Kennecott Energy

Kennecott Uranium Company
Sweetwater Uranium Project
Post Office Box 1500
Rawlins, Wyoming 82301-1500
Phone: (307) 328-1476
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22 July 2004

Mr. Gary Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
Mail Stop T-8A33
11545 Rockville Pike
Rockville, Maryland 20852-2738

Dear Mr. Janosko:

Subject: **Sweetwater Uranium Project – Docket Number 40-8584**
Source Material License #SUA-1350 – Response to Comments:
- **License Renewal Request**
- **License Amendment for the Proposed Change to the Groundwater Corrective Action Program, Environmental Monitoring Program and Reclamation Plan**

Enclosed please find the following:

1. Revised Appendix 4 of the Request for Renewal entitled – *Sweetwater Uranium Project – 2004 Surety Update for the Nuclear Regulatory Commission – May 2004.* This submittal is in response to a request dated June 24, 2004 made by Elaine Brummett of your staff. This surety document uses a long-term surveillance fee of $698,301.00, provided by Elaine Brummett of your staff in a telephone conversation on Wednesday, May 14, 2004. This fee is based on the May 2004 Consumer Price Index (CPI). Since this fee is based on the May 2004 CPI, it is requested that the anniversary month for surety calculation be May of each year.

2. *Response to Comments* submitted in response to a request dated June 24, 2004 by Elaine Brummett of your staff, for additional information regarding the license amendment request for a proposed change to the groundwater Corrective Action Program (CAP), Environmental Monitoring Program and Reclamation Plan related to contaminated soils and groundwater discovered in the vicinity of the Sweetwater Uranium Project's Catchment Basin.

3. Completed *NRC Form 313 – Application for Material License.*

This submittal has been discussed with Elaine Brummett of your staff. If you have any questions please do not hesitate to contact me.

Sincerely yours,

Oscar Paulson
Facility Supervisor

cc: Elaine Brummett (2)
Director – NRC DRSS Region IV (w/o enclosures)
Rich Atkinson

LLM5501

Kennecott Uranium Company
Sweetwater Uranium Project
Docket No. 40-8584
SML #SUA-1350

REVISED APPENDIX 4

Request for Renewal – May 12, 2004

15 July 2004

SWEETWATER URANIUM PROJECT
2004 SURETY UPDATE
FOR THE NUCLEAR REGULATORY COMMISSION
JULY 2004
REVISION 2

Prepared for:

KENNECOTT URANIUM

P.O. Box 1500
Rawlins, Wyoming 82301

Prepared by:

MFG, INC.

3801 Automation Way, Suite 100
Fort Collins, Colorado 80525
(970) 223-9600
Fax: (970) 223-7171

MFG Project No. 181113

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1.0 INTRODUCTION

MFG, Inc., on behalf of Kennecott Uranium Company, has prepared a surety rebaselining for the Sweetwater Uranium Facility for the year 2004. A rebaselining of the surety using current costs is required by the Nuclear Regulatory Commission (NRC) every five (5) years. A rebaselining of the surety involves recalculation of the surety amount using current costs as opposed to merely increasing the surety based upon changes in the Consumer Price Index (CPI). Additional backup for the referenced source, quantities, and unit rates that comprise the estimate are present or referenced in the following pages.

The attached sheets present the details of the cost estimates for mill decommissioning, existing impoundment reclamation, soil cleanup and verification, including backup and a description of assumptions. These sheets have been prepared in accordance with *NUREG-1620 – Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act.* Key unit prices used in the estimates are summarized on Table 1, and cost estimates are summarized on Table 2. The map showing the current area under the NRC bond is included as Figure 1.

2.0 COST ESTIMATE

The mill and shop area decommissioning costs are based on quantities and information from previous reports, listed in the references (Landmark Engineering, 1990; Shepherd Miller 1997, 1999). Volumes and quantities for the site calculated for the April 20, 1999 surety update were used for this update.

Various publicly available sources were used for estimating the costs in this surety update. Mill demolition rates were selected based on rates identified in RS Means (2003), and were calculated to be $0.50 per cubic foot of material. Concrete demolition and disposal rates were identified from rates presented by Portle and Jakubowksi (2002). Materials retrieved from the dismantling of the mill will be placed inside the tailings impoundment. It was assumed, for this estimate, that there will be no salvageable materials from the mill facility.

Different unit rates for soil excavation and placement were used for the Update. Unit rates were selected based on cost estimates presented by the Wyoming Department of Environmental Quality (2003) and Portle and Jakubowski (2002). These cost estimates are presented below.

Table 1 Unit Cost Summary

Item Description	2004 Unit Cost
Replace Topsoil [a]	$1.25 per cubic yard
Regrading/Ripping Soil [a]	$350 per acre
Remove/Excavate Soil [a]	$1.60 per cubic yard
Concrete Foundation Demolition [b]	$2.50 per square foot
Onsite Concrete Disposal [b]	$6.00 per cubic yard

[a]Wyoming Department of Environmental Quality, 2003
[b]Portle and Jakubowski, 2002

For situations in which use of nearby borrow areas for fill or nearby spoil areas for excess cut will be made, and in which limited engineering and construction quality assurance (CQA) is required (because moisture and compaction specifications do not apply), a unit of rate of $1.25 per cubic yard was used. For situations in which removal of soil will be performed with tight construction quality assurance and control, as will be the case with windblown and contaminated soils cleanup, a unit rate of $1.60 per cubic yard was used. Corrective Action Program (CAP) restoration costs were estimated based on MFG, Inc. consulting costs for the project.

Radiological costs have been reduced since the 1999 surety update due to advances in technology. For the 1999 surety update, the radiological survey was based on dividing the area into grids, surveying each grid location, staking the grids and walking each grid with a handheld Ludlum 2350 Gamma meter. Data from the grids was recorded manually and an analysis was completed using a spreadsheet.

Global Positioning System (GPS) based systems have considerably reduce the cost for this analysis. The handheld GPS based system is attached directly to a Ludlum meter. Data from the system is then fed directly into a laptop PC from the meter. This system can be mounted on a truck, all terrain vehicle or in a backpack, greatly increasing the data gathering ability. This method of radiological survey analysis has also reduced the time it takes to complete a survey, thus reducing the costs further. Based on recent radiological surveys conducted by MFG, Inc., the costs of this survey were estimated to be $1,000 per acre (MFG, 2003).

Engineering/CQA was considered either to have already occurred through preparation of the final design or is incorporated in the unit rates selected for this surety estimate. Engineering/CQA was not included in cost estimating for the current bond and this convention was followed for the cost estimate presented herein. A 15 percent contingency factor for all construction items, as required by NRC, was included in the cost estimate presented herein.

3.0 2004 SURETY UPDATE COSTS

The estimated cost for demolition and placement of all materials in the tailings impoundment, decommissioning the mill, reclaiming the existing tailings impoundment, performing soils cleanup, performing CAP groundwater restoration and miscellaneous building removal is estimated to be $7,664,298 in 2004 dollars. The attached Appendix A provides the details and the backup materials for this estimate. This cost estimate includes $698,301 for long-term surveillance fees. Rounding the value of the estimate up to the nearest $1,000, in keeping with existing practice, would result in a bond to cover these costs of $7,665,000.

Table 2 2004 Surety Estimate Summary

Item Description	2004 Estimated Cost
Mill Decommissioning	$1,434,256
Soils Reclamation	$ 768,257
CAP Restoration	$1,141,953
Existing Impoundment Reclamation	$2,004,851
Radiological Survey Monitoring	$ 455,680
Long Term Surveillance Fees	$ 698,301
Mobilization/Demobilization	$ 290,250
Contingency (15%)	$ 870,750
TOTAL	**$7,664,298**

4.0 REFERENCES

Landmark Reclamation, 1990. "Bonding Cost Estimate, Sweetwater Uranium Operations Tailings/Mill Area" September.

MFG, Inc., 2003. "Integrated Project Schedule for Closure of the Dawn Mining Company Millsite" Prepared for the Dawn Mining Company and presented to the Washington Department of Health. November 20.

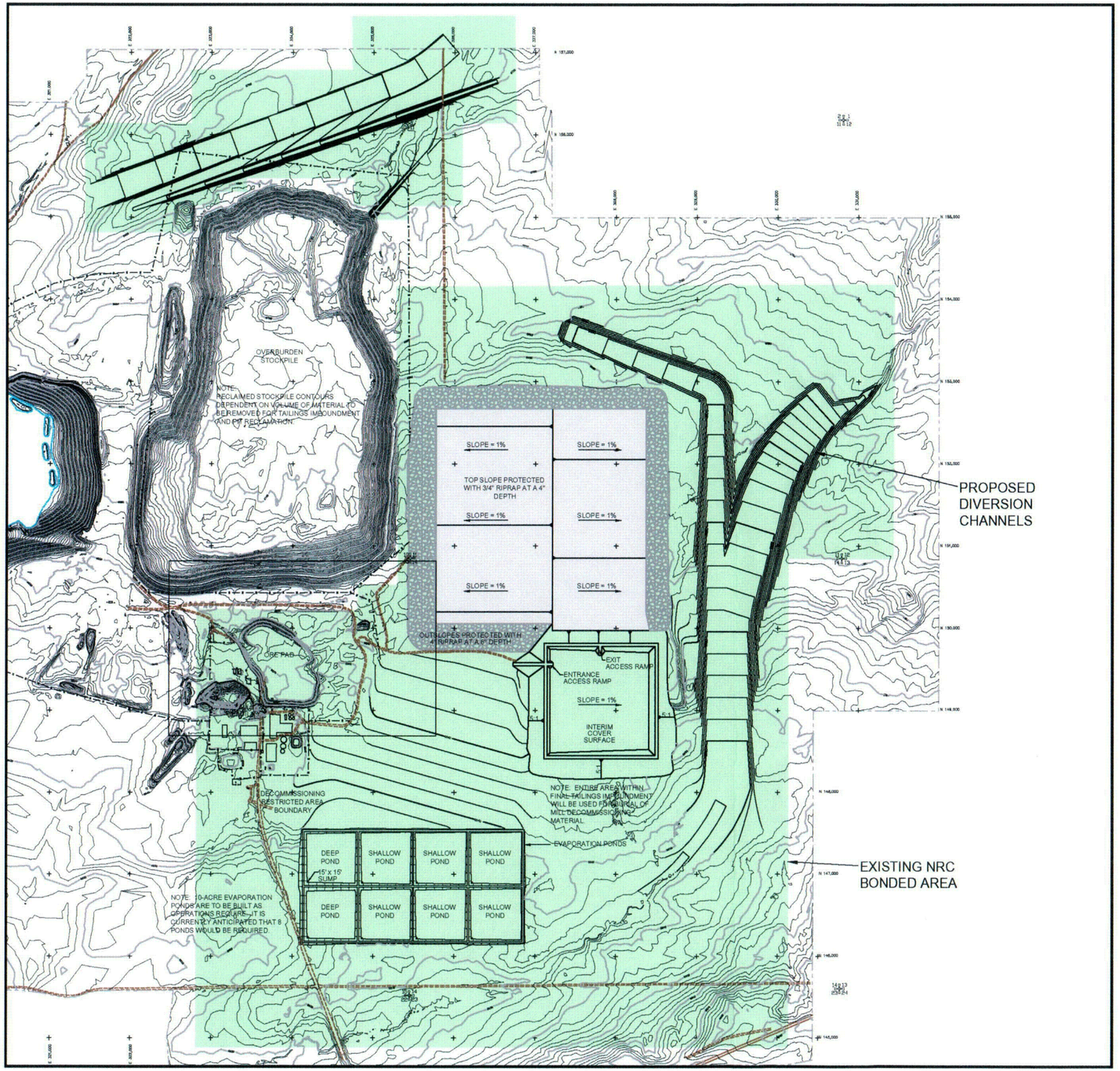
RSMeans, 2003. "Heavy Construction Cost Data 17th Annual Edition." RSMeans Construction Publishers and Consultants. Kingston, Massachusetts.

Portle, T. and Jakubowski, R., 2002. "A Guide to Preparing and Reviewing Financial Assurance for Reclamation of Nonmetallic Mining Sites in Wisconsin". PUBL-WA-835 2002. July. Wisconsin Department of Natural Resources – Bureau of Waste Management.

Shepherd Miller, Inc. (SMI), 1997. "New Impoundment Reclamation Plan Vol. I –VIII." August 5.

Shepherd Miller, Inc. (SMI), 1999. "Final Design: Sweetwater Uranium Project. Volumes I through IX."

Wyoming Department of Environmental Quality, 2003. "Standard Reclamation Performance Bond Format and Cost Calculation Methods, Guideline No. 12" Wyoming. November. Appendices A – J.



SHADING LEGEND

EXISTING NRC BONDED AREA

NOTE:
THE CURRENT NRC RESTRICTED AREAS ARE DEFINED BY STANDARD OPERATING PROCEDURE, TO BE THE MILL AND S/X BUILDINGS, STORAGE AREA IN A PORTION OF THE MAIN SHOP, AND THE TAILINGS IMPOUNDMENT.

NOTE:
CONFIGURATION SHOWN DEPICTS EXISTING IMPOUNDMENT RECLAIMED BELOW GRADE, AND THE RECLAMATION OF FOUR NEW IMPOUNDMENTS. EVAPORATION PONDS ASSUMED TO BE STORING FLUID FROM THE LAST TAILINGS IMPOUNDMENT.

NORTH

SCALE IN FEET
0 1400

FIGURE 1
EXISTING NRC BONDED AREAS

MFG, Inc.
consulting scientists and engineers

Date:	MAY 2004
Project:	181113
File:	NRCBOND

Filename: E:\181113\NRCBOND.dwg
Date: 05/14/2004
Time: 08:29:11.18

C01

APPENDIX A

COST ESTIMATE

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 1
(Revision 2, July 2004)

Mill Area Decommissioning

A. Demolition

	Area (ft^2)	Volume (ft^3)	Cost[a]
Mill Building	48,175	722,625	$361,313
S/X Building	26,400	396,000	$198,000
Main Shop	22,550	338,250	$169,125
Administration Bldg	13,050	195,750	$97,875
Tire and Lube Bldg	9,000	135,000	$67,500
Misc Buildings	10,000	150,000	$75,000
Tank #1 (75ft Diam)	4,418	66,268	$33,134
Tank #2 (65 ft Diam)	3,318	49,775	$24,887
Tank #3 (50 ft Diam)	1,963	29,452	$14,726
Misc Tanks	1,600	24,000	$12,000
Quonset Hut and Misc Buildings			$13,445

Subtotal: $1,067,005

B. Concrete Demolition and Disposal *

	Area (ft^2)	Volume (ft^3)	Cost[b]
Mill Building	48,175	24,088	$125,790
S/X Building	26,400	13,200	$68,933
Main Shop	22,550	11,275	$58,881
Admin Bldg	13,050	6,525	$34,075
Tire and Lube Bldg	9,000	4,500	$23,500
Misc Buildings	10,000	5,000	$26,111
Tank #1 (75ft Diam)	4,418	2,209	$11,536
Tank #2 (65 ft Diam)	3,318	1,659	$8,664
Tank #3 (50 ft Diam)	1,963	982	$5,127
Misc Tanks	1,600	800	$4,178

C. Chemcial Disposal

	Quantity	Volume (ft^3) **	Cost [c]
Ion Exchange Resin	174,740 lbs	2,496	$456

Subtotal: $367,251

Mill Area Decommissioning Total: $1,434,256

Notes:

[a] *RSMeans Heavy Construction Cost Data*, 2003 Cost estimate of $0.50/$ft^3$

[b] *A Guide to Preparing and Reviewing Financial Assurance For Reclamation of Nonmetallic Mining Sites in Wisconsin*, 2002 p. 19-20

* As presented in reference above, Concrete Disposal $6.00/cy; Concrete Demolition $2.50/cy.

[c] Guideline No. 12 Standard Reclamation Performance Bond Format and Cost Calculation Method, Wyoming DEQ, 2003

** Assuming 70 lb/ft^3 density

Demolition includes removal of piping, insulation and electrical equipment
Insulation on site does not contain asbestos
Electrical equipment on site does not contain Polychlorinated Biphenyls (PCBs)
Materials retrieved from the dismantling of the mill will be placed inside the tailings impoundment
It was assumed, for this estimate, that there will be no salvageable materials from the mill facility

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 2
(Revision 2, July 2004)

Soil Reclamation and Revegetation

A. Soil Reclamation and Revegetation

	Area (ft^2)	Volume (ft^3)	Cost	Notes
Scoping Survey	240 ac	-	$86,400 [a]	$355/ac
Performance Evaluation Survey	-	-	$40,000 [a]	Lump Sum
Soil Removal	-	155,567 CY	$248,907 [b,c]	$1.6/c.y.
Site Grading/Ripping	67 ac	-	$23,450 [d]	$350/ac Grading and Ripping
Overburden Cover (1.5ft thick)	20 ac	48,400 CY	$60,500 [d]	$1.25/c.y.
TopSoil Replacement	67 ac	5,472,225	$253,344 [d]	$1.25/c.y.
TopSoil Regrading	67 ac	-	$20,100 [d]	$300/ac Grading
Chiseling, Seeding, Mulching and Crimping (Including Seed and Straw)	67 ac	-	$35,556 [e]	530.69/ac

Total Soil Reclamation and Revegetation $768,257

Notes:

[a] Based on MFG, Inc. Proposed Costs
[b] Includes Catchment Basin and surrounding areas
[c] *A Guide to Preparing and Reviewing Financial Assurance For Reclamation of Nonmetallic Mining Sites in Wisconsin, 2002* p. 19-20
[d] Guideline No. 12 Standard Reclamation Performance Bond Format and Cost Calculation Method, Wyoming DEQ, 2003
[e] Costs based on actual revegetation work performed for Kennecott Uranium in September 2003 by MGM Enterprises, Inc. Change Order No. 12 - September 2, 2003.
[f] 2004 estimate includes Inberg Miller's estimate of 26,500 CY of soils containing concentrations of Ra-226 higher than 16.4 pCi/g located in the Catchment Basin plus 111,000 CY of petroleum contaminated soils in the vicinity and windblown materials. The Inberg Miller volume estimate includes some overlap, where dually contaminated soils exist as per submittal dated May 12, 2004 "Request for Amendment to Final Design - Vol 6 - Part 2, Mill Decommissioning Addendum to the Existing Impoundment Reclamation Plan".

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 3
(Revision 2, July 2004)

Groundwater

Corrective Action Program (CAP) Restoration*

	Unit	Unit Rate	Quantity	Cost	Comments
Pumping - Electricity [1]	hour	$0.239	8,760	$2,094	5 pumps (using 5 HP or 3.73 kw) running year round
Inspection [2]	hour	$28	1460	$40,880	One employee 4.0 hr per day
Acidization or Chlorination [2]	each	$85	10	$848	One employee 2 hours plus chemicals
Meter Cleaning [2]	each	$35	30	$1,050	One employee 1 hour plus supplies
Meter Replacement [2]	each	$115	4	$460	Cost to Replace meter
Pump Replacement [2]	each	$600	1	$600	Pump costs $400 plus 4 hours of employee time to replace
Miscellaneous Electric [2]	lump sum	$600	1	$600	Estimate
Quarterly Sampling [2]	samples	$335	40	$13,400	10 Pumping Wells @ 1 sample/well/quarter
Pumping Wells [2]	hour	$28	20	$560	0.5 hour per well fro technician to sample
Semi Annual Sampling [2]	sample	$335	76	$25,460	38 Monitoring Wells
Monitoring Wells [2]	hour	$28	76	$2,128	1 hours per well to sample
Summary of Annual Costs for 1 Year				**$88,079**	
CAP Costs for 10 Years	-	-	-	$880,794	Assume 10-year timeframe adequate to terminate CAP
Well Abandonment [2]	per well	$1,250	68	$85,000	Abandoned using concrete plug and overdrilling casing
			TOTAL CAP Restoration	$1,141,953	

NOTES:
[1] Electric costs per hour for operation of all 10 pumps based on Pacific Corp Schedule 25 rate of $0.06411 kw-hr (1-888-221-7070)
[2] Based on MFG, Inc. 2004 costs
* The 2004 CAP Plan includes 7 pumping wells in the vicinity of the tailings impoundment, and 3 pumping wells in the vicinity of the catchment basin.

