

May 23, 2005

Mr. Oscar Paulson
Sweetwater Uranium Facility
Kennecott Uranium Company
P.O. Box 1500
Rawlins, WY 82301-1500

SUBJECT: AMENDMENT OF SOURCE MATERIALS LICENSE SUA-1350 TO REMEDIATE
CATCHMENT BASIN CONTAMINATION AT THE KENNECOTT URANIUM
COMPANY'S SWEETWATER PROJECT, AMENDMENT 21 (TAC LU0073)

Dear Mr. Paulson:

By letter dated May 12, 2004, Kennecott Uranium Company (KUC) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) to amend Source Materials License SUA-1350 for the Sweetwater Uranium Project approving the proposed remediation plan for the catchment basin. Process fluid (11e.(2) byproduct material) had leaked from the catchment basin requiring remediation of contaminated soil and ground water. The plan, modified by submittals dated July 22, 2004, December 15, 2004, and January 18, 2005, includes changes to the Corrective Action Program for ground water, the environmental monitoring program, and the surface reclamation plan.

NRC staff has documented its review of the submittals in a technical evaluation report (Enclosure 1), in which the staff determined the proposed remediation plan would provide for appropriate basin contamination remediation, and public health and environmental protection. Approval of the remediation plan required wording changes for License Conditions 9.10, 11.3, and 11.5. These changes were discussed with you on December 30, 2004, and again on March 15, 2005. The revised license, reissued as Amendment No. 21 to Source Materials License SUA-1350, is enclosed (Enclosure 2).

NRC staff provided interested stakeholders a draft Environmental Assessment (EA) for this licensing action for comment on February 28, 2005. Written comments were received from the Wyoming Department of Environmental Quality and the U.S. Fish and Wildlife Service, responses to which were provided in Appendix A of the EA. The staff evaluation in the final EA for the catchment basin remediation plan, issued May 6, 2005, resulted in a finding of no significant impact. If you have any questions regarding this letter or the enclosures, please contact Mr. Stephen J. Cohen, at (301) 415-7182 or via e-mail to sjc7@nrc.gov.

O. Paulson

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May 23, 2005

In accordance with 10 CFR 2.390 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/NRC/reading-rm/adams.html>.

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.: 40-8584
License No.: SUA-1350

Enclosures: Technical Evaluation Report
Amendment No. 21 to License SUA-1350

cc: R. Atkinson, KUC
R. Chancellor, WY DEQ

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TECHNICAL EVALUATION REPORT FOR
KENNECOTT URANIUM COMPANY'S CATCHMENT BASIN REMEDIATION PLAN
FOR THE SWEETWATER URANIUM PROJECT

Docket No.: 40-8584 **License No.:** SUA-1350

DATE: May 9, 2005

FACILITY: Sweetwater Uranium Project

TECHNICAL REVIEWERS: Elaine Brummett, Stephen J. Cohen

PROJECT MANAGER: Stephen J. Cohen

SUMMARY AND CONCLUSIONS:

By letter dated May 12, 2004 (ADAMS accession no. ML041450424), the Kennecott Uranium Company (KUC) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) to amend Source Materials License SUA-1350 for the Sweetwater Uranium Project approving the proposed remediation plan for the catchment basin. Remediation was required for soil and ground water contaminated by process fluid leaking from this basin. The plan includes a change to the Corrective Action Plan (CAP) for ground water, the environmental monitoring program, and the surface reclamation plan.

NRC staff reviewed the submittal and provided comments on June 24, 2004 (ML041800207). A response with additional information was provided by KUC's letter dated July 22, 2004 (ML042110148). The staff requested additional information on October 28, 2004 (ML043070658), and the response was dated December 15, 2004 (ML043520255) followed by additional information submitted on January 18, 2005 (ML050350266). The staff determined that the reclamation activities would allow the area to meet applicable clean-up criteria and protect the public health and the environment.

BACKGROUND:

KUC's Sweetwater Uranium Project mill site is located in a remote area of south-central Wyoming, in Sweetwater County, approximately 42 miles northwest of Rawlins, Wyoming. The Sweetwater Uranium Project (Site), as defined by the NRC-licensed area, occupies approximately 445 ha (1,100 ac) and consists of a mill, ancillary buildings, existing tailings impoundment, and the area of proposed impoundments, evaporation ponds, and diversion channels. Bordering the Site is an overburden soil pile and a uranium ore pit (see Figure 1).

