)	2	
	Crused volume (ft^3/ft)	0.012	
	Crushed volume total (ft^3)	476	
	Volume for disposal assuming 100% void space (ft^3)	952	
	Transportation and disposal unit cost ($/$ft^3$)	$2.78	
	Subtotal wellfield piping transport and disposal costs	$2,645	
	Wellfield piping costs per wellfield		
	Total wellfield piping costs		$20,480
II.	**Well Pumps and Tubing**		
	Assumptions:		
	Ongoing pump and tubing removal costs included under ground water restoration labor costs		
	40 production wells contain pumps and tubing		
A.	Pump and tubing transportation and disposal		
	Number of production wells	226	
	Number of injection wells	215	
1	Pump volume		
	Number of production wells with pumps	40	
	Average pump volume (ft^3)	1	
	Pump volume per wellfield (ft^3)	40	
2	Tubing volume		
	Assumptions:		
	Average tubing length/wellfield based on average well depth minus 600 feet		
	Number of production wells with tubing	40	
	Average tubing length per well (ft)	600	
	Tubing length per wellfield (ft)	24000	
	Diameter of production well fiberglass tubing (inches)	2	
	Crushed volume reduction (ft^3/ft)	0.012	
	Wellfield pipe volume w 100% void	589	
	Volume of pump and tubing (ft^3)	629	
	Volume for disposal assuming 50% void space (ft^3)	944	
	Transportation and disposal unit cost ($/$ft^3$)	$2.78	
	Subtotal pump and tubing transport and disposal costs	$2,623.14	
	Pump and tubing costs per wellfield		$2,623.14

III.	**Buried Trunkline**		
	Length of trunkline trench (ft)	2250	
	A. Removal and Loading		
	Main pipeline removal unit cost ($/ft of trench)	$0.45	
	Subtotal trunkline removal and loading costs	$1,013	
	B. Pipe cutting		
	Number of operators	2	
	Operator hourly rate	$15	
	Feet pipe per hour	100	
	Subtotal cutting cost	$675	
	C. Transport and disposal costs (NRC-licensed facility)		
	1 10" HDPE trunkline		
	Piping length (ft)	1580	
	Inj and ext length	3160	
	Cut volume (ft^3/ft)	0.14	
	Cut volume (ft^3)	442	
	2 14" HDPE trunkline		
	Piping length (ft)	2250	
	Inj and ext length	4500	
	Cut volume (ft^3/ft)	0.24	
	Cut volume (ft^3)	1067	
	Total trunkline chipped volume (ft^3)	1509	
	Volume for disposal assuming 50% void space (ft^3)	2263	
	Transportation and disposal unit cost ($/$ft^3$)	$2.78	
	Subtotal trunkline transport and disposal costs	$6,292	
	Trunkline decommissioning costs		$7,980
IV.	**Well Houses**		
	Total quantity	40	
	Average well house volume (ft^3)	12.5	
	A. Removal		
	Total volume (ft^3)	500	
	Demolition unit cost per WDEQ Guideline No. 12 ($/$ft^3$)	$0.15	
	Subtotal well house demolition costs	$76	
	B. Survey and decontamination		
	Assumptions:		
	Cost per well house	$5	
	Subtotal Survey and decontamination costs	$200	
	C. Disposal		
	Total volume (yd3)	19	
	Volume for disposal assuming 10% void space (cy)	20	
	Unrestricted disposal cost of 26.7 $/yd3	$27.00	
	Subtotal unrestricted disposal costs	$530	
	Well house removal and disposal per wellfield		$806

VI.	**Header Houses**		
	Total quantity	6	
	Average header house volume (ft^3)	1600	
A.	Removal		
	Total volume (ft^3)	9600	
	Demolition unit cost per WDEQ Guideline No. 12 ($/$ft^3$)	$0.15	
	Subtotal building demolition costs	$1,459	
B.	Survey and decontamination		
	Assumptions:		
	Cost per header house	$200	
	Subtotal survey and decontamination costs	$1,200	
C.	Disposal		
	Total volume (cy) assume 10% building volume	36	
	Volume for disposal assuming 10% void space (cy)	39	
	Unrestricted disposal cost of 26.7 $/yd3	$27.00	
	Subtotal on-site disposal costs	$1,056	
	Header house removal and disposal costs per wellfield		$3,715
V.	**Soil**		
	Assumptions:		
	Acres of wellfield.	28	
	Surveys by staff.		
	Depth of contaminated soil (in)	2	
	Percent of wellfield contaminated	1	
	Soil analysis each	$100	
A.	Survey costs		
	100 soil sample analysis	$10,000	
	Flags, and supplies	$1,000	
	Subtotal survey costs	$11,000	
B.	Disposal costs		
	Backhoe one week	$1,510	
	Volume to disposal	2033	
	NRC disposal unit cost (ft3)	$2.78	
	Subtotal NRC-licensed facility disposal costs	$5,647	
	Wellfield soil D & D costs		$16,647
	TOTAL WELLFIELD BUILDINGS AND EQUIPMENT REMOVAL AND DISPOSAL COSTS		**$52,185**

July 23, 2001

ATTACHMENT E-6-2
BUDGET BACKUP

WELLFIELD PIPING REMOVAL
MAIN PIPELINE REMOVAL
PIPE VOLUMES
REGULATORY GUIDANCE
HRI CLOSEOUT PROCEDURE

WELLFIELD PIPING REMOVAL

Assumptions:

1. Trenching with backhoe at 1500 ft/day
2. Pipeline extraction and backfilling with backhoe at 1500 ft/day
3. Backhoe rental: $750/week
4. Fuel cost: $9/operating hour
5. Backhoe operation requires 1 worker at $15/hour
6. Pipeline extraction requires 2 worders at $15/hour (in addition to trackhoe operator)
7. Operating schedule: 8 hrs/day, 5 days/week

Wellfield Pipeline Removal Costs per ft of Pipe

	Weekly	Daily	Hourly	Per Foot
Equipment & Fuel				
Backhoe	$550.00	$110.00	$13.75	$0.07
Fuel		$72.00	$9.00	$0.05
Labor				
Backhoe operator		$120.00	$15.00	$0.08
Pipeline extractors (2)		$240.00	$30.00	$0.16
Totals			$67.75	
Total Per Foot Cost				$0.36

MAIN PIPELINE REMOVAL

Assumptions:

1. Trenching with trackhoe at 1,500 ft/day
2. Pipeline extraction and backfilling with trackhoe at 1500 ft/day
3. Trackhoe rental: $1600/week
4. Fuel cost: $9/operating hour
5. Trackhoe operation requires one worker at $15/hour
6. Pipeline extraction requires 2 workers at $15/hour (in addition to trackhoe operator)
7. Pipelines removed simultaneously
8. Includes removal of manholes
9. Operating schedule: 8 hours/day, 5 days/week

Main Pipeline Removal Costs per ft of Pipe

Equipment & Fuel	Weekly	Daily	Hourly	Per Foot
Trackhoe	$1,200.00	$240.00	$30.00	$0.16
Fuel		$72.00	$9.00	$0.05
Labor				
Trackhoe operator		$120.00	$15.00	$0.08
Pipeline extractors (2)		$240.00	$30.00	$0.16
Total Per Foot Cost				$0.45

HRI Churchrock Project
Section 17 Wellfield Equipment Tabulation

# H. Houses	# Injectors	# Extractors	# Feet 2"	# Feet 10"	# Feet 14"	Gravel Road
1	21	18	4240	360		
2	21	18	12210	520		
3	19	21	9640	580		
4	23	26	6780	1080		
5	16	30	3150	340		
6	13	18	2750	280		
Totals	113	131	38770	3160	4500	2250

Pipe Wall Volume Data

Outside Diameter (in)	Area Inside OD (ft2)	Wall Volume SDR17 (ft3/ft)
2	0.022	0.012
2.5	0.034	
3	0.049	0.018
3.5	0.067	
4	0.087	
4.5	0.110	
5	0.136	
5.5	0.165	
6	0.196	
6.5	0.230	
7	0.267	
7.5	0.307	
8	0.349	
8.5	0.394	
9	0.442	
9.486	0.491	
9.5	0.492	
10	0.545	0.140
10.5	0.601	
10.75	0.630	
11	0.660	
11.5	0.721	
12	0.785	
12.353	0.832	
12.5	0.852	
13	0.922	
13.5	0.994	
14	1.069	0.237
14.5	1.147	
15	1.227	
15.5	1.310	

	Wall Tk
14 " SDR 17	0.824
10 " SDR 17	0.632

Hydro Resources, Inc.

PLANT SIGHT AND WELLFIELD CLOSEOUT AND REQUEST FOR LICENSE TERMINATION

Purpose

This document is HRI's Standard Procedure for sampling, surveys, and documentation methods for the final decontamination of the Churchrock/Crownpoint sites and is intended to be an integral part of the Churchrock/Crownpoint sites Churchrock Section 8/Crownpoint Plant Restoration Action Plan.

Standards

The standard by which HRI will measure final decommissioning is the NRC adopted soil limits for radium-226 or radium-228 as described below.

The concentration of radium-226 or radium-228 in soil averaged over any 100 square meters (m^2) shall not exceed the background level by more than:

A. 5 picocuries per gram (pCi/g) averaged over the first 15 centimeter (cm) of soil below the surface; and

B. 15 pCi/g averaged over 15-cm thick layers of soil more than 15 cm below the surface.

Instrumentation

When performing close out surveys, HRI will use a general-purpose survey meter such as a 1-inch by 1-inch sodium iodide probes in conjunction with an appropriate rate meter or other appropriate instrumentation, such as microroentgen meters. The chosen instrument will be appropriately calibrated and a daily efficiency check will be performed to assure the instrument is working properly. Shielding of the instrument may be used to eliminate background interference of measurements. All measurements will be taken at ground surface.

Survey and Sampling Procedures

A. Preliminary Survey Design

A grid spacing of 10 meters will be used on all affected areas. The survey technician along the entire length of the line will survey each grid line with readings recorded at 10-meter intervals.

Background radiation levels will be established by surveying areas adjacent to the survey area, which are not affected by facility operations. The survey locations, result, date, check source ID, and name of surveyor will be recorded in the field notes. Anomalously high survey readings will trigger sampling of the soil at the "hot spot" [1] location.

Random samples will be collected from the survey area, with a minimum of three samples per acre. Any hot spots found during the first survey iteration will be decontaminated and then resurveyed. The final survey iteration will document the decontamination of those areas found to be contaminated in preceding survey iterations. The purpose of the survey program is to verify that soil limits for radium-226 or radim-228 is not exceeded.

B. Sampling Procedures

HRI's survey and sampling program will cover all areas within the license area including plant sites, previous wellfield locations and those locations adjacent to previous wellfields. During the first iteration of the close-out survey HRI will obtain a number of meter readings in the field, accompanied by soil samples at the same location to be analyzed in the laboratory for radium 226. Meter readings and soil samples taken at regular increments over the range found at the sight will be obtained.

Soil sample locations will be staked and marked for subsequent reference as necessary. The samples will be cored using a 4-inch barrel auger to a depth, as measured in place, of 0-15 cm. Where appropriate, a second lift will be taken to a depth, as measured in place, of 15-30 cm. Any vegetation and stones will be removed and the soil will be placed in a ziploc bag with the project site, project area, date, time, sampler, sample type, and sample ID clearly marked.

Cross contamination of the soil samples will be prevented by cleaning the auger after bagging each soil core.

Chain of Custody, recording the information on the label and any field measurements, or other data will be completed and then the samples will be delivered to a commercial laboratory.

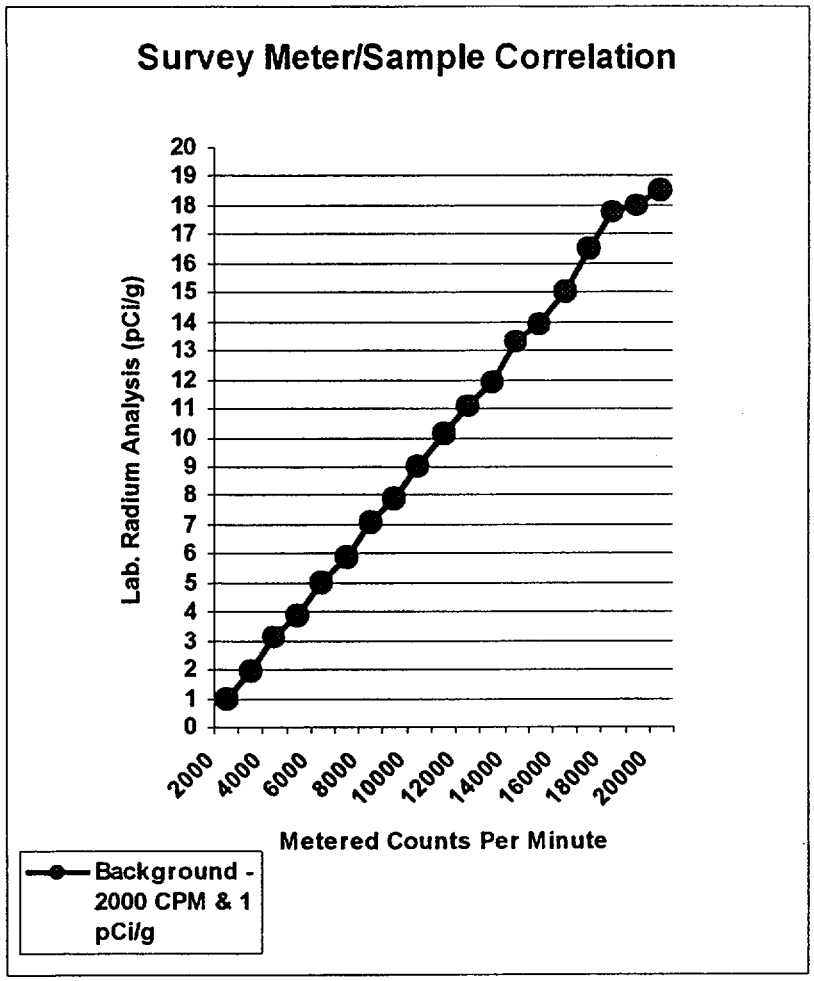
Following laboratory analysis, the meter readings and the laboratory results will be compared as shown in the hypothetical example below. With the laboratory and survey site correlation available, HRI will develop a calibration curve for the purpose of determining what levels of activity measured by survey meter correspond to actual concentration in soil. Hypothetical data and the resulting calibration curve are shown

[1] A hot spot is considered to be an area with a reading equal to or greater than the background multiple based on correlation of the laboratory instrument readings or an area with a radionuclide concentration sufficiently high such that the average for the 100-m2 area will exceed the soil contamination limits.

below. Site data will define the actual remediation targets, however based on past experienced it is anticipated that survey meter gamma radiation levels that are 2 – 3 times background will indicate Ra-226[2] levels above levels 5-pCi/g and trigger further remediation effort.

CPM	Ra-226 pCi/g	X-Bkg.
2000	1	1
3000	1.9	1.5
4000	3.1	2
5000	3.9	2.5
6000	5	3
7000	5.9	3.5
8000	7.1	4
9000	7.9	4.5
10000	9	5
11000	10.1	5.5
12000	11.1	6
13000	11.9	6.5
14000	13.3	7
15000	13.9	7.5
16000	15	8
17000	16.5	8.5
18000	17.8	9
19000	18	9.5
20000	18.5	10

HRI will average the concentrations of radium-266 over the first 15 cm of soil below the surface in a l00-m^2 area. In soil more than 15 cm below the surface, the concentrations may be averaged in 15-cm layers in a 100-m^2 area. HRI will, at a minimum, sample the initial 15-cm layer (0-15 cm) and the second 15-cm layer (15-30 cm) if concentrations in the initial 15-cm layer indicate deeper sampling is necessary. A minimum of five samples from each layer will be collected within the 100- m^2 area and composited for analysis.



When sampling a contaminated area, which is less than 100 m^2, the hot spot will be sampled as part of a single 100-m2 area. If contamination occurs in long narrow strips, 1 meter wide or less, HRI may divide the contaminated area into more than one sampling area of 100 m^2 each. The dimensions of the sampling area will not be narrower than 5 meters on any boundary.

All areas, which are surveyed and sampled, will be accurately identified on a scaled map of both the Churchrock and Crownpoint sites. The site plan will include, but not be limited to, accurate property boundaries, fences, all state, county, and private roads, location of all existing facilities, delineation of all wellfields, a north arrow, the related graphic scale, and all pertinent information found in typical site plans. A qualified laboratory will analyze all samples.

Request For NRC Confirmation Survey and Sampling

When the HRI is confident that the Churchrock and Crownpoint sites are acceptable for release for unrestricted use, a written request asking for release for unrestricted use will be submitted to the NRC. The information discussed above will be submitted in a comprehensive report accompanied by survey and sample results that show that contamination is less than the limits specified above

The report with the request asking for release for unrestricted use will contain the following information.

A. A scaled survey map as described above, which provides coordinates of the area surveyed.

B. A narrative describing the conditions before decommissioning.

C. A narrative describing each phase of the cleanup as follows:

1. Churchrock wellfield - surveyed areas, recorded results, decontaminated hot spots, disposed of contaminated soil, final conditions.

2. Churchrock Satellite –equipment decontaminated, removed and disposed, break-up pad discussion, decontamination of pad discussion, dispose of clean concrete, disposed contaminated material resulting from pad cleanup (including equipment), survey of plant area, decontaminated soil in plant area and soil which was beneath the pad, disposal of contaminated soil.

d. Crownpoint Process Plant –equipment decontaminated, removed and disposed, break-up pad discussion, decontamination of pad discussion, dispose of clean concrete, disposed contaminated material resulting from pad cleanup (including equipment), survey of plant area, decontaminated soil in plant area and soil which was beneath the pad, disposal of contaminated soil.

e. Zamzow Wellfield - surveyed areas, recorded results, decontaminated hot spots, stockpiled and/or disposed of contaminated soil, final conditions.