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 4
(Revision 2, July 2004)

Existing Impoundment Summary

A. Dewatering

Item [1]	Unit	Unit Rate	Quantity	Cost	Comments
Well Completion	Per Well	$5,000	10	$50,000	Based on MFG costs, 2004
Quarterly Sampling	sample	$335	40	$13,400	10 Pumping Wells, 4 times yearly
Pumping Wells	hour	$28	10	$280	1 hour per well to sample
Semi Annual Sampling	sample	$335	20	$6,700	10 Monitoring Wells, twice yearly
Monitoring Wells	hour	$28	10	$280	1 hours per well to sample
Pumping - Electricity	hour	$0.239	8,760	$2,094	5 pumps (using 5 HP or 3.73 kw) running year round

Subtotal Dewatering: $72,754

B. Earthwork

Item	Unit Rate	Area (ft^2)	Volume (yd^3)	Cost
Tailings Regrading [2]	$0.75	-	350,000	$262,500
Seed Delivery (Chiseling, Furrowing, Crimping, Fertilizing) [3]	$196.45	83 ac	-	$16,305
Straw Delivery [3]	$238.81	83 ac	-	$19,821
Seed Mulch [3]	$94.43	83 ac	-	$7,921

SubTotal Earthwork: $306,547

C. Cover Placement

Item	Rate	Volume (yd^3)	Cost	Comments
Move embankments [2]	$0.90	1,263,000	$1,136,700	Existing quantity
Cover topsoil [2]	$1.25	108,000	$135,000	1,951,488 SF x 1.5 ft = 108,000 CY
Place overburden fill [2]	$1.25	93,000	$116,250	Remaining cover requirement =
Margin topsoil [2]	$1.25	93,000	$116,250	1,464,000 - 1,263,000 - 108,000 = 93,000 yd3

SubTotal Cover Placement: $1,504,200

D. NESHAP Analysis

Analysis [4]	Cost/cannister	Cannisters	Total Cost
NESHAP Testing	$55.00	110	$6,050
Sample Set up/Retreival	$85/hr	220 hrs	$18,700
Shipping fees	-	-	$500
Report Preparation	$100/hr	16 hrs	$1,600

Subtotal NESHAP Testing $26,850

E. Settlement Monitoring

Item	Cost/Acre	Cost/Quarter	Total Cost (3 years)
Quarterly Survey (3 years) 150 acres [5]	$52.50	$7,875	$94,500

Subtotal Settlement Analysis $94,500

TOTAL EXISTING IMPOUNDMENT $2,004,851

Notes:

[1] Based on MFG, Inc. 2004 costs
[2] Guideline No. 12 Standard Reclamation Performance Bond Format and Cost Calculation Method, Wyoming DEQ, 2003
[3] Costs based on revegetation bid presented to Kennecott Uranium, September 2003 by MGM enterprises, Inc.
[4] Costs of analysis based on ERG Labs analytical services sheet, 2003; cost of collection and report preparation based on 2004 MFG proposed costs
[5] Survey costs based on RS Means 2003, cost of topographic survey per acre

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 5
(Revision 2, July 2004)

Radiological Survey Monitoring*

A. Soil Sampling[a]

Analysis[b]	Cost	Samples/acre	Costs/acre
Total Uranium	$15.00	3	$45
Digestion for Radiochemistry	$37.50	3	$113
Radium 226	$112.50	3	$338
Collecting Samples	$85/hr	1 hr/acre	$12,750
Data Analysis and Report Preparation	$100/hr	40 hr	$4,000
		Total per acre	**$580**
		Costs Mill area (67 ac)	$38,860
		Costs Impoundment (83 ac)	$48,140
		TOTAL COSTS - SOIL SAMPLING	**$91,000**

B. Decommissioning Equipment[b]

Item	Hours	Costs/hr	Total Costs
Scan/end of day	60	$100	$6,000
Scan/free release equipment	40	$100	$4,000
Data Analysis and Report Preparation	40	$100	$4,000
		TOTAL DECOMMISSIONING	**$14,000**

C. Gamma Survey

Item[b]	Acres	Cost/Acre	Total Costs
Radiological Support and Soil Survey	160	$1,000	$160,000
Site Verification [c]	160	$1,000	$160,000
Data Analysis and Report Preparation	120 hrs	$100/hr	$12,000
		TOTAL GAMMA SURVEY	**$332,000**

D. Environmental Monitoring[a]

Item	Weeks	Cost/wk	Total Costs
Air Pump	24	$125	$3,000
Calibration Equipment	24	$150	$3,600
Air Monitoring Sampler	24	$20	$480
Data Analysis and Report Preparation	40 hrs	$100/hr	4000
		TOTAL ENVIRONMENTAL MONITORING	**$11,080**

E. Personnel Monitoring

Item[b]	Costs/sample	Total Costs
Bioassay Urinalysis	$50	$3,000
Personal Radiation Badge Testing	$30	$600
Data Analysis and Report Preparation (40 hrs)	$100/hr	$4,000
	TOTAL PERSONNEL MONITORING	**$7,600**

TOTAL RADIOLOGICAL SURVEY **$455,680**

Notes:
[a] Costs from Energy Labs, Casper, WY Cost Sheet Version 2003. www.energylab.com
[b] Radiation Testing and Monitoring Program based on MFG, Inc. Specifications
*Assuming 6-month project completion
[c] Costs adapted from recent scans using GPS based equipment as well as costs outlined in "Integrated Project Schedule for the Closure of the Dawn Mining Company Millsite" Appendix H. November 20, 2003. Prepared by MFG, Inc. Public Record, Washington Department of Health

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 6 - Summary
(Revision 2, July 2004)

Long Term Surveillance Fees

A. Maintenance Fee

Item	Cost
Long Term Surveillance Fee [a]	$698,301

Adjusted based on Consumer Price Index (CPI), All Urban Consumers

Subtotal Maintenance Fee	$698,301
Total cost Maintenance	$698,301

Notes:

[a] Maintenance fee based on December 1978 cost of 250,000, adjusted annually for inflation based on CPI, All Urban Consumers

SWEETWATER URANIUM PROJECT
2004 Surety Update
Wyoming Operations
Worksheet 7 - Summary
(Revision 2, July 2004)

I. MILL DECOMMISSIONING	
A. Demolition Worksheet 1	$1,067,005
B. Concrete Decontamination, Demolition and Disposal Worksheet 1	$367,251
C. Chemical Disposal Worksheet 1	$456
I. TOTAL MILL DECOMMISSIONING	**$1,434,256**
II. TOTAL SOILS RECLAMATION	**$768,257**
III. TOTAL CAP RESTORATION	**$1,141,953**
IV. EXISTING IMPOUNDMENT RECLAMATION	
A. Dewatering Worksheet 4	$72,754
B. Earthwork Worksheet 4	$306,547
C. Cover Placement Worksheet 4	$1,504,200
D. NESHAP Analysis Worksheet 4	$26,850
E. Settlement Monitoring Worksheet 4	$94,500
IV. TOTAL EXISTING IMPOUNDMENT RECLAMATION	**$2,004,851**
V. RADIOLOGICAL SURVEY MONITORING	
A. Soil Sampling Worksheet 5	$91,000
B. Decommissioning Equipment Worksheet 5	$14,000
C. Gamma Survey Worksheet 5	$332,000
D. Environmental Monitoring Worksheet 5	$11,080
E. Personnel Monitoring Worksheet 5	$7,600
V. TOTAL RADIOLOGICAL SURVEY MONITORING	**$455,680**
VI. TOTAL LONG TERM SURVEILLANCE FEES	**$698,301**
Mobilization/ Demobilization [a]	$290,250
Contingency 15%	$870,750
TOTAL RESTORATION AND RECLAMATION 2004	**$7,664,298**

Notes:
[a] Mobilization/demobilization fees 5% based on California Financial Assurance Guidelines for Surface Mining

Response to Comments

1. **Table 5-1**
A revised version of Table 5.1 *NRC Standby Environmental Monitoring Summary* with changes in red text is attached, as requested. Please see Appendix 2.

2. **Reasons for Testing in the Catchment Basin Area**
Drilling in the vicinity of the Catchment Basin was begun on August 18, 2003. This drilling was performed in response to a sample containing diesel range organics excavated from approximately nine (9) feet below the Catchment Basin bottom on January 6, 2003. The Catchment Basin bottom was investigated because it was always known to be only lined on the sides with concrete, but not on the bottom. The fact that the Catchment Basin lacked a bottom liner was also known to the Nuclear Regulatory Commission (NRC), as a commitment for resumed operations was required in Volume VII of the Final Design – Operations Plan, dated September 26, 1997, stating:

> *The sides of the catchment basin are concrete-lined and the bottom will be lined with concrete prior to resumed operations.*

The mill has not operated since April 15, 1983. Aerial photographs dated September 25, 1980 (pre-operational), September 28, 1981, March 25, 1982 and July 26, 1982 all showed the Catchment Basin filled with fluid. The September 29, 1981 and March 25, 1982 photographs showed the basin filled with brown fluid. Based on the knowledge that the basin lacked a concrete bottom and the knowledge that it was filled in four aerial photographs taken over three years, an investigation was undertaken. These photographs are included on page 5 of this *Response to Comments*.

3. **Updated Sample Data**
Updated sample data is included for TMWs-90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 104, 105, 111, 112, 113 and 115, as requested. Please see Appendix 4.

4. **Organic Groundwater Plume Map**
The requested organic plume map is included in Appendix 3 of this submittal, entitled "Catchment Basin – Battle Spring Aquifer Hydrocarbon Contamination Map". In addition to the wells recently completed around the Catchment Basin, the two potable water wells (PWW-1 and PWW-2) north of the Catchment Basin were sampled and found to be free of any organics. Sample data for these wells is included with this submittal in Appendix 4. TMW-52, an existing tailings impoundment monitor well, was also sampled for organics in September, October and November of 2003. The September 15, 2003 sample contained 3.8 micrograms per liter naphthalene. Subsequent samples were free of organics.

5. **Impacts of the Contaminated Material on the Tailings Impoundment and the Environment**
The contaminated material contains Natural Uranium, Radium-226 and Thorium-230 as the primary radiological contaminants, in concentrations ranging up to 153 picocuries per gram for Natural Uranium, 75 picocuries per gram for Radium-226 and 123 picocuries per gram for Thorium-230. This material is radiologically similar to the existing tailings in the impoundment. Radium-226 concentrations for the tailings (based upon twenty (20)) samples as reported in Table A-5 of Final Design Volume VI – Existing Impoundment Reclamation Plan, averaged 70.9 picocuries per gram, ranging from 11.6 to 188 picocuries per gram.

The contaminated materials are soils/earthen materials.

The contaminated material also contains petroleum hydrocarbons (diesel and oil range organics) ranging from Non-Detect to 4870 milligrams per kilogram. The primary contaminant is diesel range organics. This contamination is from materials routinely used in the mill process. The mill incorporates a solvent extraction (SX) circuit. This circuit uses an organic based solvent consisting of 95% kerosene (a vehicle), 2.5% isodecyl alcohol (to promote phase separation) and 2.5% tertiary amine (the compound that binds/removes the uranium from the aqueous phase). The hydrocarbon contamination found in the soils is derived from kerosene based solvent extraction fluids that seeped out of the bottom of the basin into the underlying soils. Since this kerosene-based solvent was part of the mill circuit, it is by default also present in the tailings in the tailings impoundment.

It is planned to excavate approximately 120, 000 cubic yards of material around the Catchment Basin. This volume is small when compared to the approximately 2.5 million tons of tailings that are currently in the impoundment.

Addition of these contaminated soils into the tailings impoundment will not create any new environmental impacts or impacts on the tailings impoundment over and above those impacts created by materials already present in the impoundment.

6. Additional Proposed Standards

a. General Considerations

The State of Wyoming stipulates (Chapter 17 – Wyoming Water Quality Rules & Regulations, October 31, 1994 Section III) that the Applicable, Relevant and Appropriate Standards (ARARs) for protecting groundwater quality will be the Environmental Protection Agency (EPA) Safe Drinking Water Program Maximum Contaminant Level (MCL) concentrations. In the event that no MCLs are provided by the EPA, the regulations state:

*For those situations where a MCL does not exist for drinking water quality, the following procedures will be used to calculate an acceptable drinking water concentration. For non-carcinogenic chemical compounds or elements, a drinking water equivalent level (DWEL) is determined. A DWEL is defined as a medium specific (i.e., drinking water) lifetime exposure level, assuming 100% exposure from that medium, at which adverse, **non-carcinogenic** health effects would not be expected to occur. Because LUST remediation actions may require several years to complete and since groundwater quality in Wyoming must be protected as a potential drinking water source(s), these calculations will be based upon a chronic exposure scenario.*

A. ***Non-carcinogenic substances:***
$DWEL = (RfD)(ABW)(HQ)/(DWI)(AB)(FOE)$

B. ***Carcinogenic substances:***
$ADWL = (RISK)(ABW)(LIFE)/(CPF)(DWI)(AB)(FOE)(DUR)$

where;
DWEL= Drinking water equivalent level, mg/L.
ADWL= Acceptable drinking water level, mg/L.
RISK = Cancer risk factor for drinking water, (1 x 10 -6).
ABW = Average body weight over exposure period (62 kg).
CPF = Oral cancer potency factor (mg/kg-day) -1 ; chemical specific.
RfD = Oral reference dose (mg/kg-day); chemical specific.
DWI = Drinking water intake, 2 L/day.
AB = Gastrointestinal absorption rate (1.0).
LIFE = Lifetime (70 years).
DUR = Duration of exposure (30 years).
FOE = Frequency of exposure, (350 days/365 days = 0.96).
HQ = Hazard quotient (1.0).

*Values for **oral** toxicological reference doses (RfD) and/or cancer potency factors (CPF) will be obtained from current data in either the U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) or the EPA Health Effects Assessment Summary Tables (HEAST) toxicity data sources. If an oral reference dose or cancer potency factor is not listed in the above data base sources, the administrator will determine an acceptable drinking water concentration using the latest available scientific information.*

The average body weight (ABW) of 62 kilograms for potential 70-year carcinogenic substances exposures was established using the following time-weighted calculation:

$$ABW = \frac{(5\,yr)(12\,kg) + (8\,yr)(35\,kg) + (57\,yr)(70\,kg)}{70\,yr}$$

ABW = 62 kg

In some cases, the State of Wyoming has provided a Drinking Water Equivalent Level (DWEL). If such a level is provided, it is found in Appendix 1 of Chapter 17 Wyoming Water Quality Rules and Regulations. In addition, in some cases, while no MCL is available, the EPA will provide a recommendation to protect human health.

The standards proposed in this document were discussed with Mark Thiesse of the Department of Environmental Quality (DEQ) Water Quality Division (WQD) in a telephone conversation on Tuesday, July 13, 2004.

b. Naphthalene

Naphthalene is listed in 10 CFR 40, Appendix A, Criterion 13. The EPA has no MCL for naphthalene. Chapter 17, Appendix 1 of the Wyoming Water Quality Rules and Regulations provides a Drinking Water Equivalent Level (DWEL) of 1.3 milligrams per liter for naphthalene. 1.3 milligrams per liter is the proposed groundwater protection standard for naphthalene.

c. 1,1, dichloroethane

This compound is listed in 10 CFR Part 40 Appendix A Criterion 13 and has been found in well samples around the Catchment Basin. No maximum concentration limit is provided for 1, 1, dichloroethane.

Chapter 17, Appendix 1 of the Wyoming Water Quality Rules and Regulations provides a Drinking Water Equivalent Level (DWEL) of 3.0 milligrams per liter for 1,1, dichloroethane. Thus, 3.0 milligrams per liter is the proposed groundwater protection standard for 1,1,dichloroethane.

d. Chloromethane (Methyl chloride)

This compound is listed in 10 CFR Part 40 Appendix A Criterion 13 and has been found in well samples around the Catchment Basin. No maximum concentration limit exists for chloromethane. Chloromethane is discussed in the IRIS database, however no reference dose is provided. The discussion concerning chloromethane is provided in Appendix 1 of this submittal.

The Agency for Toxic Substances and Disease Registry Division of Toxicology, in their *Toxicological Profile for Chloromethane* (http://www.atsdr.cdc.gov/toxprofiles/tp106.html), provides a Regulations and Advisories document that cites a reference dose for chloromethane of 0.004 milligrams/kilogram-day. (Table 7-1 Regulations and Guidelines Applicable to Chloromethane). Using this reference dose, the following concentration is calculated:

(0.004 mg/kg-day)(62 kilograms)(1)/(2 L/day)(1)(0.96) = 0.129 milligrams per liter.

Thus, a groundwater protection standard of 0.12 milligrams per liter for chloromethane is proposed.

e. 1,1, dichloroethene/1,1,dichloroethylene

1,1, dichloroethene is listed in 10 CFR Part 40 Appendix A Criterion 13 as 1,1,dichloroethylene. A maximum concentration limit (MCL) of 0.007 milligrams per liter (7 micrograms per liter) exists for this substance. 1,1,dichlorethene has only been found in a single well, TMW-96, at levels not exceeding 1.1 micrograms per liter. The only other occurrence of this substance has been at levels not exceeding 2.6 micrograms per liter in TMW-105, one of the two wells recovering perched fluids west of the Catchment Basin. A groundwater protection standard of 0.007 milligrams per liter (7 micrograms per liter) is proposed.

f. 1,2,4 trimethylbenzene/1,3,5 trimethylbenzene

1,2,4 trimethylbenzene has been detected in TMW-90 and 105. 1,3,5 trimethylbenzene has been detected in TMW-90. These wells do not sample the Battle Spring Aquifer. They were completed to collect accumulated perched fluid at a depth of approximately forty (40) feet below the ground surface on the west side of the Catchment Basin. No form of trimethyl benzene has been detected in the Battle Spring Aquifer itself.

There are no listed MCLs for any form of trimethyl benzene. It is not listed in the EPA's Integrated Risk Information System. It is not listed in Agency for Toxic Substances and Disease Registry, Division of Toxicology toxicological profiles.

Given that no form of trimethylbenzene has been found in the aquifer itself and the fact that it is not listed in 10 CFR Part 40 Appendix A Criterion 13, no standard is proposed.

Methyl ethyl ketone has been detected in small quantities in some samples in the following well(s): TMW-91, TMW-92, TMW-102 and TMW-105. Methyl ethyl ketone is a major ingredient in primer and glue used to connect PVC pipe. The methyl ethyl ketone discovered in the above listed wells is believed not to be derived from the aquifer but rather from pipe fitting materials. In TMW-91, methyl ethyl ketone concentrations have dropped from 9.8 milligrams per liter to non-detect. This well was completed using primer and glue (as opposed to threaded pipe and screen) and the rapid drop in concentration indicates that this contaminant is not in the Battle Spring Aquifer, but rather is derived from the casing. In TMW-92, methyl ethyl ketone was detected in the initial sample and has been non-detect in all subsequent samples. TMW-102 exhibits low levels (24 to 41 micrograms per liter) with the June 15, 2004 sample being non-detect. TMW-105 (which is not a Battle Spring Aquifer well, but a perched fluid recovery well) exhibited methyl ethyl ketone in two samples; 250 micrograms per liter on March 23, 2004 and 25 micrograms per liter on June 15, 2004. The concentrations have declined by an order of magnitude and are believed to be related to the piping.

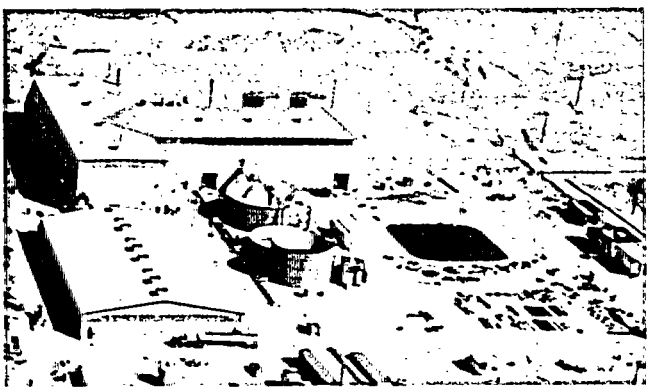
The high concentrations of methyl ethyl ketone in PVC glue and primer are clearly shown in the analysis results for PVC primer and cement provided in Appendix 5. PVC primer contains 543,000 milligrams per kilogram (54.3%) methyl ethyl ketone and PVC cement contains 150,000 milligrams per kilogram (15%) methyl ethyl ketone.

Thus, since it is not believed to be a groundwater contaminant, methyl ethyl ketone was not listed in the original amendment request and no ground water standard is proposed for it. Testing will continue for methyl ethyl ketone since it is included in the normal suite of volatile organic chemicals. Should it appear that piping materials are not the source and that it is derived from the aquifer, a groundwater protection standard will be proposed.

7. **Presence of a Groundwater Plume**

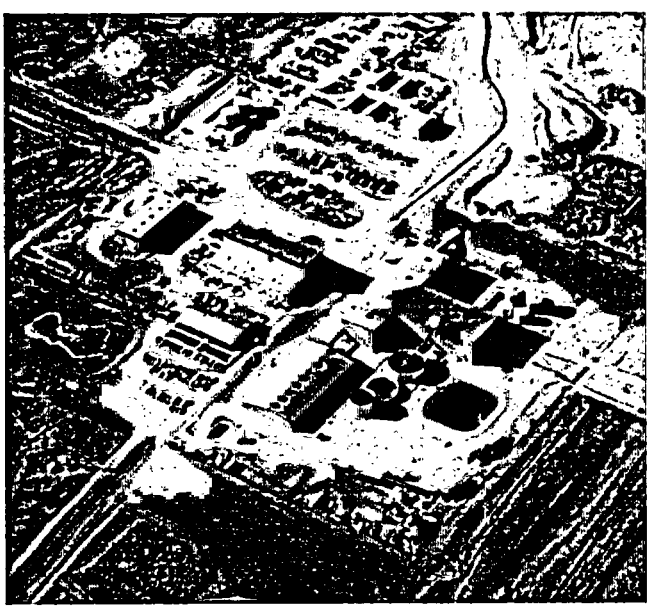
The leakage of fluids from the Catchment Basin involves contamination of the upper portion of the Battle Spring Aquifer around the basin. Since contamination of an aquifer is involved, Kennecott Uranium Company requests prompt consideration of this submittal so that groundwater remediation efforts can begin as soon as possible.

