ENVIRONMENTAL ASSESSMENT
FOR AMENDMENT TO SOURCE MATERIALS LICENSE SUA-1473
FOR GROUND WATER ALTERNATE CONCENTRATION LIMITS

RIO ALGOM MINING LLC
AMBROSIA LAKE URANIUM MILL TAILINGS SITE
AMBROSIA LAKE, MCKINLEY COUNTY, NEW MEXICO

January 2006

Source Materials License SUA-1473
Docket No. 40-8905

PREPARED BY

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
DIVISION OF FUEL CYCLE SAFETY AND SAFEGUARDS

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1.0 INTRODUCTION

This environmental assessment (EA) presents the results of the environmental review of Rio Algom Mining LLC's (RAM's) license amendment request for alternate concentration limits (ACLs) for eight hazardous constituents and four nonhazardous constituents at RAM's Ambrosia Lake, McKinley County, New Mexico, uranium mill tailings site (site). The U.S. Nuclear Regulatory Commission (NRC) staff has prepared this EA to document its review of the potential environmental impacts of approving this licensing action and to present proposed changes to RAM's Source Materials License SUA-1473. NRC staff has also addressed comments from regulatory agencies regarding the draft EA issued January 2005.

1.1 Background Information

RAM's Ambrosia Lake facility is located in McKinley County approximately 24 miles due north of Grants, New Mexico, in the Ambrosia Lake valley (see Figure 1). Uranium milling activities started at the site in 1957. Waste management structures include Tailings Impoundments 1 and 2, Decantation Pond 3, and Evaporation Ponds 4 through 10 (see Figure 2). Tailings Impoundments 1 and 2 were built in late 1958, along with Pond 3 at the eastern toe of Tailings Impoundment 1 to accept the decanted tailings liquids. Tailings were first produced at the site in November 1958. The solids fraction was disposed through a slurry transfer system to the tailings impoundments, while the liquids fraction was transferred to the evaporation ponds. Evaporation pond residues from Ponds 3, 4, 5, 6, 7, and 8 were placed in Tailings Impoundments 1 and 2 prior to final reclamation. All the aforementioned tailings impoundments and ponds were unlined. In 1976, RAM diverted the natural course of the Arroyo del Puerto east of Ponds 4, 5, and 6 and lined Ponds 9 and 10, which were constructed in 1976.

Seepage from the tailings impoundments and Evaporation Ponds 3 through 6, along with seepage from unrelated mining and milling operations, has saturated and contaminated the alluvium of the Arroyo del Puerto alluvial aquifer. Seepage from the tailings impoundments and evaporation Ponds 7 and 8 has recharged and contaminated the Tres Hermanos A and B sandstones within the Mancos Formation shales and the Dakota Sandstone, which underlies the Mancos Formation. Consequently, in 1983, RAM entered into an Assurance of Discontinuance (AOD) with the State of New Mexico to minimize the future impact of mill tailings solutions seepage on ground water. The approved AOD remedial action required the construction and maintenance of an interceptor trench (IT-1) and the cessation of discharges to unlined Ponds 4 through 8. These ponds were taken out of service in 1983. In the late 1990s, RAM added interceptor trenches IT-2, -3, and -4 south of Pond 10 to collect seepage potentially missed by IT-1.

In 1986, after the State of New Mexico relinquished its licensing authority over uranium mill activities, NRC reasserted jurisdiction at the site and required that the site begin a ground water detection monitoring program. Data from this program were the basis for the ground water protection standards established for the site by NRC. A corrective

action program (CAP) for the ground water was developed based on this information and was also required under RAM's Source Materials License. The plan required pumping and treating ground water to remove certain constituents. RAM has been implementing its CAP since the mid-1980s.

RAM submitted applications for alternate concentration limits (ACLs) as ground water standards in License Condition 34 of Source Materials License SUA–1473 for its former Ambrosia Lake, New Mexico, uranium mill site. Applications were submitted for the uppermost bedrock aquifers on February 15, 2000 (QMC, 2000), and for the alluvial aquifer on May 30, 2001 (QMC, 2001). NRC staff reviewed the applications, and the licensee's responses (RAM, 2004a & b, 2003) to a request for additional information (NRC, 2003) and subsequent information requests. A final list of proposed hazardous constituent ACLs was submitted to NRC February 2004 (RAM, 2004a). This list of hazardous constituents includes gross alpha, lead-210, molybdenum, nickel, radium-226 & -228, selenium, thorium-230, and uranium (natural).

NRC staff issued a draft EA on January 13, 2005. By letter dated February 21, 2005, the New Mexico Environment Department (NMED) provided comments on the draft EA (NMED, 2005). In one of the comments, NMED stated that the ACLs should include the nonhazardous constituents chloride, nitrate, sulfate, and total dissolved solids (TDS). The NRC staff agreed and instructed RAM to submit recommended ACLs for the aforementioned nonhazardous constituents. On July 7, 2005, RAM submitted recommendations for nonhazardous ACLs (RAM, 2005a). By letter dated October 31, 2005, the NRC staff issued an RAI (NRC, 2005), to which RAM responded by letter dated December 7, 2005 (RAM, 2005b). NRC staff accepted the final nonhazardous ACLs provided in the December 7, 2005, letter and is, therefore, approving all hazardous and nonhazardous ACLs.

1.2 Comments on January 2005 Draft EA

As stated in Section 1.1, the NRC staff received comments from NMED on February 21, 2005. In addition to the nonhazardous ACLs described in Section 1.1, NMED raised issues regarding potential additional sources at the Section 4 lined ponds, the affected environment, the environmental impacts, and alternatives to the proposed action. Appendix A contains a table of agency comments and NRC staff responses.

Regarding the Section 4 ponds, byproduct material will be relocated to Pond 2 and will be disposed in accordance with the plan that is currently under review (RAM, 2004c). Since the ponds are being relocated, RAM intends to release the Section 4 area for unrestricted use. Implementing this closure plan would result in the removal of all contaminated material attributable to the ponds, which should eliminate any potential for lingering impacts.

