October 20, 2003

Michael L. Griffin
Manager of Environmental and Regulatory Affairs
Crow Butte Resources, Inc.
86 Crow Butte Road
Post Office Box 169
Crawford, NE 69339-0169

SUBJECT: LICENSE AMENDMENT 16, CROW BUTTE RESOURCES *IN SITU* LEACH FACILITY, LICENSE NO. SUA-1534, LICENSE CONDITION (LC) 10.4 EXCURSION MONITORING PARAMETERS AND ANNUAL SURETY UPDATE (TACS LU0004, LU0005)

Dear Mr. Griffin:

I am responding to your letter dated August 28, 2003, submitting your request for an amendment to Source Materials License SUA-1534 concerning the required excursion monitoring parameters in LC 10.4.B. The Nuclear Regulatory Commission (NRC) staff has reviewed your information requesting that sodium and sulfate be deleted from LC 10.4.B, leaving chloride, conductivity, and total alkalinity, as groundwater indicator parameters for excursion detection. Crow Butte Resources' basis for removing these parameters is valid and staff's conclusion is to amend the license leaving chloride, conductivity, and total alkalinity as the indicator parameters in LC 10.4.B. as indicated in the enclosed technical evaluation report.

Additionally, I am responding to your letters dated September 8, 2003, and October 10, 2003, requesting an amendment for the annual surety update from $12,816,973.00 to $14,909,670.00, a 16.3 percent increase over the 2003 surety estimate. Significant changes to the surety estimate included the following: 1) Mine Unit 1 was removed from the groundwater restoration cost estimate; 2) the cost for well abandonment was changed to reflect the experience gained in Mine Unit 1 well abandonment work; 3) increased production in Mine Units 8, 9 &10, resulting in a significant increase in groundwater restoration and reclamation cost; 4) increase in processing plant area for yellowcake storage and two yellowcake dryers; 5) waste disposal cost; 6) annual escalation of 2.1 percent based on the Consumer Price Index (CPI) for labor, buildings, spare parts and deep injection well; all other cost for operation and restoration and reclamation were rebaselined; and 7) inclusion of a 10 percent contract administration cost and 15 percent contingency cost.

The licensee's supporting data provided more information than recommended by Appendix C of NUREG-1569, "Standard Review Plan for *In Situ* Leach Uranium Extraction License Applications." The licensee's revised estimate is based on the actual costs incurred for reclamation of wellfield 1 and current costs for equipment, chemical supplies, and disposal. The proposed CPI was verified with information from the U.S. Department of Labor, Bureau of Labor Statistics. The accompanying spreadsheets were reviewed and randomly checked for accuracy. No discrepancies were found. The inclusion of the 10 percent administration cost and the 15 percent contingency cost is consistent with the guidance in NUREG-1569. Based on this analysis, the change in the surety estimate has been determined to be acceptable. LC

9.5 has been revised to reflect the surety estimate. In addition, this LC has been revised to reflect the most current revision to NUREG-1569.

Pursuant to 10 CFR 51.22(c)(10) and (11), neither an environmental assessment nor an environmental impact statement is warranted for these actions.

These changes to Materials License SUA-1534 were discussed between you and Mr. John Lusher, the NRC Project Manager for the Crow Butte facility, on October 16, 2003. If you have any questions concerning this letter or the enclosure, please contact Mr. Lusher at (301)415-7694 or by e-mail to JHL@nrc.gov.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Gary S. Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

Docket No. 40-8943
License No. SUA-1534

Enclosure: Technical Evaluation Report
License Amendment 16

cc: Stephen P. Collings, CBR, Denver
Dave Miesbach, Nebraska, UIC, DEQ
Dave Carlson, Nebraska, UIC, DEQ
Sheryl K. Rogers, Nebraska, RMP, PHA

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Enclosure: Technical Evaluation Report
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(Closes Tac Nos. LU0004, LU0005)

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TECHNICAL EVALUATION REPORT
CROW BUTTE RESOURCES
LICENSE AMENDMENT REQUEST
DELETION OF SODIUM AND SULFATE
FROM EXCURSION MONITORING

DATE: September 29, 2003

FACILITY: Crow Butte, Nebraska

PROJECT MANAGER: John Lusher

TECHNICAL REVIEWER: William von Till

SUMMARY AND CONCLUSIONS:

Crow Butte Resources (CBR) has requested that sodium and sulfate be deleted from license condition 10.4, leaving chloride, conductivity, and total alkalinity, as groundwater indicator parameters for excursion detection. CBR's basis for removing these parameters is valid and staff's conclusion is to amend the license leaving chloride, conductivity, and total alkalinity as the indicator parameters in license condition 10.4.B.

