March 27, 2007

Mr. John McCarthy
Power Resources, Inc.
Smith Ranch-Highland Uranium Project
P.O. Box 1210
Glenrock, WY 82637

SUBJECT: REVIEW OF SOUTHWEST AREA REGIONAL HYDROLOGIC TEST REPORT - SMITH RANCH - HIGHLAND URANIUM PROJECT, SOURCE MATERIAL LICENSE SUA-1548 (TAC J00518)

Dear Mr. McCarthy:

By letter dated February 21, 2007, to the U.S. Nuclear Regulatory Commission (NRC), Power Resources, Inc. (PRI) submitted *Southwest Area Regional Hydrologic Test Report* (the report). The Southwest Area Regional Hydrologic Test was conducted on undeveloped Mine Units 9, 10, and 11, which are located in Sections 8, 16, 17, 18, and 21 of T35A R74W. PRI submitted the report in compliance with License Condition 10.1.10 of Source Material License SUA-1548 which states that:

> The licensee is prohibited from conducting well-field installation in the southwestern part of the State of Wyoming permit area, T35N R74W, excluding Section 2, until aquifer characteristics have been tested, reviewed, and approved by NRC.

NRC staff has completed its review of the report and has concluded that the aquifer characteristics of the Southwest Area have been adequately tested and characterized. The staff's detailed technical review is documented in the enclosed Technical Evaluation Report.

As detailed in PRI's Smith Ranch License Application and the report, and consistent with its Performance-Based License, mine-unit-specific hydrologic testing will be performed on Mine Units 9, 10, and 11 and reviewed by PRI's Safety and Environmental Review Panel, as well as submitted to the Wyoming Department of Environmental Quality/Land Quality Division for review prior to wellfield development.

If you have any questions regarding this letter, please contact me at (301) 415-7612, or by e-mail, at pxm2@nrc.gov.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

Sincerely,

/RA/

Paul Michalak, Hydrogeologist
Uranium Recovery and Licensing Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 40-8964
License No.: SUA-1548

Enclosure:
Technical Evaluation Report for Southwest
Area Regional Hydrologic Test

cc: S. Ingle, WDEQ

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(CLOSES TAC J00518)

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TECHNICAL EVALUATION REPORT
POWER RESOURCES, INC.
SMITH RANCH - HIGHLAND URANIUM PROJECT
SOUTHWEST AREA REGIONAL HYDROLOGIC TEST REPORT

DATE:	**March 13, 2007**
DOCKET NO.	**40-8964**
LICENSE:	**SUA-1548**
LICENSEE:	**Power Resources, Inc.** **P.O. Box 1210** **Glenrock, WY 82637**
FACILITY:	**Smith Ranch - Highland Uranium Project**
PROJECT MANAGER AND TECHNICAL REVIEWER:	**Paul Michalak**

SUMMARY AND CONCLUSIONS:

By letter dated February 21, 2007, to the U.S. Nuclear Regulatory Commission (NRC), Power Resources, Inc. (PRI) submitted *Southwest Area Regional Hydrologic Test Report* (PRI 2007). The Southwest Area, which is located in Sections 8, 16, 17, 18, and 21 of Township 35 North, Range 74 West (T35N, R74W), contains undeveloped Mine Units 9, 10, and 11 in PRI's In-Situ Leach uranium recovery operation at the Smith Ranch - Highland Uranium Project, in Converse County, Wyoming. Per License Condition 10.1.10 of Source Material License SUA-1548, PRI is prohibited

> ... from conducting well-field installation in the southwestern part of the State of Wyoming permit area, T35N R74W, excluding Section 2, until aquifer characteristics have been tested, reviewed, and approved by NRC.

PRI (2007) contains the results of the Southwest Area "regional" hydraulic (pumping) test conducted on the K Sand aquifer (i.e., the "Production Zone" which contains commercially viable uranium deposits). In addition to monitoring water levels in the K Sand aquifer, the pumping test included water level monitoring in aquifers over- and underlying the K Sand.

Based on the data and analysis presented in PRI (2007), staff concludes that the aquifer characteristics of Southwest Area have been adequately tested and characterized. The K Sand transmissivity, hydraulic conductivity, and storativity values presented in the report are based on the proper application hydraulic analytical methods. The Southwest Area pumping test

demonstrated hydraulic communication throughout the Production Zone. Geologic cross-sections based on numerous borings have established the presence of confining units (shale) directly above and below the K Sand. The results of the hydraulic test further support the shales as low-permeable units.

The Southwest Area regional hydraulic test was designed to characterize the K Sand over multiple adjacent mine units. This is distinct from PRI's mine unit-scale hydraulic testing (i.e., Mine Unit Hydrologic Testing) as described in PRI (2004). Consistent with PRI's Performance-Based License, Mine Unit Hydrologic Testing will be performed on Mine Units 9, 10, and 11 and reviewed by PRI's Safety and Environmental Review Panel (SERP), as well as submitted to the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) for review prior to wellfield development (PRI 2004 and 2007).