KUC operates the Site under NRC Source Materials License SUA-1350, which was obtained in February 1979 to permit processing of uranium ore. Mill construction was completed in 1980, and ore mined from an adjacent open pit was processed from February 1981 through April 1983. Mill tailings were disposed of in a 60-acre below-grade lined impoundment that was partially filled. The mill has been in standby status since cessation of operation in 1983, and sufficient staff have been retained to maintain the facility, supervise the CAP, and perform

environmental monitoring. One tailings impoundment occupies approximately 24.28 ha (60 ac) at the site with ponds at the top for use in the pump and evaporate program to remediate ground water contamination due to past impoundment leakage.

During mill operation upsets, fluids (11e.(2) byproduct material) from the counter-current decantation and solvent extraction process were placed in the catchment basin located between the mill buildings and the tailings impoundment (see Figure 2). This basin is approximately 42.7 meters (140 feet) square, 3.7 meters (12 feet) deep, and the bottom is approximately 19.8 meters (65 feet) square. Basin sides were lined with concrete while the bottom was unlined. Organics, metals, and radionuclides in these basin fluids slowly migrated through the soil beneath the basin and into the upper portion of the Battle Springs Aquifer at the Site. Primary contaminants are diesel range organics (DRO) and Ra-226; however, minor amounts of volatile organic compounds and metals (aluminum, iron, and manganese) are also present. Contamination was discovered in January 2003, and results of the preliminary investigation were documented in a letter to NRC dated October 15, 2003. As of March 2004, a total of 19 monitoring wells and 33 boreholes had been drilled.

The licensee is proposing a change to the Site ground water CAP and the approved decommissioning plan to remediate subsurface contamination below and adjacent to the catchment basin. Remediation will involve the excavation of soils and the subsequent extraction (pumping) of ground water contaminated primarily with DRO, natural uranium (U-nat) and radium (Ra-226). Both contaminated soil and ground water will be disposed at the lined tailings impoundment. Remedial actions will also remove a zone of perched fluid below and adjacent to the catchment basin.

TECHNICAL EVALUATION:

The staff reviewed the May 12, July 22, December 15, 2004, and January 18, 2005, submittals, as well as the CAP report dated February 25, 2004, and documents that were part of the license renewal application approved in 1999. The review was conducted according to guidance in NUREG-1620, Rev. 1.

Soil Remediation

On January 6, 2003, a 9-ft deep hole was excavated into the catchment basin bottom to collect a sample of underlying soils. This sample contained 2,720 milligrams per kilogram (mg/kg) of DRO, which is consistent with kerosene. Kerosene is a major component of the solvent extraction fluids used during milling operations. From August 2003 to March 2004, KUC undertook a drilling and subsurface sampling program to delineate soils contamination.

KUC drilled a total of 33 borings and collected approximately 520 subsurface soil samples. Subsurface soil samples were analyzed for DRO, oil range hydrocarbons (ORH), volatile organic compounds (VOC), and Toxicity Characteristic Leaching Procedure (TCLP) metals. Selected samples with high organic contaminant concentrations were analyzed for radioactive contaminants including U-nat, Ra-226, and thorium (Th-230). Analytical results indicated that the most common organic soil contaminants are DRO and naphthalene, which is the only volatile organic compound detected, with DRO occurring in the highest concentrations. All the TCLP metals test results were below the lower limit of detection.

From this information, stratigraphic and contaminant cross-sections and plan view maps were developed that delineated the vertical and horizontal extent of contamination. The area of contamination occupies approximately 3,345 square meters (4,000 square yards) with the catchment basin within the impacted area. The deepest DRO contamination in excess of 2,300 mg/kg (Wyoming Voluntary Remediation Program standard) is approximately 12.2 meters (40 feet).

KUC proposes to excavate soils exhibiting diesel range organic (DRO) contamination in excess of 2,300 mg/kg. As part of this excavation program, KUC will also excavate soils containing Ra-226 to meet the Ra-226 standard in Criterion 6(6) of 10 CFR Part 40, Appendix A, which also coincides with U-nat and thorium-230 contamination. KUC expects to excavate a total of 91,747 cubic meters (120,000 cubic yards) of petroleum contaminated soil including approximately 20,261 cubic meters (26,500 cubic yards) of material containing Ra-226 in excess of the standard.