4. Any unusual or other discussion topics.

DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND QUALITY DIVISION

GUIDELINE NO. 12

STANDARDIZED RECLAMATION PERFORMANCE BOND FORMAT AND COST CALCULATION METHODS

TABLE OF CONTENTS

INTRODUCTION

This document is a Guideline only. Its contents are not to be interpreted by the applicant/permittee or Wyoming Department of Environmental Quality (WDEQ) staff as mandatory. This Guideline intends to assist applicants/permittees in understanding and attaining the requirements of the Wyoming Environmental Quality Act (WEQA) and Land Quality Division (LQD) Rules and Regulations addressing bonding topics.

This Guideline was developed as a joint project of the Wyoming Mining Association (WMA) Reclamation Subcommittee and the LQD. The LQD has and intends to selectively and periodically publish updated versions of the Cost Calculation Methods as contained in the various Appendices.

APPLICABLE WEQA STATUTES AND LQD RULES AND REGULATIONS

This is a general summary of items from the WEQA.

W.S. §35-11-417:
Outlines some general provisions applying to initial bond and renewal bond values. This statute outlines the concept of Partial Bond Release.

W.S. §35-11-418:
Outlines acceptable bond vehicles.

W.S. §35-11-423:
Outlines procedures for bond release for coal and other mineral permittees.

W.S. §35-11-411(d):
Authorizes the WDEQ Director to establish the bond amount based upon information submitted in the annual report, an inspection and other materials.

These items in LQD Rules and Regulations have some applicability to bonding.

Coal Rules and Regulations, Chapter 1, Section 2.(k) and Noncoal Rules and Regulations, Chapter 1, Section 2.(i) defines bond.

Coal Rules and Regulations, Chapter 2, Section 3.(b)(xxi) requires that shared structures be cross-referenced in the bonds of applicable coal permittees.

Coal Rules and Regulations, Chapter 4, Section 2.(d)(ix) establishes a minimum ten (10) year bond period for coal permittees.

Coal Rules and Regulations, Chapter 11 and Noncoal Rules and Regulations, Chapter 6 outlines definitions and procedures for the self-bond program.

Coal Rules and Regulations, Chapter 12 applies exclusively to coal permittees. Section 2.(a) defines the Area and Incremental Bonds. Section 2.(b) elaborates further bond data requirements. Section 2.(d) explains the liability areas and periods for the Area and Incremental Bonds. Section 2.(e) distinguishes among and establishes procedures for bond adjustments versus bond reductions versus partial bond releases. Sections 2.(f) through (h) address requirements for specific bond vehicles.

Coal Rules and Regulations, Chapter 14, Section 4. and Noncoal Rules and Regulations, Chapter 8, Section 3. require a bond for exploration by drilling.

Coal Rules and Regulations, Chapter 15 outlines procedures for partial or complete release of coal permittee bonds.

Noncoal Rules and Regulations, Chapter 9, Section 2. discusses bond requirements for conversion of a non-coal Small Mine Permit to a Regular Mine Permit.

Coal Rules and Regulations, Chapter 20 and Noncoal Rules and Regulations, Chapter 12 details information on Letters of Credit used as a bond vehicle.

I. COST EXPLANATION FOR ITEMS USED IN STANDARDIZED RECLAMATION BOND COSTS

Equipment sizes (loaders, trucks, scrapers, motor graders, etc.) were selected and agreed upon by the WMA Committee and WDEQ/LQD based on the usual types of equipment contractors normally have available for use. Costs for other equipment may be calculated by using methodologies as shown in this package.

Owning and operating costs were determined, except where noted, by using the Dataquest Cost Reference Guide (DQCRG). The total owning and operating costs have been adjusted in this package to reflect wholesale prices rather than retail. To do this, a ten percent reduction has been made to DQCRG costs.

Costs for the electric shovel and the trucks associated with the shovel were determined from Western Mine Engineering, Inc. Surface Mine Estimator's Guide (Oct. 1997 Version). There was no adjustment factor used for these costs since they are based on actual costs at mining operations in the United States.

A standard efficiency factor of 0.83 is incorporated into all production calculations. The factor accounts for a fifty-minute work hour as recommended by many cost references.

Labor costs were obtained from the Wyoming Department of Transportation, Wage Determination Decision (1997) with an additional 25 percent for benefits, unemployment insurance, social security, etc.

Supervision costs were determined by adding $5.00 per hour to labor costs and also include the 25 percent add-on for benefits, etc. In most cases, only a portion of a supervisor's costs is applied to each task. Theoretically, this allows one supervisor the flexibility to oversee many jobs or pieces of equipment at the same time.

The supervisor's transportation is also divided among tasks. For example, where one-half of a supervisor's time is allotted, the same amount of time is used in calculating his transportation costs.

Where only a portion of support equipment are used in a calculation (i.e., one-half water truck), it is assumed that the equipment in question services more than one area.

Table D-1. Operating Costs and Adjusted Costs ($/Hour w/o Operator) For Equipment in This Standardized Bond Format

Equipment Type	Equipment Name	DQCRG Book Cost ($)	Multi-plier (%)	Adj. Cost ($)	Date
Dozer	Caterpillar D9R (SU)	113.60	90	102.24	3/98
Blade	Caterpillar 16H	72.79	90	65.51	3/98
Scraper	Caterpillar 657E P-P	221.51	90	199.36	3/98
Truck (95 ton)	Caterpillar 777D	170.45	90	153.41	3/98
Loader (13½ yd^3)	Caterpillar 992D	192.26	90	173.03	3/98
Loader (5¼ yd^3)	Caterpillar 980F	64.38	90	57.94	3/98
Dozer	Caterpillar D10R (SU)	148.97	90	134.07	3/98
Dozer	Caterpillar D11R (U)	223.85	90	201.47	3/98
Dozer	Caterpillar D9N (U)	105.11	90	94.60	3/98
Backhoe Loader	Caterpillar 428B (2WD)	16.74	90	15.07	3/98
Water Truck	14,000 Gallon	135.22	90	121.70	3/98
Dump Truck	10-12 yd^3	29.47	90	26.52	3/98
Pickup Truck	Crew 4x4 3/4T (Gas)	9.74	90	8.77	3/98
Pickup Truck	Crew 4x4 3/4T (Diesel)	7.85	90	7.07	3/98
Tractor	MF 50EX 4WD 74 H.P.	9.11	90	8.20	3/98
Towed Mower	Flail 7 ft	1.28	90	1.15	3/98
Rubber Tired Dozer	Caterpillar 834B	96.00	90	86.40	3/98
Scraper	Caterpillar 637E P-P	169.05	90	152.15	3/98

Table D-1a. Purchase Price, Lease Cost, and Operating Costs for 56 CY Electric Shovel and 793C Trucks

Operators that use the truck/shovel appendix must show a regrading plan that is suitable for a large shovel/truck operation. Many backfill operations are not suited for this type operation because the cuts are not thick enough to allow the shovel optimum digging depths, highwall reduction with dozers takes up a large percentage of the required backfill, and there is insufficient backfill to justify this large shovel/truck fleet.

Operators using the shovel/truck appendix should submit suitable cut and fill isopachs that support the choice of this backfill method.

This method is not to be used for topsoil movement from native areas or from stockpiles.

The $7,988,916.00 purchase price of the 56 CY shovel must be added to the bond costs. There is no profit or other contingency items added to this cost so it can be added to the bond cost after all the line items and add-ons have been totaled. No salvage value is allowed at the end of the project.

56 CY Electric Shovel

Purchase Price $7,988,916.00 (WME)

Productivity - 56 CY x 1 pass/35 sec. x 3,600 sec./hr. x 0.968 bucket fill factor = 5,576 CY/hr.
5,576 CY/hr. x 0.8696 BCY/LCY (15% swell of BCY) = 4,849 BCY/hr.
4,849 BCY/hr. x 0.8333 (operating efficiency) = 4,040 BCY/hr.

Hourly Costs (WME)

Parts	Maint. Labor	Elect.	Lube	Total
$55.94	$46.23	$123.64	$22.83	$248.64

Caterpillar 793C Trucks (240 Ton)

Purchase Price	$2,539,800.00 (WME)
Monthly Lease (@600 hr./month)	$45,000.00
Hourly Lease Cost	$75.00

Hourly Costs (WME)

Parts	Maint. Labor	Fuel	Lube	Tires	Total
$23.04	$16.32	$26.05	$16.80	$35.94	$118.15

Table D-2. Abbreviations Used in This Standardized Bond Format

CPH -	Caterpillar Performance Handbook (Edition No. specified where appropriate)
DQCRG -	Dataquest Cost Reference Guide (date of data indicated)
WYDOT-WDD -	Wyoming Department of Transportation - Wage Determination Decision (1997 Version)
WME -	Western Mine Engineering, Inc. (Oct. 1997 Estimating Guide)
BCY -	Bank Cubic Yard
LCY -	Loose Cubic Yard
MPH -	Miles Per Hour
BHB -	Black Hills Bentonite Corporation
AML -	DEQ Abandoned Mine Land Reclamation Program

II. STANDARDIZED RECLAMATION BOND FORMAT

Individual items may be expanded as necessary or noted as not applicable based upon the specific reclamation practices approved in each permit.

A. Area Bond

The Area Bond covers the costs of backfilling and rough grading (and special reconstruction techniques when specifically approved) according to procedures and postmining topography approved in the current term permit.

1. Introduction

Present a general discussion of assumptions, calculations, procedures, methods, etc. for summarizing or documenting calculations.

2. Backfill

Describe equipment, procedures, volumes, and costs for bringing all pits to an interim/bond topography with reference to a quality, current map of the project site. <u>The interim/bond topography must come as close as possible to the approved final topography, acknowledging that the current mine site differs from the final configuration.</u>

Appendices A through F detail equipment fleets and costs for this reclamation activity.

Operators should clearly show cut and fill areas and the associated haul distances and grades on a map.

This section should clearly list overburden Drilling and Blasting cost at $0.10/BCY when applicable.

3. Rough Grade Backfill

Describe procedures and costs for shaping interim/bond topography with reference to a quality map. NOTE: Depending upon permit approved backfill practices, rough grading may not be a necessary line item bond cost.

Appendices G and M detail equipment and costs for this reclamation activity.

4. Final Grade Backfill

Describe equipment, procedures, and costs for specific site tasks (e.g., drainage reconstruction or permit-specific postmining features).

Appendix G details equipment and costs for this reclamation activity.

B. Incremental Bond

1. Introduction

The Incremental Bond covers all other costs beyond those detailed in the Area Bond.

Present a general discussion of assumptions, calculation procedures, methods for summarizing or documenting calculations, etc.

2. Native Topsoil Removal From Borrow and/or Backslope Areas

If applicable, describe equipment, volumes, haul routes, and costs with reference to a quality, current map of the project site.

Appendices A, B, C, E, F and G detail potential equipment and costs for this reclamation activity.

3. Native Overburden Removal From Borrow and/or Backslope Areas

If applicable, describe equipment, haul routes, volumes, and costs with reference to a quality, current map of the project site.

Appendices A through G detail potential equipment and costs for this reclamation activity.

4. Miscellaneous Overburden Redistribution

Describe equipment, haul routes, volumes, and costs (with reference to a quality map) for backfilling structures, such as:

- scoria or shale pit(s)
- diversion ditches
- access/haul road cut or fill
- railroad cuts/embankments
- sediment ponds
- sewage lagoons
- culverts
- other

Appendices A through G (excluding D) detail potential equipment and costs for this reclamation activity.

5. Demolition

Equipment, procedures, and costs for demolition and disposal of each individual structure should be described in terms of size, type of construction, etc. so that appropriate demolition costs can be estimated, such as:

- fences
- power lines, transformers
- hard-surfaced roads
- bridges
- abandoned equipment (i.e., draglines, shovels, drills and pieces of same)
- culverts
- railroads (rails, ties, ballast, scales, etc.)
- facility buildings (shops, warehouse, offices, etc.)
- mineral handling facilities (truck dumps, conveyors, silos, scales, etc.)
- support facilities (ready line, fuel tanks, water tanks, equipment yards, explosive storage sites, electrical substations)

Appendices H through K contain costs for these reclamation and demolition practices.

6. Removal of Monitoring Structures and Other Miscellaneous Items

Describe the procedures, equipment, and costs required to properly abandon or remove and disposal of items, such as:

- groundwater monitor wells
- all other operator-owned wells within the permit area
- surface water monitoring stations
- all other experimental study sites within the permit area
- meteorological/air quality monitoring sites

Appendices L through O detail equipment and costs for these reclamation practices.

7. Scarification or Ripping of All Compacted Surfaces

Describe equipment, procedures, and costs (preferably on a per acre basis) with reference to a quality, current map of the project site.

Appendices H and P detail costs for this reclamation practice.

8. Topsoil Redistribution on All Disturbed Areas

Describe equipment, procedures, and costs with reference to a quality, current map of the project site. The map should show haul distances and grades.

Appendices B and C detail equipment and costs for this reclamation activity.

9. Revegetation of All Disturbed Areas

Describe equipment, practices, and costs (preferably on a per acre basis), including:

- seedbed preparation
- mulch (purchase and application)
- seed (purchase and application)
- fertilizer (if required, purchase and application)
- post-seeding maintenance over the minimum bonding period (e.g., weed control, mowing, interseeding). Operators suggest that a ten percent line item should cover this issue for the entire bonding period.

Appendix Q outlines a cost calculation process for this reclamation activity. The costs must be calculated using the specific seed mixes and practices from the approved term permit.

10. Reclamation Status and Bond Liability Status of All Lands Within the Permit Area

a. Land Status Categories

The bond calculation should describe the status of all lands within the permit area. Each land status category should be clearly identified on a quality map and cross-referenced to specific reclamation cost for each category. The LQD also prefers a tabular summary of the acreage for each category.

LANDS THAT HAVE BEEN TOPSOILED AND SEEDED BUT HAVE NO BOND RELEASE MUST BE BONDED FOR RETOPSOILING, SCARIFICATION, AND REVEGETATION. [see Section 10.b.(2)(b)i)e) on page 10]

The following is a summary of generic land status categories. Section 10.(2) below details the information and calculations necessary for each of these categories.

(1) Native lands undisturbed at the time of this specific bond calculation and which will remain undisturbed under this bond calculation (e.g., no borrow areas necessary).

(2) Lands disturbed and requiring backfilling, regrading and revegetation at the time of this specific bond calculation.

(a) Lands requiring assessment of Area Bond costs

(b) Lands requiring assessment of full or Incremental Bond costs

(c) Lands requiring assessment of partial Incremental Bond costs

i) Lands permanently reclaimed prior to December 31, 1982

ii) Lands permanently reclaimed after December 31, 1982

a) Lands with no approved Partial or Full Bond Release

b) Lands with approved 60 percent Partial Release of the Incremental Bond

c) Lands with approved larger percent Partial Release of the Incremental Bond

d) Lands with approved Full Release of Area and Incremental Bonds

b. Line Item Bond Costs

(1) The bond covers lands currently disturbed by mining and associated activities and those lands to be disturbed in the next 12-month period.

(2) The bond should include costs for the Area Bond (through backfill, rough and final grading) for all open pits, impoundments, sediment ponds, diversions, etc.

(a) Section E.1 of this Guideline and its associated appendices detail procedures and costs for the Area Bond. The bond calculation should detail costs for the operations listed in Sections E.1.B.), C) and D).

(b) Section E.2 of this Guideline and its associated appendices detail general categories and procedures for the Incremental Bond. Overall, the bond calculation should detail costs for the operations listed in Sections E.2.B) through I).

i) The bond calculation should assess the full suite of Incremental Bond tasks and costs for all disturbed lands which have no formally approved partial or full release of the Incremental Bond.

Historic LQD Administrator policy, LQD Coal Rules and Regulations Chapter 15 and W.S. §35-11-417(e) establish three (3) distinct categories of Partial Bond Release for permanently reclaimed lands.

a) Lands Permanently Reclaimed Prior to December 31, 1982

Prior to this date and prior to approval of the Wyoming State Coal Program, the LQD Administrator granted de facto Partial Bond Release for permanently reclaimed lands.

The LQD did not specifically approve or otherwise record this Partial Bond Release category, so there is generally no written approval letter.

The bond should specifically identify this Partial Bond Release category if it exists.

The bond should include a carry-over cost assessment for interseeding an appropriate, permit-approved seed mixture on these lands. These carry-over costs should include seed purchase and seed implantation.

b) 60 Percent Partial Bond Release

LQD Coal Rules and Regulations Chapter 15, Section 5.(a)(i) allows for release of 60 percent of the Incremental Bond when the permittee has completed backfilling, regrading, topsoil replacement, and drainage control according to the approved term permit procedures.

This category of Partial Bond Release requires formal, written approval by the DEQ Director. If this release category exists for your specific permit, the bond calculation should include the date of the Director's approval letter.

The bond calculation should specifically identify this category and show the appropriate units on a quality map.

The bond calculation should specifically tabulate the residual 40 percent Incremental Bond costs (preferably on a per acre basis) as the appropriate carry-over cost assessment. As noted above, the Incremental Bond includes all term permit approved Reclamation Plan practices beyond rough grading of the backfill. The tabulation of the 40 percent Incremental Bond carry-over costs should detail all approved reclamation practices.

c) Larger Percentage of Partial Bond Release

LQD Coal Rules and Regulations Chapter 15, Section 5.(a)(ii)(A) allows more than 60 percent release of the Incremental Bond as determined by the LQD Administrator and DEQ Director.