Catchment Basin Aerial Photographs

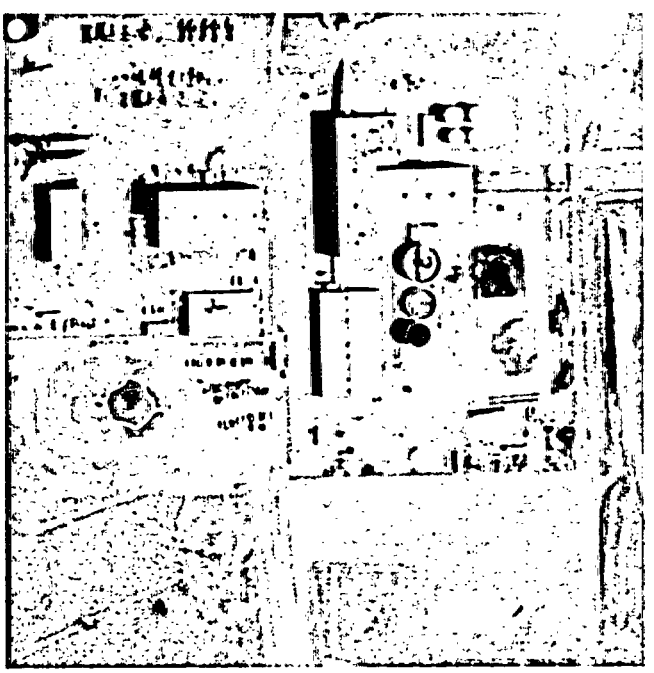


Catchment Basin – September 25, 1980

Catchment Basin – September 28, 1981



Catchment Basin During Operations – March 25, 1982



Catchment Basin – July 26, 1982

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Kennecott Energy

Kennecott Uranium Company
Sweetwater Uranium Project
Docket No. 40-8584
SML #SUA-1350

RESPONSE TO COMMENTS
RE: License Amendment
Request – May 12, 2004

15 July 2004

1

Methyl chloride (CASRN 74-87-3)

view QuickView

MAIN CONTENTS

Note: A TOXICOLOGICAL REVIEW is available for this chemical in Adobe* PDF format (95 Pages, 337 Kbytes). Similar documents can be found in the List of Available IRIS Toxicological Reviews.

Links to specific pages in the toxicological review are available throughout this summary. To utilize this feature, your Web browser and Adobe program must be configured properly so the PDF displays within the browser window. If your browser and Adobe program need configuration, please go to the IRIS Help page for instructions.

1003

Methyl chloride; CASRN 74-87-3 (07/17/2001)

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR Methyl chloride

File First On-Line 07/17/2001

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	not available	07/17/2001
Inhalation RfC Assessment (I.B.)	on-line	07/17/2001
Carcinogenicity Assessment (II.)	on-line	07/17/2001

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

_I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name -- Methyl chloride
CASRN -- 74-87-3
Last Revised -- 07/17/2001

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

__I.A.1. Oral RfD Summary

Not applicable. Methyl chloride exists primarily as a gas. No adequate oral exposure studies exist from which an oral RfD may be derived.

__I.A.2. Principal and Supporting Studies (Oral RfD)

Not applicable.

__I.A.3. Uncertainty and Modifying Factors (Oral RfD)

Not applicable.

__I.A.4. Additional Studies/Comments (Oral RfD)

Not applicable.

__I.A.5. Confidence in the Oral RfD

Not applicable.

__I.A.6. EPA Documentation and Review of the Oral RfD

Source Document-- U.S. EPA, 2001

__I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (fax), or hotline.iris@epa.gov (Internet address).

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_I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name -- Methyl chloride

CASRN -- 74-87-3
Last Revised -- 07/17/2001

The inhalation Reference Concentration (RfC) is analogous to the oral RfD and is likewise based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. The inhalation RfC considers toxic effects for both the respiratory system (portal-of-entry) and for effects peripheral to the respiratory system (extrarespiratory effects). It is generally expressed in units of mg/m^3. In general, the RfC is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure of the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. Inhalation RfCs were derived according to the Interim Methods for Development of Inhalation Reference Doses (EPA/600/8-88/066F August 1989) and subsequently, according to Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry (EPA/600/8-90/066F October 1994). RfCs can also be derived for the noncarcinogenic health effects of substances that are carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

__I.B.1. Inhalation RfC Summary

Critical Effect	Exposures*	UF	MF	RfC
Cerebellar lesions Mouse 11-day continuous inhalation study Landry et al., 1983, 1985	NOAEL: 50 ppm (103.2 mg/m^3) NOAEL(ADJ): 94.6 mg/m^3 NOAEL(HEC): 94.6 mg/m^3 LOAEL: 100 ppm (206.4 mg/m^3) LOAEL(ADJ): 189.2 mg/m^3 LOAEL(HEC): 189.2 mg/m^3	1,000	1	9E-2 mg/m^3

*Conversion Factors and Assumptions: MW = 50.49. Assuming 25° and 760 mmHg: NOAEL (no-observed-adverse-effect level) (mg/m^3) = 50 ppm × 50.49/24.45 = 103.2 mg/m^3; LOAEL (ADJ) (lowest-observed-adverse-effect level) =103.2 mg/m^3 × 22 hours/24 hours × 7 days/7 days = 94.6 mg/m^3. Methyl chloride is a Category 2 gas (U.S. EPA, 1994) for which periodicity was assumed to be attained for systemic effects and for which the blood:gas partition coefficients for humans (Nolan et al., 1985) and rats (Gargas et al., 1989) yield an approximate 1:1 ratio. The assumption is that the partition coefficient for the mouse would be similar to that for the rat on the basis of the tabulation of Gargas et al. (1989), who reported that blood:gas partition coefficients for 6/7 chemicals are similar for both the rat and mouse. In addition, it is a defensible assumption that is within the range of current modeling practice. Thus, a regional gas dose ratio (RGDR) of 1.0 was applied to calculate a human equivalent concentration (HEC) for the NOAEL, resulting in an HEC of 94.6 mg/m^3. Note: ADJ = duration-adjusted concentration.

__I.B.2. Principal and Supporting Studies (Inhalation RfC)

Dysfunction of the central nervous system (CNS) is a hallmark for toxicity due to methyl chloride both in human case reports and in short- and long-term studies in laboratory animals. The 2-year CIIT study (1981), which is the only long-term intermittent (6 hours/day, 5 days/week) inhalation study currently available, would typically have been chosen for identification of the critical effect (e.g., cerebellar lesions) because it satisfies the criteria set forth in U.S. EPA (1994) in spite of several procedural errors (e.g., some misidentification of mice, pregnancy of some mice, and an exposure error early in the study). However, the continuous (22-22.5 hr/day) 11-day exposure of the female C57BL/6 mouse (Landry et al., 1983, 1985) is considered more appropriate in the context of protecting public health for the

following reasons:

1. The study was well conducted.

2. Cerebellar lesions (considered the most critical effect in the context of known CNS deficits from human case reports) occurred at continuous exposure levels (100 ppm) and at intermittent levels (400 ppm) far below those in the $B6C3F_1$ strain exposed chronically (1,000 ppm) in the 1981 CIIT study.

3. No cerebellar lesions were observed in the 90-day pilot study in the $B6C3F_1$ mouse (Mitchell et al., 1979) at levels up to 1,500 ppm.

4. Continuous exposure of C57BL/6 mice resulted in mortality at 200 ppm, whereas intermittent 2-year exposure of the $B6C3F_1$ mouse did not cause mortality below 1,000 ppm.

Landry, TD; Quast, JF; Gushow, TS; et al. (1983) Methyl chloride: inhalation toxicity in female C57BL/6 mice continuously or intermittently exposed for 11 days. EPA/OTS Doc #878213687, NTIS/OTS0206357.

Landry, TD; Quast, JF; Gushow, TS; et al. (1985) Neurotoxicity of methyl chloride in continuously versus intermittently exposed female C57BL/6 mice. Fundam Appl Toxicol 5 (1): 87-98.

Continuous exposure of female C57BL/6 mice (12/group) to 100 ppm and higher (22 hours/day for 11 days) caused degenerative changes (slight in all 12 at 100 ppm and moderate to severe in 100% of animals at higher levels) in granule cells of the cerebellum; higher exposure levels (150 ppm and above) also led to a moribund condition and death. There were no cerebellar lesions or mortality at 15 and 50 ppm. No histopathological evidence of damage in the spinal cord area or to peripheral nerves was reported at any exposure level. Decrements in neurofunctional testing (ability to stay on an accelerating rod after 4, 8, and 11 days of exposure) were observed at 150 ppm. Decreased glycogen content in 100- to 200-ppm mice was the principal significant change observed in the liver, although focal periportal hepatocellular degeneration and/or necrosis was noted in the 400 ppm group. There was no histological evidence of kidney lesions. Duration-dependency of cerebellar lesions was observed upon serial necropsy of 150-ppm animals (5/time period except on day 11 when 12/time period were sacrificed), with moderate degeneration and neurofunctional deficits on day 4 (not days 1 and 2) and a moribund condition by day 10.5.

Mice were also exposed intermittently (5.5 hours/day) for 11 days to 0, 150, 400, 800, 1,600, or 2,400 ppm. A concentration-related increase in the cerebellar incidence of granule-cell pyknosis and karyorrhexis (slight) was observed in the 400-ppm and higher groups. Decreased hepatocyte size, without degeneration or necrosis, was variably seen in mice from the 400- through 2,400-ppm groups. Decreases in mean absolute and relative thymus weights were statistically significant and considered exposure-related (reflecting decreased body weights and stress) for the 2,400 and 1,600 ppm groups; the latter group evidenced a decrease in the size of the thymus. Evidence of kidney toxicity was found only in the 2,400-ppm group and consisted of slight multifocal tubular degeneration and regeneration, and eosinophilic-staining tubular casts. Inanition was apparent in the 2,400-ppm group, as was thin, watery blood from the heart, a finding supported by low blood packed cell volume. The spleens of this group were considerably enlarged, suggestive of extramedullary hematopoiesis, which was microscopically confirmed. The in-life observation of red urine in the 2,400-ppm group was determined to result from hemoglobinuria consistent with intravascular hemolysis. These animals deteriorated (e.g., hind limb extensor rigidity) and were sacrificed moribund on days 8–9.

Based upon cerebellar damage, this study identifies a NOAEL and LOAEL of 50 and 100 ppm, respectively, for continuous exposure. For intermittent exposure, the NOAEL and LOAEL are 150 and 400 ppm, respectively.

CIIT. 1981. Final report on a chronic inhalation toxicology study in rats and mice exposed to methyl chloride, conducted by the Battelle Columbus Laboratories for the Chemical Industry Institute of Toxicology. EPA/OTS Doc #878212061, NTIS/OTS0205952.

Groups of F-344 rats and B6C3F1 mice (117-120/sex/species/concentration) were exposed 6 hr/day, 5 days/wk, for up to 24 months to concentrations of 0, 50, 225, or 1,000 ppm (0, 103, 465, or 2,065 mg/m^3) of 99.97% pure methyl chloride. Duration-adjusted exposure levels were 0, 8.9, 40.2, or 178.6 ppm (18.4, 83.0, or 368.8 mg/m^3).

Mouse: Mouse mortality was significantly increased in females (beginning at 10 months) at 1,000 ppm compared with controls, but was unaffected at 50 and 225 ppm. Signs suggestive of CNS toxicity (e.g., tremor, paralysis) were noted only in 1,000-ppm mice. Neurofunctional impairment (clutch response) was found in nearly all 1,000-ppm mice of either sex after 18–22 months of exposure. This finding was supported by the histopathological observation of cerebellar lesions (degeneration and atrophy of the granular layer) that first appeared in 1,000-ppm male and female mice at the 18-month sacrifice. It did not occur in the 0, 50, or 225 ppm groups.

At the 24-month end-of-study sacrifice, there was no difference in incidence of spinal cord axonal swelling and degeneration between exposed and control mice. Hepatocellular lesions (vacuolization, karyomegaly, cytomegaly, multinucleation, degeneration), first noted at 6 months in 1,000 ppm male mice, were found with increasing frequency at 12 and 18 months and were seen in the majority of males suffering unscheduled deaths. Renal tubulocpithelial hyperplasia and karyomegaly were first apparent in 1,000-ppm male mice at 12 months, subsequently increasing in incidence and severity until the last males in this group were sacrificed at 21 months. Seminiferous tubule atrophy and degeneration were also statistically significant and considered exposure-related in 1,000-ppm males. Finally, 1,000-ppm mice developed splenic atrophy and lymphoid depletion during months 6–22 that was considered related to methyl chloride exposure. In mice, 1,000 ppm was identified as an FEL on the basis of high mortality.

Rat: There was no treatment-related mortality in the rat. The testes were the only target organs examined in the rat that were considered to have significant gross or histopathological lesions (bilateral, diffuse degeneration and atrophy of the seminiferous tubules) related to methyl chloride exposure (1,000 ppm). At the 18-month period, age-related interstitial hyperplasia and/or adenomas were present in controls and the 225-ppm group; these lesions exhibited an increasing incidence with level of exposure.The testicular results in rats are consistent with a LOAEL of 1,000 ppm, based on early signs of seminiferous tubule degeneration and atrophy in the absence of age-related degeneration. A NOAEL of 225 ppm appears reasonable because tubule degeneration and atrophy at this exposure level occurred upon onset of age-related hyperplasia and compressive adenomas.

A shortcoming of this study relates to some incorrect sexing (periodic pregnancies were observed in the mouse population) and misplacement of specific mice. The investigators considered the problem serious but not one that threatened the validity of interpretation of the experimental results. This conclusion appears reasonable considering that the types of effects and the levels at which they occurred were confirmed in several shorter term studies.

McKenna, MJ; Burek, JD; Henck, JW; et al. (1981a) Methyl chloride: a 72-hour continuous (23-1/2 hr/day) inhalation toxicity study in dogs and cats. EPA/OTS #878210220, NTIS/OTS0206129.

Three groups of three male beagle dogs (ages 7–8 mo) and three male cats (ages 8–9 mo) were exposed for approximately 23.5 hr/day for 3 days (i.e., 72-hr treatment regimen) to methyl chloride concentrations of 0, 200, or 500 ppm. After 48 hr of treatment, 500-ppm dogs appeared more tranquil, with one exhibiting intermittent tremor and slight excess salivation, but all were judged alert and responsive. Immediately after 72 hr of treatment, control and 200-ppm dogs were comparable. However, all 500-ppm dogs appeared weak and displayed a range of adverse effects that varied in severity from animal to animal. These included hind

and fore limb stiffness and incoordination, occasional slipping and falling, inability to sit up or walk, limb tremor, and excessive salivation. Improvement was noted in all 500-ppm dogs by postexposure day 10, which continued until termination on day 27.

Neurological evaluations and gross and histopathology revealed no treatment-related abnormalities in control or 200-ppm dogs, whereas each of the three 500-ppm dogs exhibited various clinical deficiencies (posterior paresis, opisthotonus, extensor tonus, and intention tremors). By 26 days postexposure, spinal reflexes and postural reactions were normal, balance was maintained normally, and walking with intermittent ataxia was observed. All three 500-ppm dogs displayed lesions in the brain and spinal cord (vacuolization, swollen eosinophilic axons, axon loss, demyelinization, and microglial cells that contained phagocytosed debris), which were characterized as generally very slight to slight and multifocal in nature. The lesions were localized to the brain stem and the lateral and ventral funiculi of the spinal column, and were not observed in the cerebrum, cerebellum, or peripheral nerves. During the first 48 hr of exposure, the 200- and 500-ppm cats evidenced a decline in appetite that then recovered, and after 24 hr they appeared less active than controls, but always were alert and displayed no signs of inactivity or sluggishness upon removal from the exposure chamber. Throughout the 2-week recovery period, 200 and 500 ppm cats were comparable to controls. Brain and/or spinal cord lesions were found in control (1/3), 200-ppm (1/3), and 500-ppm (3/3) cats. Several characteristics of these lesions led the authors to speculate that they were likely the result of a postvaccinal reaction, a viral infection, or both; however, it was recognized that exposure to 500 ppm methyl chloride could possibly have exacerbated such a disease process. The findings of this study indicate a NOAEL of 200 ppm for a continuous (nearly) 72 hr exposure to methyl chloride, and a LOAEL of 500 ppm based principally upon a spectrum of clinically and histopathologically observable neurological effects seen in male beagle dogs. In a second study by the same investigators, there was no evidence of brain or spinal cord lesions in male beagle dogs exposed for 6 hr/day, 5 days/week for a total of 64–66 exposures to concentrations of 0, 50, 150, or 400 ppm (McKenna et al., 1981b).

These histopathological effects (e.g., cerebellar lesions), as well as other testicular effects (e.g., decreased sperm count sperm granulomas), were also seen in shorter term studies (Burak et al., 1981; Morgan et al., 1982; Chapin et al., 1984; Working et al., 1985a,b) at levels of 500 ppm and greater. Thus, the results of these shorter-term studies lend support to the NOAEL and LOAEL from the Landry et al. (1983) study.

__I.B.3. Uncertainty and Modifying Factors (Inhalation RfC)

UF = 1,000.

A factor of 10 is used to protect sensitive human subpopulations (intraspecies variability). It is clearly established that in rodents (probably in humans as well), methyl chloride is principally metabolized in the liver via a GSH-conjugation mediated pathway. The unknown susceptibility of the two human subpopulations identified in several studies on the basis of differences in their rates of metabolism of methyl chloride in erythrocytes is considered sufficient justification for the intraspecies uncertainty factor of 10. In vivo pretreatment of laboratory animals with a specific inhibitor of γ-glutamate-cysteine ligase resulted in the elimination of lethality and cerebellar lesions, clearly indicating that reaction (metabolism) products of GSH with methyl chloride play a key role in the manifestation of cerebellar and other target organ lesions (Chellman, 1986a,b). Whether there is susceptibility on the basis of gender is another concern because there is limited, but not convincing, evidence that female C57BL/6 mice have a higher incidence (and severity) of cerebellar lesions than males or other mouse strains and rats at intermittent short-term exposure concentrations >500 ppm (Morgan et al., 1982).

A factor of 10 is used to extrapolate from an 11-day continuous study to a lifetime inhalation study. In the typical situation in which only a subchronic intermittent rodent inhalation exposure study is available, a full factor of 10 is generally applied to account for the lack of chronic intermittent exposure results. Although the 11-day study is not fully equivalent in

duration to a subchronic study, it is a valuable continuous inhalation study supported by the conclusions of a chronic study. A factor of 10 is thus considered protective to account for using a less-than-chronic study for the derivation of the RfC.

A factor of 3 ($10^{1/2}$) is used to account for interspecies variability in extrapolating from animals to humans considering that a dosimetric adjustment accounts for the pharmacokinetic portion of the interspecies uncertainty factor. Only the C57BL/6 female mouse was examined under continuous exposure conditions; therefore, it is unknown how the male or $B6C3F_1$ mice would react upon similar exposure conditions. The only strain comparisons that were made were those of Morgan et al. (1982), and they were under intermittent exposure conditions at relatively high concentrations; thus, a factor of 3 is considered prudent.

A database uncertainty factor of 3 ($10^{1/2}$) is used for lack of brain histopathology in F_1 generation mice. The effect of exposure on in utero development of the brain in mice has not been examined and remains an important data gap.

The product of the two factors of 3 ($10^{1/2}$) coalesces to a 10.

MF = 1.

__I.B.4. Additional Studies/Comments (Inhalation RfC)

In humans, methyl chloride acts principally as a depressant of the CNS. Typical signs and symptoms of intoxication have been described as appearing within 2–3 hr of exposure, including headache, nausea, vomiting, painful neck, loss of appetite, diarrhea, dizziness, giddiness, blurred vision, ataxia, confusion, slurred speech, diplopia (double vision), tremors of the hands and lips, drooping eyelids and eye twitch, muscle spasms, convulsions and opisthotonus (body spasms), cold and clammy skin, loss of memory, hallucinations, respiratory depression, unconsciousness, coma, and death (ATSDR, 1998; Ellenhorn and Barceloux, 1988; Farber and Torkelson, 1989; IPCS, 1999; Sittig, 1991). Effects of longer term, low-level exposure are thought to be generally, although not always, mild and reversible after a recovery period of days to months, and include fatigue or malaise, loss of appetite, headache, disequilibrium, blurred vision, confusion, anxiety, personality changes, short-term memory loss, vertigo, loss of coordination, weakness, pale skin, nausea, and vomiting. Evidence suggests that in persons exposed to doses of methyl chloride sufficient to cause serious CNS effects, other organ systems including the heart, gastrointestinal tract, liver, kidneys, and lungs can be adversely affected, although the cardiovascular and gastrointestinal effects may largely be secondary to CNS toxicity (ATSDR, 1998; IPCS, 1999; Farber and Torkelson, 1989).