Two sample locations contain either thorium-230 or U-nat that are expected to exceed remediation standards after soil excavation is completed. One sample that exceeds 14 pCi/g of Th-230 exists at a depth of 35-40 feet and is very close to the mill building. It will be documented and addressed during final decommissioning of the site. A second location that exceeds 30 pCi/g of U-nat is approximately 25 feet deep and will be captured during the soil excavation phase. Two other sample locations contain U-nat either equal to or slightly in excess of 30 pCi/g. These locations are at least 30 feet deep and appear to be natural (ore) material because of the depth (25-35 and 40-45 feet deep) and the dis-equilibrium with Th-230 and Ra-226. Therefore, KUC will leave this material in place. Also, as part of the soil remediation, a perched saturated zone (discussed below) will be excavated and wells associated with this zone will be removed.

Remediation verification will be accomplished according to the approved decommissioning plan and includes measurements on the sides and bottom of the excavation. KUC's verification strategy includes collecting composite samples on 10-meter grids and analyzing the samples for ORH (Method SW8015M), DRO (Method SW8015M), total extractable hydrocarbons (TEH - Method SW8015M), radium-226 (E903.0), thorium-230 (E903.09), and U-nat (SW-6020). If verification sampling identifies soils that exceed 2,300 mg/kg DRO, KUC will excavate the non-compliant soil and collect additional post-excavation samples. DRO is the driving the soil remediation because KUC expects to remove all radiological contamination along with the DRO-contaminated soils, except as noted above. Once the remediation is successfully verified, it will be backfilled with clean material obtained from the sides of the Ore Pad, the site's Overburden Pile or another suitable source of clean fill. Any residual contamination remaining under structural foundations will be isolated with plastic liner material prior to backfilling so the additional removal can be performed during the final site decommissioning when the buildings are demolished.

The licensee proposed to provide the verification data with the Annual ALARA Report. However, the verification data shall be submitted as soon as it has been compiled, for NRC approval. The catchment basin verification report and NRC approval letter shall be referenced in the Final Status Survey Report.

Based on the available information, the proposed soil remediation program appears sufficient for reducing concentrations of DRO and radionuclides (Ra-226, Th-230 and U-nat). Because much of the DRO contamination occurs as hot spots (shallow and deep), KUC will be excavating and disposing of a large quantity of soil exhibiting DRO concentrations less than the proposed standard. This type of excavation program provides the opportunity to remove radionuclide contamination with the DRO contamination. The proposed plan to isolate residual contamination located under structural foundations is acceptable with the understanding that this residual contamination will be removed when the structures are decommissioned.

Ground Water Restoration

KUC proposes to undertake a program to remediate ground water contamination resulting from discharges to the catchment basin. Because of the aforementioned soils contamination, KUC began an investigation to identify and delineate ground water contamination in the catchment basin area. This program of drilling bore holes and installing monitoring wells was completed in two phases; the first phase occurred in August 2003, and the second phase occurred from December 2003 to March 2004. A total of 19 wells were installed, the construction data for which is presented in Table 1. Figure 2 contains a monitoring well location map.

**Table 1
Monitoring Well Construction Data**

Well	Total Depth (ft)	Screened Interval (ft)	Pipe Interval (ft)	Sand Pack Interval (ft)	Bentonite Seal Interval (ft)	Cemented Interval (ft)	Aquifer
TMW-90	55	35 - 55	0 - 35	35 - 55	25 - 35	0 - 25	Perched Zone*
TMW-105	40	20 - 40	0 - 20	20 - 40	10 - 20	0 - 10	Perched Zone*
TMW-91	110	90 - 110	0 - 90	90 - 110	80 - 90	0 - 80	Battle Spring
TMW-92	130	110 - 130	0 - 110	110 - 130	100 - 110	0 - 100	Battle Spring
TMW-102	150	130 - 150	0 - 130	130 - 150	120 - 130	0 - 120	Battle Spring
TMW-93, -94, -95, -96, -97, -98, -99, -100, -101, -104, -111, -112, -113, -115	145	95 - 145	0 - 95	95 - 145	85 - 95	0 - 85	Battle Spring

*Perched recovery wells will be removed during excavation phase.