W.S. §35-11-423(d) mandates development of specific rules and regulations for release of coal bonds. These rules are controlling not withstanding other provisions of W.S. §35-11-417 and §35-11-423 to the contrary.

LQD Coal Rules and Regulations, Chapter 15 is that formulation.

Coal Chapter 15 governs partial and 100 percent release of the Incremental Bond. For partial release, the amount remaining cannot be less than the cost of reseeding.

This category of Partial Bond Release requires formal, written approval by the DEQ Director. If this release category exists for your specific permit, the bond calculation should identify the date of the Director's approval letter.

The bond calculation should specifically tabulate the residual percentage Incremental Bond costs (preferably on a per acre basis) as the appropriate carry-over cost assessment. As previously noted, the Incremental Bond includes <u>all</u> term permit approved Reclamation Plan practices beyond rough grading of the backfill. The tabulation of the percentage Incremental Bond carry-over costs should detail all approved reclamation practices.

NOTE: The percentages of partial release of the Incremental Bond vary for Noncoal Permittees. A Noncoal Permittee seeking partial release should consult with the LQD.

d) Full Bond Release of the Area and Incremental Bonds

This category includes all land permanently reclaimed <u>and</u> formally released under provisions of the 1973 Environmental Quality Act and LQD Coal Rules and Regulations Chapter 15.

Full Bond Release requires formal, written approval by the DEQ Director. If this category exists for your specific permit, the bond calculation should list the date of the DEQ Director's Full Bond Release decision.

e) Lands Permanently Reclaimed After December 31, 1982

This category includes all land permanently reclaimed that has no bond release.

These reclaimed lands must be bonded to scarify, retopsoil, and reseed. There are no provisions made for where the topsoil would come from. It is assumed that topsoil would be spread at the same average depth on these lands as it is on the rest of the areas requiring topsoil. Topsoil haul distance and grade used would be the weighted average used for the rest of the reclamation. Scarification and reseeding costs would be the same per acre as those used on other lands requiring reclamation.

NOTE: The DEQ/LQD continues development of a DRAFT Guideline on Full and Partial Bond Release Procedures. Please consult with the LQD concerning the status of that Guideline, should you consider bond release for permanently reclaimed lands.

11. Coal Drilling

Describe the approximate number, depth, diameter, and location (show on inclusive map, if possible) of all holes drilled into or through coal during the current and next annual report period. A tabular format with reference to map locations may be an efficient presentation. This description should distinguish between coal drill holes which will be or have been removed by the pit advance within the annual report period versus those coal drill holes which will not be mined out in a report cycle. The operator may distinguish between abandonment/plugging procedures for the coal drill holes mined out in the report cycle versus the longer term abandoned holes. Each category should have a total line item cost entry in the bond. The LQD prefers that all coal drill hole reclamation costs be estimated according to Appendices L and M.

12. Miscellaneous Items

Each individual operator should identify these items as a line item or include each in some specific bond category. Otherwise, the LQD will enter the item as an addition to total dollar value of the Area and Incremental Bonds.

a. COSTS FOR AN INDEPENDENT FIRM TO DESIGN THE FINAL RECLAMATION PROJECT: All design and engineering work (including field and office time) through production of construction documents should be included under this heading. At the least, some surveying and redesign of the operator's reclamation plan to fit the current situation would be required. Reference sources place this category at 2 to 6½ percent of the total bond cost. LQD typically uses 3 percent.

b. CONTRACTOR PROFIT, OVERHEAD, MOBILIZATION AND DEMOBILIZATION COSTS: The Dataquest Cost Reference Guides used to construct the appendices do not include these costs. If an operator uses these appendices in bond calculations, there is still a need for this distinct line item cost in the bond. Assorted references place these items from 8 to 15 percent of the total bond cost. Presently LQD is using 10 percent.

c. PRECONSTRUCTION INVESTIGATION AND STABILIZATION: This item addresses all field work necessary to document and mitigate dangerous and/or quickly deteriorating conditions, such as slumping highwalls or drainage problems. Any assessment under this item will be based upon the LQD's knowledge of specific site conditions and the length of time between cessation/forfeiture and initiation of the final reclamation project. When necessary, reference sources place this cost at 1 to 2 percent. LQD is using 1 percent.

d. COSTS FOR AN INDEPENDENT FIRM TO MANAGE THE FINAL RECLAMATION PROJECT: This category includes complete oversight of all demolition, construction, and reclamation activities. Probable tasks would include supervision of earthmoving and reclamation, construction surveying, and soil sampling. References place this cost at 3 to 4 percent. LQD uses 3 percent.

e. COSTS FOR ON SITE MONITORING PROGRAMS FOR TEN YEARS AFTER COMPLETION OF THE FINAL RECLAMATION PROJECT (INCLUDES SUCH ITEMS AS UTILITIES AND GROUNDWATER SAMPLING): Costs of this item will vary depending upon specific permit commitments. The LQD uses a range of 1/2 to 2 percent. Usually LQD uses 0.5 percent.

f. COSTS FOR SITE SECURITY DURING THE FINAL RECLAMATION PROJECT AND LIABILITY INSURANCE COST DURING THE FINAL RECLAMATION PROJECT AND OVER THE FULL BONDING PERIOD: References place this cost at about 1 percent of the total bond amount.

g. LONG-TERM ADMINISTRATION AND ACCOUNTING COSTS: After completion of a major reclamation project, a minimum of five years (non-coal permits) or a minimum of ten years (coal permits) will expire before the LQD can move for final bond release. The LQD will incur additional administrative costs during this extended period. The scale of some coal reclamation projects may necessitate employment of an outside contractor.

   The LQD uses a range of 1 to 2 percent for this category depending upon the scale and complexity of the reclamation and post-reclamation monitoring projects. Currently LQD uses 2 percent.

h. ANY OTHER SITE-SPECIFIC PERMIT COMMITMENTS SHOULD ALSO BE INCLUDED HERE: Costs will vary according to specific permit commitments.

The LQD has historically used the following sources to establish the range of percentages list in the Miscellaneous Items.

* Means Heavy Construction Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA

* Means Site Work Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA

* Building Construction Cost Data (current edition), published by R. S. Means Company, Inc., Kingston, MA

* Handbook for Calculation of Reclamation Bond Costs, 1987, Department of Interior, Office of Surface Mining Reclamation and Enforcement, Washington, D.C.

Wyoming DEQ Abandoned Mine Land Program contracting and reclamation practices and cumulative experience

13. Unknown Costs

The items under L) represent the usual contingency items applied to bonds. If these items are included as line items in the bond, the only remaining category could be unknown as per W.S. §35-11-417(c)(ii). References place this cost at 2 to 5 percent of the total bond cost. Under normal circumstances LQD is using 4 percent.

14. References

List sources of information, procedures, costs, etc. which were used in the bond calculations.

15. Maps

This Guideline requests that the various tasks, operations, disturbed areas, reclamation areas, etc., be illustrated on or referenced to a QUALITY, CURRENT MAP. Several of the tasks may be illustrated on the same map. All maps presented in support of the bond calculations must be clear and legible contour maps or recent (with date) aerial photographs. The preferred scale is 1"=500', unless it is necessary to directly compare (e.g., overlay) a bond map to an existing permit map. In this case the scales should be identical. Each map should be of a reasonable size, generally no larger than 48" on a side.

Each map must have a complete title block, including:

- Map title
- Name and address of permittee
- Permit number and term designation
- Annual report period
- Scale, north arrow, contour interval, date of photography or date of preparation

All maps must show and clearly label:

- Legal subdivisions with section, township, and range lines
- Permit area boundary and term boundary

III. APPENDICES

The following appendices are intended for use in this standardized bond calculation package. Any references to specific equipment should not be interpreted as a recommendation of any kind by any person, company or agency for the use of specific brand-name equipment.

Appendix A

Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

NOTE: THESE COSTS ARE FOR EXCAVATION ONLY. MATERIAL REQUIRING BLASTING SHOULD HAVE AN ADDITIONAL $0.10/BCY ADDED FOR DRILLING AND BLASTING COSTS.

Material Movement By Loader-Truck Combination

1) Caterpillar 992D Loader	12.1 BCY	CPH 25
2) Caterpillar 777D Trucks (85 ton)	58.8 BCY	CPH 25
3) Material Density	2,850.0 LB/BCY	CPH 25
4) Operating Efficiency Factor (50 Min/Hr)	0.83 %	CPH 25
5) Rolling Resistance Factor	4.00 %	CPH 25
6) 777D Truck Operating Costs	$153.41 Per Hour	90% of DataQuest Cost Reference Guide
7) 992D Loader Operating Costs	$173.03 Per Hour	90% DQCRG
8) Labor Costs	$18.75 Per Hour	WYDOT-WDD
9) 1/2 of 1 - 14,000 Gal. Water Trucks + 1 Operator	$70.23 Per Hour	1/2 of 90% DQCRG
10) 1 - 16H Blade for Road Work + 1 Operator	$84.26 Per Hour	90% DQCRG + Operator
11) 1 - D9R for Misc. Work + 1 Operator	$120.99 Per Hour	90% DQCRG + Operator
12) Supervision Labor Costs	$12.50 Per Hour	1/2 of WYDOT-WDD
13) Supervisor Transportation	$4.39 Per Hour	1/2 of 90% DQCRG
14) Total Fleet Hourly Costs (Except Trucks)	$464.53	

TO USE TABLE: Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

Case #1: Level Ground — Loaded (0% grade + 4% rolling = 4% total resistance) — Empty (0% grade + 4% total resistance)

One-Way Distance (FL)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Loader Productivity (BCY/Hr)	Number of Trucks Required	Oper Cos. ($/BCY)
500	3.50	0.70	0.47	1.10	0.36	6.13	9.8	58.8	479.6	840.0	1.75	$0.91
1000	3.50	0.70	0.78	1.10	0.56	6.64	9.0	58.8	442.8	840.0	1.90	$0.94
1500	3.50	0.70	1.06	1.10	0.74	7.10	8.5	58.8	414.1	840.0	2.03	$0.97
2000	3.50	0.70	1.34	1.10	0.90	7.54	8.0	58.8	389.9	840.0	2.15	$0.99
2500	3.50	0.70	1.60	1.10	1.06	7.96	7.5	58.8	369.3	840.0	2.27	$1.02
3000	3.50	0.70	1.86	1.10	1.22	8.38	7.2	58.8	350.8	840.0	2.39	$1.04
3500	3.50	0.70	2.11	1.10	1.39	8.80	6.8	58.8	334.1	840.0	2.51	$1.07
4000	3.50	0.70	2.37	1.10	1.55	9.22	6.5	58.8	318.9	840.0	2.63	$1.09
4500	3.50	0.70	2.63	1.10	1.71	9.64	6.2	58.8	305.0	840.0	2.75	$1.12
5000	3.50	0.70	2.89	1.10	1.88	10.07	6.0	58.8	292.0	840.0	2.88	$1.14
5500	3.50	0.70	3.15	1.10	2.04	10.49	5.7	58.8	280.3	840.0	3.00	$1.17
6000	3.50	0.70	3.41	1.10	2.21	10.92	5.5	58.8	269.2	840.0	3.12	$1.19
6500	3.50	0.70	3.66	1.10	2.37	11.33	5.3	58.8	259.5	840.0	3.24	$1.22
7000	3.50	0.70	3.92	1.10	2.53	11.75	5.1	58.8	250.2	840.0	3.36	$1.24

Operating Costs = (((# Trucks x (Truck costs + Labor costs)) + Total Fleet costs)/Loader Productivity)

Appendix A (Continued)
Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

Material Movement By Loader-Truck Combination

Case #2: 5% Assisting Grade — Loaded (-5% grade + 4% rolling = -1% total) — Empty (5% grade + 4% rolling = 9% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Loader Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	3.50	0.70	0.38	1.10	0.41	6.09	9.9	58.8	482.8	840.0	1.74	$0.91
1000	3.50	0.70	0.58	1.10	0.68	6.56	9.1	58.8	448.2	840.0	1.87	$0.94
1500	3.50	0.70	0.74	1.10	0.94	6.98	8.6	58.8	421.2	840.0	1.99	$0.96
2000	3.50	0.70	0.89	1.10	1.18	7.37	8.1	58.8	398.9	840.0	2.11	$0.99
2500	3.50	0.70	1.05	1.10	1.43	7.78	7.7	58.8	377.9	840.0	2.22	$1.01
3000	3.50	0.70	1.20	1.10	1.68	8.18	7.3	58.8	359.4	840.0	2.34	$1.03
3500	3.50	0.70	1.35	1.10	1.92	8.57	7.0	58.8	343.1	840.0	2.45	$1.06
4000	3.50	0.70	1.50	1.10	2.17	8.97	6.7	58.8	327.8	840.0	2.56	$1.08
4500	3.50	0.70	1.66	1.10	2.42	9.38	6.4	58.8	313.4	840.0	2.68	$1.10
5000	3.50	0.70	1.81	1.10	2.66	9.77	6.1	58.8	300.9	840.0	2.79	$1.12
5500	3.50	0.70	1.96	1.10	2.91	10.17	5.9	58.8	289.1	840.0	2.91	$1.15
6000	3.50	0.70	2.11	1.10	3.16	10.57	5.7	58.8	278.1	840.0	3.02	$1.17
6500	3.50	0.70	2.27	1.10	3.40	10.97	5.5	58.8	268.0	840.0	3.13	$1.19
7000	3.50	0.70	2.42	1.10	3.65	11.37	5.3	58.8	258.6	840.0	3.25	$1.22

Case #3: 10% Assisting Grade — Loaded (-10% grade + 4% rolling = -6% total) — Empty (10% grade + 4% rolling = 14% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Loader Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	3.50	0.70	0.35	1.10	0.49	6.14	9.8	58.8	478.8	840.0	1.75	$0.91
1000	3.50	0.70	0.52	1.10	0.90	6.72	8.9	58.8	437.5	840.0	1.92	$0.95
1500	3.50	0.70	0.67	1.10	1.31	7.28	8.2	58.8	403.8	840.0	2.08	$0.98
2000	3.50	0.70	0.82	1.10	1.72	7.84	7.7	58.8	375.0	840.0	2.24	$1.01
2500	3.50	0.70	0.97	1.10	2.13	8.40	7.1	58.8	350.0	840.0	2.40	$1.04
3000	3.50	0.70	1.13	1.10	2.54	8.97	6.7	58.8	327.8	840.0	2.56	$1.08
3500	3.50	0.70	1.28	1.10	2.94	9.52	6.3	58.8	308.8	840.0	2.72	$1.11
4000	3.50	0.70	1.43	1.10	3.35	10.08	6.0	58.8	291.7	840.0	2.88	$1.14
4500	3.50	0.70	1.59	1.10	3.76	10.65	5.6	58.8	276.1	840.0	3.04	$1.18
5000	3.50	0.70	1.74	1.10	4.17	11.21	5.4	58.8	262.3	840.0	3.20	$1.21
5500	3.50	0.70	1.89	1.10	4.58	11.77	5.1	58.8	249.8	840.0	3.36	$1.24
6000	3.50	0.70	2.04	1.10	4.99	12.33	4.9	58.8	238.4	840.0	3.52	$1.27
6500	3.50	0.70	2.20	1.10	5.40	12.90	4.7	58.8	227.9	840.0	3.69	$1.31
7000	3.50	0.70	2.35	1.10	5.80	13.45	4.5	58.8	218.6	840.0	3.84	$1.34

Appendix A (Continued)
Calculations for Moving Materials With a Caterpillar 992D Loader and Caterpillar 777D Truck Fleet

Material Movement by Loader-Truck Combination

Case #4: 5% Resisting Grade — Loaded (5% grade + 4% rolling = 9% total) — Empty (-5% grade + 4% rolling = -1% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Loader Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	3.50	0.70	0.66	1.10	0.33	6.29	9.5	58.8	467.4	840.0	1.80	$0.92
1000	3.50	0.70	1.23	1.10	0.50	7.03	8.5	58.8	418.2	840.0	2.01	$0.97
1500	3.50	0.70	1.81	1.10	0.65	7.76	7.7	58.8	377.3	840.0	2.23	$1.01
2000	3.50	0.70	2.38	1.10	0.81	8.49	7.1	58.8	347.9	840.0	2.41	$1.05
2500	3.50	0.70	2.95	1.10	0.96	9.21	6.5	58.8	318.5	840.0	2.64	$1.09
3000	3.50	0.70	3.53	1.10	1.11	9.94	6.0	58.8	294.0	840.0	2.86	$1.14
3500	3.50	0.70	4.10	1.10	1.26	10.66	5.6	58.8	274.4	840.0	3.06	$1.18
4000	3.50	0.70	4.68	1.10	1.42	11.40	5.3	58.8	259.7	840.0	3.23	$1.22
4500	3.50	0.70	5.25	1.10	1.57	12.12	5.0	58.8	245.0	840.0	3.43	$1.26
5000	3.50	0.70	5.82	1.10	1.72	12.84	4.7	58.8	230.3	840.0	3.65	$1.30
5500	3.50	0.70	6.40	1.10	1.87	13.57	4.4	58.8	215.6	840.0	3.90	$1.35
6000	3.50	0.70	6.97	1.10	2.03	14.30	4.2	58.8	205.8	840.0	4.08	$1.39
[illegible]00	3.50	0.70	7.54	1.10	2.18	15.02	4.0	58.8	196.0	840.0	4.29	$1.43
[illegible]0	3.50	0.70	8.12	1.10	2.33	15.75	3.8	58.8	186.2	840.0	4.51	$1.48

Case #5: 10% Resisting Grade — Loaded (10% grade + 4% rolling = 14% total) — Empty (-10% grade + 4% rolling = -6% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Loader Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	3.50	0.70	0.94	1.10	0.33	6.57	9.1	58.8	445.9	840.0	1.88	$0.94
1000	3.50	0.70	1.83	1.10	0.49	7.62	7.9	58.8	387.1	840.0	2.18	$1.00
1500	3.50	0.70	2.72	1.10	0.64	8.66	6.9	58.8	338.1	840.0	2.47	$1.06
2000	3.50	0.70	3.60	1.10	0.79	9.69	6.2	58.8	303.8	840.0	2.77	$1.12
2500	3.50	0.70	4.49	1.10	0.94	10.73	5.6	58.8	274.4	840.0	3.07	$1.18
3000	3.50	0.70	5.38	1.10	1.10	11.78	5.1	58.8	249.9	840.0	3.37	$1.24
3500	3.50	0.70	6.26	1.10	1.25	12.81	4.7	58.8	230.3	840.0	3.66	$1.30
4000	3.50	0.70	7.15	1.10	1.40	13.85	4.3	58.8	210.7	840.0	3.96	$1.36
4500	3.50	0.70	8.04	1.10	1.55	14.89	4.0	58.8	196.0	840.0	4.25	$1.42
5000	3.50	0.70	8.94	1.10	1.71	15.94	3.8	58.8	186.2	840.0	4.55	$1.49
5500	3.50	0.70	9.81	1.10	1.86	16.97	3.5	58.8	171.5	840.0	4.85	$1.55
6000	3.50	0.70	10.70	1.10	2.01	18.01	3.3	58.8	161.7	840.0	5.15	$1.61
[illegible]500	3.50	0.70	11.59	1.10	2.16	19.05	3.1	58.8	151.9	840.0	5.44	$1.67
[illegible]0	3.50	0.70	12.48	1.10	2.32	20.10	3.0	58.8	147.0	840.0	5.74	$1.73

Appendix B

Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

NOTE: DRILLING AND BLASTING COSTS ARE NOT INCLUDED IN THESE CALCULATIONS. THE LQD DOES NOT CONSIDER DRILLING AND BLASTING COSTS NECESSARY WHEN USING APPENDIX C.