1.3 Need for Proposed Action

RAM has attempted to perform active ground water remediation for approximately 20 years. Regarding the uppermost bedrock units, remedial actions included pumping from the Section 30 and Section 30 West mines to capture seepage from the Tres Hermanos A and B units, and the Dakota Sandstone. A dewatering trench was installed between Pond 7 and Tailings Impoundment 2 during mill operations to minimize the quantity of seepage that entered the bedrock aquifers. Dewatering the Section 30 and Section 30 West mine area has reached a

point of diminishing returns because the seepage rates and pollutant loads from the Dakota and Tres Hermanos units have decreased to fractions of the original rates and loads. Therefore, continued remediation would not produce any substantial improvement.

Remedial actions for the alluvial aquifer included the installation of an interceptor trench to extract seepage contaminated ground water from the tailings impoundment. From 1984 to 2000, RAM extracted approximately 856 million gallons of contaminated ground water from the interceptor trench. Analytical data from RAM's 2001 alluvial aquifer ACL applications indicates that contaminant concentrations have decreased to the point of diminishing returns. Also, deactivation of the bedrock CAP would stop recharge to the alluvial aquifer, and the alluvial aquifer would dewater by downward seepage through vent holes and mine shafts. Dewatering the alluvial aquifer is an important aspect of this proposal because without water, no contaminant transport would occur.

1.4 Proposed Action

1.4.1 ACL Program

The proposed action is a modification of License Condition 34 to Source Materials License SUA-1473 approving ACLs for the following eight hazardous and four nonhazardous constituents at the site: chloride, gross alpha, lead-210, molybdenum, nickel, nitrate, radium-226 & -228, selenium, sulfate, thorium-230, total dissolved solids (TDS), and uranium (natural). The license amendment would require following actions:

1) Replace the current GWPS with ACLs for eight hazardous constituents. Add ACLs for the four nonhazardous constituents at NMED's request. Table 1 presents the proposed ACLs.

2) Establish the point of exposure (POE) location at the long-term care boundary, as stated in the response to the NRC staff's RAI dated December 7, 2005. Figure 3 presents the long-term care boundary.

3) Conduct ground water sampling at the compliance monitoring wells (formerly called point of compliance (POC) and trend wells) in the alluvial and bedrock aquifers. Conduct ground water sampling at the POE in the alluvial aquifer. As previously agreed to by RAM, sampling will be done quarterly for the first 2 years after the ACL approval and semi-annually until license termination.

Table 1
Proposed ACL Concentrations

Contaminant	Alluvial Aquifer	Tres Hermanos B	Tres Hermanos A	Dakota
Molybdenum (mg/L)	176	—	—	—
Nickel (mg/L)	98	6.8	—	6.8
Selenium (mg/L)	49	—	—	—
Gross alpha (pCi/L)	8,402	—	—	—
Radium-226 & -228 (pCi/L)	3,167	218	218	218
Thorium-230 (pCi/L)	13,627	945	945	945
Uranium (mg/L)	23	1.6	-	1.6
Lead-210 (pCi/L)	1,274	88	88	88
Chloride (mg/l)	7,110	2,810	1,070	3,200
Nitrate (mg/l)	351	7.7	9.2	22.8
Sulfate (mg/l)	12,000	4,760	2,584	6,480
TDS (mg/l)	26,100	11,700	6,400	14,100

The licensee computed the concentration of constituents that would not exceed the lifetime fatal cancer risk or 1 x 10^{-4} for radiological constituents and 1x 10^{-6} for nonradiological constituents. The resulting concentrations represent the ACLs. ACLs are not themselves protective of human health and the environment at the POE but are higher concentrations that would ensure risk-based concentrations are maintained at the POE because of attenuation during ground water transport between the POC and POE.

1.4.2 ACL Development

RAM developed the site ACLs through a combination of statistical analysis of recent monitoring data, ground water modeling, and contaminant transport modeling. Many technical issues needed to be resolved in the computation and modeling for ACL development, including the computation of the original ACLs, retardation factors used in transport modeling, and model uncertainty. In the case of the bedrock aquifers, NRC staff and RAM could not agree on attenuation factors for the transport model, and NRC staff considered RAM's simplified model approach to be highly uncertain. However, certain mitigating factors indicate RAM's proposed bedrock ACLs would be protective of human health and the environment.

First, the TRA and TRB formations have been significantly dewatered within the compliance boundary as a result of decades of drainage into the nearby mineworks (QMC, 2000). While it is technologically possible to obtain ground water from the TRA and TRB aquifers, the potential sustained yield would be minute and not economically feasible for most foreseeable uses. Second, it is expected to take at least several centuries for the regional potentiometric surface

to recover sufficiently from decades of mine dewatering in the TRA and TRB aquifers to resaturate the bedrock aquifers within the compliance area. When this occurs, it will cause a reversal in the ground water flow direction, which would tend to keep contamination within the compliance boundary and dilute any remaining contaminants. Therefore, despite the disagreements about the modeling, NRC staff has shown that the ACLs are still protective of human health and the environment.

1.5 Review Scope

1.5.1 Federal and State Authorities

NRC source material licenses are issued under Title 10, of the Code of Federal Regulations, Part 40 (10 CFR Part 40). In addition, the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), as amended, requires persons who conduct uranium source material operations to obtain a byproduct material license to own, use, or possess tailings and wastes generated by the operations. This EA has been prepared in accordance with 10 CFR Part 51, Licensing and Regulatory Policy and Procedures for Environmental Protection, which implements NRC's environmental protection program under the National Environmental Policy Act (NEPA) of 1969. In accordance with 10 CFR Part 51, an EA serves to (a) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI), (b) facilitate preparation of an EIS when one is necessary; and c) demonstrate the NRC's compliance with NEPA when an EIS is not necessary. Evidence presented herein includes a detailed description of the proposed action, impacts of the proposed action, and impacts of alternatives to the proposed action, including the no-action alternative. In undertaking this project, the licensee committed to complying with all applicable Federal and State regulations.