BACKGROUND:

Hydrogeology

The Southwest Area comprises Sections 8, 16, 17, 18, and 21 of T35N, R74W, which contains undeveloped Mine Units 9, 10, and 11 of the SR-HUP. The subsurface geologic sequence of deposits underlying Southwest Area is illustrated in PRI's five geologic cross sections oriented through the Southwest Area: three west-east cross-sections (PRI 2007, Figures 2-7 through 2-9) and two north-south cross-sections (PRI 2007, Figures 2-10 through 2-11). Commercial uranium deposits (i.e., the "Production Zone") are found in the "K Sand." This differs from nearby Mine Units 15 and 15A where the shallower O Sand is the primary uranium producing zone.

The K Sand consists of two to three channel sand deposits, separated by predominantly continuous claystone and shale beds. In the Southwest Area, it is generally located approximately 800 to 950 feet below ground surface, with an average thickness of about 90 feet. The K Sand is bracketed above and below by two shale units, the L Shale and J Shale, respectively. The L Shale, which is continuous throughout the Southwest Area, ranges in thickness from 20-to-85 feet. Overlying the L Shale is the M Sand. The J Shale, which is present throughout the Southwest Area, directly underlies the O-Sand. Its thickness ranges from 10-to-25 feet. Underlying the J Shale is the I Sand. I Sand thickness varies from 11-to-60 feet across the Southwest Area; however, it does completely pinch out in localized areas.

Hydraulic Test

The Southwest Area Regional Hydrologic Test was designed to characterize the hydraulic properties of the K Sand, including interconnection with over- and underlying aquifers, across undeveloped Mine Units 9, 10, and 11. This hydraulic test is distinct from mine unit-scale hydraulic testing typically performed at the SR-HUP. Consistent with PRI's Performance-Based License, Mine Unit Hydrologic Testing will be performed for Southwest Area Mine Units 9, 10, and 11 and reviewed by PRI's SERP, and submitted to the WDEQ/LQD prior to wellfield development (PRI 2004 and 2007).

Wells SWPW-1 and SWPW-2 were installed as the K Sand pumping wells. Well SWPW-1 is screened across the K Sand; however, the K Sand is bifurcated with a low permeable shale at this location. Consequently, the 90-foot screen is divided into 50-foot and 40-foot segments

separated by a 15 foot blank (i.e., at the shale interval). Well SWPW-2 consists of a continuous 100-foot screen across the entire K Sand. K Sand monitoring wells were placed at distances of between 3,000 and 5,000 feet from the pumping wells to access the horizontal hydraulic influence of the pumping wells. Two monitor wells were installed in both the overlying M Sand and underlying I Sand to access the vertical hydraulic influence of the pumping wells.

Hydraulic testing in the Southwest Area was conducted in several phases. Initially, step-drawdown tests were performed on wells SWPW-1 and SWPW-2 to determine the optimal pumping rates that would produce 1-2 feet of drawdown within the test area in about seven days. The SWPW-1 and SWPW-2 step-drawdown tests were performed on August 18 and 23, 2006, respectively. The step-drawdown tests indicated optimum pumping rates of approximately 30 gallons per minute (gpm) for SWPW-1 and about 25 gpm for SWPW-2.

Hydraulic Test 1 (Test 1) involved continuously pumping well SWPW-2 at an average rate of 26.9 gpm from September 7 and September 15, 2006. Continuous automated background water level monitoring (utilizing a pressure transducer) was conducted at SWPW-2 between August 21 and September 7, 2006, while water level recovery monitoring was performed between September 15 and October 4, 2006. Continuous automated water level measurements (utilizing pressure transducers) were also collected in six K Sand wells (KM-8-136, SWMP-1, -2, -3, and -4; and SWPW-1), two M Sand wells (SWMO-1 and SWMO-2), and two I Sand wells (SWMU-1 and SWMU-2). Virtually complete sets of pretest, pumping, and recovery water level data (15 minute intervals) were collected from all wells monitored during the test. Two of the monitored locations for Test 1 consisted of nested wells where the K, I, and M Sand aquifers were continuously monitored. These included the SWPW-1, SWMU-1, and SWMO-1; and SWPW-2, SWMU-2, and SWMO-2 locations. Barometric pressure in the test area was monitored between August 23 and October 24, 2006. Well locations are shown on the attached figure.