Material Movement By Scrapers

1) Caterpillar 657E Push-Pull Scraper		
2) Material Density	2,850. LB/BCY	CPH 25
3) Payload	104,000. LB	CPH 25
	35.0 BCY	
4) Maximum Vehicle Speed Loaded	34.9 MPH	CPH 25
5) Operating Efficiency Factor (50 Min./Hr.)	0.83 %	CPH 25
6) 657E PP Operating Costs	$199.36 Per Hour	90% DQCRG
7) Labor Costs	$18.75 Per Hour	WYDOT-WDD
8) Supervision Labor Costs	$3.13 Per Hour	1/8 of WYDOT-WDD
9) Supervisor Transportation	$1.10 Per Hour	1/8 of 90% DQCRG
10) 1/8 of 1 - 14,000 Gal. Water Trucks + 1 Operator	$17.56 Per Hour	1/8 of 90% DQCRG
11) 1/8 of 1 - 16H Blade for Road Work + 1 Operator	$10.53 Per Hour	1/8 of 90% DQCRG
12) ½ - D9R for Ripping Ovb. and Misc. Work + 1 Operator	$60.50 Per Hour	½ of 90% DQCRG
13) Total Hourly Costs	$310.93	

TO USE TABLE: Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

Case Level Ground — Loaded (0% grade + 4% rolling = 4% total) — Empty (0% grade + 4% rolling = 4% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.10	0.42	0.60	0.36	2.48	24.2	35.0	0.83	706	$0.44
1000	1.10	0.68	0.60	0.57	2.95	20.3	35.0	0.83	593	$0.52
1500	1.10	0.92	0.60	0.75	3.37	17.8	35.0	0.83	519	$0.60
2000	1.10	1.15	0.60	0.92	3.77	15.9	35.0	0.83	464	$0.67
2500	1.10	1.37	0.60	1.09	4.16	14.4	35.0	0.83	421	$0.74
3000	1.10	1.59	0.60	1.26	4.55	13.2	35.0	0.83	385	$0.81
3500	1.10	1.81	0.60	1.44	4.95	12.1	35.0	0.83	354	$0.88
4000	1.10	2.02	0.60	1.61	5.33	11.3	35.0	0.83	328	$0.95
4500	1.10	2.22	0.60	1.78	5.70	10.5	35.0	0.83	307	$1.01
5000	1.10	2.43	0.60	1.95	6.08	9.9	35.0	0.83	288	$1.08
5500	1.10	2.64	0.60	2.13	6.47	9.3	35.0	0.83	270	$1.15
6000	1.10	2.85	0.60	2.30	6.85	8.8	35.0	0.83	255	$1.22
6500	1.10	3.05	0.60	2.47	7.22	8.3	35.0	0.83	242	$1.28
7000	1.10	3.26	0.60	2.64	7.60	7.9	35.0	0.83	230	$1.35

Appendix B (Continued)
Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

Material Movement By Scrapers

Case #2: 5% Assisting Grade — Loaded (-5% grade + 4% rolling = -1% total) — Empty (5% grade + 4% rolling = 9% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.10	0.36	0.60	0.42	2.48	24.2	35.0	0.83	706	$0.44
1000	1.10	0.54	0.60	0.71	2.95	20.3	35.0	0.83	593	$0.52
1500	1.10	0.71	0.60	0.98	3.39	17.7	35.0	0.83	516	$0.60
2000	1.10	0.87	0.60	1.25	3.82	15.7	35.0	0.83	458	$0.68
2500	1.10	1.03	0.60	1.51	4.24	14.2	35.0	0.83	413	$0.75
3000	1.10	1.19	0.60	1.78	4.67	12.8	35.0	0.83	375	$0.83
3500	1.10	1.36	0.60	2.05	5.11	11.7	35.0	0.83	342	$0.91
4000	1.10	1.52	0.60	2.32	5.54	10.8	35.0	0.83	316	$0.98
4500	1.10	1.68	0.60	2.59	5.97	10.1	35.0	0.83	293	$1.06
5000	1.10	1.85	0.60	2.86	6.41	9.4	35.0	0.83	273	$1.14
5500	1.10	2.01	0.60	3.12	6.83	8.8	35.0	0.83	256	$1.21
6000	1.10	2.17	0.60	3.39	7.26	8.3	35.0	0.83	241	$1.29
6500	1.10	2.33	0.60	3.66	7.69	7.8	35.0	0.83	228	$1.36
7000	1.10	2.50	0.60	3.93	8.13	7.4	35.0	0.83	215	$1.45

Case #3: 10% Assisting Grade — Loaded (-10% grade + 4% rolling = -6% total) — Empty (10% grade + 4% rolling = 14% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.10	0.34	0.60	0.51	2.55	23.5	35.0	0.83	686	$0.45
1000	1.10	0.51	0.60	0.96	3.17	18.9	35.0	0.83	552	$0.56
1500	1.10	0.67	0.60	1.41	3.78	15.9	35.0	0.83	463	$0.67
2000	1.10	0.83	0.60	1.85	4.38	13.7	35.0	0.83	400	$0.78
2500	1.10	0.99	0.60	2.30	4.99	12.0	35.0	0.83	351	$0.89
3000	1.10	1.16	0.60	2.74	5.60	10.7	35.0	0.83	313	$0.99
3500	1.10	1.32	0.60	3.19	6.21	9.7	35.0	0.83	282	$1.10
4000	1.10	1.48	0.60	3.63	6.81	8.8	35.0	0.83	257	$1.21
4500	1.10	1.64	0.60	4.08	7.42	8.1	35.0	0.83	236	$1.32
5000	1.10	1.81	0.60	4.52	8.03	7.5	35.0	0.83	218	$1.43
5500	1.10	1.97	0.60	4.97	8.64	6.9	35.0	0.83	203	$1.53
6000	1.10	2.13	0.60	5.41	9.24	6.5	35.0	0.83	189	$1.65
6500	1.10	2.30	0.60	5.86	9.86	6.1	35.0	0.83	177	$1.76
7000	1.10	2.46	0.60	6.30	10.46	5.7	35.0	0.83	167	$1.86

Appendix B (Continued)
Calculations for Moving Materials With a Caterpillar 657E Push-Pull Scraper Fleet

Material Movement By Scrapers

Case #4: 5% Resisting Grade — Loaded (5% grade + 4% rolling = 9% total) — Empty (-5% grade + 4% rolling = -1% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.10	0.55	0.60	0.33	2.58	23.3	35.0	0.83	678	$0.46
1000	1.10	1.01	0.60	0.50	3.21	18.7	35.0	0.83	545	$0.57
1500	1.10	1.46	0.60	0.66	3.82	15.7	35.0	0.83	458	$0.68
2000	1.10	1.92	0.60	0.83	4.45	13.5	35.0	0.83	393	$0.79
2500	1.10	2.38	0.60	0.99	5.07	11.8	35.0	0.83	345	$0.90
3000	1.10	2.83	0.60	1.15	5.68	10.6	35.0	0.83	308	$1.01
3500	1.10	3.29	0.60	1.31	6.30	9.5	35.0	0.83	278	$1.12
4000	1.10	3.75	0.60	1.48	6.93	8.7	35.0	0.83	253	$1.23
4500	1.10	4.21	0.60	1.64	7.55	7.9	35.0	0.83	232	$1.34
5000	1.10	4.66	0.60	1.80	8.16	7.4	35.0	0.83	214	$1.45
5500	1.10	5.12	0.60	1.96	8.78	6.8	35.0	0.83	199	$1.56
6000	1.10	5.58	0.60	2.13	9.41	6.4	35.0	0.83	186	$1.67
6500	1.10	6.04	0.60	2.29	10.03	6.0	35.0	0.83	174	$1.79
00	1.10	6.49	0.60	2.45	10.64	5.6	35.0	0.83	164	$1.90

Case #5: 10% Resisting Grade — Loaded (10% grade + 4% rolling = 14% total) — Empty (-10% grade + 4% rolling = -6% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.10	0.75	0.60	0.32	2.77	21.7	35.0	0.83	632	$0.49
1000	1.10	1.43	0.60	0.49	3.62	16.6	35.0	0.83	483	$0.64
1500	1.10	2.12	0.60	0.65	4.47	13.4	35.0	0.83	391	$0.80
2000	1.10	2.81	0.60	0.81	5.32	11.3	35.0	0.83	329	$0.95
2500	1.10	3.49	0.60	0.98	6.17	9.7	35.0	0.83	284	$1.09
3000	1.10	4.18	0.60	1.14	7.02	8.5	35.0	0.83	249	$1.25
3500	1.10	4.87	0.60	1.30	7.87	7.6	35.0	0.83	222	$1.40
4000	1.10	5.56	0.60	1.46	8.72	6.9	35.0	0.83	201	$1.55
4500	1.10	6.24	0.60	1.63	9.57	6.3	35.0	0.83	183	$1.70
5000	1.10	6.93	0.60	1.79	10.42	5.8	35.0	0.83	168	$1.85
5500	1.10	7.62	0.60	1.95	11.27	5.3	35.0	0.83	155	$2.00
6000	1.10	8.31	0.60	2.12	12.13	4.9	35.0	0.83	144	$2.16
6500	1.10	8.99	0.60	2.28	12.97	4.6	35.0	0.83	135	$2.30
00	1.10	9.68	0.60	2.44	13.82	4.3	35.0	0.83	127	$2.45

Appendix C
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

NOTE: DRILLING AND BLASTING COSTS ARE NOT INCLUDED IN THESE CALCULATIONS. THE LQD DOES NOT CONSIDER DRILLING AND BLASTING COSTS NECESSARY WHEN USING APPENDIX C.

Material Movement By Scrapers

1) Caterpillar 637E Push-Pull Scraper		
2) Material Density	2,850. LB/BCY	CPH 25
3) Payload	75,000. LB	CPH 25
	25.0 BCY	
4) Maximum Vehicle Speed Loaded	33.0 MPH	CPH 25
5) Operating Efficiency Factor (50 Min./Hr.)	0.83 %	CPH 25
6) 637E PP Operating Costs	$152.15 Per Hour	90% DQCRG
7) Labor Costs	$18.75 Per Hour	WYDOT-WDD
8) Supervision Labor Costs	$3.13 Per Hour	1/8 of WYDOT-WDD
9) Supervisor Transportation	$1.10 Per Hour	1/8 of 90% DQCRG
10) 1/8 of 1 - 14,000 Gal. Water Trucks + 1 Operator	$17.56 Per Hour	1/8 of 90% DQCRG
11) 1/8 of 1 - 16H Blade for Road Work + 1 Operator	$10.53 Per Hour	1/8 of 90% DQCRG
12) ½ - D9R for Ripping Ovb. and Misc. Work + 1 Operator	$60.50 Per Hour	½ of 90% DQCRG
13) Total Hourly Costs	$263.72	

TO USE TABLE: Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

Case #1: Level Ground — Loaded (0% grade + 4% rolling = 4% total) — Empty (0% grade + 4% rolling = 4% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.0	0.42	0.60	0.36	2.38	25.2	25.0	0.83	523	$0.50
1000	1.0	0.68	0.60	0.57	2.85	21.1	25.0	0.83	438	$0.60
1500	1.0	0.92	0.60	0.75	3.27	18.4	25.0	0.83	382	$0.69
2000	1.0	1.15	0.60	0.92	3.67	16.3	25.0	0.83	338	$0.78
2500	1.0	1.37	0.60	1.09	4.06	14.8	25.0	0.83	307	$0.86
3000	1.0	1.59	0.60	1.26	4.45	13.5	25.0	0.83	280	$0.94
3500	1.0	1.81	0.60	1.44	4.85	12.4	25.0	0.83	257	$1.03
4000	1.0	2.02	0.60	1.61	5.23	11.5	25.0	0.83	239	$1.11
4500	1.0	2.22	0.60	1.78	5.60	10.7	25.0	0.83	222	$1.19
5000	1.0	2.43	0.60	1.95	5.98	10.0	25.0	0.83	208	$1.27
5500	1.0	2.64	0.60	2.13	6.37	9.4	25.0	0.83	195	$1.35
6000	1.0	2.85	0.60	2.30	6.75	8.9	25.0	0.83	185	$1.43
6500	1.0	3.05	0.60	2.47	7.12	8.4	25.0	0.83	174	$1.51
7000	1.0	3.26	0.60	2.64	7.50	8.0	25.0	0.83	166	$1.59

Appendix C (Continued)
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

Material Movement By Scrapers

Case #2: 5% Assisting Grade — Loaded (-5% grade + 4% rolling = -1% total) — Empty (5% grade + 4% rolling = 9% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.0	0.36	0.60	0.42	2.38	25.2	25.0	0.83	523	$0.50
1000	1.0	0.54	0.60	0.71	2.85	21.0	25.0	0.83	436	$0.61
1500	1.0	0.71	0.60	0.98	3.29	18.2	25.0	0.83	378	$0.70
2000	1.0	0.87	0.60	1.25	3.72	16.1	25.0	0.83	334	$0.79
2500	1.0	1.03	0.60	1.51	4.14	14.5	25.0	0.83	301	$0.88
3000	1.0	1.19	0.60	1.78	4.57	13.1	25.0	0.83	272	$0.97
3500	1.0	1.36	0.60	2.05	5.01	12.0	25.0	0.83	249	$1.06
4000	1.0	1.52	0.60	2.32	5.44	11.0	25.0	0.83	228	$1.16
4500	1.0	1.68	0.60	2.59	5.87	10.2	25.0	0.83	212	$1.25
5000	1.0	1.85	0.60	2.86	6.31	9.5	25.0	0.83	197	$1.34
5500	1.0	2.01	0.60	3.12	6.73	8.9	25.0	0.83	185	$1.43
6000	1.0	2.17	0.60	3.39	7.16	8.4	25.0	0.83	174	$1.51
[illegible]00	1.0	2.33	0.60	3.66	7.59	7.9	25.0	0.83	164	$1.61
[illegible]00	1.0	2.50	0.60	3.93	8.03	7.5	25.0	0.83	156	$1.69

Case #3: 10% Assisting Grade — Loaded (-10% grade + 4% rolling = -6% total) — Empty (10% grade + 4% rolling = 14% total)

One-Way Distance (Ft.)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.0	0.34	0.60	0.51	2.45	24.5	25.0	0.83	508	$0.52
1000	1.0	0.51	0.60	0.96	3.07	19.5	25.0	0.83	405	$0.65
1500	1.0	0.67	0.60	1.41	3.68	16.3	25.0	0.83	338	$0.78
2000	1.0	0.83	0.60	1.85	4.28	14.0	25.0	0.83	291	$0.91
2500	1.0	0.99	0.60	2.30	4.89	12.3	25.0	0.83	255	$1.03
3000	1.0	1.16	0.60	2.74	5.50	10.9	25.0	0.83	226	$1.17
3500	1.0	1.32	0.60	3.19	6.11	9.8	25.0	0.83	203	$1.30
4000	1.0	1.48	0.60	3.63	6.71	8.9	25.0	0.83	185	$1.43
4500	1.0	1.64	0.60	4.08	7.32	8.2	25.0	0.83	170	$1.55
5000	1.0	1.81	0.60	4.52	7.93	7.6	25.0	0.83	158	$1.67
5500	1.0	1.97	0.60	4.97	8.54	7.0	25.0	0.83	145	$1.82
6000	1.0	2.13	0.60	5.41	9.14	6.5	25.0	0.83	135	$1.96
[illegible]500	1.0	2.30	0.60	5.86	9.76	6.2	25.0	0.83	129	$2.05
[illegible]00	1.0	2.46	0.60	6.30	10.36	5.8	25.0	0.83	120	$2.19