Under 10 CFR Part 40, Appendix A, Criterion 5B, NRC can grant alternate limits for ground water at uranium mill tailings sites provided that the new limits are protective of human health and the environment. ACLs must also meet the as low as reasonably achievable (ALARA) criterion found in Criterion 5B(6). RAM has proposed ACLs it considers protective of human health and the environment based on ground water flow modeling, fate and transport modeling, and exposure and risk assessments. Constituents for which new limits have been requested are chloride, gross alpha, lead-210, molybdenum, nickel, nitrate, radium-226 & -228, selenium, sulfate, thorium-230, TDS, and uranium (natural).

1.5.2 Basis of NRC Review

NRC staff has assessed the environmental impacts associated with this request for a license amendment to modify the ground water protection standards, and documented the results of the assessment in this report. The staff performed this assessment in accordance with the requirements of 10 CFR Part 51.

In conducting the assessment, the staff considered the following:

- information in the ACL application and supporting documentation
- information in modeling reports and NRC staff review reports

- information in land use and environmental monitoring reports
- personal communications with RAM staff, the State of New Mexico, and Federal agencies (see Section 6.0)
- information from NRC staff site visits and inspections

2.0 ALTERNATIVES TO THE PROPOSED ACTION

2.1 No-Action Alternative

The no-action alternative would involve the continued operation of the CAP, including the interceptor trench and mine dewatering.

2.1.1 Alluvial Aquifer

Continued CAP operation in the alluvial aquifer would not likely produce any significant benefit over the ACL alternative because ground water levels are decreasing due to tailings reclamation and installation of the radon barrier. This water level reduction is occurring despite the fact that mine water is still being discharged to the alluvium, recharging the alluvial aquifer. With time, total head would be minimal, requiring a large effort to extract a minimal amount of water. Costs of the alluvial CAP operation are $830,000 per year. Over 20 years, this cost would be $16.6 million. NRC staff concludes that this high cost would not result in a commensurate benefit; therefore, the no-action alternative is not viable.

2.1.2 Bedrock Units

As with the Alluvial aquifer, continued mine dewatering and ground water interception would likely produce little benefit, because contaminant concentrations are significantly diminished and the aquifers are dewatering. RAM estimates that continuing the CAP for an additional 20 years would cost approximately $14 million ($700,000/year x 20 years). This cost is disproportionately high compared to the expected benefit. Therefore, continuing the current ground water interception and mine dewatering is also not a viable option at this time.

2.2 Enhanced Tailings Dewatering

2.2.1 Alluvial Aquifer

In the 2001 ACL application, RAM provided the alternative of enhanced tailings dewatering. This alternative would involve the installation of approximately 50 extraction wells through the tailings cover and radon barrier, extraction and treatment of tailings water, and the evaporation of treated water. This approach would remove recoverable water from the coarse materials, further reducing seepage to the alluvial aquifer. It has three disadvantages:

1. Tailings can only be dewatered from the sandy materials; slimes cannot be dewatered. Therefore, contaminated tailings water would continue to seep out slowly over time.

2. Approximately 50 wells would be required to dewater the tailings. The wells would pierce the impoundment cap and the radon barrier, and would allow meteoric water to infiltrate the cap and seep into the tailings. NRC staff would consider an increase in the seepage into the tailings impoundment to be undesirable.

3. Tailings dewatering would result in marginal changes to the seepage rate and would not produce any significant change in contaminant concentrations at the POE. The alluvial aquifer would be dewatered before additional seepage could migrate to the POE. Essentially, the transport mechanism would be essentially terminated.

As of 2000, RAM had spent approximately $5 million operating the current CAP. Enhanced tailings dewatering would cost an additional $4 million, not including the cost of constructing new ponds to evaporate treated tailings water. Because of the minimal benefit at the POE and the potential for introducing new seepage, NRC staff did not consider enhanced tailings dewatering a viable alternative.

2.2.2 Bedrock Aquifers

Enhanced tailings dewatering is also an option discussed for the bedrock aquifers. As with the alluvial aquifer, enhanced tailings dewatering would reduce seepage to the bedrock aquifer resulting in smaller pollutant loads. However, seepage is already diminishing due to the existing tailings cap and barrier, and further tailings water removal would not significantly reduce contaminant concentrations in the bedrock aquifers. Estimated costs for enhanced tailings removal are the same as discussed in Section 2.2.1

3.0 DESCRIPTION OF AFFECTED ENVIRONMENT

3.1 Land Use

The site is located approximately 24 miles due north of Grants, New Mexico, in the Ambrosia Lake valley. Uranium mining started in this area in mid-1950s, and 17 mines are located within approximately 3 miles of the site (RAM, 2005a). Land uses within 2 miles of the site are grazing, utilities, and mine reclamation activities, according to the 2005 land use survey (RAM, 2005b).

3.2 Geology

3.2.1 Regional Geology

RAM's mill and tailings facility is located north of the Zuni Uplift portion of the San Juan Basin. The basin is characterized by broad areas of relatively flat-lying sedimentary rocks, dipping to the northeast; portions of the basin are covered with alluvium and basalt flows. The site is within the Ambrosia Lake valley, which is formed by the Mesa Montanosa to the west and the San Mateo Mesa to the east. The stratigraphic sequence of hydrologic significance at the site consists of, in descending order, the Arroyo del Puerto alluvium (alluvial aquifer), the Mancos Formation and Tres Hermanos A and B (TRA and TRB) sandstones, the Dakota Sandstone,

the Brushy Basin and the Westwater Canyon members of the Morrison Formation. The ore-bearing unit in the vicinity is the Westwater Canyon. Bedrock formations above the Westwater Canyon Member of the Morrison Formation have essentially been dewatered by ventilation holes and mine shafts located to the north and east of RAM's mill and tailings facility. Units that have been affected by milling activities are the alluvium, the TRB sandstone, and the Dakota Sandstone.