In a two-generation reproduction study in F-344 rats exposed intermittently (10-week exposure periods followed by 10-week recovery periods) to 0, 150, 475, or 1,500 ppm methyl chloride, degeneration and atrophy of the seminiferous tubules in all 1,500 ppm F_0 males (10/10) were observed, in addition to increased incidences of epididymal sperm granulomas (3/10) and decreased testes size in these latter three animals (Hamm et al., 1985). This study identified a two-generation reproductive LOAEL based on statistically significant reduced male fertility at 475 ppm (fertility returned to control levels after 10 weeks of recovery), with a corresponding NOAEL of 150 ppm. There was no clear effect of exposure on fertility of the F_1 generation (no histopathology was performed) other than a reduced percentage of male offspring in the 475-ppm group compared with controls and the 150-ppm group.

In a study of female F-344 rats and female C57B/6 mice (bred to C3H males) exposed to concentrations up to 1,500 ppm during gestation, the mouse progeny ($B6C3F_1$) exhibited a small but statistically significant increase in the incidence of a heart anomaly in the 500-ppm group only (Wolkowski-Tyl, 1983a). No such effects were seen in rats. In a further extension of this work, female C57BL/6 mice bred to C3H males were exposed to 0, 250, 500, or 750-ppm (Wolkowski-Tyl et al., 1983b). The 750-ppm level was maternally toxic and heart

malformations were observed in both male and female progeny at 500 and 750 ppm, but not at 250 ppm. Because this lesion was not observed in another laboratory (John-Greene et al., 1985) under a different exposure protocol, some uncertainty exists regarding the exposure conditions under which this lesion occurs, although it is prudent to regard methyl chloride as a mouse teratogen.

For more detail on Susceptible Populations, exit to the toxicological review, Section 4.7 (PDF).

__I.B.5. Confidence in the Inhalation RfC

Study -- High
Database -- Medium
RfC -- Medium

The overall confidence in the RfC assessment is medium. Although the confidence in the principal and supporting studies is high, overall confidence in the database is medium because of the lack of brain histopathology on F_1 generation mice, particularly female C57BL/6, a strain that may be particularly sensitive to the effects of methyl chloride. There is suggestive evidence that methyl chloride may cross the placenta (Bus et al., 1980) and, given the known effects of methyl chloride on the cerebellum, is cause for concern about the lack of histopathological data in offspring of exposed laboratory animals. A reproduction/teratology study in the rat through the F_1 generation has been performed and provides some support for effects on the male reproductive system, but no brain histopathology was performed.

For more detail on Characterization of Hazard and Dose Response, exit to the toxicological review, Section 6 (PDF).

__I.B.6. EPA Documentation and Review of the Inhalation RfC

Source Document -- U.S. EPA, 2001

This assessment was peer reviewed by external scientists. Their comments have been evaluated carefully and incorporated in finalization of this IRIS summary. A record of these comments is included as an appendix to the Toxicological Review of Methyl Chloride. ***To review this appendix, exit to the toxicological review, Appendix A, Summary of and Response to External Peer Review Comments (PDF).***

Agency Consensus Date 6/26/2001

Screening-Level Literature Review Findings -- A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the RfC for Methyl chloride conducted in August 2003 did not identify any critical new studies. IRIS users who know of important new studies may provide that information to the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

__I.B.7. EPA Contacts (Inhalation RfC)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (fax), or hotline.iris@epa.gov (Internet address).

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_II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name -- Methyl chloride
CASRN -- 74-87-3
Last Revised -- 07/17/2001

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per µg/L drinking water or risk per $\mu g/m^3$ air breathed. The third form in which risk is presented is a concentration of the chemical in drinking water or air associated with cancer risks of 1 in 10,000, 1 in 100,000, or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/887/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

_II.A. Evidence for Human Carcinogenicity

__II.A.1. Weight-of-Evidence Characterization

Methyl chloride is found ubiquitously in nature and exists primarily as a gas, with inhalation as the predominant route of exposure. However, it is moderately soluble in water, which suggests that ingestion of drinking water containing methyl chloride can be a secondary route of exposure.

Applying the criteria for evaluating the overall weight of evidence for carcinogenicity to humans outlined in EPA's guidelines for carcinogen risk assessment (U.S. EPA, 1986), methyl chloride is most appropriately designated a Group D — Not classifiable as to its human carcinogenicity. Using the Proposed Guidelines for Carcinogen Risk Assessment (U.S. EPA, 1996), the available data suggest that methyl chloride would be classified as an agent whose carcinogenic potential *cannot be determined.*

Limited human epidemiology studies show no suggestive evidence that methyl chloride exposure was associated with a carcinogenic response. However, weak to moderate mutagenicity has been demonstrated in *S. typhimurium* (albeit at high concentrations), and an increased incidence of tumor formation (benign and malignant) in male mouse kidneys does provide some suggestive information of carcinogenic risk, although no renal tumors were found in female mice or in either sex of rats tested in the same study. In addition, induction of sister chromatid exchanges (SCE) by methyl chloride has been observed in human lymphoblasts, and by a congener, methyl bromide, in lymphocytes from a human subgroup categorized as "slow metabolizers." This group is known to be genetically predisposed (polymorphisms in glutathione transferase) to have a lower rate of metabolism compared with the majority of human populations studied.

The lack of detectable CYP2E1 protein in human kidney (in contrast to mice, which have high levels) suggests that the metabolism of methyl chloride by P450 (presumably leading to elevated formaldehyde concentrations) that could be responsible for the induction of male mouse kidney tumors may not be relevant to humans. However, the role of hepatic (and/or kidney) metabolism (leading to potential genotoxic metabolites) via the predominant GSH pathway (or even by P450 isozymes other than CYP2E1) in this regard cannot be discounted; in vivo metabolism of methyl chloride to formate in liver is GSH-dependent, via the GSH-requiring formaldehyde dehydrogenase that oxidizes formaldehyde to formate. Inasmuch as methyl chloride exposure can lower tissue nonprotein sulfhydryl concentrations, it thus has

the potential to inhibit formaldehyde dehydrogenase and increase formaldehyde levels. The extent to which this may or may not take place in the human kidney is an area for further research.

For more detail on Characterization of Hazard and Dose Response, exit to the toxicological review, Section 6 (PDF).

For more detail on Susceptible Populations, exit to the toxicological review, Section 4.7 (PDF).

__II.A.2. Human Carcinogenicity Data

Inadequate. The few studies that have examined methyl chloride's potential carcinogenicity in humans have failed to convincingly demonstrate any association, and in one instance even indicated a lower cancer incidence than expected in workers chronically exposed to methyl chloride in a butyl rubber manufacturing plant (Holmes et al., 1986). There was no conclusive evidence for an effect of acute, severe exposure to methyl chloride on mortality from all cancers or from lung cancer in a small cohort accidentally exposed to methyl chloride from a leaking refrigeration unit (Rafnsson and Gudmundsson, 1997); because of the wide confidence intervals that included unity, the data cannot be construed as suggestive of an elevated cancer mortality risk Other occupational studies involved exposure to multiple chemicals in addition to methyl chloride, making it difficult to attribute any effects specifically to methyl chloride (Dow Corning Corporation, 1992; Olsen et al., 1989).

__II.A.3. Animal Carcinogenicity Data

In animals, the only evidence of carcinogenicity comes from a single 2-year bioassay, which found a statistically significant increased incidence of renal benign and malignant tumors only in male B6C3F1 mice at the high concentration (1,000 ppm), although two renal adenomas occurring in 225-ppm males may also be treatment-related (CIIT, 1981). Neoplasia were not found at lower concentrations or at any other site in the male mouse, nor at any site or concentration in female mice or F-344 rats of either sex. Renal cortical tubuloepithelial hyperplasia and karyomegaly were also confined to 1,000-ppm male mice.

__II.A.4. Supporting Data for Carcinogenicity

There is some evidence that methyl chloride is a weak genotoxin at high concentrations when tested in vitro; however, its in vivo cytotoxicity appears to dominate any potential genotoxic effects that may occur. Methyl chloride was mutagenic in *Salmonella* strain TA100 at a 5% concentration (Simmon, 1981), in strain TM677 at 5%–30% (Fostel et al., 1985), in TA1535 at 0.5%–0.8% to 20.7% (Andrews et al., 1976; Longstaff et al., 1984), and in strain TA1535 at 4% and 7% and strain TA100 at 1%, 4%, and 7% (du Pont, 1977). It has not been shown to methylate DNA (Kornbrust et al., 1982). Methyl chloride was weakly positive for the in vivo induction of unscheduled DNA synthesis (UDS) in rat liver at 15,000 ppm, but not at 3,500 ppm, nor in pachytene spermatocytes or tracheal epithelial cells at either concentration (Working et al., 1986). In vitro exposure of the spermatocytes induced UDS at 3%–10%, but not 1%, while in the tracheal cells the response was negative at 1%, negative but suggestively positive at 3%, and toxic at 5% and 10%. Primary cultures of human hepatocytes from three individuals were collectively negative at 0.1%–0.3%, negative or weakly positive at 1%, and toxic at 2%–10% (Butterworth et al., 1989). A high concentration (20%) of methyl chloride was found to be a potent inducer of sex-linked recessive lethal mutations in *Drosophila* (University of Wisconsin, 1982), and 6,000–25,000 ppm (but not 3,000 ppm) enhanced viral transformation in cultured Syrian hamster embryo (SHE) cells (Hatch et al., 1983). An increase in the frequency of SCE in human lymphoblasts was induced by 0.3%-5% methyl chloride, although there was no evidence of DNA damage (Fostel et al., 1985). Finally, 2,000–3,000 ppm (but not 1,000 ppm) produced dominant lethal effects in Sprague-Dawley rats (SRI, 1984) and F-344 rats (Working et al., 1985a). This dominant lethality appears attributable to cytotoxic effects on sperm in the testes rather than to direct genotoxicity, and to the effects of genotoxic oxidative metabolites resulting from an induced inflammatory

response in the epididymides (Chellman et al., 1986a,b, 1987; Working et al., 1985b; Working and Bus, 1986; Working and Chellman, 1989). Thus, methyl chloride has mutagenic potential, but does not appear to methylate DNA. On the other hand, both methyl chloride and methyl bromide induce SCEs in human lymphocytes in vitro; methyl bromide induced SCE in lymphocytes from a human subgroup characterized as "slow metabolizers" in terms of glutathione transferase polymorphisms, but not in "fast metabolizers." It remains to be established whether methyl chloride behaves similarly.

Renal tumors in the male mouse may be related to the production of formaldehyde during methyl chloride metabolism. Generation of formaldehyde has been demonstrated in renal microsomes of male CD-1 mice (Dekant et al., 1995) that exceeds that of naive (androgen-untreated) female mice, whereas kidney microsomes from the rat did not generate formaldehyde. The P-450 isozyme believed to be responsible, CYP2E1, is present in male mouse kidney and is androgen-dependent; female mice had levels only 20%–25% of those in males (Dekant et al., 1995); in the rat, renal activity of CYP2E1 was very low. The findings of Hu et al. (1990) show that there is a specific cellular localization of CYP2E1 in mouse kidney. Cell-type-specific localization was confirmed by Cummings et al. (1999), who found that CYP2E1 in F-344 kidney was produced by both proximal and distal tubular cells, with the level of certain P-450 isozymes being cell-type-specific. On the other hand, no CYP2E1 activity was detected in human kidney microsomal samples (Amet et al., 1977; de Waziers et al., 1990; Lasker et al., 2000), nor was it detected in freshly isolated proximal tubular cells from human kidney (Cummings et al., 2000). CYP4A11 was detected in human kidney (Cummings et al., 2000), but its ability to metabolize methyl chloride is unknown. The only P-450 enzymes found at significant levels in human renal microsomes are, in addition to CYP4A11, CYP4F2 (Lasker et al., 2000) and CYP3A isoforms (Kharasch et al., 1995). According to the P-450 review by Parkinson (1996), no commonly known environmental chemicals appear to be metabolized by the CYP4A family.

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_II.B. Quantitative Estimate of Carcinogenic Risk from Oral Exposure

Not applicable.

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_II.C. Quantitative Estimate of Carcinogenic Risk from Inhalation Exposure

Not applicable.

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_II.D. EPA Documentation, Review, and Contacts (Carcinogenicity Assessment)

__II.D.1. EPA Documentation

Source Document -- U.S. EPA, 2001

This assessment was peer reviewed by external scientists. Their comments have been

evaluated carefully and incorporated in finalization of this IRIS summary. A record of these comments is included as an appendix to the Toxicological Review of Methyl Chloride. ***To review this appendix, exit to the toxicological review, Appendix A, Summary of and Response to External Peer Review Comments (PDF).***

__II.D.2. EPA Review (Carcinogenicity Assessment)

Agency Consensus Date 6/26/2001

Screening-Level Literature Review Findings -- A screening-level review conducted by an EPA contractor of the more recent toxicology literature pertinent to the cancer assessment for Methyl chloride conducted in August 2003 did not identify any critical new studies. IRIS users who know of important new studies may provide that information to the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

__II.D.3. EPA Contacts (Carcinogenicity Assessment)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676(phone), (202)566-1749 (Fax), or hotline.iris@epa.gov (Internet address).

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_III. [reserved]
_IV. [reserved]
_V. [reserved]

_VI. Bibliography

Methyl chloride
CASRN -- 74-87-3
Last Revised -- 07/17/2001

_VI.A. Oral RfD References

Not applicable.

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_VI.B. Inhalation RfC References

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_VII. Revision History

Substance Name -- Methyl chloride
CASRN -- 74-87-3
07/17/2001

Date	Section	Description
04/01/1997	III., IV., V.	Drinking Water Health Advisories, EPA Regulatory Actions, and Supplementary Data were removed from IRIS on or before April 1997. IRIS users were directed to the appropriate EPA Program Offices for this information.
07/17/2001	I.B., II., VI	RfC, carcinogenicity assessment, and references first on line
10/28/2003	I.B.6., II.D.2.	Screening-Level Literature Review Findings message has been added.

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_VIII. Synonyms

Methyl chloride
CASRN -- 74-87-3
Last Revised -- 07/17/2001

CHLOROMETHANE
MONOCHLOROMETHANE

Note: A TOXICOLOGICAL REVIEW is available for this chemical in Adobe* PDF format (95 Pages, 337 Kbytes). Similar documents can be found in the List of Available IRIS Toxicological Reviews.

* You will need Adobe Acrobat Reader, available as a free download, to view some of the files on this page. See EPA's PDF page to learn more about PDF, and for a link to the free Acrobat Reader.

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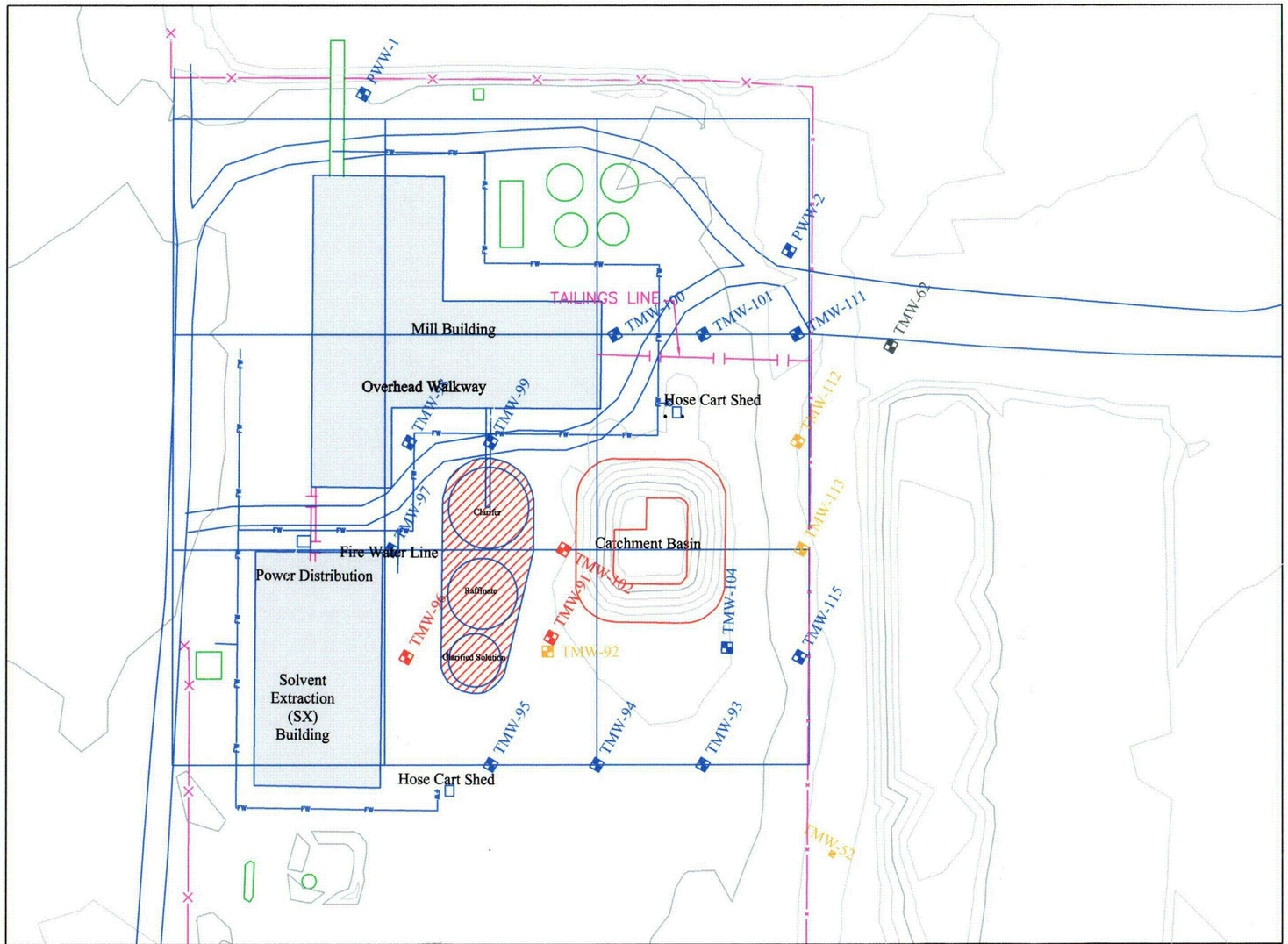
Table 5-1 NRC Standby Environmental Monitoring Summary

Category	Locations	Frequency	Analytical Parameters
Air (Particulate)	Downwind: Air-4A	Continuously; Composited Quarterly	Natural uranium, Ra-226, Th-230, Pb-210
Air (Env. Radon)	Downwind: Air-4A Upwind: Air-2	Continuously with quarterly changes	Radon-222
Gamma	Downwind: Air-4A Control: Admin. Bldg.	Continuously with quarterly changes	Environmental Gamma (TLD)
Original Tailings Cell (Cell "C")	Original Tailings Cell	Weekly	Visual inspection of condition of liner and evaporation system.
		Annually	Visual inspection of liner/ embankment by a registered engineer and biannual lab analysis of liner on even-numbered years.
Tailings Liquid	Original Tailings Cell	Annually	See Table 5-5
		Monthly	Fluid Level *(1)*
Tailings Impoundment Point of Compliance Wells	TMW-15, TMW-16, TMW-17, TMW-18	Semiannually	Arsenic, beryllium, cadmium, chromium, Pb-210, nickel, combined Ra-226 and Ra-228, selenium, Th-230, natural uranium, gross alpha, chloride, iron, nitrate, sulfate, pH and TDS
		Monthly (Corrective Action Program)	Water Levels
Catchment Basin Point of Compliance Well	TMW-91	Semiannually *(3)*	See Table 5-5
		Monthly for organics, only if organic chemicals are present *(3)*	See Table 5-5b
		Monthly (Corrective Action Program) *(3) (4)*	Water Level
Tailings Monitor Well (TMW) Sampling and Water Levels	36 locations: TMW-1, 2, 3, 4, 5, 6, 8, 16, 24, 29, 31, 35, 36, 37, 44, 45, 47, 48, 49, 50, 51, 52, 53, 56, 57, 61, 62, 63, 64, 69, 70, 71, 78, 82, 84 and 89	Semiannually (Corrective Action Program)	See Table 5-5
		Monthly (Corrective Action Program)	Water Levels
		Monthly	Water Levels
Catchment Basin Monitor Well (TMW) Sampling and Water Levels	14 locations: TMW-92, 93, 94, 95, 97, 98, 99, 100, 101, 104, 111, 112, 113 and 115	Semiannually *(3)*	See Table 5-5
		Monthly for organics, only if organic chemicals are present *(3)*	See Table 5-5b
		Monthly *(3) (4)*	Water Levels
Tailings Impoundment Pumpback Well Sampling (as required by the Corrective Action Program) *(2)*	7 locations: TMW-7, 17, 18, 57, 58, 59 and 75	Quarterly (Corrective Action Program)	See Table 5-5
		Monthly (Corrective Action Program)	Water Levels
Catchment Basin Pumpback Well Sampling (as required by the Corrective Action Program) *(2)*	3 locations: TMW-91, 96 and 102	Quarterly (Corrective Action Program) *(3)*	See Table 5-5
		Monthly for organics, only if organic chemicals are present *(3)*	See Table 5-5b
		Monthly (Corrective Action Program) *(3) (4)*	Water Levels
Potable Water Well Quality	3 locations: PWW-1, PWW-2 and Drake-1	Quarterly	Dissolved and suspended natural uranium, Ra-226, Th-230, Pb-210
	PWW-1, PWW-2	Monthly	Water Levels
Meteorological Monitoring	Meteorological Station	Continuously	Wind speed and direction, sigma/theta, temperature, precipitation, pan evaporation, barometric pressure and relative humidity.