Appendix C (Continued)
Calculations for Moving Materials With a Caterpillar 637E Push-Pull Scraper Fleet

Material Movement By Scrapers

Case #4: 5% Resisting Grade — Loaded (5% grade + 4% rolling = 9% total) — Empty (-5% grade + 4% rolling = -1% total)

One-Way Distance (FL)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.0	0.55	0.60	0.33	2.48	24.2	25.0	0.83	502	$0.53
1000	1.0	1.01	0.60	0.50	3.11	19.3	25.0	0.83	400	$0.66
1500	1.0	1.46	0.60	0.66	3.72	16.1	25.0	0.83	334	$0.79
2000	1.0	1.92	0.60	0.83	4.35	13.8	25.0	0.83	286	$0.92
2500	1.0	2.38	0.60	0.99	4.97	12.1	25.0	0.83	251	$1.05
3000	1.0	2.83	0.60	1.15	5.58	10.8	25.0	0.83	224	$1.18
3500	1.0	3.29	0.60	1.31	6.20	9.7	25.0	0.83	201	$1.31
4000	1.0	3.75	0.60	1.48	6.83	8.8	25.0	0.83	183	$1.44
4500	1.0	4.21	0.60	1.64	7.45	8.1	25.0	0.83	168	$1.57
5000	1.0	4.66	0.60	1.80	8.06	7.4	25.0	0.83	154	$1.72
5500	1.0	5.12	0.60	1.96	8.68	6.9	25.0	0.83	143	$1.84
6000	1.0	5.58	0.60	2.13	9.31	6.4	25.0	0.83	133	$1.99
[illegible]0	1.0	6.04	0.60	2.29	9.93	6.0	25.0	0.83	125	$2.12
[illegible]000	1.0	6.49	0.60	2.45	10.54	5.7	25.0	0.83	118	$2.23

Case #5: 10% Resisting Grade — Loaded (10% grade + 4% rolling = 14% total) — Empty (-10% grade + 4% rolling = -6% total)

One-Way Distance (FL)	Load Time (Min.)	Travel Time Loaded (Min.)	Maneuver & Spread Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Efficiency Factor (50 min/hr)	Adjusted Productivity (BCY/Hr)	Operating Costs ($/BCY)
500	1.0	0.75	0.60	0.32	2.67	22.5	25.0	0.83	467	$0.56
1000	1.0	1.43	0.60	0.49	3.52	17.0	25.0	0.83	353	$0.75
1500	1.0	2.12	0.60	0.65	4.37	13.7	25.0	0.83	284	$0.93
2000	1.0	2.81	0.60	0.81	5.22	11.5	25.0	0.83	238	$1.11
2500	1.0	3.49	0.60	0.98	6.07	9.9	25.0	0.83	205	$1.28
3000	1.0	4.18	0.60	1.14	6.92	8.7	25.0	0.83	181	$1.46
3500	1.0	4.87	0.60	1.30	7.77	7.7	25.0	0.83	160	$1.65
4000	1.0	5.56	0.60	1.46	8.62	7.0	25.0	0.83	145	$1.82
4500	1.0	6.24	0.60	1.63	9.47	6.3	25.0	0.83	131	$2.02
5000	1.0	6.93	0.60	1.79	10.32	5.8	25.0	0.83	120	$2.19
5500	1.0	7.62	0.60	1.95	11.17	5.4	25.0	0.83	112	$2.35
6000	1.0	8.31	0.60	2.12	12.03	4.9	25.0	0.83	102	$2.59
[illegible]0	1.0	8.99	0.60	2.28	12.87	4.7	25.0	0.83	98	$2.70
[illegible]0	1.0	9.68	0.60	2.44	13.72	4.4	25.0	0.83	91	$2.89

Appendix D

Calculations for Moving Materials With a Caterpillar 56 CY Cable Shovel and Caterpillar 240T (793C) Trucks

N/ THESE COSTS ARE FOR EXCAVATION ONLY. MATERIAL REQUIRING BLASTING SHOULD HAVE AN ADDITIONAL $0.10/BCY ADDED FOR DRILLING AND BLASTING COSTS.

Material Movement By Shovel-Truck Combination

1) 56 CY Shovel	56.0 LCY Heaped	
2) Caterpillar 793B - 240-Ton End Dumps	193.0 LCY/156.8 BCY	
3) Material Density	2,850.0 LB/BCY	CPH 25
4) Operating Efficiency Factor	0.83 %	CPH 25
5) Rolling Resistance Factor	4.00 %	CPH 25
6) 56 CY Shovel Operating Costs (No Ownership Cost)	$248.64	WME
7) 793C Lease + Operating Costs	$193.15	WME
8) Labor Costs	$18.75 Per Hour	WYDOT-WDD
9) ½ of 1 - 14,000 Gal. Water Truck + 1 Operator	$70.23 Per Hour	½ of 90% DQCRG + Operator
10) 1 - 16H Blade + 1 Operator	$84.26 Per Hour	90% DQCRG + Operator
11) 1 - D9R + 1 Operator	$120.99 Per Hour	90% DQCRG + Operator
12) 1 834B Rubber Tired Dozer + 1 Operator	$105.15 Per Hour	90% DQCRG + Operator
13) Supervision Labor Costs	$12.50 Per Hour	½ of WYDOT-WDD
14) Supervisor Transportation	$4.39 Per Hour	½ of 90% DQCRG
15) Total Fleet Hourly Costs (Except Trucks)	$664.91 Per Hour	

TO USE TABLE: Locate your approximate grade by reference to case number. Determine cost per BCY by using distance column that approximates your distance. No calculations are necessary.

Case #1: Level Ground — Loaded (0% grade + 4% rolling = 4% total resistance) — Empty (0% grade + 4% = 4% total)

One-Way Distance	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Shovel Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	1.70	0.60	0.4	1.20	0.2	4.1	14.6	156.8	1912	4040	2.11	$0.275
1000	1.70	0.60	0.7	1.20	0.4	4.6	13.0	156.8	1704	4040	2.37	$0.289
1500	1.70	0.60	1.0	1.20	0.6	5.1	11.8	156.8	1537	4040	2.63	$0.303
2000	1.70	0.60	1.3	1.20	0.7	5.5	10.9	156.8	1425	4040	2.83	$0.313
2500	1.70	0.60	1.6	1.20	0.9	6.0	10.0	156.8	1307	4040	3.09	$0.327
3000	1.70	0.60	1.9	1.20	1.1	6.5	9.2	156.8	1206	4040	3.35	$0.340
3500	1.70	0.60	2.2	1.20	1.3	7.0	8.6	156.8	1120	4040	3.61	$0.354
4000	1.70	0.60	2.4	1.20	1.5	7.4	8.1	156.8	1059	4040	3.81	$0.364
4500	1.70	0.60	2.7	1.20	1.7	7.9	7.6	156.8	992	4040	4.07	$0.378
5000	1.70	0.60	3.0	1.20	1.9	8.4	7.1	156.8	933	4040	4.33	$0.392
5500	1.70	0.60	3.2	1.20	2.1	8.8	6.8	156.8	891	4040	4.53	$0.402
6000	1.70	0.60	3.5	1.20	2.3	9.3	6.5	156.8	843	4040	4.79	$0.416
6500	1.70	0.60	3.8	1.20	2.5	9.8	6.1	156.8	800	4040	5.05	$0.430
7000	1.70	0.60	4.1	1.20	2.7	10.3	5.8	156.8	761	4040	5.31	$0.443

Operating Costs = (((# Trucks x (Truck costs + Labor costs)) + Total Fleet costs)/Shovel Productivity)

Appendix D (Continued)
Calculations for Moving Materials With a Caterpillar 56 CY Cable Shovel and Caterpillar 240T (793C) Trucks

Material Movement By Shovel-Truck Combination

Case #2: 5% Resisting Grade — Loaded (5% grade + 4% rolling = 9% total resistance) — Empty (-5% grade + 4% rolling = -1% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Shovel Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	1.70	0.60	0.8	1.20	0.4	4.7	12.8	156.8	1668	4040	2.42	$0.292
1000	1.70	0.60	1.4	1.20	0.7	5.6	10.7	156.8	1398	4040	2.89	$0.316
1500	1.70	0.60	2.2	1.20	1.0	6.7	9.0	156.8	1170	4040	3.45	$0.346
2000	1.70	0.60	2.9	1.20	1.3	7.7	7.8	156.8	1019	4040	3.96	$0.372
2500	1.70	0.60	3.6	1.20	1.6	8.7	6.9	156.8	902	4040	4.48	$0.400
3000	1.70	0.60	4.3	1.20	1.9	9.7	6.2	156.8	810	4040	4.99	$0.426
3500	1.70	0.60	5.0	1.20	2.2	10.7	5.6	156.8	731	4040	5.52	$0.454
4000	1.70	0.60	5.7	1.20	2.5	11.7	5.1	156.8	669	4040	6.04	$0.481
4500	1.70	0.60	6.4	1.20	2.8	12.7	4.7	156.8	615	4040	6.57	$0.509
5000	1.70	0.60	7.1	1.20	3.2	13.8	4.4	156.8	570	4040	7.09	$0.537
5500	1.70	0.60	7.8	1.20	3.5	14.8	4.1	156.8	531	4040	7.61	$0.564
6000	1.70	0.60	8.5	1.20	3.8	15.8	3.8	156.8	497	4040	8.14	$0.592
6500	1.70	0.60	9.2	1.20	4.1	16.8	3.6	156.8	467	4040	8.66	$0.619
	1.70	0.60	9.9	1.20	4.4	17.8	3.4	156.8	440	4040	9.17	$0.646

Case #3: 5% Assisting Grade — Loaded (-5% grade + 4% rolling = -1% total resistance) — Empty (5% grade + 4% = 9% total)

One-Way Distance (Ft.)	Load Time (Min.)	Maneuver Time (Min.)	Travel Time Loaded (Min.)	Dump Time (Min.)	Travel Time Empty (Min.)	Total Cycle Time (Min.)	Trips Per Hour	Payload (BCY)	Adjusted Truck Productivity (BCY/Hr)	Adjusted Shovel Productivity (BCY/Hr)	Number of Trucks Required	Operating Costs ($/BCY)
500	1.70	0.60	0.4	1.20	0.3	4.2	14.3	156.8	1867	4040	2.16	$0.278
1000	1.70	0.60	0.7	1.20	0.5	4.7	12.7	156.8	1662	4040	2.43	$0.292
1500	1.70	0.60	1.0	1.20	0.8	5.3	11.3	156.8	1479	4040	2.73	$0.308
2000	1.70	0.60	1.3	1.20	1.0	5.8	10.3	156.8	1344	4040	3.00	$0.322
2500	1.70	0.60	1.6	1.20	1.3	6.4	9.4	156.8	1227	4040	3.29	$0.337
3000	1.70	0.60	1.9	1.20	1.6	7.0	8.6	156.8	1128	4040	3.58	$0.352
3500	1.70	0.60	2.2	1.20	1.8	7.5	8.0	156.8	1044	4040	3.87	$0.368
4000	1.70	0.60	2.5	1.20	2.1	8.1	7.4	156.8	972	4040	4.16	$0.383
4500	1.70	0.60	2.8	1.20	2.3	8.6	7.0	156.8	909	4040	4.44	$0.398
5000	1.70	0.60	3.2	1.20	2.6	9.3	6.5	156.8	845	4040	4.78	$0.415
5500	1.70	0.60	3.5	1.20	2.8	9.8	6.1	156.8	797	4040	5.07	$0.431
6000	1.70	0.60	3.8	1.20	3.1	10.4	5.8	156.8	754	4040	5.36	$0.446
6500	1.70	0.60	4.1	1.20	3.4	11.0	5.5	156.8	715	4040	5.65	$0.461
	1.70	0.60	4.4	1.20	3.6	11.5	5.2	156.8	681	4040	5.93	$0.476

Appendix E
Calculations for Moving Material With a Caterpillar D9N Dozer

Material Movement By Dozing

1) Caterpillar D9N Dozer With U Blade		
2) Operating Costs	$94.60 Per Hour	90% of DQCRG
3) Labor Costs	$18.75 Per Hour	WYDOT-WDD
4) Supervisor Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
5) Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
6) Total Hourly Costs	$117.58 Per Hour	

TO USE TABLE: Locate your approximate grade by referencing "Grade" column. Determine cost per LCY by using the distance that best approximates your distance.

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (0%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	2100	1.0	1.0	0.90	0.83	1.00	1575	$0.075
100	1200	1.0	1.0	0.90	0.83	1.00	900	$0.131
150	900	1.0	1.0	0.90	0.83	1.00	675	$0.174
200	700	1.0	1.0	0.90	0.83	1.00	525	$0.224
250	570	1.0	1.0	0.90	0.83	1.00	428	$0.275
300	480	1.0	1.0	0.90	0.83	1.00	360	$0.327
350	410	1.0	1.0	0.90	0.83	1.00	308	$0.382
400	370	1.0	1.0	0.90	0.83	1.00	278	$0.423
450	350	1.0	1.0	0.90	0.83	1.00	263	$0.447
500	340	1.0	1.0	0.90	0.83	1.00	255	$0.461

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (-10%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	2100	1.0	1.0	0.90	0.83	1.20	1890	$0.062
100	1200	1.0	1.0	0.90	0.83	1.20	1080	$0.109
150	900	1.0	1.0	0.90	0.83	1.20	810	$0.145
200	700	1.0	1.0	0.90	0.83	1.20	630	$0.187
250	570	1.0	1.0	0.90	0.83	1.20	513	$0.229
300	480	1.0	1.0	0.90	0.83	1.20	432	$0.272
350	410	1.0	1.0	0.90	0.83	1.20	369	$0.317
400	370	1.0	1.0	0.90	0.83	1.20	333	$0.353
450	350	1.0	1.0	0.90	0.83	1.20	315	$0.373
500	340	1.0	1.0	0.90	0.83	1.20	306	$0.384

[1] Job Correction Factors:

Operator	Excellent	= 1.00
Material	Good	= 1.00
Visibility	Fair	= 0.90
Efficiency	50 min/hr	= 0.83

Appendix E (Continued)
Calculations for Moving Material With a Caterpillar D9N Dozer

Material Movement By Dozing

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (-20%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	2100	1.0	1.0	0.90	0.83	1.40	2205	$0.053
100	1200	1.0	1.0	0.90	0.83	1.40	1260	$0.093
150	900	1.0	1.0	0.90	0.83	1.40	945	$0.124
200	700	1.0	1.0	0.90	0.83	1.40	735	$0.160
250	570	1.0	1.0	0.90	0.83	1.40	599	$0.196
300	480	1.0	1.0	0.90	0.83	1.40	504	$0.233
350	410	1.0	1.0	0.90	0.83	1.40	431	$0.273
400	370	1.0	1.0	0.90	0.83	1.40	389	$0.302
450	350	1.0	1.0	0.90	0.83	1.40	368	$0.320
500	340	1.0	1.0	0.90	0.83	1.40	357	$0.329

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (10%)	Adjusted Productivity (LCY/Hr.)	Cc ($/LCY)
50	2100	1.0	1.0	0.90	0.83	0.75	1181	$0.100
100	1200	1.0	1.0	0.90	0.83	0.75	675	$0.174
150	900	1.0	1.0	0.90	0.83	0.75	506	$0.232
200	700	1.0	1.0	0.90	0.83	0.75	394	$0.298
250	570	1.0	1.0	0.90	0.83	0.75	321	$0.366
300	480	1.0	1.0	0.90	0.83	0.75	270	$0.436
350	410	1.0	1.0	0.90	0.83	0.75	231	$0.509
400	370	1.0	1.0	0.90	0.83	0.75	208	$0.565
450	350	1.0	1.0	0.90	0.83	0.75	197	$0.600
500	340	1.0	1.0	0.90	0.83	0.75	191	$0.616

[1] Job Correction Factors:

Operator	Excellent	= 1.00
Material	Good	= 1.00
Visibility	Fair	= 0.90
Efficiency	50 min/hr	= 0.83

Appendix F
Calculations For Moving Material With a Caterpillar D11R Dozer

Material Movement By Dozing With D11R

1) Caterpillar D11R Dozer With U Blade (Operating Costs) $223.85 per DataQuest		
2) Operating Costs	$201.47 Per Hour	90% of DQCRG
3) Labor Costs	$18.75 Per Hour	WYDOT-WDD
4) Supervisor Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
5) Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
6) Total Hourly Costs	$224.45 Per Hour	

TO USE TABLE: Locate your approximate grade by referencing "Grade" column. Determine cost per LCY by using the distance that best approximates your distance.