Data from these wells were used to delineate the nature and extent of the ground water contamination near the Catchment Basin. Ground water contaminants include DRO, naphthalene, uranium (natural), radium-226 and -228. Minute amounts of other organic compounds have been detected including 1,1,1-trichloroethane, gasoline range organics

(GRO), toluene, m+p-xylenes, 1,1-dichloroethane, 1,1-dichloroethene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene. Minute amounts of metals associated with licensed activities have also been detected including aluminum, iron, and manganese. Methyl ethyl ketone (MEK) was originally detected in well TMW-91 at 9,800 micrograms per liter (Fg/l) in August 2003; however, it was no longer detected by February 2004. KUC explained that well TMW-91 was constructed using PVC primer and glue that contained MEK resulting in the observed ground water contamination. Furthermore, only low MEK concentrations have been intermittently detected in adjacent wells. Therefore, MEK was not considered a hazardous constituent for this site.

A review of the available ground water data indicates that the plume is elliptical in shape with the major axis trending northeast to southwest. Dimensions of axes are as follows: major axis - 131 meters (430 feet) (length) and minor axis - 39.6 meters (130 feet) (width). The catchment basin is in the central portion of the plume. Data indicates that ground water contamination exists in a perched saturated zone and also in the Battle Spring Aquifer itself. The perched zone is not considered the uppermost aquifer because it is comprised of seepage from the catchment basin and it is very limited in areal extent according to geologic information provided by KUC. As stated above, this zone will be eliminated during the soil excavation phase.

According to aquifer test data obtained from the document, "Evaluation of Aquifer Test Data," by Shepherd Miller, Inc. (SMI) dated February 1997, hydraulic conductivity and hydraulic gradient in the Battle Spring Aquifer are 0.019 cm/sec and 0.003 ft/ft, respectively. The resulting ground water velocity assuming an effective porosity of 0.3 (30 percent) is 0.00019 cm/sec (0.54 ft/day). Natural ground water flow direction is toward the south or southwest.

KUC intends to remediate ground water contamination by ground water extraction using wells TMW-91, TMW-96, and TMW-102. However, License Condition 11.3 states that pump-back wells may be added or removed to improve remediation system performance. Each recovery well will be pumped at a rate of 6 gallons per minute (gpm) to avoid exceeding the total allowable site withdrawal rate of 25 million gallons per year. A review of available pumping test data indicates that 6 gpm should create a sufficient cone of depression to sequester and extract contaminated ground water.

KUC will also monitor ground water quality in this area quarterly. Table 2 presents all the pumping and monitoring wells that comprise the monitoring network.

**Table 2
Well Monitoring Frequency**

Well	Sampling Interval	Parameters
Pumping Wells TMW-91, -96, -102	Quarterly	Table 5-5(1)
Monitoring Wells TMW -92, 93, -94, -95, -97, -98, -99, -100, -101, -104, -111, -112, -113, -115	Quarterly	Table 5-5

1. Table 5-5 of the May 12, 2004, license amendment request.

During the excavation phase some of the monitoring wells may be destroyed. KUC will document the condition of each well during construction and will replace any destroyed well.

Ground water remediation will continue until contaminant concentrations are below the ground water protection standards presented in Table 3.

**Table 3
Ground Water Protection Standards**

Parameter	Ground Water Protection Standard (mg/l)
1,1-Dichloroethane	3.0 (2)
1,1-Dichloroethene	0.007(1)
DRO	10(3)
GRO	10(3)
Naphthalene	1.5(3)
Toluene	1(1)
1,1,1-Trichloroethane	0.20(1)
1,2,4-Trimethylbenzene	0.012(4)
1,3,5-Trimethylbenzene	0.012(4)
m+p Xylenes	10(1)
Manganese	0.2(5)
Aluminum	1.8(5)
Iron	0.6(5)

- (1) - EPA MCL
- (2) - Wyoming Drinking Water Equivalent Level
- (3) - Wyoming VRP, Fact Sheet 12
- (4) - EPA RBC - Tap Water
- (5) - Background

KUC may submit a license amendment to remove certain contaminants from the ground water protection standards list when ground water monitoring data indicates that concentrations of those certain contaminants meet the respective ground water protection standards.

Based on the available information, the proposed ground water restoration program for the catchment appears to be sufficient to protect human health and safety and the environment. The number and location of ground water extraction wells are appropriately located to extract ground water contaminants at the prescribed pumping rate (6 gpm). Monitoring wells are

sufficient in number and appropriately placed to enable KUC to measure the progress of the restoration effort. Ground water protection standards are appropriately conservative and based on U.S. Environmental Protection Agency and State of Wyoming standards, as well as NRC-approved background computational procedures.