3.2.2 Site Geology

The mill site and Tailings Impoundments 1 and 2 are located on the weathered Mancos Formation (saprolite) or on alluvium overlying the Mancos section (see Figure 4). The alluvium consists of clay and clayey sand derived from reworked shales of the Mancos Formation. Bedrock units impacted by tailings seepage are the Dakota Sandstone that outcrops at Ponds 7 and 8, and the TRB that underlies the saprolite throughout most of Tailings Impoundments 1 and 2. Most of the seepage from Tailings Impoundments 1 and 2 migrates laterally through the alluvium and shallow saprolite in the direction of the surface slope to the alluvial aquifer, where it enters the interception trench. Seepage that enters the unweathered bedrock beneath Tailings Impoundments 1 and 2 slowly migrates through the TRB to the north and northeast of the Facility in the general direction of the dip. The dewatering trench located between Pond 7 and Pond 2 has minimized any tailings seepage to the TRA that underlies the saprolite and alluvium in the general vicinity of Pond 7.

3.3 Water Resources

3.3.1 Surface Water

Prior to mining activity, the Arroyo del Puerto was an ephemeral drainage. Flow in the creek occurred only in response to large rainfall or snowmelt events. Currently, the creek is dry until it reaches the discharge point for treated mine water. During 1999 an average of 337,000 ft^3/d of treated mine water was discharged to the Arroyo del Puerto channel. Some water was then diverted from the creek for mine injection. Since January 2000 an average of 125,000 ft^3/d of treated mine water has been released to the Arroyo del Puerto channel and no water has been used for mine injection. Water leaks from the creek between the mine water discharge point and the Puertocito Creek weir. This leakage is the primary source of recharge to the alluvial ground water system in the site. Mine discharges are permitted under a National Pollutant Discharge Elimination System (NPDES) permit (Permit No. NM0020532) by the State of New Mexico.

3.3.2 Ground Water

3.3.2.1 Bedrock Aquifers

The principal near-surface bedrock hydrogeologic units beneath the site are the TRA, the TRB, and the Dakota Sandstone. The Mancos Formation serves as an aquitard that separates each of these water-bearing units (see Figure 4). Ground water flow within bedrock units is generally down-dip, toward the north-northeast. An exception is a small portion of TRB in the southwest portion of the study area. Interception trenches IT-2 and IT-3 intercept water flowing in the TRB to the east from beneath Tailings Impoundment 1 (see Figure 2).

A regional cone of depression has formed within bedrock units beneath the site as a result from the dewatering of mines through vent holes and mine shafts (see Figure 5). Bedrock units are recharged where they crop out or where they are covered by alluvium. Transmissivity values for TRB and Dakota of 4.7 square feet per day (ft^2/d) and 13 ft^2/d, respectively (RAM, 2000b).

3.3.2.2 Alluvial Aquifers

Figure 6 is a water table map of the alluvial system based on average ground water elevations measured in representative water table wells for the second half of 1999. Current ground water flow in the alluvial system is generally to the southeast with a gradient of approximately 0.006. A ground water mound has formed in the northern portion of the study area, caused by infiltration from the Arroyo del Puerto bypass channel. North of this mound, ground water flows north toward mine shafts and vent holes located in Section 30. South of the mound ground water flows toward the northern half of trench IT-l, creating the ground water sweep. Ground water seeping from Tailings Impoundment 1 flows east toward trench IT-1. Estimates of hydraulic conductivity for the alluvium range from 0.6 feet per day (ft/d) based on pumping tests performed in wells AW-1 and AW-2, to 20 ft/d based on lithologic descriptions in monitoring well logs. Based on the lithology of the alluvium, porosity is estimated to range from 0.15 to 0.25. Specific yield estimates range from 0.10 to 0.20.

Prior to mining in the area, natural sources of recharge to the alluvial system were insufficient to establish saturated conditions within the alluvium. Therefore, natural sources of recharge such as infiltrating overland flow and drainage are insignificant. Two principal sources of recharge to the system are currently maintaining the saturated condition:

- infiltration of water from the Arroyo del Puerto bypass channel
- leakage from Tailings Impoundment 1

Ground water exits the alluvial system at the northern and eastern margins of the study area where vent holes and mine shafts intersect the water table. Alluvial ground water also exits the southern end of study area as underflow beneath the Arroyo del Puerto through a narrow gap in the bedrock. Hydraulic gradients between the alluvial system and subcropping Tres Hermanos units are generally downward, indicating that some ground water is probably moving from the alluvial system into subjacent sandstone units.

3.3.3 Background Water Quality

Background values for the site were determined by the calculation of an upper tolerance limit (UTL) for constituent data sets that were either normally or lognormally distributed. In data sets that were not normally or lognormally distributed, the highest observed value was assigned as the UTL. Background concentrations established for hazardous constituents in the alluvium near the site are shown in Table 2.

RAM raises issues with the computation of background water quality data because sources unrelated to site activities have impacted offsite water quality. Such sources include seepage from the Department of Energy (DOE) facility, mine pumping and discharge, and the runoff and erosion from mine spoils and ore piles. As a result, widespread ambient ground water

contamination has occurred that is unrelated to but inseparable from impacts related to milling at the site. Consequently, calculated background values may not be representative of ground water in other parts of the Ambrosia Lake valley outside of mined areas.

Table 2
Background Ground Water Concentrations

Parameter	Background Concentration (UTL)
Gross Alpha (pCi/l)	16,726
Lead-210 (pCi/l)	36
Molybdenum (mg/l)	83
Nickel	0.14
Radium-226 & -228 (pCi/l)	196.1
Selenium (mg/l)	3.1
Thorium-230 (pCi/l)	5
Uranium (natural) (mg/l)	11.1

Source: RAM, 2001

3.3.4 Current and Future Water Uses

Ground water in the Ambrosia Lake area is used for irrigation and livestock watering. Neither irrigation nor livestock watering wells are completed in the alluvial aquifer in the vicinity of the tailings impoundments. Although the alluvium extends to the south along the Arroyo del Puerto channel, it is not saturated anywhere except near the site and the DOE tailings impoundment and cannot provide sufficient water for use downgradient of the site. Furthermore, the alluvial aquifer is and will continue to dewater gradually; therefore, future use of alluvial aquifer ground water is not feasible.