Distance (FL)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (0%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	3200	1.0	1.0	0.90	0.83	1.00	2400	$0.094
100	2700	1.0	1.0	0.90	0.83	1.00	2025	$0.111
150	1800	1.0	1.0	0.90	0.83	1.00	1350	$0.166
200	1400	1.0	1.0	0.90	0.83	1.00	1050	$0.214
250	1150	1.0	1.0	0.90	0.83	1.00	863	$0.260
300	1000	1.0	1.0	0.90	0.83	1.00	750	$0.300
350	850	1.0	1.0	0.90	0.83	1.00	638	$0.352
400	750	1.0	1.0	0.90	0.83	1.00	563	$0.400
450	670	1.0	1.0	0.90	0.83	1.00	503	$0.446
500	600	1.0	1.0	0.90	0.83	1.00	450	$0.500

Distance (FL)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (-10%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	3200	1.0	1.0	0.90	0.83	1.20	2880	$0.078
100	2700	1.0	1.0	0.90	0.83	1.20	2430	$0.092
150	1800	1.0	1.0	0.90	0.83	1.20	1620	$0.139
200	1400	1.0	1.0	0.90	0.83	1.20	1260	$0.178
250	1150	1.0	1.0	0.90	0.83	1.20	1035	$0.217
300	1000	1.0	1.0	0.90	0.83	1.20	900	$0.249
350	850	1.0	1.0	0.90	0.83	1.20	765	$0.293
400	750	1.0	1.0	0.90	0.83	1.20	675	$0.333
450	670	1.0	1.0	0.90	0.83	1.20	603	$0.372
500	600	1.0	1.0	0.90	0.83	1.20	540	$0.416

[1] Job Correction Factors:

Operator	Excellent	= 1.00
Material	Good	= 1.00
Visibility	Fair	= 0.90
Efficiency	50 min/hr	= 0.83

Appendix F (Continued)
Calculations For Moving Material With a Caterpillar D11R Dozer

Material Movement By Dozing With D11R

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (-20%)	Adjusted Productivity (LCY/Hr.)	Costs ($/LCY)
50	3200	1.0	1.0	0.90	0.83	1.40	3360	$0.067
100	2700	1.0	1.0	0.90	0.83	1.40	2835	$0.079
150	1800	1.0	1.0	0.90	0.83	1.40	1890	$0.119
200	1400	1.0	1.0	0.90	0.83	1.40	1470	$0.153
250	1150	1.0	1.0	0.90	0.83	1.40	1208	$0.186
300	1000	1.0	1.0	0.90	0.83	1.40	1050	$0.214
350	850	1.0	1.0	0.90	0.83	1.40	893	$0.251
400	750	1.0	1.0	0.90	0.83	1.40	788	$0.285
450	670	1.0	1.0	0.90	0.83	1.40	704	$0.319
500	600	1.0	1.0	0.90	0.83	1.40	630	$0.356

Distance (Ft.)	Productivity (LCY/Hr.)	Job Correction Factors[1] Operator	Material	Visibility	Efficiency	Grade (10%)	Adjusted Productivity (LCY/Hr.)	Cos_ ($/LCY)
50	3200	1.0	1.0	0.90	0.83	0.75	1800	$0.125
100	2700	1.0	1.0	0.90	0.83	0.75	1519	$0.148
150	1800	1.0	1.0	0.90	0.83	0.75	1013	$0.222
200	1400	1.0	1.0	0.90	0.83	0.75	788	$0.285
250	1150	1.0	1.0	0.90	0.83	0.75	647	$0.347
300	1000	1.0	1.0	0.90	0.83	0.75	563	$0.399
350	850	1.0	1.0	0.90	0.83	0.75	478	$0.470
400	750	1.0	1.0	0.90	0.83	0.75	422	$0.532
450	670	1.0	1.0	0.90	0.83	0.75	377	$0.595
500	600	1.0	1.0	0.90	0.83	0.75	338	$0.664

[1] Job Correction Factors:

Operator	Excellent	= 1.00
Material	Good	= 1.00
Visibility	Fair	= 0.90
Efficiency	50 min/hr	= 0.83

Appendix G
Calculations for Final Grading With a Caterpillar 16H Motor Grader

Final Grading

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Caterpillar 16H Motor Grader		
Speed in Miles Per Hour (Second Gear)	3.3 Miles/Hour	CPH 25
Width of Grading Per Pass	8 Feet	CPH 25
Feet Per Mile	5,280 Feet	
Square Feet Per Acre	43,560 Sq. Ft.	
Operating Efficiency Factor 50 Min./Hr.	0.83 %	CPH 25
Operating Costs	$65.51 Per Hour	90% of DQCRG
Labor Costs	$18.75 Per Hour	WYDOT-WDD
Supervision Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
Total Hourly Costs	$88.49	
Grading Rate		
(3.3 Miles/Hour)x(5,280 Ft./Mile)x(8 Ft./Pass)	139,392 Ft^2/Hour	
(139,392 Ft^2/Hour)/(43,560 Ft^2/Acre)	3.2 Acres/Hour	
(3.2 Acres/Hour)x(0.83 Efficiency Factor)	2.66 Acres/Hour	
Operating Costs		
($88.49/Hour)/(2.66 Acres/Hour)	$33.27 Per Acre	

Appendix H
Cost Estimates for Handling Wire Fencing and Electrical Power Lines

FENCING		SOURCES
Construction 4-Strand Barbed	Overall Average - $1.15/LF	Wyoming Highway Department Weighted Average Bid Prices, 1997
Removal	Overall Average - $0.68/LF	Wyoming Highway Department, Average Bid Prices, 1997
	Power Line Removal	
Distribution Lines:	No Charge	From: Tri-County Electric
Transmission Lines:	No Charge	From: Tri-County Electric

Note: Cost estimates for power line removal are based on phone contact with Tri-County Electric. Distribution lines are owned by Tri-County Electric and would be removed upon request at no charge by Tri-County Electric. Transmission lines (lines which go from the main metering point to various electrical substations and are not owned by Tri-County Electric) would be removed by Tri-County Electric at no cost for their salvage value.

Appendix I
Cost Estimate for Ripping Asphalt Using a Caterpillar D9R Dozer

Asphalt Ripping (3"-4" Mat)

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Caterpillar D9R Dozer With 3 Shank Ripper		
Speed in Miles Per Hour	1 Mile/Hour	CPH 25
Width of Ripping Pass	3 Feet	CPH 25
Feet Per Mile	5,280 Feet	
Square Feet Per Acre	43,560 Sq. Ft.	
Operating Efficiency Factor 50 Min./Hr.	0.83 %	CPH 25
Operating Costs	$102.24 Per Hour	90% of DQCRG
Labor Costs	$18.75 Per Hour	WYDOT-WDD
Supervision Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
Total Hourly Costs	$125.22	
Ripper Productivity		
(1.0 Mile/Hour)x(5,280 Ft./Mile)x(3 Ft./Pass)	15,840 Ft^2/Hour	
(15,840 Ft^2/Hour)/(43,560 Ft^2/Acre)	0.36 Acres/Hour	
(0.36 Acres/Hour)x(0.83 Efficiency Factor)	0.299 Acres/Hour	
Operating Costs		
($125.22/Hour)/(0.299 Acres/Hour)	$418.80 Per Acre	

Appendix I1
Cost Estimate for Ripping Overburden Using a Caterpillar D10R Dozer

Overburden Ripping

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Caterpillar D10R Dozer With Single Shank Ripper		
Speed in Miles Per Hour	1 Mile/Hour	CPH 25
Width of Ripping Pass	3 Feet	CPH 25
Feet Per Mile	5,280 Feet	
Square Feet Per Acre	43,560 Sq. Ft.	
Operating Efficiency Factor 50 Min./Hr.	0.75 %	CPH 25
) Depth	2 Feet	CPH 25
Operating Costs	$134.07 Per Hour	90% of DQCRG
Labor Costs	$18.75 Per Hour	WYDOT-WDD
Supervision Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
Total Hourly Costs	$157.05	
Ripper Productivity		
(1.0 Mile/Hour)x(5,280 Ft./Mile)x(3 Ft./Pass)	15,840 Ft^2/Hour	
(15,840 Ft^2/Hour)/(43,560 Ft^2/Acre)	0.36 Acre/Hour	
(0.36 Acre/Hour)x(0.75 Efficiency Factor)	0.27 Acre/Hour	
Operating Costs		
($157.05/Hour)/(0.27 Acre/Hour)	$581.67 Per Acre	

:: A 75 percent Efficiency Factor was used to account for slowing, raising ripper, maneuvering and turn time.

Appendix J
Cost Estimate for Culvert Removal

Culvert Removal

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Average Length of CMP Section	20 Feet	
Assumed Culvert Diameter	48 Inches	
Time to Cut One Band	10 Minutes	
Time to Load One 20' Section (2 People)	20 Minutes	
Average Haul, Dump and Return Time	30 Minutes	
Number of Sections of CMP Per Load	2	
Operating Efficiency Factor 50 Min./Hr.	0.83 %	
[illegible] or	$18.75 Per Hour	WYDOT-WDD
Dump Truck (10-12 yd^3)	$26.52 Per Hour	90% of DQCRG
Caterpillar 980F Front-End Loader	$57.94 Per Hour	90% of DQCRG
Cost to Remove One 20' Section of CMP		
Labor Cost x Time to Cut One Band	$3.13	
+ ((Labor Cost x 2) + FEL Cost) x Time to Load 1 Section	$31.78	
+ (Labor Cost + Truck Cost) x Haul Time	$22.64	
Cost to Remove One 20' Section of CMP (not including dirt removal)	$57.55	

Note: Culverts may be smashed and buried in place when feasible.

Appendix K
Cost Estimates for Demolition and Removal of Railroad Spurs and Facilities Buildings

TASK	COST PER UNIT ($)	REGIONAL COST ADJUSTMENT[1]	ADJUSTED COST PER UNIT ($)
Track Removal	6.19/lin. ft.	84.2%	5.21/lin. ft.
Ballast Removal	2.54/cy	84.2%	2.14/cy
Building Demolition and Disposal[1,2,3]			
Mixture of Types	0.18/ft^3	84.2%	0.152/ft^3
Explosive Demolition, Concrete or Steel	0.18/ft^3	84.2%	0.152/ft^3
Disposal	6.47/cy	84.2%	5.45/cy
City Landfill Dump Charges	$50.00/ton	84.2%	$42.10/ton
crete Footings and Foundations			
6" Thick With Rebar	9.65/sq. ft.	84.2%	8.13/sq. ft.
Footings - 2' Thick, 3' Wide	13.15/lin. ft.	84.2%	11.07/lin. ft.
Concrete Disposal On-Site	5.25/cy	84.2%	4.42/cy

Note: Operators may also provide a verifiable cost estimate from a qualified contractor for these demolition tasks. This estimate may be used for one to three consecutive years, assuming few substantial changes in mine facilities.

1 Costs From: 1998 Means Heavy Construction Cost Data
2 Based on Total Volume of Building, does not include disposal cost
3 Based on Concrete Structures Volume Only, does not include disposal cost

Appendix L
Abandonment and Sealing of Cased Drill Holes and Monitor Wells

TASKS	UNIT COST	UNITS	TOTAL COST
DRILL HOLE RECLAMATION COSTS			
Site Locating	$10.00/site		
Sealing Using High-Solids Bentonite Grout[1,2] ≤ 500' deep ≤ 1,000' deep	 $4.00/lin. ft. $6.28/lin. ft.		
Capping Using a Pre-cast Concrete Cap (if needed)	$7.50/hole		
Site Grading	$30.00/site		
Seeding - Small Site (15' x 25')	$1.00/site		
(ouring & Seeding - Large Sites (100' x 100')	$250.00/site		
MONITORING WELL RECLAMATION COSTS			
Site Locating	$10.00/site		
Removal of Top Few Feet of Casing (Backhoe & Welder)	$15.00/well		
Sealing Using High-Solids Bentonite Grout[1,2] ≤ 500' deep ≤ 1,000' deep	 $4.00/lin. ft. $6.28/lin. ft		
Site Smoothing (Hand Work) & Seeding	$5.00/site		

Costs based on industry sources.

1 Assumes a hole/well size of 5" diameter.

2 Gassy or artesian wells would require class G neat cement plugging @ $6.46/ft. for wells up to 500' deep and $7.64/ft. for holes over 500' deep.

Appendix M
Cost Estimate for Rough Grading Backfill Using
Caterpillar D9R Dozer or Caterpillar 834B

ITEMS	CATERPILLAR D9R DOZER	CATERPILLAR 834B RUBBER TIRED DOZER	COMMENT/SOURCE
Speed in Miles Per Hour (First Gear)	2.0 Miles/Hour	4.0 Miles/Hour	CPH 25
Width of Dozer Pass	14 Feet	14 Feet	CPH 25
Feet Per Mile	5,280 Feet	5,280 Feet	
Square Feet Per Acre	43,560 Sq. Ft.	43,560 Sq. Ft.	
Operating Efficiency Factor 50 Min./Hr.	0.83%	0.83%	CPH 25
Operating Costs	$102.24 Per Hour	$86.40 Per Hour	90% of DQCRG
Labor Costs	$18.75 Per Hour	$18.75 Per Hour	WYDOT-WDD
Supervision Labor Costs	$3.13 Per Hour	$3.13 Per Hour	1/8 of 90% of DQCRG
[illegible]rvisor Transportation	$1.10 Per Hour	$1.10 Per Hour	1/8 of 90% of DQCRG
Total Hourly Costs	$125.20	$109.38	
SCARIFICATION RATE			
(2.0 Miles/Hour)x(5,280 Ft./Mile)x(14 Ft./Pass)[1] (4.0 Miles/Hour)x(5,280 Ft./Mile)x(14 Ft./Pass)[2]	147,840 Ft^2/Hour	295,680 Ft^2/Hour	
(147,890 Ft^2/Hour)/(43,560 Ft^2/Acre)[1] (295,680 Ft^2/Hour)/(43,560 Ft^2/Acre)[2]	3.39 Acres/Hour	6.79 Acres/Hour	
(3.39 Acres/Hour)x(0.83 Efficiency Factor)[1] (6.79 Acres/Hour)x(0.83 Efficiency Factor)[2]	2.82 Acres/Hour	5.66 Acres/Hour	
OPERATING COSTS			
($125.20/Hour)/(2.82 Acres/Hour)[1] ($109.38/Hour)/(5.66 Acres/Hour)[2]	$44.40 Per Acre	$19.33 Per Acre	

[1] Caterpillar D9R Dozer

[2] Caterpillar 834B Rubber Tired Dozer

Appendix N

Cost Estimates for Demolition and Removal of One "Standard" Surface Water Monitoring Station

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Assumed Time to Remove One Station	8 Hours	
Labor	$18.75 Per Hour	WYDOT-WDD
Dump Truck (10-12 yd^3)	$26.52 Per Hour	90% of DQCRG
Caterpillar 980F Front-End Loader	$57.94 Per Hour	90% of DQCRG
Cost to Remove One Surface Water Station = (Labor Cost x Time to Remove Station) + (Labor Cost + Truck Cost) x Time to Remove Station + (Labor Cost + Loader Cost) x Time to Remove Station	 $150.00 $362.16 $613.52	
Cost to Remove One Surface Water Station =	$1125.68	

Appendix O

Cost Estimates for Demolition and Removal of One "Standard" Meteorological or Air Quality Monitoring Site

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
Assumed Time to Remove One Station	4 Hours	
Labor	$18.75 Per Hour	WYDOT-WDD
Dump Truck (10-12 yd^3)	$26.52 Per Hour	90% of DQCRG
Caterpillar 428B (2WD) Front-End Loader	$15.07 Per Hour	90% of DQCRG
Cost to Remove One Meteorological or Air Quality Station = (Labor Cost x Time to Remove Station) + (Labor Cost + Truck Cost) x Time to Remove Station + (Labor Cost + Loader Cost) x Time to Remove Station	 $75.00 $181.08 $135.28	
t to Remove One Meteorological or Air Quality Station =	$391.36	

Appendix P
Cost Estimate for Scarification of Compacted Surfaces

	INPUT, UNIT AS INDICATED	COMMENT/ SOURCE
CATERPILLAR 16H MOTOR GRADER		
Speed in Miles Per Hour (First Gear)	2.4 Miles/Hour	CPH 25
Width of Scarifying Pass	12 Feet	CPH 25
Feet Per Mile	5,280 Feet	
Square Feet Per Acre	43,560 Sq. Ft.	
Operating Efficiency Factor 50 Min./Hr.	0.83%	CPH 25
Operating Costs	$65.51 Per Hour	90% of DQCRG
Labor Costs	$18.75 Per Hour	WYDOT-WDD
Supervision Labor Costs	$3.13 Per Hour	1/8 of 90% of DQCRG
Supervisor Transportation	$1.10 Per Hour	1/8 of 90% of DQCRG
Total Hourly Costs	$88.49	
SCARIFICATION RATE		
(2.4 Miles/Hour)x(5,280 Ft./Mile)x(12 Ft./Pass)	152,064 Ft^2/Hour	
(152,064 Ft^2/Hour)/(43,560 Ft^2/Acre)	3.49 Acres/Hour	
(3.49 Acres/Hour)x(0.83 Efficiency Factor)	2.90 Acres/Hour	
OPERATING COSTS		
($88.49/Hour)/(2.90 Acres/Hour)	$30.51 Per Acre	

General Revegetation Activity	Calculate According To Specific Permit Commitments
1) Seedbed Preparation	
Ripping	$
Chisel Plowing	$
Disking	$
Harrowing or Cultipacking	$
2) Drill Seed Stubble Mulch Mix	
Seed Costs	$
Drill Seeding	$
Mowing Prior to Planting Permanent Seed Mix	$
3) Seeding Permanent Mixes: Detail for each seed mix, if different seed mixes will be applied. The costs/acre for each individual mix should then be proportioned on the basis of acreage per parcels to derive a single weighted average cost/acre.	
Drill Seeding	$
Broadcast Seeding	$
Seed Costs	$
4) Mulching	
Mulch Purchase	$
Hydromulch Application	$
Straw Mulch Placement and Crimping	$
5) Fertilizer	
Fertilizer Purchase by Defined Composition	$
Application	$
6) Fencing	
Construction	$
Removal	$
Subtotal	$
7) Maintenance Operations at 10% of Total Revegetation Costs: This cost addresses standard husbandry practices applied over the minimum 10-year bonding period, such as remedial seeding, mowing, selective weed treatment, etc. The 10 percent figure is derived from historical operator experience for the Powder River Basin.	$
Total Revegetation Cost Per Acre	$

July 23, 2001

ATTACHMENT E-6-3
QUOTES AND PRICES

EQUIPMENT RATES

HRI, INC.