BACKGROUND:

The following licence condition states that chloride, sodium, sulfate, conductivity, and total alkalinity be sampled in groundwater as indicator parameters to detect an excursion from a well field:

10.4 The licensee shall establish upper control limits (UCLs) in designated upper aquifer and perimeter monitoring wells before lixiviant is injected in each well field unit. The UCLs shall be established by collecting and analyzing groundwater samples from those designated wells according to the following criteria:

A. Three samples shall be collected from each designated monitoring well at a minimum density of: 1) one upper aquifer monitoring well per 5 acres of well field area, and 2) all perimeter monitoring wells. These samples shall be collected at least 14 days apart. The results of these analyses shall constitute the baseline for each designated well.

B. **The samples shall be analyzed for the following indicator parameters: chloride, sodium, sulfate, conductivity, and total alkalinity [emphasis added].**

C. The UCLs shall be calculated for each indicator parameter, in each monitoring well, as equal to 20 percent above the maximum concentration measured for that parameter, among the three baseline samples. For those indicator parameters with baseline concentrations that average 50 mg/L or less, the UCL for that parameter may be calculated as equal to

20 percent above the maximum baseline concentration, the baseline average plus 5 standard deviations, or the baseline average plus 15 mg/L.

[Applicable Amendments: 8, 10]

LICENSEE'S REQUEST:

CBR requests that sodium and sulfate be eliminated as indicator parameters in license condition 10.4 leaving chloride, conductivity, and total alkalinity as the remaining sampled parameters. CBR contends that sodium provides no additional information, that the sodium peaks in excursion wells are of relative low magnitude, and that sodium is not a reliable parameter due to its potential for cation exchange within the aquifer. CBR also contends that sulfate is a poor indicator parameter due to its natural variability in ambient groundwater and potential effects of biological and chemical reactions within the aquifer. CBR bases these claims on site specific data and industry practice over the last 20 years.

TECHNICAL EVALUATION:

NUREG-1569 entitled "Standard Review Plan for *In Situ* Leach Uranium Extraction License Applications" June, 2003, was used for guidance in reviewing this amendment request.

Section 5.7.8.3.(2) of the guidance states, "the use of cations (e.g., calcium^{2+}, sodium^{+}) as excursion indicators is generally not appropriate because they are subject to ion exchange with the host rock. The use of sulfate may give false alarms because of induced oxidation around a monitoring well (Staub, 1986; Deutsch, 1985)." CBR presents site data for actual excursions that demonstrate that sodium gives a weaker response than the other parameters (Figure 1 of CBR amendment request). CBR also demonstrates with site data that sulfate is variable in ambient groundwater conditions (Figure 3 of CBR amendment request).

The guidance also states, "chloride is an excellent indicator because it acts as a conservative tracer, it is easily measured, and chloride concentrations are significantly increased during *in situ* leaching. Conductivity, which is correlated to total dissolved solids, is also considered to be a good excursion indicator (Staub, 1986; Deutsch, 1985). Total alkalinity (carbonate plus bicarbonate plus hydroxide) is an excellent indicator in well fields where sodium bicarbonate or carbon dioxide is used in the lixiviant." Sodium bicarbonate is used as the lixiviant in the CBR operations. As depicted in Figure 1 of the CBR request, chloride, conductivity, and total alkalinity are excellent indicator parameters at the CBR site. In addition, other NRC licenses for *in situ* leach uranium recovery facilities were reviewed and the proposed approach is consistent with the excursion indicator monitoring programs at their well fields. Therefore, the three parameters, chloride, conductivity, and total alkalinity, are sufficient to detect well field excursions and the license should be amended accordingly.