A list provided by the U.S. Geological Survey shows approximately 65 ground water wells within a 25-mile radius of the facility. The closest ground water supply well is completed in the Westwater Canyon Sandstone Member of the Morrison Formation approximately 1.5 miles west of the site. A large reduction in water use and ground water withdrawals has occurred in the Ambrosia Lake area over the past 10 to 15 years because of poor economic conditions as a result of the decline of the uranium industry. The current economic base in the Ambrosia Lake area is reclamation at the site and ranching. With facility reclamation nearing completion, this area would not be likely to experience an increase in ground water use.

3.4 Ecology

By letter dated September 20, 2004, the U.S. Fish and Wildlife Service (FWS) transmitted the

Federal list of threatened and endangered species for McKinley County, New Mexico, to NRC staff (FWS, 2004). According to this list, the following threatened and endangered species are found in McKinley County: bald eagle (*Haliaeetus leucocephalus*), black-footed ferret (*Mustela nigripes*), Mexican spotted owl (*Strix occidentalis lucida*) with critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus*), and the Zuni fleabane (*Erigeron rhizomatus*). No habitat for these species has been identified at the site.

3.5 Meteorology, Climatology, and Air Quality

New Mexico has a mild, arid or semiarid, continental climate characterized by light precipitation totals, abundant sunshine, low relative humidity, and a relatively large annual and diurnal temperature range. Table 3 presents monthly average data from the Grants Airport except for pan evaporation data, which is from the Gallup ranger station.

Table 3
Climatic Data

Month	Avg. Temp (°F)	Avg Max. Temp. (°F)	Avg. Min. Temp. (°F)	Precip. (in)	Snowfall (in)	Wind Speed (mph)	Prevailing Direction	Pan Evaporation (in)
Jan	30.2	46.2	14.3	0.50	2.5	7.7	NW	0
Feb	34.9	51.3	18.5	0.42	22	9.2	NW	0
Mar	41.1	58.2	23.9	0.53	1.6	9.8	NW	0
Apr	48.8	67.4	30.1	0.47	0.3	11	W	6.61
May	57.5	76.3	38.8	0.54	0	10.3	W	9.31
Jun	66.9	86.3	47.5	0.57	0	9.9	W	12.12
Jul	71.6	88.2	55.0	1.71	0	8.0	SE	10.50
Aug	69.0	85.1	53.0	1.99	0	7.3	SE	8.70
Sep	62.2	79.7	44.6	1.32	0	7.8	NW	7.95
Oct	51.0	69.4	32.7	1.10	0.4	8.6	NW	5.07
Nov	39.1	56.1	22.1	0.59	0.9	7.7	NW	2.20
Dec	30.8	47.2	14.5	0.63	4.0	7.5	NW	0
Avg/ Total	50.3	67.6	32.9	10.37	11.9	8.7	NW	62.46

Source: Western Regional Climatic Center, 2005

3.6 Socioeconomic

According to the 2000 Census data, the closest population center to the site is Milan, which is

20 miles south of the site and immediately north of Grants (24 miles south of the site). As of the 2000 Census, Milan has a total population of 1,891 people (down from 1,911 people in 1990) with a median age of 29.8 years. Approximately 22 percent of the population is under 18 years old. Approximately 59 percent of the population 16 years or older is in the workforce, and the median household income is $24,635. Approximately 29 percent of the population is below the poverty level.

As of the 2000 Census, Grants has a total population of 8,806 people (up from 8,626 people in 1990) with a median age of 34.4 years. Approximately 17 percent of the population is under 18 years old. Approximately 58 percent of the population 16 years or older is in the workforce, and the median household income is $30,652. Approximately 22 percent of the population is below the poverty level (Census Bureau, 2005).

3.7 Historical and Cultural Resources

The site is not known to contain any historical or cultural resources.

3.8 Public and Occupational Health

The potential for public exposures to contaminated ground water is limited, as a result of this action. No ground water uses occur in the bedrock aquifers or alluvial aquifer near the site, and contaminated ground water does not express itself as surface water. Also, the alluvial aquifer is dewatering gradually, which would diminish future offsite pollutant loading. Pathways for an occupational exposure do not exist as a result of this action.

3.9 Transportation

The site is accessible by a series of small roads off State Route 509.

4.0 EVALUATION OF ENVIRONMENTAL IMPACTS

4.1 Land Use

Land use will not be affected by the proposed action because no resources that are currently being utilized by ranchers and wildlife will be impacted.

4.2 Geology

The proposed action is not expected to impact any geologic resources.

4.3 Water Resources

4.3.1 Surface Water

The Arroyo del Puerto would not be impacted because all discharges of treated mine water would cease. Ground water does not recharge the arroyo on site; therefore, the likelihood of site-derived contaminants entering the arroyo is minimal.

4.3.2 Ground Water

Currently, the CAP is containing ground water contamination in interceptor trenches and Section 30 and Section 30 West mine areas. Deactivating the CAP will allow residual contamination to disperse through the alluvial aquifer and bedrock units. However, because of the dewatering effects of deactivating the CAP and tailings reclamation, actual loading to offsite ground water would be minimal and indistinguishable from current contamination. Water level data from well 5-08 indicates that alluvial aquifer dewatering has occurred due to tailings reclamation and capping. Deactivating the CAP would further promote aquifer dewatering. As the aquifers dewater, they are less able to transmit water and contamination because hydraulic gradients and saturated thicknesses decrease.

Because of model uncertainty, a ground water monitoring program would be implemented to track ground water contamination after the CAP is deactivated. Monitoring would provide early indications that actual ground water flow and contaminant transport are not acting as predicted by the models. As previously stated, under such circumstances corrective actions could be implemented if pollutant concentrations exceeded acceptable levels due to excessive anticipated contaminant transport.