11e.(2) Byproduct Material Disposal

All excavated contaminated soil and extracted ground water will be placed in the tailings impoundment with the catchment basin components as these additional materials are byproduct material similar to what is already in the impoundment. The property around the catchment basin is owned by KUC and its affiliate, and it shall be deeded to the Department of Energy at license termination.

Radiation Safety

All equipment and personnel monitoring will be performed according to standard operating procedures. The 1999 license renewal included approval of the Radiation Safety Program, as well as the preliminary Decommissioning Plan and the Emergency Response Plan.

CONCLUSIONS:

Based on the available information presented above, the NRC concludes that the proposed soil and ground water reclamation programs are sufficient to remediate contamination within these media. The soil excavation program will remove gross soil contamination and isolate any residual contamination under foundations until the foundations and associated buildings are decommissioned. The ground water restoration program will be sufficient to contain and remove ground water contamination resulting from the discharges to the catchment basin.

LICENSE CONDITION CHANGES:

Proposed changes in **BOLD**.

- 9.10 Decommissioning of the facility shall be performed as presented in the Final Design, Volume VI, Part 2 - "Mill Decommissioning Addendum to the Existing Impoundment Reclamation Plan", submitted May 28, 1998, as supplemented by the response to comments submitted February 3, 1999, **and the catchment basin remediation plan dated May 12, 2004, as revised July 22, 2004, December 15, 2004, and January 18, 2005. The verification results of this remediation are to be submitted to NRC for approval, as soon as reasonably possible. The catchment basin verification report and NRC's approval letter shall be referenced in the Final Status Survey Report. Residual contamination remaining under structural foundations after the catchment basin remediation shall be removed at the time the structures are decommissioned.** The NRC shall be notified and detailed SOPs for decommissioning (land and buildings) shall be available for review at least three (3) months before decommissioning begins.
- 11.3 The licensee shall conduct a corrective action program (CAP) with the objective of returning the **ground-water** concentrations of chromium, natural uranium, and

combined radium-226/228 to the levels referenced in “Addendum to the Revised Environmental Report, Background Ground Water Quality and Detection Standards,” January 1996, as revised by page changes January 8, 1998 (approved by the NRC letter of May 28, 1998), **and the catchment basin ground-water corrective action plan dated May 12, 2004, as revised July 22, 2004, December 15, 2004, and January 18, 2005.**