Crownpoint Office
P. O. Box 777
Physical Address: ½ mile W of Crownpoint
Crownpoint, New Mexico 87313
Voice: 505-786-5845 Fax: 505-786-5555

MARK:

BACKHOE 140.00 DAY 550.00 WEEK 1650.00 MONTH
(RUST TRACTOR RENTAL ALBUQ/FARM.

200.00/DAY 600.00 WEEK 1800.00 MONTH
ROAD MACHINERY ABQ / FARMINGTON

ESCAVATORS (TRACK HOE)

54HP 400/DAY 1200.00 WEEK 3600.00 MONTH.
ROAD MACHINERY

330.00/DAY 1330.00 WEEK 3990.00 MONTH
RUST RENTAL
ABQ / FARMINGTON

+ 35% FOR FUEL / OPERATOR / DELIVERY

I HAVE CALL IN TO AMERICAN CEMENT CORP ALBUQ FOR QUOTE ON BULK CEMENT DEL TO CHURCHROCK
505-753-6269 (Peter CANTRUP)

3300 CU YARDS X 21 SACKS PER YARD = 69,300 SACKS.

10/5/00 Salvador

July 23, 2001

ATTACHMENT E-6-4
BUDGET CALCULATIONS
DISPOSAL COSTS

PIPE VOLUME
TRANSPORTATION AND DISPOSAL

Pipe Wall Volume Data

Outside Diameter (in)	Area Inside OD (ft2)	Wall Volume SDR17 (ft3/ft)
2	0.022	0.012
2.5	0.034	
3	0.049	0.018
3.5	0.067	
4	0.087	
4.5	0.110	
5	0.136	
5.5	0.165	
6	0.196	
6.5	0.230	
7	0.267	
7.5	0.307	
8	0.349	
8.5	0.394	
9	0.442	
9.486	0.491	
9.5	0.492	
10	0.545	0.140
10.5	0.601	
10.75	0.630	
11	0.660	
11.5	0.721	
12	0.785	
12.353	0.832	
12.5	0.852	
13	0.922	
13.5	0.994	
14	1.069	0.237
14.5	1.147	
15	1.227	
15.5	1.310	

	Wall Tk
14 " SDR 17	0.824
10 " SDR 17	0.632

TRANSPORTATION AND DISPOSAL

By-Product Material Transportation Disposal Costs per Ft3

Assumptions:
1. Based on URI contract costs for transportation to and disposal at the IUC White Mesa Mill near Blanding Utah
2. Transportation assumed a 200 mile trip at $2.00 per mile. Bulk truck capacity 20 yds3. Drum truck capacity 48

Type of Waste: Sludge, resin, and other by-product type wastes shipped in drums.

	Unit Cost	Units/Drum	Drums/Truck	Total $/ft3
Disposal fee	$10.00			$10.00
Shipping	$400.00	7.35	48	$1.13
Total shipping and disposal				$11.13

Type of waste: Soil, sand, demolished concreteand other bulk wastes

	Unit Cost	Ft3/Truck	Total $/ft3
Disposal fee	$2.04		$2.04
Shipping	$400.00	540	$0.74
Total shipping and disposal			$2.78

Unrestricted Material Transportation Disposal Costs per ton

Assumptions:
1. Based on public costs disposal at theWaste Management Red Rocks Landfill. 24 $/ton
2. 1 ton is equal to 1 yd3
2. Transportation assumed a 30 mile trip at $2.00 per mile. Bulk truck capacity 20 yds3.

	Unit Cost	Total $/yds3
Disposal fee (ton)	$24.00	$24.00
Shipping (truck trip)	$60.00	$3.00
Total shipping and disposal (yd3)		$27.00

ATTACHMENT E-6-5
QUOTES AND PRICES

LANDFILL FEES
LANDFILL DISTANCE
WHITE MESA FEES

HRI, INC.

Crownpoint Office
P. O. Box 777
Physical Address: ½ mile W of Crownpoint
Crownpoint, New Mexico 87313
Voice: 505-786-5845 Fax: 505-786-5555

MARK: WASTE MANAGEMENT
RED ROCKS LANDFILL
505-862-8402

24.00/TON REG WASTE
46.00/TON special WASTE
(CONTAMINATED with oil/gas/grease)

25 MILES FROM CP site

Salvador
9-12-00

HRI, INC.

Crownpoint Office
P. O. Box 777
Physical Address: ½ mile W of Crownpoint
Crownpoint, New Mexico 87313
Voice: 505-786-5845 Fax: 505-786-5555

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

MARK:

MILES TO LANDFILL

TO CP SITE 25 MILES
TO SEC 8-CR – 35 MILES (VIA I-40)
TO SE 8-CR – 35 MILES (VIA SMITH LAKE PINE DALE)

Schwader 9-13-00

CROWNPOINT/Gallup HAVE TRANSFER STATIONS ONLY. – LANDFILL close TO THOREAU NM.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

BYPRODUCT DISPOSAL AGREEMENT

This BYPRODUCT DISPOSAL AGREEMENT ("Agreement") is made on April 23 1999, by and between Uranium Resources, Inc. ("Shipper") with its principal offices at ~~12377~~ Merit Drive, Suite 1210, Dallas, Texas 75251 and INTERNATIONAL URANIUM (USA) CORPORATION ("IUSA"), with its principal corporate offices at 1050 Seventeenth Street, Independence Plaza, Suite 950, Denver, Colorado 80265. 12750

RECITALS:

A. Shipper is the operator and owner of an in-situ uranium recovery project located in the State of Texas and commonly known as the Vasquez Mine (the "Mine"), and such operations are conducted in accordance with a permit issued by the State of Texas ("Shipper's State License").

B. Shipper desires an agreement with the operator and/or owner of a duly licensed facility authorized to permanently dispose of all of the ByProduct Material as defined under Section 11(e)(2) of the Atomic Energy Act of 1954, as amended, 42 U.S.C. § 2014(e)(2) and 10 C.F.R.§ 40.4(a-1) (the "ByProduct Material"), associated with the Mine or arising from activities at the Mine.

C. IUSA is the operator of the White Mesa Mill located near Blanding, Utah (the "White Mesa Mill"). The White Mesa Mill is owned by IUC White Mesa, LLC., an affiliate of IUSA. The NRC has duly licensed (the "IUSA NRC License") the White Mesa Mill and its component facilities to permit the disposal of ByProduct Material generated as a result of uranium mining and processing by placement of the ByProduct Material in the White Mesa Mill's tailings impoundment (the "Tailings Facility").

D. IUSA and IUC White Mesa, LLC have the necessary expertise, equipment, facilities, permits and licenses to safely and lawfully dispose of the Material and to perform all work required in accordance with the terms and conditions set forth in this Agreement.

E. IUSA is willing to accept ByProduct Material from Shipper for permanent disposal in the Tailings Facility at the White Mesa Mill upon the terms and conditions set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual promises, covenants and agreements set forth in this Agreement, Shipper and IUSA agree as follows:

1. AGREEMENT TO ACCEPT BYPRODUCT MATERIAL.

A. During the Term of this Agreement, Shipper shall ship all but not less than all of the ByProduct Material of Shipper associated with or now located at the Mine or arising from activities at the Mine site to IUSA for final disposal at the White Mesa Mill pursuant to the terms and conditions of this Agreement. All such ByProduct Material shall be delivered to IUSA at the White Mesa Mill.

B. IUSA agrees to accept for final disposal the ByProduct Material of Shipper, as described herein, which is delivered to the White Mesa Mill pursuant to the terms and conditions of this Agreement during the period extending from the date of this Agreement through December 31, 2002, unless this Agreement is terminated sooner under Paragraph 14 hereof.

2. ANALYSIS, TRANSPORTATION, SCHEDULING, AND DELIVERY OF BYPRODUCT MATERIAL.

A. Shipper shall provide and arrange for the transportation of Shipper's ByProduct Material through a transportation contractor. Any and all ByProduct Material shipped for disposal shall be transported in trucks or in 55 gallon drums. All trucks shall be self dumping/end dump trucks. and all such drums shall be full of ByProduct Material and shall be so labeled. Shipper shall require that the transportation contractor comply with all applicable federal and state transportation regulations. Shipper shall make a copy of its contract with the transportation contractor available to IUSA upon request. By releasing a shipment from the Mine, Shipper shall be deemed to have represented and warranted that all information set forth in the forms, reports and logs completed by Shipper is in accordance with this Agreement, and all applicable laws, rules and regulations. All deliveries of ByProduct Material to the White Mesa Mill shall be between the hours of 8:00 a.m. and 4:00 p.m., Monday through Friday. Shipper shall schedule loading at the Mine accordingly. Shipper shall be responsible for any demurrage charges resulting from failure to load trucks to ensure that this delivery requirement can be met. As used herein, "shipment" is defined as any number of drums loaded on one truck or a partial or one full truckload of ByProduct Material, transported at one time. Scheduling of the shipments shall be coordinated with IUSA. Shipper shall segregate types of ByProduct Material based on the categories set forth in Paragraph 10(B) hereof to facilitate determination of quantities being shipped for disposal and all shipments shall be in compliance with the requirements of Paragraph 5(D) hereof.

B. Shipper shall notify IUSA, in writing, thirty days prior to an intended shipment of the ByProduct Material. Such notice shall include (1) a detailed description of the content of the proposed shipment, setting forth with specificity a list of categories or types of ByProduct Material that it intends to ship to the White Mesa Mill and; (2) a date when sampling (as described in paragraph (C)) of the material proposed for shipment will occur.

C. At its sole expense, Shipper shall provide sample analyses (RCRA characterization, radionuclides, and other characterizations requested by IUSA) in sufficient detail to enable IUSA to confirm the content of the intended delivery of ByProduct Material. Shipper shall collect and analyze representative samples for each category or type of ByProduct Material that will be delivered to IUSA for disposal. IUSA reserves the right to have its representative present when Shipper collects the samples. The samples shall be sent to a commercial analytical laboratory which is acceptable to both IUSA and Shipper. An original report of the results of the commercial analytical laboratory analyses will be provided to IUSA thirty (30) days prior to scheduling the actual delivery of the ByProduct Material.

D. Shipper shall provide IUSA with advance notice of the actual date of delivery of the ByProduct Material two (2) business days prior to such delivery.

E. Unloading at the White Mesa Mill shall occur only in areas designated for unloading by IUSA, and in strict accordance with the procedures established by IUSA.

3. REJECTION OF MATERIAL. IUSA shall be entitled to reject delivery of any ByProduct Material or other material of Shipper which, (1) IUSA is not authorized to permanently dispose of at the White Mesa Mill by any term or condition of the IUSA NRC License, or by the terms or conditions of any other applicable permit or license, as by any applicable laws or regulations, or (2) IUSA, in good faith, determines it is not the material from which a sample analysis has been provided to IUSA. Upon receipt of notice from IUSA of any such rejection, Shipper will promptly remove any such nonconforming material from the White Mesa Mill. IUSA may also direct the transportation contractor to return the entire load to the Mine. The removal cost, including any demurrage or delay costs incurred by the trucker, and all of IUSA's costs associated with identifying and handling any rejected material shall be paid for by Shipper. To the extent that IUSA has the legal obligation to identify, and to notify governmental agencies of any shipment of material (or portion thereof) which IUSA believes not to be in compliance with applicable regulations, shall not be liable to Shipper for any loss or damage incurred by Shipper because of such identification and notification. IUSA shall make every effort to notify Shipper of such identification and notification in a timely manner. IUSA's right to reject material of Shipper shall continue up to the time that IUSA has accepted the material for permanent disposal at the Tailings Facility. "Permanent disposal" means the actual placement of the material in a tailings impoundment at the White Mesa Mill. After permanent disposal, Shipper's ByProduct Material will not be segregated from any other material received from any other third party or from any of IUSA's material. Title to the material shall pass to IUSA upon acceptance of the material by IUSA for permanent disposal at the Tailings Facility.

4. REPRESENTATIONS AND WARRANTIES OF IUSA. As material inducements to Shipper to enter into this Agreement, IUSA represents and warrants to Shipper as follows:

A. IUSA is a corporation duly organized, validly existing, in good standing under the laws of the State of Delaware, and is duly qualified and authorized to do business in the State of Utah.

B. IUSA has full corporate power and authority to own its property, carry on its business as being conducted on the date of this Agreement, and has full authority to enter into and perform its obligations under this Agreement.

C. The obligations of IUSA, which are set forth in this Agreement, are enforceable in accordance with their terms except as such terms may be limited by bankruptcy, insolvency, or similar laws affecting the enforcement of creditors' rights generally.

D. The White Mesa Mill facility (i) is not or has not been the subject of response costs as defined by the Comprehensive Environmental Response, Compensatory, and Liability Act, as amended, 42 U.S.C. § 9601-9657 ("CERCLA"), or (ii) is not listed, or is not proposed to be listed, on the National Priority List as defined in CERCLA.

5. REPRESENTATIONS AND WARRANTIES OF SHIPPER. As material inducements to IUSA to enter into this Agreement, Shipper represents and warrants to IUSA as follows:

A. Shipper is a corporation duly organized, validly existing, in good standing under the laws of the state of its incorporation. Shipper has been duly licensed under the Shipper's State License to operate the Mine and to generate the ByProduct Material.

B. Shipper has full corporate power and authority to own its property; to carry on its business as being conducted on the date of this Agreement, and has full authority to enter into and perform its obligations under this Agreement.

C. The obligations of Shipper, which are set forth in this Agreement, are enforceable in accordance with their terms except as such terms may be limited by bankruptcy, insolvency, or similar laws affecting the enforcement of creditors' rights generally.

D. Each shipment of ByProduct Material to be delivered to the White Mesa Mill for final disposal in the Tailings Facility will comply with all applicable provisions of Titles 10 and 49 of the U.S. Code of Federal Regulations, Shipper's State License, the IUSA NRC License, and all other applicable regulations, permits and licenses.

E. The ByProduct Material is not hazardous waste as defined in the Resource Conservation and Recovery Act, as amended, 42 U.S.C. § 6901-6991, or comparable state laws or regulations. The ByProduct Material has not been transported from any site or facility which (i) is or has been the subject of response costs or demands for the payment of response costs as defined in CERCLA, or (ii) is listed, or is proposed to be listed, on the National Priority List as defined in CERCLA.

6. COVENANTS OF IUSA. IUSA covenants are as follows:

A. IUSA shall remain in compliance with its representations and warranties as set forth in this Agreement during the term of this Agreement.

B. IUSA shall maintain, at its expense, during the continuance of the effectiveness of this Agreement, policies of insurance which provide at least the following types of coverage in at least the following amounts:

COVERAGE	LIMITS
Worker's Compensation	Statutory
Employer's Liability	$1,000,000 each occurrence
General Liability	$2,000,000 combined single limit
Automotive Liability (bodily injury & property damage)	$1,000,000 each accident

C. Worker's Compensation insurance shall contain a waiver of subrogation clause.

D. IUSA shall, throughout the continuance of the effectiveness of this Agreement, remain in compliance with the requirements of any federal or state agency for the deposit of surety bonds, cash funds, or other surety arrangements as required by any such agency, to assure it of performance and completion of requirements for reclamation of the White Mesa Mill in accordance with applicable law and regulations.

7. COVENANTS OF SHIPPER. Shipper covenants as follows:

A. Shipper shall remain in compliance with its representations and warranties as set forth in Paragraph 5 of this Agreement during the continuance of the effectiveness of this Agreement.

B. Shipper shall maintain or cause the transportation contractor to maintain, at its expense, during the continuance of the effectiveness of this Agreement, policies of insurance which name each of IUSA and IUC White Mesa LLC as an additional insured, and which provide at least the following types of coverage in at least the following amounts. Prior to delivering any ByProduct Material to the White Mesa Mill and, as a condition to doing so, then, and from time to time during the continuance of this Agreement, Shipper shall furnish to IUSA duly executed certificates of insurance establishing that the required insurance coverage has been obtained and is being maintained in full force and effect.

COVERAGE	LIMITS
Worker's Compensation	Statutory
Employer's Liability	$1,000,000 each occurrence
General Liability	$2,000,000 combined single limit
Automotive Liability (bodily injury & property damage)	$1,000,000 each accident
Automotive Liability (LSA - Highway Route Controlled Quantity Coverage)	$5,000,000

C. Worker's Compensation insurance shall contain a waiver of subrogation clause.

D. The ByProduct Material to be delivered to the White Mesa Mill for disposal in the Tailings Facility will consist of contaminated soil, sand, rocks, demolition masonry, concrete rubble, filter material, pond liners, pond sediments, processing equipment, piping, and other miscellaneous material and equipment. No separate pieces of any material shall exceed 30 cubic feet in volume, with no single dimension greater than six feet. Any and all material containing void space of one cubic foot or greater, except open-ended steel piping, shall be opened by Shipper such that the void space can be filled during disposal, or the material shall be crushed by Shipper such that the remaining void space is less than one cubic foot. No partially filled drums shall be shipped, and any empty drums which are shipped for disposal shall be crushed by Shipper. Materials of a friable nature, such as PVC or fiberglass, shall be crushed or chipped by Shipper to reduce void space. ByProduct Materials saturated with liquid will not be shipped. No rebar or other sharp objects shall be protruding from concrete or cement type of rubble. Any deviation from these requirements must be approved in writing by IUSA prior to transporting such materials. The ByProduct Material is expected to include the radionuclides Radium-226, Thorium-230, and natural uranium. The Radium-226 levels will not exceed 6,000 pci/gram, and total radioactivity will not exceed 6,000 pci gross alpha activity per gram, and sample reports showing radioactivity levels shall be included with the Bill of Lading delivered to IUSA.