Ground water quality beyond the POE is significantly impacted by contaminant sources unrelated to the site milling activities (see Section 3.3.3). Decreasing aquifer transmissivity due to dewatering decreases the overall pollutant load (contaminant concentration x discharge) leaving the site. If concentrations remained the same, diminishing discharges due to aquifer dewatering would result in minimal offsite pollutant loads and, therefore, minimal impact to offsite ground water. Therefore, the proposed action would have no significant impact on ground water.

4.4 Ecology

No land disturbance or habitat changes are associated with the proposed action; therefore, no impacts to threatened and endangered species are expected.

4.5 Meteorology, Climatology, and Air Quality

No meteorological, climatological, or air quality impacts are anticipated from implementing the proposed action.

4.6 Socioeconomic

No socioeconomic impacts are anticipated from implementing the proposed action.

4.7 Historical and Cultural Resources

The NRC staff has determined that the proposed action is not a type of activity that would affect historic properties.

4.8 Public and Occupational Health

This action is not expected to impact occupational health. Public health could only be impacted if site ground water was ingested. Due to the hydraulic properties of the aquifer and expected dewatering, impacts to offsite ground water are expected to be minimal and indistinguishable from current contamination levels. Therefore, this action is not expected to impact human health.

4.9 Transportation

No transportation impacts are anticipated from implementing the proposed action.

5.0 GROUND WATER MONITORING

To protect public health, NRC staff is requiring quarterly monitoring for the first 2 years followed by semiannual monitoring until license termination. Table 4 presents the proposed monitoring well network for the site (RAM, 2005), and Figures 7 through 10 present the monitoring well locations. Table 5 presents the parameters to be analyzed in each aquifer. The well network has been designed to track and assess ground water contamination between the tailings impoundment and the long-term care boundary and POE. More frequent monitoring during the beginning of the compliance monitoring program is required because of the uncertainty of the hydrogeologic and transport models. Contaminated ground water would not emerge as surface water; therefore any exposure must occur through actual ground water use.

Table 4
Ground Water Monitoring Network[1]

Dakota	TRA	TRB	Alluvium
36-06 (old POC) 30-02 32-45	31-01 (old POC) 30-01	36-02 (Old POC) 31-67 36-01	31-61 (old POC) 32-59 5-08 MW-24 (POE)

Source: RAM 2005b
[1.] All wells are considered compliance wells. Former POC and current POE wells are noted.

Table 5
Ground Water Monitoring Parameters

Dakota	TRA	TRB	Alluvium
pH (s.u.)	pH (s.u.)	pH (s.u.)	pH (s.u.)
Chloride (mg/L)	Chloride (mg/L)	Chloride (mg/L)	Chloride (mg/L)
Sulfate (mg/L)	Sulfate (mg/L)	Sulfate (mg/L)	Sulfate (mg/L)
TDS (mg/L)	TDS (mg/L)	TDS (mg/L)	TDS (mg/L)
Nitrate (mg/L)	Nitrate (mg/L)	Nitrate (mg/L)	Nitrate (mg/L)
Nickel (mg/L)	Pb-210 (pCi/L)	Nickel (mg/L)	Mo (mg/L)
Uranium (mg/L)	Ra-226 + 228 (pCi/L)	Uranium (mg/L)	Ni (mg/L)
Pb-210 (pCi/L)	Th-230 (pCi/L)	Pb-210 (pCi/L)	Se (mg/L)
Ra-226 & -228 (pCi/L)		Ra-226 & -228 (pCi/L)	Uranium (mg/L)
Th-230 (pCi/L)		Th-230 (pCi/L)	Pb-210 (pCi/L)
			Ra-226 & -228 (pCi/L)
			Th-230 (pCi/L)
			Gross Alpha (pCi/L)

Source: RAM, 2005b

The purpose of this monitoring is to ensure that RAM remains in compliance with the ground water standards in the license. Sampling data also allows monitoring of ground water plume movement over time and distance and assures that ground water contamination does not present an unacceptable risk to human health or the environment in the future. If future data suggests that pollutant concentrations in ground water exceed acceptable levels, RAM would be required to implement more frequent monitoring or corrective actions.

Certain conditions mitigate the presence of ground water contamination at the site. After CAP deactivation, discharges to the alluvial aquifer would cease resulting in the gradual dewatering of this unit. Dewatering would substantially reduce the risk that unacceptable contamination concentrations would leave the site. Seepage to the bedrock units has also decreased due to the tailings reclamation and installation of the radon barrier, lowering transmissivities and pollutant loads. Site drainage would also migrate down to the Westwater Canyon aquifer, which has been significantly dewatered due to mining activities, causing a ground water piezometric depression to occur under the site. This depression would take hundreds of years to hydraulically adjust, preventing potential contamination from migrating out of the Ambrosia Lake area.

The DOE will propose a ground water monitoring plan as part of the long-term surveillance plan to be approved by the NRC. As custodian of the tailings after termination of the site's license, DOE will be responsible for continued monitoring and any needed corrective action under an

NRC general license. Figure 3 presents the long-term care boundary for the site.

6.0 CONSULTATION WITH AFFECTED FEDERAL AND STATE AGENCIES

As required by NRC guidance, the FWS and the State of New Mexico were asked to provide input regarding the impacts of this action. The New Mexico Historic Preservation Division was not contacted because this action does not involve any land disturbance. However, the New Mexico Historic Preservation Division (NMHPD) Web site was reviewed to identify any potential sites in the Ambrosia Lake area. No such historic sites were noted (NMHPD, 2005).

7.0 CONCLUSION

NRC staff is considering the approval of a request to replace some of the ground water protection standards in License Condition 34 with ACLs and add ACLs for chloride, nitrate, sulfate, and TDS by amending Source Materials License SUA-1473 issued pursuant to 10 CFR Part 40. The NRC staff has three alternatives:

1. approve the license amendment request as submitted;

2. amend the license with such additional conditions as are considered necessary or appropriate to protect public health and safety and the environment; or

3. deny the request.