(1) Except when frozen.
(2) Pumpback wells may be added or removed from service with the goal of improving the performance of the CAP - License Condition 11.3.
(3) Except when inaccessible due to excavation work, etc.
(4) Except when blocked by a pump.

Catchment Basin - Battle Spring Aquifer Hydrocarbon Contamination Map



Legend

TMW-92	Well that never showed organic contamination
TMW-96	Well that currently shows organic contamination
TMW-112	Well that showed organic contamination in past samples but does not currently
TMW-62	Well that was never sampled for organic contamination

0 400

CONTOUR INTERVAL = 2.0'

Notes:

1. Perched fluid recovery wells, TMW-90 and 105 not shown. Map solely applies to the Battle Spring Aquifer.

C02

4

KENNECOTT URANIUM COMPANY											
TMW-90											
NORTHING: 148,611.42 EASTING: 323,958.91	Groundwater Protection	2003				2004					
ND = Non-detectable	Standard	08/26/03	09/08/03	09/15/03	10/14/03	01/19/04	02/11/04	03/17/04	04/06/04	05/01/04	06/10/04
FIELD DATA mg/l:	(GPS)										
Temperature (C)	*as of 5/28/98	8	8	8	8	18	12	10	21		23
pH (Std. Units)		5.6	5.8	5.8	4.8	6.1	5.8	4.3	5.4		5
Cond. (umho/cm)		940	1080	1080	1000	880	1220	780	840		1000
TDS										Pump down; pipe in hole.	
MAJOR IONS mg/l:											
Alk-CaCO3		40			2	3			6.2		
Bicarbonate (HCO3)		48.8			2.4	3.7			7.6		
Calcium (Ca)		196			207	195			179		
Carbonate (CO3)		-1			-1	-1			-1		
Chloride (Cl)		33.14			47.5	45.1			36.3		
Fluoride (F)		0.2			0.4	0.3			0.2		
Magnesium (Mg)		28			33.9	32.4			29		
Nitrate-N (NO3)		6.8			-0.1	-0.1			-0.1		
Potassium (K)		49.8			5.1	5.7			5.5		
Silica (SiO2)		55.6			54.8	45.6			44.9		
Sodium (Na)		733			52.2	52.3			48.4		
Sulfate (SO4)		-0.1			861	767			662		
NON-METALS:											
Cyanide (CN)		-0.005			-0.005	-0.005			-0.005		
PHYSICAL PROPERTIES:											
Cond (umho/cm)		1400			1670	1510			1320		
pH	GPS (6.8)	6.04			4.69	4.96			6.22		
TDS @ 180° C.	GPS (500)	1140			1350	1190			996		
METALS-DISSOLVED mg/l:											
Aluminum (Al)		0.2			2.2	0.1			-0.1		
Arsenic (As)	GPS (.05)	-0.001	-0.5		-0.002	-0.001			0.001		
Barium (Ba)		-0.1	-10		-0.1	-0.1			-0.1		
Beryllium (Be)	GPS (.01)	-0.01			-0.01	-0.01			-0.01		
Boron (B)		0.16			0.15	0.12			0.11		
Cadmium (Cd)	GPS (.01)	-0.005	-0.1		0.006	-0.005			-0.005		
Chromium (Cr)	GPS (.05)	-0.01	-0.5		-0.01	-0.01			-0.01		
Cobalt (Co)		0.06			0.087	0.071			0.059		
Copper (Cu)		-0.01			0.03	0.03			-0.01		
Iron (Fe)		28.4			49	29.1			25.1		
Lead (Pb)		-0.01	-0.5		0.02	-0.01			-0.01		
Manganese (Mn)		1.33			1.49	1.2			1.17		
Mercury (Hg)		-0.0002	-0.02		-0.0004	-0.0002			-0.0002		
Molybdenum (Mo)		-0.01			-0.01	-0.01			-0.01		
Nickel (Ni)	GPS (.01)	0.07			0.12	0.09			0.09		
Selenium (Se)	GPS (.01)	0.013	-0.1		0.01	0.009			0.007		
Silver (Ag)		-0.01	-0.5		-0.01	-0.01			-0.01		
Thallium (Tl)		-0.01			-0.01	-0.01			-0.01		
Vanadium (V2O5)		-0.1			-0.1	-0.1			-0.1		
Zinc (ZN)		0.65			0.67	0.66			0.26		
RADIOMETRIC pCi/l:											
Uranium, natural	GPS (36)*	162			240	126			27.8		
Radium 226		23			10.8	15.2			13.7		
Radium Precision +/-		1.6			0.7	1.3			1.2		
Radium 228		5.6			11.3	3.4			15.6		
Radium Precision +/-		1.7			2.1	1.5			1.8		
Comb. Ra226/228	GPS (5.8)*	28.6			22.1	18.6			29.3		
Thorium 230	GPS (7.0)*	-0.2			-0.2	-0.2			-0.2		
Thorium Precision +/-											
Lead (Pb210)	GPS (8.9)*	-2.7			-2.7	-2.7			-1		
Lead Precision +/-											
Gross Alpha	GPS 15*	22.1			12.1	22.2			14.8		
Gross Alpha Precision +/-		2.2			1.1	1.5			1.1		
ORGANICS:											
Diesel Range Organics (DRO)	(mg/L)		11	13	45	1500	13	11	94		320
Gasoline Range Organics (GRO)	(mg/L)		0.132	0.117	0.105	0.093	105	0.058	0.129		0.056
1,1,1-Trichloroethane	(ug/L)		ND	ND	2.8	ND	ND	2.5	5.5		1.1
1,2,4-Trimethylbenzene	(ug/L)		ND	ND	ND	ND	ND	ND	3.7		ND
1,3,5-Trimethylbenzene	(ug/L)		ND	ND	ND	ND	ND	ND	1.1		ND
Naphthalene	(ug/L)		21	25	35	67	28	2.6	34		1.9
QUALITY ASSURANCE DATA:											
TDS A/C Balance (dec. %)		0.98			1.12	1.08			1.03		
(LAB: Energy Labs Inc. unless noted.)											

KENNECOTT URANIUM COMPANY											
TMW-91											
NORTHING: 148,518.38 EASTING: 323,956.86	Groundwater Protection	2003						2004			
ND = Non-detectable	Standard	08/26/03	09/18/03	10/22/03	11/12/03	12/10/03	12/31/03	01/13/04	02/16/04	03/17/04	04/12/04
FIELD DATA mg/l:	(GPS)										
Temperature (C)	*as of 5/28/98	8	8	8	8	8	8	8	8	8	9
pH (Std. Units)		6.3	6.8	6.8	6.7	7.2	7.3	7.9	7.2	7.1	6.8
Cond. (umho/cm)		520	860	980	900	1100	1080	1240	1100	1240	960
TDS											
MAJOR IONS mg/l:											
Alk-CaCO3		85					121	118			
Bicarbonate (HCO3)		103					148	143			
Calcium (Ca)		65.9					355	320			
Carbonate (CO3)		-1					-1	-1			
Chloride (Cl)		17.6					67	43.6			
Fluoride (F)		0.3					-1	0.1			
Magnesium (Mg)		7.3					33	26.4			
Nitrate-N (NO3)		-0.1					-0.1	-0.1			
Potassium (K)		5.2					6.3	5.6			
Silica (SiO2)		8.5					13	11.1			
Sodium (Na)		87.8					72	69.5			
Sulfate (SO4)		303					908	839			
NON-METALS:											
Cyanide (CN)		-0.005					-0.005	-0.005			
PHYSICAL PROPERTIES:											
Cond (umho/cm)		801					1800	1920			
pH	GPS (6.8)	7.76					7.89	7.86			
TDS @ 180° C.	GPS (500)	534					1440	1570			
METALS-DISSOLVED mg/l:											
Aluminum (Al)		-0.1					-0.1	-0.1			
Arsenic (As)	GPS (.05)	0.002					0.002	-0.001			
Barium (Ba)		-0.1					-0.1	-0.1			
Beryllium (Be)	GPS (.01)	-0.01					-0.01	-0.01			
Boron (B)		-0.1					-0.1	-0.1			
Cadmium (Cd)	GPS (.01)	-0.005					-0.005	-0.005			
Chromium (Cr)	GPS (.05)	-0.01					-0.01	-0.01			
Cobalt (Co)		0.003					0.003	0.002			
Copper (Cu)		-0.01					-0.01	-0.01			
Iron (Fe)		-0.05					-0.05	0.209			
Lead (Pb)		-0.01					-0.01	-0.01			
Manganese (Mn)		0.08					0.34	0.36			
Mercury (Hg)		0.0005					-0.0002	-0.0002			
Molybdenum (Mo)		-0.01					-0.01	-0.01			
Nickel (Ni)	GPS (.01)	-0.01					-0.01	-0.01			
Selenium (Se)	GPS (.01)	0.003					-0.001	-0.001			
Silver (Ag)		-0.01					-0.01	-0.01			
Thallium (Tl)		-0.01					-0.01	-0.01			
Vanadium (V2O5)		-0.1					-0.1	-0.1			
Zinc (ZN)		0.04					0.27	0.03			
RADIOMETRIC pCi/l:											
Uranium, natural	GPS (36)*	110					39.8	37.9			
Radium 226		1.6					2.5	3.1			
Radium Precision +/-		0.3					0.3	0.6			
Radium 228		-1					3.3	3.5			
Radium Precision +/-							1.2	0.9			
Combined Ra226/228	GPS (5.8)*	1.6					5.8	6.6			
Thorium 230	GPS (7.0)*	-0.2					-0.2	-0.2			
Thorium Precision +/-											
Lead (Pb210)	GPS (8.9)*	-2.7					-2.7	-2.7			
Lead Precision +/-											
Gross Alpha	GPS 15*	2.5					3.6	4			
Gross Alpha Precision +/-		1					1.2	1.4			
ORGANICS:											
Diesel Range Organics (DRO)	(mg/L)	130	40	52	6.2	35	130	16	21	6.7	5.7
Gasoline Range Organics (GRO)	(mg/L)	1.9	1.5	0.749	0.182		1.9	0.046		ND	
1,1,1-Trichloroethane	(ug/L)	15					15	ND	ND	ND	ND
Methyl ethyl ketone	(ug/L)	9800	7400	4400	1200	430		68	ND	ND	ND
Naphthalene	(ug/L)	58	30	17	4.6	2.7	58	ND	1.4	ND	ND
Toluene	(ug/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
QUALITY ASSURANCE DATA:											
TDS A/C Balance (dec. %)								1.14			
(LAB: Energy Labs Inc. unless noted.)											

KENNECOTT URANIUM COMPANY			
TMW-91			
NORTHING: 148,518.38 EASTING: 323,956.86	Groundwater Protection		
ND = Non-detectable	Standard	05/11/04	06/15/04
FIELD DATA mg/l:	(GPS)		
Temperature (C)	*as of 5/28/98	10	12
pH (Std. Units)		7.8	7.2
Cond. (umho/cm)		1000	1280
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3			
Bicarbonate (HCO3)			
Calcium (Ca)			
Carbonate (CO3)			
Chloride (Cl)			
Fluoride (F)			
Magnesium (Mg)			
Nitrate-N (NO3)			
Potassium (K)			
Silica (SiO2)			
Sodium (Na)			
Sulfate (SO4)			
NON-METALS:			
Cyanide (CN)			
PHYSICAL PROPERTIES:			
Cond (umho/cm)			
pH	GPS (6.8)		
TDS @ 180° C.	GPS (500)		
METALS-DISSOLVED mg/l:			
Aluminum (Al)			
Arsenic (As)	GPS (.05)		
Barium (Ba)			
Beryllium (Be)	GPS (.01)		
Boron (B)			
Cadmium (Cd)	GPS (.01)		
Chromium (Cr)	GPS (.05)		
Cobalt (Co)			
Copper (Cu)			
Iron (Fe)			
Lead (Pb)			
Manganese (Mn)			
Mercury (Hg)			
Molybdenum (Mo)			
Nickel (Ni)	GPS (.01)		
Selenium (Se)	GPS (.01)		
Silver (Ag)			
Thallium (Tl)			
Vanadium (V2O5)			
Zinc (ZN)			
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*		
Radium 226			
Radium Precision +/-			
Radium 228			
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*		
Thorium 230	GPS (7.0)*		
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*		
Lead Precision +/-			
Gross Alpha	GPS 15*		
Gross Alpha Precision +/-			
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	21	3.1
Gasoline Range Organics (GRO)	(mg/L)	ND	ND
1,1,1-Trichloroethane	(ug/L)	ND	ND
Methyl ethyl ketone	(ug/L)	ND	ND
Naphthalene	(ug/L)	ND	ND
Toluene	(ug/L)	ND	2.6
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)			
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY										
TMW-92										
NORTHING: 148,504.47 EASTING: 323,951.33	Groundwater Protection	2003			2004					
ND = Non-detectable	Standard	12/3/2003	12/10/03	12/16/03	01/13/04	02/16/04	03/17/04	04/12/04	05/11/04	06/10/04
FIELD DATA mg/l:	(GPS)									
Temperature (C)	*as of 5/28/98		8		8	8	8	9	10	10
pH (Std. Units)			7.5		8.6	7.8	7.3	7.4	7.8	7.1
Cond. (umho/cm)			640		640	640	600	660	900	860
TDS										
MAJOR IONS mg/l:										
Alk-CaCO3			87		68					
Bicarbonate (HCO3)			106		83					
Calcium (Ca)			99.3		65.3					
Carbonate (CO3)			-1		-1					
Chloride (Cl)			9.3		15					
Fluoride (F)			0.2		0.2					
Magnesium (Mg)			8		6.9					
Nitrate-N (NO3)			-0.1		0.14					
Potassium (K)			13.7		15.4					
Silica (SiO2)			13.1		10.8					
Sodium (Na)			49.1		65.5					
Sulfate (SO4)			275		252					
NON-METALS:										
Cyanide (CN)			-0.005		-0.005					
PHYSICAL PROPERTIES:										
Cond (umho/cm)			736		738					
pH	GPS (6.8)		8.06		8.16					
TDS @ 180° C.	GPS (500)		493		491					
METALS-DISSOLVED mg/l:										
Aluminum (Al)			-0.1		-0.1					
Arsenic (As)	GPS (.05)		-0.001		0.001					
Barium (Ba)			-0.1		-0.1					
Beryllium (Be)	GPS (.01)		-0.01		-0.01					
Boron (B)			-0.1		-0.1					
Cadmium (Cd)	GPS (.01)		-0.005		-0.005					
Chromium (Cr)	GPS (.05)		0.01		0.02					
Cobalt (Co)			-0.001		-0.001					
Copper (Cu)			-0.01		-0.01					
Iron (Fe)			-0.05		-0.05					
Lead (Pb)			-0.01		-0.01					
Manganese (Mn)			0.03		0.01					
Mercury (Hg)			-0.0002		0.001					
Molybdenum (Mo)			-0.01		-0.01					
Nickel (Ni)	GPS (.01)		-0.01		-0.01					
Selenium (Se)	GPS (.01)		0.002		-0.001					
Silver (Ag)			-0.01		-0.01					
Thallium (Tl)			-0.01		-0.01					
Vanadium (V2O5)			-0.1		-0.1					
Zinc (ZN)			-0.01		0.01					
RADIOMETRIC pCi/l:										
Uranium, natural	GPS (36)*		9.9		32.5					
Radium 226			0.9		1.6					
Radium Precision +/-			0.3		0.5					
Radium 228			-1		-1					
Radium Precision +/-										
Combined Ra226/228	GPS (5.8)*		0.9		1.6					
Thorium 230	GPS (7.0)*		-0.2		-0.2					
Thorium Precision +/-										
Lead (Pb210)	GPS (8.9)*		-2.7		-2.7					
Lead Precision +/-										
Gross Alpha	GPS 15*		1.5		-1					
Gross Alpha Precision +/-			1							
ORGANICS:										
Diesel Range Organics (DRO)	(mg/L)	3.8	ND	ND	ND	1.3	ND	ND	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	ND	ND	ND		ND		ND	ND
m+p-Xylenes	(ug/L)	ND	1.2	ND	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	(ug/L)	26	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	(ug/L)	3.5	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	(ug/L)	ND	1.4	ND	ND	ND	ND	ND	ND	ND
QUALITY ASSURANCE DATA:										
TDS A/C Balance (dec. %)			0.98		1.06					
(LAB: Energy Labs Inc. unless noted.)										