Hydraulic Test 2 (Test 2) involved continuously pumping well SWPW-1 at 27 gpm from October 6 and October 13, 2006. Continuous automated background water level monitoring (utilizing a pressure transducer) was conducted at SWPW-1 between August 23 and October 6, 2006, while water level recovery monitoring was performed between October 13 and October 24, 2006. As in Test 1, continuous automated water level measurements were also collected in five K Sand wells (KM-8-136, and SWMP-1, -2, -3, and -4), two M Sand wells (SWMO-1 and SWMO-2), and two I Sand wells (SWMU-1 and SWMU-2). Due to transducer failure, no water level data was available for well SWPW-2. Virtually complete sets of pretest, pumping, and recovery water level data (15 minute intervals) were collected from all wells monitored during the test. Two of the monitored locations for Test 2 consisted of nested wells where multiple aquifers were continuously monitored. These included the SWPW-1, SWMU-1, and SWMO-1; and SWMU-2, and SWMO-2 locations. Barometric pressure in the test area was monitored between August 23 and October 24, 2006.

Test Analyses and Results

Test 1 and 2 drawdown data collected from K Sand aquifer monitoring wells was graphically analyzed to determine transmissivity, hydraulic conductivity, and storativity in the Production Zone. Drawdown data from the K Sand aquifer monitoring wells was analyzed using the Theis (1935) log-log method. Water level recovery data from pumping wells SWPW-1 and SWPW-2 was analyzed using the Theis (1935) recovery method.

For Test 1, measurable drawdown in the K Sand monitor wells ranged from 4.83 feet in SWMP-3 (3,585 feet from the pumping well SWPW-2) to 0.05 feet in well SWPW-2 (9,028 feet from the pumping well SWPW-1). No measurable drawdown was recorded in any of the M Sand or I Sand aquifer monitoring wells during Test 1. For Test 2, measurable drawdown in the K Sand monitor wells ranged from 3.81 feet in SWMP-1 (4,694 feet from the pumping well SWPW-1) to 0.05 feet in well SWMP-3 (6,197 feet from the pumping well SWPW-1). No measurable drawdown was recorded in any of the M Sand or I Sand aquifer monitoring wells during Test 2.

K Sand transmissivity results based on the Theis log-log curve-matching method ranged from 58.6 to 185.8 ft^2/day, with an average transmissivity of 125.2 ft^2/day. Assuming an aquifer thickness of 90 feet, the average hydraulic conductivity was 1.39 ft/day. Storativity values ranged from 0.000054 to 0.00013, with an average value of 0.000085.

EVALUATION:

As discussed in PRI (2007), the Southwest Area Regional Hydrologic Test had four objectives:

- Determine the general hydrologic characteristics of the Production Zone (K Sand) Aquifer;
- Demonstrate general hydraulic communication between the Production Zone and the surrounding Production Zone monitoring wells;
- Assess the presence of hydrologic boundaries, if any, within the Production Zone; and
- Evaluate the degree of general hydrologic communication, if any, between the Production Zone and the overlying and underlying aquifers.

Overall, the Southwest Area pumping test was well designed and executed. Monitoring equipment failure was noted at wells SWMP-1, KM-8-136, SWPW-2, and SWMU-2; however, the problems were resolved and the data sets were sufficient for analysis. The test design included ample water level monitoring in all three aquifer units and the four objectives identified above were accomplished.

The use of both the Theis (1935) log-log and recovery methods in the hydraulic analysis of test data is appropriate. A review of the Southwest Area site geology and the drawdown data from the pumping test indicates that the assumptions necessary to apply these methods were adequately met. The K Sand aquifer is confined and appears relatively homogeneous and isotropic over the scale of the test. The pre-testing piezometric surface of the K Sand aquifer was relatively flat. The pumping wells (SWPW-1 and SWPW-2) were both fully penetrating and the wells were pumped at a constant rate. In addition, the absence of drawdown in the under- and overlying aquifers (see below) supports the use of Theis hydraulic test analyses over a method that assumes a leaky aquifer (i.e., Lohman 1979). The analytical results from the two different methods are reasonably consistent in both intra- and inter-well comparisons, further supporting their applicability at the site.

Drawdown was measured in all the Southwest Area K Sand monitoring wells, indicating hydraulic communication throughout the test area. Neither pumping test indicated the presence

of a hydrologic boundary. The test data did not indicate a strong trend in directional permeability. Background, pumping, and recovery water level data collected from monitoring wells in the overlying M Sand and underlying I Sand aquifers was generally steady and showed no indication of influence from either Test 1 or Test 2t. Consequently, PRI's assertion that no drawdown was detected in either the overlying M Sand and the underlying I Sand is consistent with the data and physical conditions. As a result, the Southwest Area Regional Hydrologic Test is consistent with the finding that sufficient overlying and underlying confinement of the K Sand in the Southwest Area is present.

REFERENCES:

Lohman, S. W. (1979) Ground-Water Hydraulics. U. S. Geological Survey Professional Paper 708.

Power Resources Inc. (2004) Reynolds Ranch Amendment, Volumes I through IV. December 2004 [Adams Accession No. ML050390095, ML050390126, ML050390168, and ML050460389].

Power Resources Inc. and Hydro-Engineering L.l.C. (2007) Southwest Area Hydrologic Test Report.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage: Transactions American Geophysical Union, v. 16, p. 519-524.