E. With each shipment of the ByProduct Material to the White Mesa Mill, Shipper shall execute and deliver to IUSA (or the transporter, as appropriate) the Bill of Lading and Material Release Authorization in the Forms attached hereto as Exhibits A and B, respectively, and the information provided on such shall be true and accurate in all respects. A copy of Shipper's State License shall also be attached to the Bill of Lading.

8. INDEMNIFICATION BY IUSA. IUSA shall indemnify, defend, and save harmless Shipper and their representative officers, employees, and agents against all liability whatsoever, including all costs and expenses each of Shipper and their representative officers, agents, and employees may incur, including without limitation by reason of enumeration, claims asserted against either Shipper by any employee of IUSA, environmental response costs, clean up costs, governmental fines, costs of settlement, and reasonable attorney's fees which in any way results from a breach by IUSA of its representations, warranties or covenants made in this Agreement or failure of IUSA to comply with the terms and provisions of the IUC NRC license and/or any state issued permits, or other applicable federal and state statutes or regulations.

9. INDEMNIFICATION BY SHIPPER. Shipper shall indemnify, defend, and save harmless IUSA, IUC White Mesa, LLC and their representative officers, employees, and agents against all liability whatsoever, including all costs and expenses that IUSA, IUC White Mesa, LLC and their representative officers, agents, and employees may incur, including without limitation, loss of profits or revenues, claims asserted against IUSA or IUC White Mesa, LLC by any employee of Shipper, environmental response costs, clean up costs, governmental fines, costs of settlement, and reasonable attorney's fees which in any way relate to or arise out of or are incurred in connection with the disposal of any ByProduct Material delivered to IUSA, the White Mesa Mill, from Shipper, if such loss or liability, in any way whatsoever, results from the failure of the ByProduct Material to conform to the terms of this Agreement or the data supplied on any of the reports, logs or forms

provided by Shipper, or said shipment fails to meet applicable standards prescribed by the Department of Transportation, or any other federal or state governmental agency, having jurisdiction over such matters, or which are related to breaches by Shipper of its representations, warranties or covenants made in this Agreement, or the failure of Shipper to comply with the terms and provisions of the Shipper's State License, and/or any other permits or other applicable federal and state statutes or regulations, regardless of whether title to the ByProduct Material has passed to IUSA under the terms of this Agreement.

10. PAYMENTS AND FEES. For all the ByProduct Material delivered to and disposed of by IUSA, Shipper shall pay IUSA as follows:

A. Shipper shall pay IUSA within 21 days of receipt of an invoice, therefore the following disposal fees for quantities of ByProduct Material delivered for disposal, as indicated below:

(i) For ByProduct Material consisting of soils, sand, gravel, rock, concrete rubble within size specification, masonry-type demolition material, unpackaged pond sediments, PVC, fiberglass, and process equipment: $55.00/cu. yd.

(ii) For ByProduct Material consisting of ion exchange resin, and packaged or drummed demolition and process waste, including PVC, fiberglass, process equipment, and other miscellaneous items not included as bulk material in A(i): $10.00/cu. ft.

(iii) A charge of $35.00 per hour shall be made for unloading time at the White Mesa Mill.

(iv) A decontamination charge of $30.00 per hour, or any part thereof, will be made in the event IUSA determines that any truck or container has been contaminated to the extent that additional decontamination efforts are required due to surface contamination not caused by IUSA actions.

(v) Package quantities specified in A(i), and A(ii) shall not be mixed within a single shipment. The determination of "cubic yard" or "cubic feet" shall be based on the shipping container or package volume.

IUSA will provide Shipper with a copy of IUSA's scale ticket to support IUSA's weight measurement and subsequent invoice.

B. All sales and use taxes, that are applicable to the services covered herein, shall be paid by Shipper.

11. FEE REVIEW. Any increase of IUSA's costs of operation, due to regulatory requirements, shall be charged to the Shipper, in a fair and reasonable proportion, from the date a particular requirement becomes effective.

12. INSPECTIONS. Shipper's representatives, as designated to IUSA in writing, shall have the right to inspect IUSA's White Mesa Mill facilities which are related to receipt, handling, and disposal of the ByProduct Material, at reasonable times and frequency designated by IUSA, and upon at least seven days written notice from Shipper. Shipper shall also have the right to inspect, upon reasonable notice, IUSA's licenses and permits to receive, handle and dispose of ByProduct Material at the White Mesa Mill facility. Such inspections shall be at the sole cost and risk of Shipper's participating representatives, and shall not interfere with IUSA's operations at the White Mesa Mill.

13. SAFETY. Shipper, its employees, all its contractors and subcontractors ("Shipper's Personnel"), shall abide by all health, safety, and security rules and regulations in force at the White Mesa Mill, or on any property controlled by IUSA or IUC White Mesa, LLC, while they are present on the premises. Shipper shall indemnify and hold harmless IUSA and IUC White Mesa LLC, for any loss or damages, including reasonable attorney's fees, suffered by IUSA or IUC White Mesa LLC resulting from the failure of Shipper's employees, contractors or subcontractors to comply with the terms of this paragraph 13.

14. TERMINATION.

A. This Agreement may be terminated by notice from either party in the event of substantial failure by the other party to fulfill its obligations through no fault of the terminating party, provided that no such termination may be effected unless the other party is given not less than 15 business days written notice (delivered in person or by certified mail, return receipt requested) of intent to terminate, during which time the default may be cured and the Agreement reinstated.

B. If termination is caused by default of Shipper, Shipper shall pay IUSA all sums due hereunder, through the date of termination.

C. In the event termination is caused by default of IUSA, IUSA will reimburse Shipper for all sampling and characterization costs incurred for any pending shipments; any transportation costs incurred for pending shipments.

D. In the event any one party shall have declared force majeure, as cited in Paragraph 24 herein, for any event or events cumulating over 60 days, the other party may terminate this Agreement by five days written notice.

15. CONFIDENTIALITY. IUSA and Shipper shall endeavor to keep this Agreement and the terms and conditions contained herein confidential and shall not disclose same to third parties without the other party's prior written consent, which will not be unreasonable withheld, unless such disclosure is required pursuant to applicable law or regulation, including tax and securities laws and regulations, or for the purposes of the financing of IUSA or any of its affiliates. Either party may make such disclosures as it deems appropriate to affiliates, employees, agents, contractors or prospective purchasers, lessees or assigns, provided that any such persons are advised of this confidentiality clause and agree to be bound by it.

16. NOTICES. Except as specifically provided to the contrary in this Agreement, any notices or communications permitted or required hereunder shall be deemed properly transmitted when delivered in person or sent by mail, telecopy, or any other form of written communication, addressed to the respective party at the addresses listed below or at such other address as either party may notify that other in writing in accordance with the provisions of this paragraph. Notices shall be deemed to have been given on the date of receipt.

IF TO IUSA: International Uranium (USA) Corporation
Independence Plaza, Suite 950
1050 Seventeenth Street
Denver, Colorado 80265
Phone: (303) 628-7798
Fax: (303) 389-4125

IF TO SHIPPER: Uranium Resources, Inc.
12750 ~~12377~~ Merit Drive, Suite 1210
Dallas, Texas 75251
Phone: (972) 387-7777
Fax: (972) 387-7779

17. SURVIVAL OF OBLIGATIONS. As provided in this Agreement, the obligations, representations and warranties of each party to the other, which are to be performed after termination, shall survive the termination of this Agreement regardless of the cause of termination.

18. GOVERNING LAW AND VENUE. This Agreement shall be governed by and construed in accordance with the laws of the State of Colorado.

19. INUREMENT. The terms and provisions of this Agreement shall be binding upon and inure to the benefit of the parties hereto, their successors, and assigns. Provided, however, Shipper shall not assign or transfer any of its rights or obligations under this Agreement except with the prior written consent of IUSA, and the written assumption by the transferee of all of the obligations of Shipper in a form satisfactory to IUSA. IUSA's consent to one transfer shall not operate as a waiver of IUSA's rights as to any subsequent transfer by Shipper or any subsequent transferee.

20. COMPLETE AGREEMENT AND AMENDMENT. This Agreement constitutes the full and complete understanding of the parties with respect to the subject matter hereof and supersedes any prior agreement, oral or written, relating thereto. This Agreement shall not be amended except in writing, signed by both parties, unless otherwise provided for within this Agreement. The parties hereto agree that any amendments that may be necessary to achieve or maintain compliance with any regulatory program that may apply to the subject of this Agreement shall be made as soon as practicable, provided, however, either party may elect to terminate this Agreement rather than agree to any amendment unless such amendment applies to ByProduct Material already disposed of at the White Mesa Mill, in which case the necessary amendment shall be made.

21. HEADINGS. The paragraph headings used in this Agreement are for convenience only, and shall not be deemed part of this Agreement nor used in its interpretation or construction.

22. ARBITRATION. Any controversy or claim arising out of or relating to this Agreement or the breach thereof shall be resolved in accordance with the Commercial Arbitration Rules of the American Arbitration Association by one arbitrator. The selection of the Arbitrator shall be in accordance with such rules. The Arbitrator's decision shall be final and binding upon the parties hereto; and judgment upon the award may be entered in any court having jurisdiction. The parties shall each pay one-half of the fees and expenses of the Arbitrator except for all fees and expenses of its own witnesses and counsel. Disputes shall not interrupt operations or other actions contemplated herein.

23. COSTS AND ATTORNEY FEES. Except to the extent that such will be considered liquidated damages payable to Shipper under Paragraph 24 and/or to the extent a matter is submitted to arbitration under Paragraph 22, if it is necessary for either party to obtain legal representation to enforce any provision of this Agreement, the non-prevailing party agrees to bear the court costs and reasonable attorney fees of the prevailing party.

24. LIMITATIONS OF REMEDY. The parties agree that IUSA shall not be liable for any incidental and/or consequential damages of any nature claimed by Shipper. If IUSA is unable for any reason, except a breach of this Agreement by the Shipper, and other than a breach of any of the provisions of this Agreement by IUSA, to accept delivery and dispose of ByProduct Material of Shipper, Shipper's sole remedy in such an instance shall be a refund of any advance payments or costs incurred by Shipper for pending shipments. Refund of such amount shall be considered as constituting liquidated damages, including any and all incidental and/or consequential damages that might be claimed by Shipper. The parties agree that such a refund is reasonable compensation, and not a penalty, for the reason that actual damages, if any, that might be sustained by the Shipper are uncertain and would be difficult to ascertain.

25. FORCE MAJEURE. Except for both parties' indemnification, the obligations of confidentiality and the Shipper's obligations to make payments, the obligations of either party shall be suspended to the extent, and for the period that performance is prevented by any cause, whether foreseeable or unforeseeable, beyond its reasonable control, including, without limitation, labor disputes (however arising and whether or not employee demands are reasonable or within the power of the party to grant), acts of God; laws, regulations, orders, proclamations, instructions or requests of any government or governmental entity whether federal, state or local; acts of war or conditions arising out of or attributable to war, whether declared or undeclared, riot, civil strife, disobedience, insurrection or rebellion, fire, explosion, earthquake, storm, flood, sink holes, drought or other adverse weather condition, or any other cause whether similar or dissimilar to the foregoing, but specifically excluding increasing in the costs of transportation or handling of ByProduct Materials. The affected party shall promptly give notice to the other party, as appropriate of the suspension of performance, stating therein the nature of the suspension, the reasons therefor, and the expected duration thereof. The affected party shall resume performance as soon as reasonably possible.

26. BOOKS AND RECORDS. Shipper shall keep complete and accurate books and records respecting all matters covered by this Agreement, including without limitation, records of the quantities and disposition of all ByProduct Materials, which shall be open for inspection by IUSA during business hours.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their duly authorized representatives as of the day and year first set forth above.

INTERNATIONAL URANIUM (USA) CORPORATION

By: _____

URANIUM RESOURCES, INC.

By: _____

July 23, 2001

ATTACHMENT E-6-6
BUDGET BACKUP

RELEASE STANDARDS

Limits for Release to Uncontrolled Areas

Nuclide	Average[a]	Maximum[b]	Removable[c]
U-nat	5,000 dpm/100 cm2	15,000 dpm/100 cm2	1,000 dpm/100 cm^2
226-Ra	100 dpm/100 cm2	300 dpm/100 cm^2	20 dpm/100 cm^2

a. Averaged over no more than 1 m^2.

b. Applies to an area of not more than 100 cm^2.

c. Determined by smearing with dry filter, or soft absorbent paper, applying moderate pressure and assessing the amount of radioactive material on the smear.

Source: Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," and "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use, or Termination of License for Byproduct, Source, or Special Nuclear Material."

7. Building Decommissioning

There is no office or process buildings planned for the Section 17 site. Section 17 will be in situ wellfield only that will feed the IX satellite on the adjacent Section 8.

8. Surface Reclamation

8.1. Introduction and Description

The purpose of the surface reclamation program will be to reestablish the sites to their premining topographic conditions, stabilize the site with self-sustaining vegetative cover, and to restore all land disturbed by mining, and related activities to a productive condition for livestock grazing, and wildlife habitat consistent with the present, and historical use of the area. It is anticipated that future land use will be similar to current uses.

There are no ponds planned for the Section 17 site. Section 17 will be in situ wellfield only that will feed the IX satellite on the adjacent Section 8.

8.2. Budget Assumptions

The Surface Reclamation Budget is formatted with the underlying assumptions integrated into the tabulation. The budget figures distinguish individually costs associated with wellfield area reclamation, wellfield road.

Wellfield sizes and road lengths were estimated using the schematic diagram COP Figure 1.4-8. Unit costs for road, wellfield, pond were calculated by HRI (See Attachment E-8-2).

After all of the equipment is removed the entire wellfield area will be scanned to assure that no residual contamination remains on the soil. Scans will be conducted according to the according to Procedure shown in Attachment E-6-2, and the hot spots characterized, picked up and disposed of at a NRC licensed facility. The on site management would conduct these surveys.

All disposal was priced at the bulk rate as shown in Attachment E-6-4.

As shown in Attachment E-8-1, the total cost for final surface reclamation is $7,153.

July 23, 2001

ATTACHMENT E-8-1
SURFACE RECLAMATION BUDGET

Wellfield Surface Reclamation

	Description	Unit	Total
I.	**Wellfield Area Reclamation**		
	Wellfields area (acres)	28	
	Disking/seeding unit cost ($/acre)	$200	
	Subtotal reclamation costs for wellfield		$5,600
II.	**Wellfield Road Reclamation**		
	Length of wellfield roads (1000 ft)	2.25	
	Wellfield road reclamation unit cost ($/1000 ft)	$690	
	Subtotal wellfield road reclamation costs		$1,553
TOTAL WELLFIELD AND SATELLITE SURFACE RECLAMATION COSTS			**$7,153**

July 23, 2001

ATTACHMENT E-8-2
BUDGET CALCULATIONS

ROAD REMOVAL

WELLFIELD ROAD RECLAMATION

Assumptions:

1. Gravel road base removed at cost of $0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C)
2. Gravel road base: average depth = 0.5 ft, average width = 15 ft
3. Roads scarified prior to topsoil application at cost of $30.51/acre (WDEQ Guideline No. 12, Appendix P)
4. Grading of scarified roads prior to topsoil application at cost of $33.27/acre (WDEQ Guideline No. 12, Appendix G)
5. Topsoil applied at cost or $0.60/cy/1000 ft (WDEQ Guideline No. 12, Appendix C, surface grade: level ground)
6. Stripped topsoil: average depth = 0.67 ft, average width = 25 ft
7. Discing/seeding cost of $200/acre

Costs per 1000 ft of road

	Width (ft)	Thick (ft.)	Yd3	$/Yd3	Total
Road base removal	15	0.5	278	$0.60	$166.67
Topsoil application	25	0.67	620	$0.60	$372.22

	Width (ft)	Acres	$/Acres	Total
Scarification	25	0.6	$30.51	$17.51
Grading	25	0.6	$33.27	$19.09
Disking/seeding	25	0.6	$200.00	$114.78

TOTAL WELLFIELD ROAD RECLAMATION $690.28

DISKING/SEEDING

Assumption:

1. Based on actual contractor costs

TOTAL DISCING/SEEDING COSTS PER ACRE = $200.00

9. Contingency/Profit

Contractor profit has been included at 15% of the total cost for groundwater restoration, groundwater stability analysis, well plugging and equipment removal and 25% of the total cost for wellfield D & D, building D & D, and surface reclamation.

Shown in Section 10 Contingency/Profit is $674,380.

10. Summary

HRI CROWNPOINT URANIUM PROJECT			
Financial Assurance Plan for Churchrock Section 17			
Summary			
Category	Project Total	Contingency/ Profit 15%	Contingency/ Profit 25%
Groundwater Restoration	$4,089,818	$613,473	
Groundwater Stability Analysis	$56,000	$8,400	
Well Plugging	$251,045	$37,657	
Wellfield D & D	$52,250		$13,062
Surface Reclamation	$7,153		$1,788
Totals	$4,456,265	$659,529	$14,851
Contingency/Profit			$674,380
Total Surety Proposed			$5,130,645

ABBREVIATIONS/ACRONYMS

$	Dollars
$/Kgal	Dollars per 1000 gallons
avg	average
ft	feet
ft2	square feet
ft3	cubic feet
gal	gallons
gpm	gallons per minute
H&S	Health and Safety
H2S	Hydrogen Sulfide
H2SO4	Sulfuric Acid
HCl	Hydrochloric Acid
Hp	Horsepower
Kgal	1000 gallons
Kwh	Kilowatt-hours
HaOH	Caustic Soda
OD	Outside Diameter
PPE	personal protective equipment
PV	Pore Volume
reqm't	requirement
RO	Reverse Osmosis
WDEQ	Wyoming Department of Environmental Quality
WDW	Waste Disposal Well
yd3	cubic yards
yr	year