KENNECOTT URANIUM COMPANY			
TMW-93			
NORTHING: 148,399.92 EASTING: 324,099.96	Groundwater Protection	2004	
ND = Non-detectable	Standard	1/19/2004	02/16/04
FIELD DATA mg/l:	**(GPS)**		
Temperature (C)	*as of 5/28/98	8	8
pH (Std. Units)		9.3	8.4
Cond. (umho/cm)		700	400
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		69	
Bicarbonate (HCO3)		84.2	
Calcium (Ca)		73.6	
Carbonate (CO3)		-1	
Chloride (Cl)		23.2	
Fluoride (F)		0.3	
Magnesium (Mg)		7.6	
Nitrate-N (NO3)		-0.1	
Potassium (K)		7.7	
Silica (SiO2)		11	
Sodium (Na)		84.1	
Sulfate (SO4)		325	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		798	
pH	GPS (6.8)	8.27	
TDS @ 180° C.	GPS (500)	537	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	0.006	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	-0.01	
Cobalt (Co)		-0.001	
Copper (Cu)		-0.01	
Iron (Fe)		-0.05	
Lead (Pb)		-0.01	
Manganese (Mn)		0.02	
Mercury (Hg)		0.0015	
Molybdenum (Mo)		0.01	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	0.004	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	38.8	
Radium 226		1.6	
Radium Precision +/-		0.5	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	1.6	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-1	
Lead Precision +/-			
Gross Alpha	GPS 15*	2.5	
Gross Alpha Precision +/-		1	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		0.95	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY			
TMW-94			
NORTHING: 148,400.13 EASTING: 324,000.02	Groundwater Protection	2004	
ND = Non-detectable	Standard	1/14/2004	02/16/04
FIELD DATA mg/l:	**(GPS)**		
Temperature (C)	*as of 5/28/98	8	8
pH (Std. Units)		8.5	8
Cond. (umho/cm)		960	520
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		98	
Bicarbonate (HCO3)		120	
Calcium (Ca)		132	
Carbonate (CO3)		-1	
Chloride (Cl)		17.6	
Fluoride (F)		0.2	
Magnesium (Mg)		10.2	
Nitrate-N (NO3)		-0.1	
Potassium (K)		5.8	
Silica (SiO2)		10.2	
Sodium (Na)		85.9	
Sulfate (SO4)		444	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		789	
pH	GPS (6.8)	8.09	
TDS @ 180° C.	GPS (500)	774	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	0.006	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	-0.01	
Cobalt (Co)		0.003	
Copper (Cu)		-0.01	
Iron (Fe)		0.052	
Lead (Pb)		-0.01	
Manganese (Mn)		0.07	
Mercury (Hg)		0.0019	
Molybdenum (Mo)		0.02	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	-0.001	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	27.8	
Radium 226		1	
Radium Precision +/-		0.7	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	1	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-2.7	
Lead Precision +/-			
Gross Alpha	GPS 15*	7	
Gross Alpha Precision +/-		1	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.02	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY			
TMW-95			
NORTHING: 148,399.94 EASTING: 323,900.08	Groundwater Protection	2004	
ND = Non-detectable	Standard	1/14/2004	02/16/04
FIELD DATA mg/l:	(GPS)		
Temperature (C)	*as of 5/28/98	8	8
pH (Std. Units)		8.8	8
Cond. (umho/cm)		760	580
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		149	
Bicarbonate (HCO3)		182	
Calcium (Ca)		99.4	
Carbonate (CO3)		-1	
Chloride (Cl)		10.1	
Fluoride (F)		0.2	
Magnesium (Mg)		7.1	
Nitrate-N (NO3)		0.14	
Potassium (K)		5.3	
Silica (SiO2)		15.2	
Sodium (Na)		59.7	
Sulfate (SO4)		278	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		1080	
pH	GPS (6.8)	8.09	
TDS @ 180° C.	GPS (500)	552	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	0.001	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	-0.01	
Cobalt (Co)		-0.001	
Copper (Cu)		-0.01	
Iron (Fe)		0.056	
Lead (Pb)		-0.01	
Manganese (Mn)		0.04	
Mercury (Hg)		0.0008	
Molybdenum (Mo)		-0.01	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	-0.001	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	6	
Radium 226		1.4	
Radium Precision +/-		0.5	
Radium 228		3.9	
Radium Precision +/-		1.2	
Combined Ra226/228	GPS (5.8)*	5.3	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-2.7	
Lead Precision +/-			
Gross Alpha	GPS 15*	1.5	
Gross Alpha Precision +/-		1	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.01	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY					
TMW-96					
NORTHING: 148,500.01 EASTING: 323,807.75	Groundwater Protection	2004			
ND = Non-detectable	Standard	3/3/2004	04/13/04	05/11/04	06/10/04
FIELD DATA mg/l:	(GPS)				
Temperature (C)	*as of 5/28/98	8	10	12	10
pH (Std. Units)		7.6	6.6	7.5	6.8
Cond. (umho/cm)		1360	1440	1800	1400
TDS					
MAJOR IONS mg/l:					
Alk-CaCO3		144			
Bicarbonate (HCO3)		176			
Calcium (Ca)		374			
Carbonate (CO3)		-1			
Chloride (Cl)		95			
Fluoride (F)		0.1			
Magnesium (Mg)		65.4			
Nitrate-N (NO3)		1.77			
Potassium (K)		5.4			
Silica (SiO2)		8.2			
Sodium (Na)		103			
Sulfate (SO4)		1060			
NON-METALS:					
Cyanide (CN)		-0.005			
PHYSICAL PROPERTIES:					
Cond (umho/cm)		2330			
pH	GPS (6.8)	7.68			
TDS @ 180° C.	GPS (500)	1910			
METALS-DISSOLVED mg/l:					
Aluminum (Al)		-0.1			
Arsenic (As)	GPS (.05)	0.002			
Barium (Ba)		-0.1			
Beryllium (Be)	GPS (.01)	-0.01			
Boron (B)		-0.1			
Cadmium (Cd)	GPS (.01)	-0.005			
Chromium (Cr)	GPS (.05)	-0.01			
Cobalt (Co)		0.007			
Copper (Cu)		-0.01			
Iron (Fe)		-0.05			
Lead (Pb)		-0.01			
Manganese (Mn)		0.14			
Mercury (Hg)		-0.0002			
Molybdenum (Mo)		-0.01			
Nickel (Ni)	GPS (.01)	0.01			
Selenium (Se)	GPS (.01)	0.034			
Silver (Ag)		-0.01			
Thallium (Tl)		-0.01			
Vanadium (V2O5)		-0.1			
Zinc (ZN)		0.01			
RADIOMETRIC pCi/l:					
Uranium, natural	GPS (36)*	572			
Radium 226		5.5			
Radium Precision +/-		0.8			
Radium 228		-1			
Radium Precision +/-					
Combined Ra226/228	GPS (5.8)*	5.5			
Thorium 230	GPS (7.0)*	-0.2			
Thorium Precision +/-					
Lead (Pb210)	GPS (8.9)*	-1			
Lead Precision +/-					
Gross Alpha	GPS 15*	8.1			
Gross Alpha Precision +/-		1.3			
ORGANICS:					
Diesel Range Organics (DRO)	(mg/L)	ND	ND	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND		ND	ND
1,1,1-Trichloroethane	ug/L	6	14	15	4.6
1,1-Dichloroethane	ug/L	ND	2.2	2.1	1.1
1,1-Dichloroethene	ug/L	ND	1	1.1	ND
QUALITY ASSURANCE DATA:					
TDS A/C Balance (dec. %)		1.07			
(LAB: Energy Labs Inc. unless noted.)					

KENNECOTT URANIUM COMPANY			
TMW-97			
NORTHING: 148,599.86 EASTING: 323,799.93	Groundwater Protection	2004	
ND = Non-detectable	Standard	3/3/2004	
FIELD DATA mg/l:	**(GPS)**		
Temperature (C)	*as of 5/28/98	8	
pH (Std. Units)		11.7	
Cond. (umho/cm)		660	
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		50.7	
Bicarbonate (HCO3)		3.3	
Calcium (Ca)		65.6	
Carbonate (CO3)		35.1	
Chloride (Cl)		10.2	
Fluoride (F)		0.2	
Magnesium (Mg)		7.4	
Nitrate-N (NO3)		2.42	
Potassium (K)		27	
Silica (SiO2)		7.4	
Sodium (Na)		62.4	
Sulfate (SO4)		246	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		848	
pH	GPS (6.8)	11.3	
TDS @ 180° C.	GPS (500)	470	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	0.002	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	0.06	
Cobalt (Co)		-0.001	
Copper (Cu)		-0.01	
Iron (Fe)		-0.05	
Lead (Pb)		-0.01	
Manganese (Mn)		-0.01	
Mercury (Hg)		0.0006	
Molybdenum (Mo)		0.01	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	0.055	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	66.3	
Radium 226		0.9	
Radium Precision +/-		0.4	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	0.9	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	37	
Lead Precision +/-		5.7	
Gross Alpha	GPS 15*	1.1	
Gross Alpha Precision +/-		1	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.02	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY			
TMW-98			
NORTHING: 148699.84 EASTING: 323810.19	Groundwater Protection	2004	
ND = Non-detectable	Standard	2/23/2004	
FIELD DATA mg/l:	**(GPS)**		
Temperature (C)	*as of 5/28/98	8	
pH (Std. Units)		7.9	
Cond. (umho/cm)		560	
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		108	
Bicarbonate (HCO3)		132	
Calcium (Ca)		189	
Carbonate (CO3)		-1	
Chloride (Cl)		36	
Fluoride (F)		0.2	
Magnesium (Mg)		16.2	
Nitrate-N (NO3)		-0.1	
Potassium (K)		4.9	
Silica (SiO2)		10.7	
Sodium (Na)		56.3	
Sulfate (SO4)		508	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		1220	
pH	GPS (6.8)	7.8	
TDS @ 180° C.	GPS (500)	905	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	0.002	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	-0.01	
Cobalt (Co)		0.002	
Copper (Cu)		-0.01	
Iron (Fe)		-0.05	
Lead (Pb)		-0.01	
Manganese (Mn)		0.11	
Mercury (Hg)		-0.0002	
Molybdenum (Mo)		-0.01	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	0.003	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	118	
Radium 226		2.6	
Radium Precision +/-		0.5	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	2.6	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-1	
Lead Precision +/-			
Gross Alpha	GPS 15*	2.9	
Gross Alpha Precision +/-		1.2	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.03	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY			
TMW-99			
NORTHING: 148707.32 EASTING: 323898.85	Groundwater Protection	2004	
ND = Non-detectable	Standard	2/23/2004	
FIELD DATA mg/l:	(GPS)		
Temperature (C)	*as of 5/28/98	8	
pH (Std. Units)		7.5	
Cond. (umho/cm)		960	
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		111	
Bicarbonate (HCO3)		135	
Calcium (Ca)		230	
Carbonate (CO3)		-1	
Chloride (Cl)		17.6	
Fluoride (F)		0.2	
Magnesium (Mg)		27.7	
Nitrate-N (NO3)		0.1	
Potassium (K)		10.2	
Silica (SiO2)		9.9	
Sodium (Na)		78.6	
Sulfate (SO4)		732	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		1580	
pH	GPS (6.8)	7.55	
TDS @ 180° C.	GPS (500)	1190	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		-0.1	
Arsenic (As)	GPS (.05)	-0.001	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	-0.01	
Cobalt (Co)		0.024	
Copper (Cu)		-0.01	
Iron (Fe)		1.43	
Lead (Pb)		-0.01	
Manganese (Mn)		0.38	
Mercury (Hg)		-0.0002	
Molybdenum (Mo)		-0.01	
Nickel (Ni)	GPS (.01)	0.04	
Selenium (Se)	GPS (.01)	0.001	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	138	
Radium 226		3.8	
Radium Precision +/-		0.6	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	3.8	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-1	
Lead Precision +/-			
Gross Alpha	GPS 15*	6.1	
Gross Alpha Precision +/-		1.4	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	
Gasoline Range Organics (GRO)	(mg/L)	ND	
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.03	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY		
TMW-100		
NORTHING: 148799.77 EASTING: 324004.42	Groundwater Protection	
ND = Non-detectable	Standard	02/17/04
FIELD DATA mg/l:	(GPS)	
Temperature (C)	*as of 5/28/98	8
pH (Std. Units)		7.8
Cond. (umho/cm)		400
TDS		
MAJOR IONS mg/l:		
Alk-CaCO3		19.8
Bicarbonate (HCO3)		21.5
Calcium (Ca)		45.1
Carbonate (CO3)		1.6
Chloride (Cl)		6.4
Fluoride (F)		0.2
Magnesium (Mg)		4.9
Nitrate-N (NO3)		-0.1
Potassium (K)		4.2
Silica (SiO2)		10.9
Sodium (Na)		47.2
Sulfate (SO4)		197
NON-METALS:		
Cyanide (CN)		-0.005
PHYSICAL PROPERTIES:		
Cond (umho/cm)		520
pH	GPS (6.8)	9.12
TDS @ 180° C.	GPS (500)	313
METALS-DISSOLVED mg/l:		
Aluminum (Al)		-0.1
Arsenic (As)	GPS (.05)	0.002
Barium (Ba)		-0.1
Beryllium (Be)	GPS (.01)	-0.01
Boron (B)		-0.1
Cadmium (Cd)	GPS (.01)	-0.005
Chromium (Cr)	GPS (.05)	-0.01
Cobalt (Co)		-0.001
Copper (Cu)		-0.01
Iron (Fe)		-0.05
Lead (Pb)		-0.01
Manganese (Mn)		-0.01
Mercury (Hg)		0.0015
Molybdenum (Mo)		0.01
Nickel (Ni)	GPS (.01)	-0.01
Selenium (Se)	GPS (.01)	0.002
Silver (Ag)		-0.01
Thallium (Tl)		-0.01
Vanadium (V2O5)		-0.1
Zinc (ZN)		-0.01
RADIOMETRIC pCi/l:		
Uranium, natural	GPS (36)*	19.2
Radium 226		-0.2
Radium Precision +/-		
Radium 228		-1
Radium Precision +/-		
Combined Ra226/228	GPS (5.8)*	0
Thorium 230	GPS (7.0)*	-0.2
Thorium Precision +/-		
Lead (Pb210)	GPS (8.9)*	-1
Lead Precision +/-		
Gross Alpha	GPS 15*	-1
Gross Alpha Precision +/-		
ORGANICS:		
Diesel Range Organics (DRO)	(mg/L)	ND
Gasoline Range Organics (GRO)	(mg/L)	ND
QUALITY ASSURANCE DATA:		
TDS A/C Balance (dec. %)		0.99
(LAB: Energy Labs Inc. unless noted.)		

KENNECOTT URANIUM COMPANY				
TMW-101				
NORTHING: 148,800.10 EASTING: 324,100.06	Groundwater Protection	2004		
ND = Non-detectable	Standard	02/17/04		
FIELD DATA mg/l:	**(GPS)**			
Temperature (C)	*as of 5/28/98	8		
pH (Std. Units)		9.8		
Cond. (umho/cm)		640		
TDS				
MAJOR IONS mg/l:				
Alk-CaCO3		20.2		
Bicarbonate (HCO3)		17.1		
Calcium (Ca)		73.9		
Carbonate (CO3)		4.5		
Chloride (Cl)		9.4		
Fluoride (F)		0.5		
Magnesium (Mg)		2.5		
Nitrate-N (NO3)		-0.1		
Potassium (K)		7		
Silica (SiO2)		20.3		
Sodium (Na)		93.7		
Sulfate (SO4)		355		
NON-METALS:				
Cyanide (CN)		-0.005		
PHYSICAL PROPERTIES:				
Cond (umho/cm)		820		
pH	GPS (6.8)	9.67		
TDS @ 180° C.	GPS (500)	533		
METALS-DISSOLVED mg/l:				
Aluminum (Al)		-0.1		
Arsenic (As)	GPS (.05)	0.007		
Barium (Ba)		-0.1		
Beryllium (Be)	GPS (.01)	-0.01		
Boron (B)		-0.1		
Cadmium (Cd)	GPS (.01)	-0.005		
Chromium (Cr)	GPS (.05)	-0.01		
Cobalt (Co)		-0.001		
Copper (Cu)		-0.01		
Iron (Fe)		-0.05		
Lead (Pb)		-0.01		
Manganese (Mn)		-0.01		
Mercury (Hg)		0.004		
Molybdenum (Mo)		0.01		
Nickel (Ni)	GPS (.01)	-0.01		
Selenium (Se)	GPS (.01)	0.006		
Silver (Ag)		-0.01		
Thallium (Tl)		-0.01		
Vanadium (V2O5)		-0.1		
Zinc (ZN)		-0.01		
RADIOMETRIC pCi/l:				
Uranium, natural	GPS (36)*	27.1		
Radium 226		0.8		
Radium Precision +/-		0.5		
Radium 228		-1		
Radium Precision +/-				
Combined Ra226/228	GPS (5.8)*	0.8		
Thorium 230	GPS (7.0)*	-0.2		
Thorium Precision +/-				
Lead (Pb210)	GPS (8.9)*	-1		
Lead Precision +/-				
Gross Alpha	GPS 15*	-1		
Gross Alpha Precision +/-				
ORGANICS:				
Diesel Range Organics (DRO)	(mg/L)	ND		
Gasoline Range Organics (GRO)	(mg/L)	ND		
QUALITY ASSURANCE DATA:				
TDS A/C Balance (dec. %)		0.96		
(LAB: Energy Labs Inc. unless noted.)				

KENNECOTT URANIUM COMPANY									
TMW-102									
NORTHING: 148,600.02 EASTING: 323,968.63	Groundwater Protection	2003		2004					
ND = Non-detectable	Standard	12/10/03	12/16/03	01/14/04	02/16/04	03/17/04	04/13/04	05/11/04	06/15/04
FIELD DATA mg/l:	(GPS)								
Temperature (C)	*as of 5/28/98	8		8	8	8	10	11	12
pH (Std. Units)		11.7		13.3	13.4	12.8	12.7	12.5	13.2
Cond. (umho/cm)		3800		5800	4400	4600	3400	3400	5200
TDS									
MAJOR IONS mg/l:									
Alk-CaCO3		1080		1900					
Bicarbonate (HCO3)		2.4		7.8					
Calcium (Ca)		470		758					
Carbonate (CO3)		212		1380					
Chloride (Cl)		5.1		6.4					
Fluoride (F)		0.2		0.2					
Magnesium (Mg)		-1		-1					
Nitrate-N (NO3)		-0.1		-0.1					
Potassium (K)		95.5		217					
Silica (SiO2)		3.9		-1					
Sodium (Na)		63.5		111					
Sulfate (SO4)		407		370					
NON-METALS:									
Cyanide (CN)		-0.005		-0.005					
PHYSICAL PROPERTIES:									
Cond (umho/cm)		5420		8780					
pH	GPS (6.8)	12.2		12.5					
TDS @ 180° C.	GPS (500)	1640		2530					
METALS-DISSOLVED mg/l:									
Aluminum (Al)		-0.1		-0.1					
Arsenic (As)	GPS (.05)	-0.001		-0.001					
Barium (Ba)		0.2		0.3					
Beryllium (Be)	GPS (.01)	-0.01		-0.01					
Boron (B)		-0.1		-0.1					
Cadmium (Cd)	GPS (.01)	-0.005		-0.005					
Chromium (Cr)	GPS (.05)	0.09		0.21					
Cobalt (Co)		-0.001		0.001					
Copper (Cu)		-0.01		-0.01					
Iron (Fe)		-0.05		-0.05					
Lead (Pb)		0.02		0.16					
Manganese (Mn)		-0.01		-0.01					
Mercury (Hg)		-0.0002		-0.0002					
Molybdenum (Mo)		0.03		0.04					
Nickel (Ni)	GPS (.01)	-0.01		-0.01					
Selenium (Se)	GPS (.01)	0.003		0.007					
Silver (Ag)		-0.01		-0.01					
Thallium (Tl)		-0.01		-0.01					
Vanadium (V2O5)		-0.1		-0.1					
Zinc (ZN)		-0.01		-0.01					
RADIOMETRIC pCi/l:									
Uranium, natural	GPS (36)*	-0.2		-0.2					
Radium 226		3.5		2.4					
Radium Precision +/-		0.6		0.9					
Radium 228		-1		3.6					
Radium Precision +/-				2					
Combined Ra226/228	GPS (5.8)*	3.5		6					
Thorium 230	GPS (7.0)*	-0.2		0.2					
Thorium Precision +/-				0.3					
Lead (Pb210)	GPS (8.9)*	-2.7		-2.7					
Lead Precision +/-									
Gross Alpha	GPS 15*	3.6		2.2					
Gross Alpha Precision +/-		1.1		1					
ORGANICS:									
Diesel Range Organics (DRO)	(mg/L)	1.5	1.3	1.6	27	20	32	24	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	ND	0.041		0.088		0.099	ND
1,1,1-Trichloroethane	(ug/L)	ND	ND	ND	ND	1	1.1	1.3	ND
Methyl ethyl ketone	(ug/L)	ND	ND	ND	24	37	38	41	ND
Naphthalene	(ug/L)	3	12	16	21	12	16	20	1.1
Toluene	(ug/L)	ND	ND	ND	ND	ND	ND	ND	5.4
QUALITY ASSURANCE DATA:									
TDS A/C Balance (dec. %)		0.97		0.97					
(LAB: Energy Labs Inc. unless noted.)									

KENNECOTT URANIUM COMPANY		
TMW-104		
NORTHING: 148,508.55 EASTING: 324,122.60	Groundwater Protection	2004
ND = Non-detectable	Standard	3/3/04
FIELD DATA mg/l:	**(GPS)**	
Temperature (C)	*as of 5/28/98	8
pH (Std. Units)		8.9
Cond. (umho/cm)		380
TDS		
MAJOR IONS mg/l:		
Alk-CaCO3		90.2
Bicarbonate (HCO3)		107
Calcium (Ca)		39.9
Carbonate (CO3)		1.9
Chloride (Cl)		4.2
Fluoride (F)		0.2
Magnesium (Mg)		4.3
Nitrate-N (NO3)		0.27
Potassium (K)		3.5
Silica (SiO2)		9.4
Sodium (Na)		54
Sulfate (SO4)		131
NON-METALS:		
Cyanide (CN)		-0.005
PHYSICAL PROPERTIES:		
Cond (umho/cm)		490
pH	GPS (6.8)	8.49
TDS @ 180° C.	GPS (500)	306
METALS-DISSOLVED mg/l:		
Aluminum (Al)		0.1
Arsenic (As)	GPS (.05)	0.005
Barium (Ba)		-0.1
Beryllium (Be)	GPS (.01)	-0.01
Boron (B)		-0.1
Cadmium (Cd)	GPS (.01)	-0.005
Chromium (Cr)	GPS (.05)	-0.01
Cobalt (Co)		-0.001
Copper (Cu)		-0.01
Iron (Fe)		0.135
Lead (Pb)		-0.01
Manganese (Mn)		0.01
Mercury (Hg)		0.0004
Molybdenum (Mo)		-0.01
Nickel (Ni)	GPS (.01)	-0.01
Selenium (Se)	GPS (.01)	-0.001
Silver (Ag)		-0.01
Thallium (Tl)		-0.01
Vanadium (V2O5)		-0.1
Zinc (ZN)		-0.01
RADIOMETRIC pCi/l:		
Uranium, natural	GPS (36)*	57.1
Radium 226		-0.2
Radium Precision +/-		
Radium 228		-1
Radium Precision +/-		
Combined Ra226/228	GPS (5.8)*	0
Thorium 230	GPS (7.0)*	0.2
Thorium Precision +/-		0.2
Lead (Pb210)	GPS (8.9)*	-1
Lead Precision +/-		
Gross Alpha	GPS 15*	-1
Gross Alpha Precision +/-		
ORGANICS:		
Diesel Range Organics (DRO)	(mg/L)	ND
Gasoline Range Organics (GRO)	(mg/L)	ND
QUALITY ASSURANCE DATA:		
TDS A/C Balance (dec. %)		1.04
(LAB: Energy Labs Inc. unless noted.)		