Based on its review, the NRC staff has concluded that the environmental impacts of the proposed action are not significant and, therefore, do not warrant denial of the license amendment request. Additionally, in the Technical Evaluation Report (TER) being prepared for this action, the staff documents its review of the licensee's proposed action with respect to the criteria for ground water restoration specified in 10 CFR Part 40, Appendix A. NRC staff has no basis for denial of the proposed action. However, because of concerns regarding model uncertainty, the NRC staff considers that Alternative 2 is the best alternative for selection.

The NRC staff is considering preparation of a FONSI. The following statements support a FONSI and summarize the conclusions of the draft EA.

1. Potential access to the seepage-impacted ground water is prevented by the inclusion of aquifers impacted by mill activities within the long-term care boundary. Therefore, no exposure or environmental impact from tailings-contaminated ground water is expected.

2. No impacted ground water discharges to the Arroyo del Puerto.

3. Ground water fate and transport modeling conducted by PMC indicates that revising the ground water standards to ACLs would cause no degradation to the use of ground water or surface water outside the long-term care boundary as a

result of mill-related activities, .

4. The ACLs are protective of public health and the environment.

5. An acceptable compliance ground water monitoring program will be implemented to adequately monitor the future movements of the ground water plume and assure that no significant environmental impacts will occur and that the ACLs will not be exceeded.

8.0 LIST OF PREPARERS

Jill Caverly, Project Manager, Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, NRC

Stephen J. Cohen, Hydrogeologist, Division of Fuel Cycle Safety and Safeguards, Office of Nuclear Material Safety and Safeguards, NRC

9.0 REFERENCES

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APPENDIX A

AGENCY COMMENTS AND NRC STAFF RESPONSES

AGENCY	COMMENT	RESPONSE
NMED - February 21, 2005 Comment 1	"Arroyo del Puerto is considered a Water of the U.S. It is unclear from the surface water discussion in the DEA that Rio Algom Mill has permit coverage under NPDES for the current pump and treat system that discharges to the Arroyo del Puerto. This should be made clear and It should include the type of permit coverage for this specific discharge and the permit number. It should also be made clear that NPDES permit coverage will continue if an 'alternate' is chosen."	Statements regarding the Arroyo del Puerto's status as a Water of the U.S. and the current NPDES permit have been added to the text.
Comment 2	"It is stated in the DEA that the proposed action will improve water quality in the Arroyo because ground water will no longer be discharged and that flows will return to storm events. Is there some evidence that water quality will improve or is this theoretical? This should be explained better in the document."	The draft EA explains that water levels in the alluvial aquifer are currently decreasing due to tailings reclamation, which reduces the seepage quantity. Because infiltration of mine discharge water will be eliminated, water levels will further decrease. This will minimize the quantity of contaminants or pollutant load that migrates offsite by diminishing hydraulic gradients and transmissivity. Diminishing these characteristics in turn reduces contaminant transport potential.
Comment 3	Are the adverse affects on threatened and endangered species the only concern for NRC. The Arroyo del Puerto is also a Water of the State and thus should meet water quality standards for all designated uses as presented in the State of New Mexico Standards for Interstate and Intrastate Surface Water (20.6.4 NMAC).	As explained in the draft EA, discharges to the Arroyo del Puerto will cease, rendering this waterway an ephemeral channel. Contaminated ground water would not enter the channel because of decreasing head in the alluvial aquifer due to drastic recharge reductions. Therefore, impacts to the Arroyo del Puerto are not expected.

Comment 4	“Although the State of New Mexico is not an agreement state with regard to licensing authority, the State still maintains its authority to regulate ground water and discharges at the RAM facility. As a clarification, in 1986, NMED became a non-agreement state for uranium mill sites, so the federal licensing is administered by NRC. Since the New Mexico Water Quality Control Commission (WQCC) Regulations were adopted in 1977, NMED has continuously regulated ground water at the RAM mill and mine site facilities.	NRC staff acknowledge that NMED is exercising authority over certain aspects of the site. However, this licensing action is concerned with the Federal regulation of this site. Regardless of the particular regulatory authority, NRC staff are actively working with NMED to ensure that their concerns are addressed to the extent practicable.

Comment 5	“As written, the values selected for ACLs would not be supportable under the New Mexico WQCC Regulations process where an alternative abatement standards petition will be required for several of the same parameters plus other non radiological parameters. The requested ACLs are based upon site data at an adjacent site rather than the current or historical water quality on site. The requested ACLs are also substantially higher than concentrations ever observed at the site. The basis for using such high concentration values for ACLs is not clear. The draft environmental assessment seems to acknowledge that analysis and modeling of site-specific data was not a workable basis by the statement, "In 2000 and 2001, Rio Algom proposed in its application to revise the listed background concentrations for the constituents by basing the revised concentrations on an updated analysis that includes additional data and modeling. During the course of review, Rio Algom abandoned this line of reasoning and argued that the safety of the public would be maintained if Rio Algom was granted the revised standards." The values selected do not appear to be "as low as reasonably achievable", as required for NRC approval. The values do not represent measured concentrations at the site or even predictions that may occur in the future. The ACLs also omit nitrate, chloride, sulfate and total dissolved solids contamination at the site.”	The final EA addresses the issue of modeling and analysis to develop the ACLs. Although NRC staff and RAM could not agree on certain aspects of the modeling, independent analysis led NRC staff to the conclusion that the selected ACLs would be protective of human health and the environment at the POE. Although the ACLs are not themselves protective, these are concentrations that cannot be exceeded at the POC, which is immediately downgradient of the tailings impoundments and ponds. Natural attenuation, aquifer dewatering, and diminished contaminant transport capabilities allow the selected ACLs to be protective of human health and the environment. ACLs should also be sufficiently high to ensure to the extent practicable that they will not be exceeded at the POC, otherwise NRC staff could not approve them. The final EA also addresses nonhazardous constituents as requested by NMED.