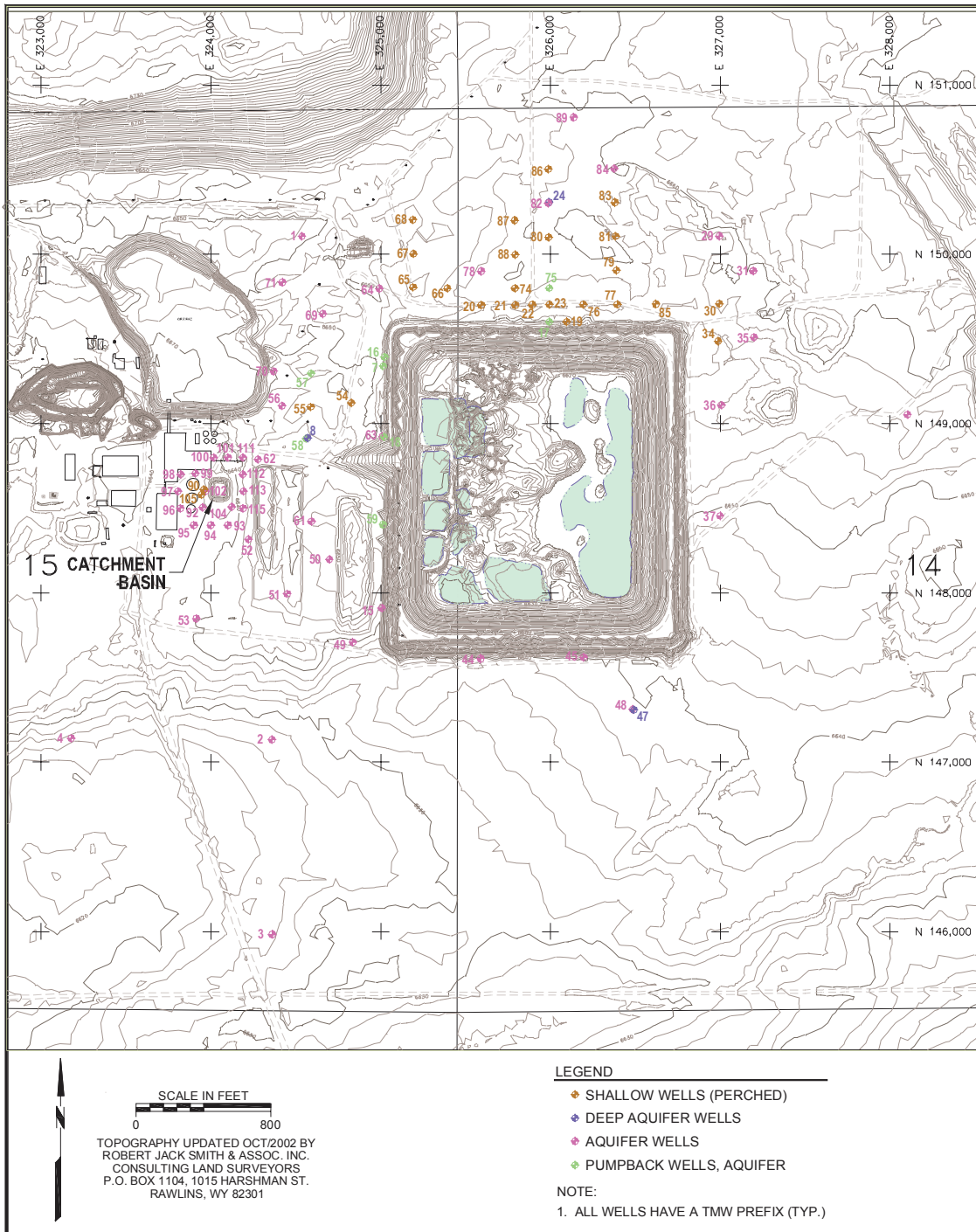
The ground-water protection standards at point of compliance (POC) wells TMW-15, 16, 17, and 18, with background being recognized in well TMW-5, are: arsenic = 0.05 mg/l, beryllium = 0.01 mg/l, cadmium = 0.01 mg/l, chromium = 0.05 mg/l, lead-210 = 8.9 pCi/l, nickel = 0.01 mg/l, combined radium-226/228 = 5.8 pCi/l, selenium = 0.01 mg/l, thorium-230 = 7.0 pCi/l, natural uranium = 36.0 pCi/l, gross alpha = 15.0 pCi/l, **manganese = 0.2 mg/l, aluminum = 1.8 mg/l, and iron = 0.6 mg/l.**

Pump-back wells may be added or removed from service with the goal of improving the performance of the CAP. POC, monitoring, and pump-back wells shall be sampled at the locations, at the frequency, and for the parameters provided in Table 5-1 (for existing impoundment) of the Final Design Volume VII, submitted (page change) June 21, 1999. Reporting limits for sampled constituents shall be as provided in Table 5-11 of the Final Design Volume VII, submitted April 13, 1998.

The catchment basin pump-back wells and monitoring wells TMW-92, 93, 94, 95, 97, 98, 99, 100, 101, 104, 111, 112, 113, and 115 will be sampled quarterly for diesel range and gasoline range organics and volatile organic compounds, in addition to the above constituents. The ground-water protection standards to be used to assess data from these wells are as follows: 1,1-dichloroethane = 3.0 mg/l, 1,1-dichloroethene = 0.007 mg/l, DRO = 10 mg/l, GRO = 10 mg/l, naphthalene = 1.5 mg/l, toluene = 1 mg/l, 1,1,1-trichloroethane = 0.20 mg/l, 1,2,4-trimethylbenzene = 0.012 mg/l, 1,3,5-trimethylbenzene = 0.012 mg/l, m+p xylenes = 10 mg/l, manganese = 0.2 mg/l, aluminum = 1.8 mg/l, and iron = 0.6 mg/l.

- 11.5 During any period of mill standby, the licensee shall conduct an environmental monitoring program in accordance with on-file SOPs for environmental monitoring, and in accordance with Table 5-1 of the Final Design Volume VII, submitted (page change) June 21, 1999, **as revised January 18, 2005.**

FIGURE 1



MFG, Inc.
consulting scientists and engineers

SWEETWATER URANIUM FACILITY
CATCHMENT BASIN LOCATION MAP

Date: APRIL 2004
Project: 06-442\REP2004\1
File: GW-MAP.dwg

FIGURE 2