KENNECOTT URANIUM COMPANY								
TMW-105								
NORTHING: 148,581.02 EASTING: 323,943.82	Groundwater Protection	2003	2004					
ND = Non-detectable	Standard	12/30/03	1/19/04	2/11/04	3/23/04	4/12/04	5/11/04	6/15/04
FIELD DATA mg/l:	(GPS)							
Temperature (C)	*as of 5/28/98		8	8	6	19	21	28
pH (Std. Units)			6.8	5	5.11	3.6	3.9	3.5
Cond. (umho/cm)			800	1420	1100	1120	1380	1400
TDS								
MAJOR IONS mg/l:								
Alk-CaCO3			39.5			1.6		
Bicarbonate (HCO3)			48.2			1.9		
Calcium (Ca)			168			303		
Carbonate (CO3)			-1			-1		
Chloride (Cl)			23			67.3		
Fluoride (F)			0.2			0.4		
Magnesium (Mg)			24.8			51.4		
Nitrate-N (NO3)			-0.1			-0.1		
Potassium (K)			5.8			6.5		
Silica (SiO2)			28			53.1		
Sodium (Na)			60.5			73		
Sulfate (SO4)			637			1160		
NON-METALS:								
Cyanide (CN)			-0.005			-0.005		
PHYSICAL PROPERTIES:								
Cond (umho/cm)			1300			2180		
pH	GPS (6.8)		6.54			4.7		
TDS @ 180° C.	GPS (500)		964			1880		
METALS-DISSOLVED mg/l:								
Aluminum (Al)			-0.1			2.4		
Arsenic (As)	GPS (.05)		-0.001			-0.001		
Barium (Ba)			-0.1			-0.1		
Beryllium (Be)	GPS (.01)		-0.01			-0.01		
Boron (B)			-0.1			0.16		
Cadmium (Cd)	GPS (.01)		-0.005			-0.005		
Chromium (Cr)	GPS (.05)		-0.01			-0.01		
Cobalt (Co)			0.067			0.136		
Copper (Cu)			-0.01			0.01		
Iron (Fe)			9.41			50.5		
Lead (Pb)			-0.01			0.04		
Manganese (Mn)			1.09			2.26		
Mercury (Hg)			-0.0002			-0.0002		
Molybdenum (Mo)			-0.01			-0.01		
Nickel (Ni)	GPS (.01)		0.08			0.13		
Selenium (Se)	GPS (.01)		0.01			0.013		
Silver (Ag)			-0.01			-0.01		
Thallium (Tl)			-0.01			-0.01		
Vanadium (V2O5)			-0.1			-0.1		
Zinc (ZN)			0.17			0.43		
RADIOMETRIC pCi/l:								
Uranium, natural	GPS (36)*		228			858		
Radium 226			18.7			10.7		
Radium Precision +/-			1.5			1.1		
Radium 228			3.7			25.8		
Radium Precision +/-			1.5			2.4		
Combined Ra226/228	GPS (5.8)*		22.4			36.5		
Thorium 230	GPS (7.0)*		-0.2			-0.2		
Thorium Precision +/-								
Lead (Pb210)	GPS (8.9)*		-1			-1		
Lead Precision +/-								
Gross Alpha	GPS 15*		19.1			22.4		
Gross Alpha Precision +/-			1.4			1.3		
ORGANICS:								
Diesel Range Organics (DRO)	(mg/L)	22	25	290	20	15	220	14
Gasoline Range Organics (GRO)	(mg/L)	ND	0.073		0.134	0.125	0.083	0.092
1,1,1-Trichloroethane	(ug/L)		13	20	ND	ND	ND	ND
1,1-Dichloroethene	(ug/L)		ND	2.6	ND	ND	ND	ND
1,2,4-Trimethylbenzene	(ug/L)		ND	6.2	ND	ND	ND	ND
Methyl ethyl ketone	(ug/L)	ND	ND	ND	250	ND	ND	25
Naphthalene	(ug/L)		ND	120	48	41	54	23
QUALITY ASSURANCE DATA:								
TDS A/C Balance (dec. %)			1.02			1.13		
(LAB: Energy Labs Inc. unless noted.)								

KENNECOTT URANIUM COMPANY			
TMW-111			
NORTHING: 148,800.06 EASTING: 324,200.03	Groundwater Protection	2004	
ND = Non-detectable	Standard	2/2/2004	02/11/04
FIELD DATA mg/l:	(GPS)		
Temperature (C)	*as of 5/28/98	8	8
pH (Std. Units)		12.2	11.3
Cond. (umho/cm)		1400	820
TDS			
MAJOR IONS mg/l:			
Alk-CaCO3		164	
Bicarbonate (HCO3)		18.5	
Calcium (Ca)		69.1	
Carbonate (CO3)		109	
Chloride (Cl)		7.1	
Fluoride (F)		0.3	
Magnesium (Mg)		-1	
Nitrate-N (NO3)		-0.1	
Potassium (K)		24.5	
Silica (SiO2)		15.1	
Sodium (Na)		55.5	
Sulfate (SO4)		95.1	
NON-METALS:			
Cyanide (CN)		-0.005	
PHYSICAL PROPERTIES:			
Cond (umho/cm)		1100	
pH	GPS (6.8)	11	
TDS @ 180° C.	GPS (500)	364	
METALS-DISSOLVED mg/l:			
Aluminum (Al)		0.1	
Arsenic (As)	GPS (.05)	0.004	
Barium (Ba)		-0.1	
Beryllium (Be)	GPS (.01)	-0.01	
Boron (B)		-0.1	
Cadmium (Cd)	GPS (.01)	-0.005	
Chromium (Cr)	GPS (.05)	0.01	
Cobalt (Co)		-0.001	
Copper (Cu)		-0.01	
Iron (Fe)		-0.05	
Lead (Pb)		-0.01	
Manganese (Mn)		-0.01	
Mercury (Hg)		0.0018	
Molybdenum (Mo)		0.01	
Nickel (Ni)	GPS (.01)	-0.01	
Selenium (Se)	GPS (.01)	-0.001	
Silver (Ag)		-0.01	
Thallium (Tl)		-0.01	
Vanadium (V2O5)		-0.1	
Zinc (ZN)		-0.01	
RADIOMETRIC pCi/l:			
Uranium, natural	GPS (36)*	-0.2	
Radium 226		0.6	
Radium Precision +/-		0.3	
Radium 228		-1	
Radium Precision +/-			
Combined Ra226/228	GPS (5.8)*	0.6	
Thorium 230	GPS (7.0)*	-0.2	
Thorium Precision +/-			
Lead (Pb210)	GPS (8.9)*	-1	
Lead Precision +/-			
Gross Alpha	GPS 15*	1.6	
Gross Alpha Precision +/-		1	
ORGANICS:			
Diesel Range Organics (DRO)	(mg/L)	ND	ND
Gasoline Range Organics (GRO)	(mg/L)		
QUALITY ASSURANCE DATA:			
TDS A/C Balance (dec. %)		1.04	
(LAB: Energy Labs Inc. unless noted.)			

KENNECOTT URANIUM COMPANY							
TMW-112							
NORTHING: 148,700.09 EASTING: 324,199.95	Groundwater Protection	2004					
ND = Non-detectable	Standard	2/2/2004	02/17/04	03/17/04	04/12/04	05/11/04	06/10/04
FIELD DATA mg/l:	(GPS)						
Temperature (C)	*as of 5/28/98	8	8	8	10	10	12
pH (Std. Units)		8.4	6.1	5.8	5.8	6.8	6.7
Cond. (umho/cm)		1000	1400	1800	1200	1200	1020
TDS							
MAJOR IONS mg/l:							
Alk-CaCO3		88.8			37.5		
Bicarbonate (HCO3)		108			45.8		
Calcium (Ca)		153			396		
Carbonate (CO3)		-1			-1		
Chloride (Cl)		11.4			37.5		
Fluoride (F)		0.2			0.2		
Magnesium (Mg)		20.2			47.5		
Nitrate-N (NO3)		-0.1			0.24		
Potassium (K)		6.1			7.9		
Silica (SiO2)		10.3			14.1		
Sodium (Na)		67.4			81.7		
Sulfate (SO4)		474			1160		
NON-METALS:							
Cyanide (CN)		-0.005			-0.005		
PHYSICAL PROPERTIES:							
Cond (umho/cm)		1090			2280		
pH	GPS (6.8)	8.09			6.33		
TDS @ 180° C.	GPS (500)	771			2040		
METALS-DISSOLVED mg/l:							
Aluminum (Al)		-0.1			-0.1		
Arsenic (As)	GPS (.05)	-0.001			0.002		
Barium (Ba)		-0.1			-0.1		
Beryllium (Be)	GPS (.01)	-0.01			-0.01		
Boron (B)		-0.1			-0.1		
Cadmium (Cd)	GPS (.01)	-0.005			-0.005		
Chromium (Cr)	GPS (.05)	-0.01			-0.01		
Cobalt (Co)		0.027			0.112		
Copper (Cu)		-0.01			-0.01		
Iron (Fe)		0.164			10.2		
Lead (Pb)		-0.01			-0.01		
Manganese (Mn)		0.33			0.71		
Mercury (Hg)		0.0004			-0.0002		
Molybdenum (Mo)		-0.01			-0.01		
Nickel (Ni)	GPS (.01)	0.05			0.15		
Selenium (Se)	GPS (.01)	0.003			0.003		
Silver (Ag)		-0.01			-0.01		
Thallium (Tl)		-0.01			-0.01		
Vanadium (V2O5)		-0.1			-0.1		
Zinc (ZN)		0.02			0.08		
RADIOMETRIC pCi/l:							
Uranium, natural	GPS (36)*	82.6			25.1		
Radium 226		1.9			5.7		
Radium Precision +/-		0.5			0.8		
Radium 228		-1			19.8		
Radium Precision +/-					1.5		
Combined Ra226/228	GPS (5.8)*	1.9			25.5		
Thorium 230	GPS (7.0)*	-0.2			-0.2		
Thorium Precision +/-							
Lead (Pb210)	GPS (8.9)*	-1			-1		
Lead Precision +/-							
Gross Alpha	GPS 15*	2.6			2.5		
Gross Alpha Precision +/-		1			1		
ORGANICS:							
1,1,1-Trichloroethane	(ug/L)	ND	2.3	1.9	2.3	ND	ND
Chloromethane	(ug/L)				1	ND	ND
Naphthalene	(ug/L)	ND	ND	ND	ND	1.5	ND
Diesel Range Organics (DRO)	(mg/L)	ND	ND	ND	ND	ND	ND
Gasoline Range Organics (GRO)	(mg/L)		ND	ND	ND	ND	ND
QUALITY ASSURANCE DATA:							
TDS A/C Balance (dec. %)		0.98			1.16		
(LAB: Energy Labs Inc. unless noted.)							

KENNECOTT URANIUM COMPANY							
TMW-113							
NORTHING: 148,600.06 EASTING: 324,199.95	Groundwater Protection	2004					
ND = Non-detectable	Standard	1/26/04	2/17/04	3/17/04	4/12/04	5/11/04	6/10/04
FIELD DATA mg/l:	(GPS)						
Temperature (C)	*as of 5/28/98	8	8	8	10	10	14
pH (Std. Units)		12.3	11.4	10.8	10.9	8.9	7.2
Cond. (umho/cm)		2400	1140	1800	780	1000	1200
TDS							
MAJOR IONS mg/l:							
Alk-CaCO3		260			22.8		
Bicarbonate (HCO3)		8			26.8		
Calcium (Ca)		178			236		
Carbonate (CO3)		104			-1		
Chloride (Cl)		14.3			36.3		
Fluoride (F)		0.4			0.2		
Magnesium (Mg)		-1			21.6		
Nitrate-N (NO3)		-0.1			-0.1		
Potassium (K)		14.8			9.1		
Silica (SiO2)		8.1			7.6		
Sodium (Na)		83.7			90.7		
Sulfate (SO4)		391			752		
NON-METALS:							
Cyanide (CN)		-0.005			-0.005		
PHYSICAL PROPERTIES:							
Cond (umho/cm)		1730			1560		
pH	GPS (6.8)	11.4			8.56		
TDS @ 180° C.	GPS (500)	804			1230		
METALS-DISSOLVED mg/l:							
Aluminum (Al)		-0.1			-0.1		
Arsenic (As)	GPS (.05)	0.001			0.006		
Barium (Ba)		-0.1			-0.1		
Beryllium (Be)	GPS (.01)	-0.01			-0.01		
Boron (B)		-0.1			-0.1		
Cadmium (Cd)	GPS (.01)	-0.005			-0.005		
Chromium (Cr)	GPS (.05)	-0.01			-0.01		
Cobalt (Co)		-0.001			-0.001		
Copper (Cu)		-0.01			-0.01		
Iron (Fe)		-0.05			-0.05		
Lead (Pb)		-0.01			-0.01		
Manganese (Mn)		-0.01			0.03		
Mercury (Hg)		0.0007			0.0013		
Molybdenum (Mo)		0.01			-0.01		
Nickel (Ni)	GPS (.01)	-0.01			-0.01		
Selenium (Se)	GPS (.01)	0.009			0.003		
Silver (Ag)		-0.01			-0.01		
Thallium (Tl)		-0.01			-0.01		
Vanadium (V2O5)		-0.1			-0.1		
Zinc (ZN)		-0.01			-0.01		
RADIOMETRIC pCi/l:							
Uranium, natural	GPS (36)*	6.2			160		
Radium 226		1.1			1.6		
Radium Precision +/-		0.4			0.6		
Radium 228		-1			3.8		
Radium Precision +/-					1.1		
Combined Ra226/228	GPS (5.8)*	1.1			5.4		
Thorium 230	GPS (7.0)*	-0.2			-0.2		
Thorium Precision +/-							
Lead (Pb210)	GPS (8.9)*	-1			-1		
Lead Precision +/-							
Gross Alpha	GPS 15*	1.6			9.6		
Gross Alpha Precision +/-		1			1.6		
ORGANICS:							
Diesel Range Organics (DRO)	(mg/L)	ND	ND	ND	ND	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	ND	ND	ND	ND	ND
Naphthalene	(ug/L)	2.2	1.8	1.4	ND	ND	ND
QUALITY ASSURANCE DATA:							
TDS A/C Balance (dec. %)		0.96			1.06		
(LAB: Energy Labs Inc. unless noted.)							

KENNECOTT URANIUM COMPANY				
TMW-115				
NORTHING: 148,499.96 EASTING: 324,199.79	Groundwater Protection	2004		
ND = Non-detectable	Standard	1/21/2004	02/17/04	04/12/04
FIELD DATA mg/l:	**(GPS)**			
Temperature (C)	*as of 5/28/98	8	8	11
pH (Std. Units)		12.5	12.3	12.1
Cond. (umho/cm)		1100	1360	1280
TDS				
MAJOR IONS mg/l:				
Alk-CaCO3		113		266
Bicarbonate (HCO3)		13.5		6
Calcium (Ca)		129		187
Carbonate (CO3)		74.5		191
Chloride (Cl)		9.7		8.9
Fluoride (F)		0.3		0.3
Hydroxide as OH		16.6		-1
Magnesium (Mg)		1.2		-0.1
Nitrate-N (NO3)		-0.1		14.6
Potassium (K)		13.5		14.6
Silica (SiO2)		15.1		8.8
Sodium (Na)		70.9		79.3
Sulfate (SO4)		308		353
NON-METALS:				
Cyanide (CN)		-0.005		-0.005
PHYSICAL PROPERTIES:				
Cond (umho/cm)		1290		1860
pH	GPS (6.8)	11		11.8
TDS @ 180° C.	GPS (500)	641		814
METALS-DISSOLVED mg/l:				
Aluminum (Al)		-0.1		-0.1
Arsenic (As)	GPS (.05)	0.002		0.003
Barium (Ba)		-0.1		-0.1
Beryllium (Be)	GPS (.01)	-0.01		-0.01
Boron (B)		-0.1		-0.1
Cadmium (Cd)	GPS (.01)	-0.005		-0.005
Chromium (Cr)	GPS (.05)	-0.01		-0.01
Cobalt (Co)		-0.001		-0.001
Copper (Cu)		-0.01		-0.01
Iron (Fe)		-0.05		-0.05
Lead (Pb)		-0.01		-0.01
Manganese (Mn)		-0.01		-0.01
Mercury (Hg)		0.0011		0.006
Molybdenum (Mo)		0.02		0.02
Nickel (Ni)	GPS (.01)	-0.01		-0.01
Selenium (Se)	GPS (.01)	0.007		0.002
Silver (Ag)		-0.01		-0.01
Thallium (Tl)		-0.01		-0.01
Vanadium (V2O5)		-0.1		-0.1
Zinc (ZN)		-0.01		-0.01
RADIOMETRIC pCi/l:				
Uranium, natural	GPS (36)*	-0.2		0.4
Radium 226		1		1
Radium Precision +/-		0.4		0.5
Radium 228		-1		-1
Radium Precision +/-				
Combined Ra226/228	GPS (5.8)*	1		1
Thorium 230	GPS (7.0)*	-0.2		-0.2
Thorium Precision +/-				
Lead (Pb210)	GPS (8.9)*	-1		-1
Lead Precision +/-				
Gross Alpha	GPS 15*	3.1		-1
Gross Alpha Precision +/-		1.1		
ORGANICS:				
Diesel Range Organics (DRO)	(mg/L)	ND	ND	ND
Gasoline Range Organics (GRO)	(mg/L)	ND	ND	ND
QUALITY ASSURANCE DATA:				
TDS A/C Balance (dec. %)		1.07		1.01
(LAB: Energy Labs Inc. unless noted.)				

KENNECOTT URANIUM COMPANY									
TMW-52									
NORTHING: 148,316.56 EASTING: 324,221.64	Groundwater Protection	2002		2003				2004	
ND = Non-detectable	Standard	3/7/02	9/4/02	3/5/03	9/15/03	10/22/03	11/10/03	1/13/04	3/11/04
FIELD DATA mg/l:	(GPS)								
Temperature (C)	*as of 5/28/98	8	8	8	8	8	8	8	8
pH (Std. Units)		7.2	7.2	6.8	6.8	6.9	6.6	8.3	7.2
Cond. (umho/cm)		860	780	860	800	780	780	800	700
TDS									
MAJOR IONS mg/l:									
Alk - CaCO3		155	150	156	150			153	154
Bicarbonate (HCO3)		188	183	190	183			187	188
Calcium (Ca)		187	156	154	161			206	172
Carbonate (CO3)		-1	-1	-1	-1			-1	-1
Chloride (Cl)		18.9	15.8	12.2	18.7			15.1	15.9
Fluoride (F)		0.1	0.2	0.2	0.2			0.1	0.2
Magnesium (Mg)		12.9	11.4	10.8	11.1			14.4	12.7
Nitrate - N (NO3)		-0.1	-0.1	-0.1	-0.1			-0.1	-0.1
Potassium (K)		3.9	3.5	4.2	3.8			7.9	3.8
Silica (SiO2)			13.9	12.9	14.7			16.5	15.2
Sodium (Na)		50.9	47.7	46.4	45.7			54.8	53.4
Sulfate (SO4)		392	358	352	363			471	398
NON-METALS:									
Cyanide (CN)		-0.005	-0.005	-0.005	-0.005			-0.005	-0.005
PHYSICAL PROPERTIES:									
Cond. (umho/cm)		1020	967	1030	1080			1050	1060
pH	GPS (6.8)	7.8	7.97	7.6	8.05			8.05	7.92
TDS @ 180 C.	GPS (500)	753	730	744	739			754	786
METALS-DISSOLVED mg/l:									
Aluminum (Al)		-0.1	-0.1	-0.1	0.1			-0.1	-0.1
Arsenic (As)	GPS (.05)	-0.001	-0.001	-0.001	-0.002			-0.002	-0.002
Barium (Ba)		-0.1	-0.1	-0.1	-0.1			-0.1	-0.1
Beryllium (Be)	GPS (.01)	-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Boron (B)		-0.1	-0.1	-0.1	-0.1			-0.1	-0.1
Cadmium (Cd)	GPS (.01)	-0.005	-0.005	-0.005	-0.005			-0.005	-0.005
Chromium (Cr)	GPS (.05)	-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Cobalt (Co)		-0.001	0.001	-0.001	-0.001			-0.001	-0.001
Copper (Cu)		-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Iron (Fe)		0.46	0.222	-0.05	0.411			0.459	0.409
Lead (Pb)		-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Manganese (Mn)		0.1	0.09	0.09	0.11			0.1	0.1
Mercury (Hg)		-0.0002	-0.0002	-0.0002	-0.0004			-0.0004	-0.0004
Molybdenum (Mo)		-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Nickel (Ni)	GPS (.01)	-0.01	0.01	-0.01	-0.01			-0.01	-0.01
Selenium (Se)	GPS (.01)	-0.001	-0.001	-0.001	-0.005			-0.005	-0.005
Silver (Ag)		-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Thallium (Tl)		-0.01	-0.01	-0.01	-0.01			-0.01	-0.01
Vanadium (V2O5)		-0.1	-0.1	-0.1	-0.1			-0.1	-0.1
Zinc (ZN)		-0.01	0.01	-0.01	0.02			-0.01	-0.01
RADIOMETRIC pCi/l:									
Uranium, natural	GPS (36)*	5.2	5.8	4.8	4.8			6.3	6.2
Radium 226		2.3	2.1	2.5	1.8			3.7	2.1
Radium Precision +/-		0.2	0.3	0.2	0.2			0.7	0.6
Radium 228		3	3.9	4.9	2.2			2.8	
Radium Precision +/-		1	1	1	1			0.9	
Combined Ra226/228	GPS (5.8)*	5.3	6	7.4	4			6.5	2.1
Thorium 230	GPS (7.0)*	-0.2	-0.2	-0.2	-0.2			-0.2	-0.2
Thorium Precision +/-									
Lead (Pb210)	GPS (8.9)*	-2.7	-2.7	-2.7	-2.7			-2.7	-1
Lead Precision +/-									
Gross Alpha	GPS 15*	3.8	2	3.8	3			3.3	2.5
Gross Alpha Precision +/-		1.9	1.1	1	1			1.3	1
ORGANICS:									
Diesel Range Organics (mg/L)					ND	ND	ND		
Gasoline Range Organics (mg/L)					ND	ND	ND		
1,1,1-Trichloroethane (ug/L)					ND	ND	ND		
Naphthalene (ug/L)					3.8	ND	ND		
QUALITY ASSURANCE DATA:									
TDS A/C Balance (dec. %)		0.96	1.04	1.08				0.88	1.05
(LAB: Energy Labs Inc. unless noted.)									