Comment 6	"The environmental assessment does not include a map or identify monitoring wells, which would delineate the point of exposure (POE) boundary (e.g., Figure 1.2, RAM, May 2001 ACL application) and locations for point of compliance (POC) wells (e.g., Table 3, RAM response letter, February 9, 2004. NRC Accession No. ML0404304190)."	This final EA contains figures with the requested information.
Comment 7	The final reclamation plan for the Section 4 Evaporation ponds may substantively change contamination issues at the site. Until the plan is resolved, it does not seem appropriate to set ACLs and the monitoring well network. Otherwise, there may be two source areas that continue to generate contamination, which may move into or out of the alluvial aquifer.	The Section 4 evaporations ponds are being decommissioned for unrestricted release. Therefore, no additional contaminant loading is expected from this area.
Comment 8	The environmental assessment should reference the details of the post- remediation monitoring program even if it will undergo revision in the near future. The protectiveness of the program greatly depends upon the specific monitoring wells, parameters, frequency of sampling events, and duration of sampling. The POC wells, trend wells, and sample parameters appear to be selected in Table 3 and Table 4 (i.e., RAM response letter, February 9, 2004. NRC Accession No. ML0404304190). However, the well selection omits testing for nitrate, sulfate and total dissolved solids in the alluvium. These parameters currently exceed New Mexico state ground water standards in several wells.	Details regarding post-remediation monitoring are provided in this final EA. Nonhazardous constituents, as requested by NMED, are included in the sampling program.

Comment 9	“In the environmental assessment it is stated that alternative treatments would not provide substantial benefits to justify the costs. However, a cost-benefit analysis and the costs of alternative treatments are not provided.”	Additional information regarding costs of the alternatives has been included in this final EA.
Comment 10	“As a clarification, NMED recommends inserting the word "unlined" as follows, "...transfer system to the unlined tailings impoundments." The discussion should include the information that the evaporative ponds were unlined until the 1980s, and, over decades of use, the lined ponds have also leaked.”	Background information in this final EA states that the tailings impoundments and original evaporation ponds were unlined. This background information also presents a usage timeline.
Comment 11	“Prior to mining activities, the alluvium recharged underlying aquifers, even if episodically. Prior to NPDES permitting, local mines discharged process water to the Arroyo del Puerto, which flowed into the San Mateo Alluvium. The subsurface flow in the Arroyo del Puerto also flows into the San Mateo Alluvium. Ground water in the San Mateo alluvium has been used directly by well owners and serves to recharge the underlying Chinle aquifers.”	Mining activities near the site have resulting in shafts that drain the alluvial aquifer to deeper units. RAM’s modeling indicates that alluvial aquifer ground water from the site will drain to deeper units that are contained within the current regional cone of depression formed by extensive dewatering of the Westwater Canyon aquifer.
Comment 12	The draft environmental assessment does not evaluate the migration of residual contaminants in the alluvial aquifer from the Section 4 Evaporation pond area. After the termination of the alluvial cutoff trench, there is a potential for an increase in contaminants from the tailing impoundments or residual contamination in the alluvium that is no longer hydraulically contained. The monitoring program should monitor and detect these problems, if they occur.	The Section 4 Ponds were lined; only minimal seepage would have occurred. Also, as previously stated, the Section 4 Ponds will be decommissioned to unrestricted release; therefore, additional contaminant loading from this area is not expected.

NMED Comments December 30, 2005 Comment 1	"Page 3-4, methodology for ACL. RAMC should provide the data sets rather than simply results in Table 1. The values presented in Table 1 and subsequent tables appear reasonable, but it is not possible to review which wells and data were selected for the statistical analysis."	The requested data has been sent to NMED.
Comment 2	"Page 5, 4th paragraph. RAMC cites a retardation factor for sulfate of 1.5. What is the basis for a retardation factor for sulfate?"	RAM estimated the sulfate retardation factor considering that sulfate does not migrate as quickly as chloride and sulfate migration is affected by chemical equilibrium conditions with gypsum and calcite. Based on the current conditions, RAM expects to migrate slightly slower than chloride which is assumed to have a retardation factor of 1. Therefore, RAM estimate the sulfate retardation factor to be 1.5.
Comment 3	"Page 7, Table 2. RAMC proposes ACLs for the Dakota, TRA and TRB. When compared to measured results from wells, the Dakota and TRA appear to be okay, but one well for TRB may be problematic. For the Dakota it looks to be okay, while wells 36-01 and 36-04 have had values close to but below for Cl, SO4 and TDS. For the TRB, well 31-66 has recently spiked and been erratic for Cl, SO4 and TDS above the proposed ACLs. For the TRA, well 36-02 had two measurements in 1997 over for the Cl, however these values appear anomalous and look much different than previous and subsequent lab results."	Well 31-66 is going to be abandoned because of RAM's reclamation activities. Therefore, the new POC wells will be as presented in the December 7, 2005. We expect contaminant concentrations to remain below the ACLs at the POC.
Comment 4	"Page10, Bedrock 2nd paragraph. Does the sentence with "...exist upgradient of the northernmost..." read correctly? It may have been intended to say downgradient. Otherwise, explain the upgradient with respect to the site hydrogeology."	Ground water in the bedrock flows in a northeasterly direction in this part of the site. Therefore, wells south of the northernmost LTSM boundary are actually upgradient of the boundary.

Comment 5	"Page 10, Bedrock 3rd paragraph. With the exception of approved wells in the stability monitoring plan, RAMC proposes to abandon all other TRB, TRA and Dakota wells. NMED requires that RAMC seek approval before plugging and abandoning the remaining wells."	Once the ACLs are approved and active ground water remediation ceases, RAM may plug and abandon those wells that are not required for the monitoring program. NRC would not require RAM to obtain NMED permission to abandon wells in its license.
Comment 6	"Page 11, Table 3. TRB well 36-01 has been dry recently, so it may be worth considering another well location. Otherwise, support that this is the best location, which in the future is anticipated to have more water."	RAM has determined that well 36-01 is necessary to monitor any potential influxes during the reclamation activities. Therefore, we would like to keep this well in the monitoring network.