KENNECOTT URANIUM COMPANY											
PWW-1	Ground Water	EPA Drinking				2003				2004	
ND = Non-detectable	Protection	Water	5/23/02	7/23/02	10/8/02	1/8/03	4/7/03	7/1/03	10/20/03	1/12/04	4/6/04
FIELD DATA mg/l:	Standard	Standard									
Temperature (C)				8	8	8	8	8	8	8	11
pH (Std. Units)				7.5	7.5	6.9	7.2	6.9	7.3	8.6	7.4
Cond (umho/cm)				380	340	280	300	300	280	300	260
TDS											
MAJOR IONS mg/l:											
Alk-CaC03				85	85	82	82	82	80	83	81.2
Bicarbonate (HCO3)				104	104	100	100	99.4	97	101	99
Calcium (Ca)				26.6	24	14.7	16.8	18.4	15.8	17	19.4
Carbonate (CO3)				-1	-1	-1	-1	-1	-1	-1	-1
Chloride (Cl)				3.8	7	4.4	3.7	2.6	-1	4.5	1.4
Fluoride (F)		4		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Magnesium (Mg)				1.9	1.6	-1	-1	1.1	-1	-1	1.1
Nitrate-N (NO3)		10		-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Potassium (K)				1.2	1.4	1.1	1.9	1.6	1.3	1.6	1.8
Silica (SiO2)				10	12.9	8.3	9.3	10.7	10.7	10.4	11
Sodium (Na)				45	44	38.1	44.1	43.9	43.8	43.5	39.8
Sulfate (SO4)				81.8	72.5	43.4	55.2	60.7	58.7	49.7	52.5
NON-METALS:											
Cyanide (CN)	.005			-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
PHYSICAL PROPERTIES:											
Cond (umho/cm)				358	334	282	285	306	298	295	283
pH (units)	6.8	6.5-8.5		8.1	8.2	7.98	7.88	8.23	8.09	8.13	8.19
TDS @ 180°	500			247	217	165	204	193	167	182	147
TRACE METALS mg/l:											
Aluminum (Al)				-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Arsenic (As)	.05	.05		0.002	0.002	0.002	0.002	0.002	-0.002	0.001	0.002
Barium (Ba)	1	1		-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Beryllium (Be)	.01			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Boron (B)				-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Cadmium (Cd)	.01	.01		-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005
Chromium (Cr)	.05	.05		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Cobalt (Co)				-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Copper (Cu)				-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Iron (Fe)				0.095	0.09	0.109	0.198	0.284	0.295	0.34	0.484
Lead (Pb)	.5	.05		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Manganese (Mn)				0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.04
Mercury (Hg)	.002	.002		-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
Molybdenum (Mo)	.04			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Nickel (Ni)	.01			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Selenium (Se)	.01	.01		-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Silver (Ag)	.05			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Thallium (Tl)	.01			-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Vanadium (V205)				-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Zinc (ZN)				0.04	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
RADIOMETRIC pCi/l:											
Uranium, Natural	1.7	3385		12.1	6.5	2.9	1.1	2.6	0.8	2.1	0.4
Radium 226				0.6 +/- 0.2	0.4 +/- 0.2	-0.2	0.3 +/- 0.2	0.4 +/- 0.2	0.4 +/- 0.2	1.2 +/- 0.5	0.4+/-0.3
Radium 228				-1	-1	-1	7.3 +/- 1.7	-1	-1	-1	-1
Comb. Ra226/228	2.8	5		0.6	0.4	0	7.6	0.4	0.4	1.2	0.4
Thorium 230	10			-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Lead (Pb210)	1.4			-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-1
Gross Alpha	6.6	15		-1	2.0 +/- 1.0	-1	-1	-1	-1	-1	-1
A/C Balance				1.09	1	1.02	1.11	1.01	0.99	1.09	0.89
Energy Labs, Inc. unless noted otherwise											
				7/23/02	10/8/02	1/8/03	4/7/03	7/1/03	10/20/03	1/12/04	4/6/04
Oil & Grease				ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Volatile Organic Chemicals											
Gasoline Range Organics (mg/L)			ND								

KENNECOTT URANIUM COMPANY											
PWW-2											
EPA DWS = EPA Drinking Water Standard						2003				2004	
ND = Non-detectable	(GPS)	EPA DWS	05/23/02	07/23/02	10/08/02	01/08/03	04/07/03	07/02/03	10/20/03	01/07/04	04/06/04
FIELD DATA mg/l:											
Temperature (C)				8	8	8	Pump down	8	8	8	11
pH (Std. Units)				7.5	7.5	7.3	no power.	7.3	6.7	8.6	7.6
Cond (umho/cm)				320	300	260		280	280	380	240
TDS											
MAJOR IONS mg/l:											
Alk-CaC03				58	86	83		84	82	85	82.2
Bicarbonate (HCO3)				70.2	104	101		102	99.4	104	98
Calcium (Ca)				9	22.5	12.1		15	13.2	16	14.2
Carbonate (CO3)				-1	-1	-1		-1	-1	-1	1.4
Chloride (Cl)				2.2	7.7	2.3		6.6	-1	1.9	2.2
Fluoride (F)		4		0.1	0.2	0.2		0.2	0.2	0.2	0.2
Magnesium (Mg)				-1	1.5	-1		-1	-1	1	-1
Nitrate-N (NO3)		10		-0.1	-0.1	-0.1		-0.1	-0.1	-0.1	-0.1
Potassium (K)				-1	1.3	-1		1.3	1.3	1.1	1.5
Silica (SiO2)				8.2	12.3	8		10.4	10.5	11	10.3
Sodium (Na)				40.2	42.3	40.2		42.8	42	41	43.6
Sulfate (SO4)				44.2	67	39.4		48.7	46.4	45	45.6
NON-METALS:											
Cyanide (CN)	.005			-0.005	-0.005	-0.005		-0.005	-0.005	-0.005	-0.005
PHYSICAL PROPERTIES:											
Cond (umho/cm)				192	319	272		280	274	273	269
pH (units)	6.8	6.5-8.5		7.83	8.27	8.06		8.26	8.16	8.14	8.39
TDS @ 180°	500			128	207	169		181	176	133	139
TRACE METALS mg/l:											
Aluminum (Al)				-0.1	-0.1	-0.1		-0.1	-0.1	-0.1	-0.1
Arsenic (As)	.05	.05		0.002	0.002	0.002		0.002	-0.002	0.002	0.002
Barium (Ba)	1	1		-0.1	-0.1	-0.1		-0.1	-0.1	-0.1	-0.1
Beryllium (Be)	.01			-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Boron (B)				-0.1	-0.1	-0.1		-0.1	-0.1	-0.1	-0.1
Cadmium (Cd)	.01	.01		-0.005	-0.005	-0.005		-0.005	-0.005	-0.005	-0.005
Chromium (Cr)	.05	.05		-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Cobalt (Co)				-0.001	-0.001	-0.001		-0.001	-0.001	-0.001	-0.001
Copper (Cu)				-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Iron (Fe)				-0.05	0.081	0.118		0.141	0.329	0.24	0.302
Lead (Pb)	.5	.05		-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Manganese (Mn)				-0.01	0.02	0.02		0.02	0.02	0.02	0.02
Mercury (Hg)	.002	.002		-0.0002	-0.0002	-0.0002		-0.0002	-0.0002	-0.0002	-0.0002
Molybdenum (Mo)	.04			-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Nickel (Ni)	.01			-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Selenium (Se)	.01	.01		-0.001	-0.001	-0.001		-0.001	-0.001	-0.001	-0.001
Silver (Ag)	.05			-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Thallium (Tl)	.01			-0.01	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
Vanadium (V205)				-0.1	-0.1	-0.1		-0.1	-0.1	-0.1	-0.1
Zinc (ZN)				0.03	-0.01	-0.01		-0.01	-0.01	-0.01	-0.01
RADIOMETRIC pCi/l:											
Uranium, Natural	1.7	3385		3.5	4	2.7		2.6	2.1	2.2	2.2
Radium 226				-0.2	0.9 +/- 0.3	-0.2		-0.2	-0.2	0.6+/-0.4	0.6+/-0.3
Radium 228				-1	-1	-1		3.4 +/- 1.8	-1	-1	10.7+/-1.
Comb. Ra226/228	2.8	5		0	0.9	0		3.4	0	0.6	11.3
Thorium 230	10			-0.2	-0.2	-0.2		-0.2	-0.2	-0.2	-0.2
Lead (Pb210)	1.4			-2.7	-2.7	-2.7		-2.7	-2.7	-2.7	-1
Gross Alpha	6.6	15		-1	1.4 +/- 1.0	-1		-1	2.1+/-1.0	1.0+/-1.0	-1
A/C Balance				0.9	0.99	1.09		1.02	1.15	0.85	0.89
GPS = Groundwater Protection Standard											
				7/23/02	10/8/02	1/8/03		7/9/03	10/20/03	1/7/04	4/6/04
Oil & Grease				ND (1.0)	1.1	ND (1.0)		ND (1.0)	ND (1.0)	ND (1.0)	ND (1.0)
Volatile Organic Chemicals											
Gasoline Range Organics	mg/L		ND								

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ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
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LABORATORY ANALYTICAL REPORT

MAY 2 8 2002

Client: Kennecott Uranium Company
Project: Sweetwater Uranium
Lab ID: C02050327-001
Client Sample ID: Can PVC Primer

Report Date: 05/23/02
Collection Date: 05/09/02 13:50
Date Received: 05/10/02
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC CHEMICALS							
1,1,1,2-Tetrachloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1,1-Trichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1,2,2-Tetrachloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1,2-Trichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1-Dichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,1-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2,3-Trichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2,3-Trichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2,4-Trichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2,4-Trimethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2-Dibromo-3-chloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2-Dibromoethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,2-Dichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
3,5-Trimethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,3-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,3-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
1,4-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
2,2-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
2-Chlorotoluene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
4-Chlorotoluene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Benzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Bromobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Bromochloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Bromodichloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Bromoform	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Bromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Carbon tetrachloride	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Chlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Chlorodibromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Chloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Chloroform	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Chloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
cis-1,2-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
cis-1,3-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Dibromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

TRACKING NO. PAGE NO.
50327R00001

ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602
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LABORATORY ANALYTICAL REPORT

Client: Kennecott Uranium Company
Project: Sweetwater Uranium
Lab ID: C02050327-001
Client Sample ID: Can PVC Primer

Report Date: 05/23/02
Collection Date: 05/09/02 13:50
Date Received: 05/10/02
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC CHEMICALS							
Dichlorodifluoromethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Ethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Hexachlorobutadiene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Isopropylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
m+p-Xylenes	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Methyl ethyl ketone	543000 E	mg/kg	D	16000		SW8260B	05/21/02 20:23 / rh
Methylene chloride	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Naphthalene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
n-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
n-Propylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
o-Xylene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
p-Isopropyltoluene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
sec-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Styrene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
tert-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Tetrachloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Toluene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
trans-1,2-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
trans-1,3-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Trichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Trichlorofluoromethane	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Vinyl chloride	ND	mg/kg	D	200		SW8260B	05/21/02 21:01 / rh
Surr: 1,2-Dichlorobenzene-d4	78.0	%REC	D		70-130	SW8260B	05/21/02 21:01 / rh
Surr: Dibromofluoromethane	85.0	%REC	D		60-135	SW8260B	05/21/02 21:01 / rh
Surr: p-Bromofluorobenzene	62.0	%REC	DS		70-130	SW8260B	05/21/02 21:01 / rh
Surr: Toluene-d8	62.0	%REC	DS		70-130	SW8260B	05/21/02 21:01 / rh

- Matrix interference resulted in low surrogate recoveries.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

TRACKING NO. PAGE NO.
50327R00002

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LABORATORY ANALYTICAL REPORT

Client: Kennecott Uranium Company
Project: Sweetwater Uranium
Lab ID: C02050327-002
Client Sample ID: Can PVE Cement

Report Date: 05/23/02
Collection Date: 05/09/02 13:50
Date Received: 05/10/02
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC CHEMICALS							
1,1,1,2-Tetrachloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1,1-Trichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1,2,2-Tetrachloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1,2-Trichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1-Dichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,1-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2,3-Trichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2,3-Trichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2,4-Trichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2,4-Trimethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2-Dibromo-3-chloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2-Dibromoethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2-Dichloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,2-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,3,5-Trimethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,3-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,3-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
1,4-Dichlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
2,2-Dichloropropane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
2-Chlorotoluene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
4-Chlorotoluene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Benzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Bromobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Bromochloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Bromodichloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Bromoform	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Bromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Carbon tetrachloride	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Chlorobenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Chlorodibromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Chloroethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Chloroform	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Chloromethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
cis-1,2-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
cis-1,3-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Dibromomethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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50327R00003

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LABORATORY ANALYTICAL REPORT

Client: Kennecott Uranium Company
Project: Sweetwater Uranium
Lab ID: C02050327-002
Client Sample ID: Can PVE Cement

Report Date: 05/23/02
Collection Date: 05/09/02 13:50
Date Received: 05/10/02
Matrix: AQUEOUS

Analyses	Result	Units	Qual	RL	MCL/ QCL	Method	Analysis Date / By
VOLATILE ORGANIC CHEMICALS							
Dichlorodifluoromethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Ethylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Hexachlorobutadiene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Isopropylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
m+p-Xylenes	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Methyl ethyl ketone	150000	mg/kg	D	16000		SW8260B	05/21/02 22:19 / rh
Methylene chloride	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Naphthalene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
n-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
n-Propylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
o-Xylene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
p-Isopropyltoluene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
sec-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Styrene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
tert-Butylbenzene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Tetrachloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Toluene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
trans-1,2-Dichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
trans-1,3-Dichloropropene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Trichloroethene	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Trichlorofluoromethane	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Vinyl chloride	ND	mg/kg	D	200		SW8260B	05/21/02 22:56 / rh
Surr: 1,2-Dichlorobenzene-d4	81.0	%REC	D		70-130	SW8260B	05/21/02 22:56 / rh
Surr: Dibromofluoromethane	95.0	%REC	D		60-135	SW8260B	05/21/02 22:56 / rh
Surr: p-Bromofluorobenzene	56.0	%REC	DS		70-130	SW8260B	05/21/02 22:56 / rh
Surr: Toluene-d8	65.0	%REC	DS		70-130	SW8260B	05/21/02 22:56 / rh

- Matrix interference resulted in low surrogate recoveries.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

TRACKING NO. PAGE NO.
50327R00004

ENERGY LABORATORIES

CHAIN OF CUSTODY RECORD

PLEASE PRINT OR TYPE ALL INFORMATION EXCEPT SIGNATURES

Received Date: _____ Cust. No.: _____
Login Date: _____ Custody Seal: (Yes/No
Shipped by: _____ Intact: Yes/No
Shipping Bill #: _____ Signature Match?: Yes/No
Sample Temp: 10 °C If no - Reason:

For Lab Use Only

BILLINGS, MT
P.O. Box 30916 (59107) 1120 South 27th (59101)
toll free 800-735-4489 voice 406-252-6325 Fax 406-252-6069

CASPER, WY
P.O. Box 3258 (82602) 2393 Salt Creek Highway (82601)
toll free 888-235-0515 voice 307-235-0515 Fax 307-234-1639

GILLETTE, WY
1105 West First Street (82716)
voice 307-686-7175 Fax 307-682-4625

HELENA, MT
P.O. Box 5688 (59604) 2704 Billings Ave. (59601)
Toll Free 877-472-0711 Voice/Fax 406-442-0711

RAPID CITY, SD
P.O. Box 2470 (57709) 610 Fairwood (57701)
toll free 888-672-1225 voice 605-342-1225 Fax 605-342-1397

P.O. # 02169 | Project Name / Address: Sweetwater Uranium Project

Contact Name & Phone: Oscar Paulson (307)-321-4925 | Sampler's Signature:

Invoice to: Kennecott Uranium Company, P.O. Box 1500, Rawlins, Wyoming 82301-1500

Report to: Kennecott Uranium Company, P.O. Box 1500, Rawlins, Wyoming 82301-1500

Lab No. (For Lab Use Only)	DATE	TIME	SAMPLE I.D.	number of containers	Sample Type: A W S V U O (Air Water Soils/Solids Vegetation Urine Other)	Analysis Requested: Volatile Organics	Comments, Special Instructions, etc.
	5/9/02	1:50	Can PVC Primer	1-O	W		Steve:
	↓	↓	Can PVC Cement	↓	↓		1,1,1 Trichloroethane and others are appearing in the water. The glue and primer need testing to see if it is the source

TRACKING NO. 5232 R0003

PAGE NO. 3

1. Relinquished (signature)	Date	Time	Received by: (signature)	2. Relinquished (signature)	Date	Time	Received for Laboratory by: (signature)
	5/9/02	1:52pm			5/9/02	1000	

Energy Laboratories Inc.

Sample Receipt Checklist

Client Name: KNNCTT-URNM

Date and Time Received: 05/10/2002 10:00:00

Work Order Number C02050327

Received by: sh

Checklist completed by Signature 5/10/02 Date

Reviewed by Initials Date

Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	10 °C
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Adjusted? _____ Checked by _____

Any No and/or NA (not applicable) response must be detailed in the comments section below.

Client contacted: _____ Date contacted: _____ Person contacted _____

Contacted by: _____ Regarding: _____

Comments:

Corrective Action

TRACKING NO. PAGE NO.

50327R00006

ENERGY LABORATORIES

ANALYTICAL SUMMARY REPORT

May 23, 2002

Oscar Paulson
Kennecott Uranium Company
43 miles NW of Rawlins
PO Box 1500
Rawlins, WY 82301

Workorder No.: C02050327

Project Name: Sweetwater Uranium

Energy Laboratories Inc. received the following 2 samples from Kennecott Uranium Company on 5/10/2002 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C02050327-001	Can PVC Primer	05/09/02 13:50	05/10/02	Aqueous	Volatile Organics, Methanol Extraction SW8260B VOCs, Standard List
C02050327-002	Can PVE Cement	05/09/02 13:50	05/10/02	Aqueous	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:

TRACKING NO. PAGE NO.
50327R00007

ENERGY LABORATORIES

Date: *23-May-02*

CLIENT: Kennecott Uranium Company
Project: Sweetwater Uranium
Sample Delivery Group: C02050327

CASE NARRATIVE

THIS IS THE FINAL PAGE OF THE LABORATORY ANALYTICAL REPORT

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT
eli-g - Energy Laboratories, Inc. - Gillette, WY
eli-h - Energy Laboratories, Inc. - Helena, MT
eli-r - Energy Laboratories, Inc. - Rapid City, SD

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ENERGY LABORATORIES, INC. - CASPER,WY certifies that certain method selections contained in this report meet requirements as set forth by NELAC. Some client specific reporting requirements may not require NELAC reporting protocol.

The total number of pages of this report are indicated by the last four digits of the tracking number located in the lower right corner.

TRACKING NO. PAGE NO.
[illegible]27R00008

NRC FORM 313 (4-2004) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIAL LICENSE

APPROVED BY OMB: NO. 3150-0120 EXPIRES: 10/31/2005

Estimated burden per response to comply with this mandatory collection request: 7 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, MISSISSIPPI, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-4006

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [x] C. RENEWAL OF LICENSE NUMBER SUA-1350

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Kennecott Uranium Company
PO Box 1500
Rawlins, Wyoming 82301-1500

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Sweetwater Uranium Project
42 Miles Northwest of Rawlins
Rawlins, Wyoming 82301

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Oscar A. Paulson

TELEPHONE NUMBER

(307) 324-4924

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number; b. chemical and/or physical form; and c. maximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY 2A(2) | AMOUNT ENCLOSED $ 0.00

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTAINED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER – TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
Oscar Paulson, Facility Supervisor	Oscar Paulson	07/01/2004

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	