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Uranium Project  
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July 31, 2006

Mr. Paul Michalak  
Fuel Cycle Licensing Branch, NMSS  
Mail Stop T-8A33  
U. S. Nuclear Regulatory Commission  
Washington D.C. 20555

RE: SOUTHWEST AREA HYDROLOGIC TEST PLAN  
NRC LICENSE SUA-1548, DOCKET NO. 40-8964

Dear Paul,

Power Resources, Inc. (PRI) is herein submitting a pump test plan as required by Source Material License SUA-1548, Section 10.1.10 as follows: *"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"*. This plan will also be presented to the Wyoming Department of Environmental Quality, Land Quality Division (WDEQ/LQD) to comply with Permit to Mine # 633.

The purpose of the Southwest Area pump test is to determine the hydrologic characteristics of the production zone and to demonstrate communication within the production aquifer. The test will assess the presence of hydrologic boundaries within the production zone and potential communication with overlying and underlying aquifers. Following completion of the pump test and data analysis, a report that fully discusses the pump test results will be prepared by PRI and submitted to NRC and WDEQ/LQD for approval.

If you have any questions regarding this report, please contact me at (307) 358-6541, ext. 46.

Sincerely,

A handwritten signature in black ink that reads 'John McCarthy'.

John McCarthy  
Manager, Safety, Health and Environmental Affairs

JM

Enclosure

Cc: C. Foldenauer w atta.

S.P. Collings w atta.

File: SR4.6.4.1



**POWER RESOURCES, INC.  
SMITH RANCH-HIGHLAND URANIUM PROJECT  
SOUTHWEST AREA HYDROLOGIC TEST PLAN**



**July 2006**

**NRC License No. SUA-1548  
WDEQ/LQD PERMIT NO. 633**



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## 1.0 INTRODUCTION

The Smith Ranch-Highland Uranium Project (SR-HUP) is located in the southern Powder River Basin of east central Wyoming, within Converse County. Power Resources, Inc. (PRI) has been developing and extracting uranium from in-situ leach (ISL) wellfields within the Smith Ranch-Highland Sand Group since 1988. This Pump Test Plan provides a summary of the hydrogeologic testing scheduled for the Southwest Area mine development. The Plan presents the information necessary to install the required monitor and pumping wells and perform the Southwest Area Pump Test.

This pump test plan is required under PRI's Nuclear Regulatory Commission (NRC) Source Material License #SUA-1548 Section 10.1.10 as follows: *"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"*. This plan will also be presented to the Wyoming Department of Environmental Quality, Land Quality Division (WDEQ/LQD) to comply with Permit #633.

The Southwest Area is planned to cover portions of Sections 7, 8, 16, 17, 18, 19 and 21, T. 35 N., R. 74 W. and Sections 13 and 24, T. 35 N., R. 75 W. Converse County Wyoming. Figure 1 shows the relationship between the proposed S.W. Area, adjacent wellfields and the PRI Central Processing Plant (CPC). The S.W. Area will likely contain 4 to 5 Units (wellfields) each addressing approximately one million lbs.  $eU_3O_8$  in-place. The Area will have its own Satellite Plant (SR-2) and associated trunk line to the CPC (Figures 1 and 2).

The objectives of the pump test described in this Plan, as stated in the NRC License Application, are to:

1. Determine the hydrologic characteristics of the Production Zone (K Sand) Aquifer;
2. Demonstrate hydrologic communication between the Production Zone and the surrounding Production Zone monitor wells;
3. Assess the presence of hydrologic boundaries, if any, within the Production Zone Aquifer; and,
4. Evaluate the degree of hydrologic communication, if any, between the Production Zone and the overlying and underlying aquifers; and,

The Southwest Area development is anticipated to begin in the fall of 2007. The current pump test is scheduled for August, 2006.

The nearest existing ISL Wellfield production is approximately one mile northeast of the eastern edge of the planned Southwest Area development, in the lower O Sand of Mine Unit (MU) 15 (Figure 1).

Several historic monitoring wells are completed in the Southwest Area (Figure 1), one of which (KM-8-136) will be used for the Pump Test. Other wells include KM-8-137CM, KM-8-138-8, KM-8-140P, KM17-421 and KM17-422. These wells are completed in the K Sand with one exception (KM17-422), which is completed in the Upper O Sand. It is anticipated that none of these wells will adversely impact the regional pump test and will, therefore, be left at their current status.

## 2.0 GENERAL SITE CHARACTERIZATION

Production in the Southwest Area will be from the Tertiary Wasatch and Ft. Union Formations. The section consists of approximately 4,500 feet of fluvial sediments consisting of interbedded silty/sandy - claystones, shales and localized thin to moderate lignitic/sub-bituminous coal beds. The host sediments for the uranium geo-chemical cells are fine to very coarse grained, relatively clean, channel sands within the above described aquiclude beds. The degree of lithification is variable, ranging from non-cemented sands to moderately well cemented siltstones and sandstones. Along the primary paleo-drainage axis (Southwest to Northeast) relatively thick stratigraphic units can be traced for several miles. Perpendicular to the channel systems, the host strata are highly lenticular with numerous facies changes occurring within short distances, typically no more than a few thousand feet.

The geologic features associated with the Southwest Area are depicted on the Project Location Map (Figure 1), three west-east cross-sections (Figures 3, 4, and 4a) and two north-south cross-sections (Figures 5 and 6). Specific to the Southwest Area, the stratigraphic sequence of interest, in descending order, follows. References to associated isopach maps are included.

- M Sand (overlying aquifer) - typically 20 to 80 feet thick (Figure 7)
- L Shale (upper confining layer) - 10 to 90 feet thick (Figure 8)
- K Sand (primary production zone) - 40 to 170 feet thick (Figure 9)
- J Shale (underlying confining layer) - 10 to 150 feet thick (Figure 10)
- I Sandstone (underlying aquifer) - 0 to 100 feet thick (Figure 11)

The primary production zone in the Southwest Area is the K sandstone. The K Sand is a continuous sandstone unit across most of the Smith Ranch-Highland Project and specifically across the Southwest Area, where it is composed of two to three channel sands, separated by predominately continuous claystone and shale beds. The K Sand thickness ranges from 40 to 170 feet, with an average thickness of approximately 110 feet (Figure 9). The K Sand is separated from the overlying M Sand and underlying I Sand by the L and J Clay/Shales, respectively (Figures 3 through 6; Figure 10).

The K Sand geo-chemical cell predominately occurs in the upper K Sand horizon (Figure 4), but may migrate into lower K Sand lenses as yet undefined. PRI has therefore established the I Sand horizon as the underlying aquifer. The I Sand typically occurs 30 to 75 feet below the basal K Sand, and varies in thickness from 60 to as little

as 11 feet (Figure 11). The I Sand occasionally is completely absent, resulting in a thick lower J Shale aquitard section. However, the I Sand has sufficient continuity across the Southwest Area such that utilizing the I Sand for an underlying monitoring zone is appropriate.

Some sporadic uranium mineralization does occur in a shallower sandstone host designated as the Upper O Sand. This horizon will be addressed in a later wellfield-specific pump test if significant concentrations of mineral are defined.

### **3.0 SUMMARY OF PREVIOUS TESTING RESULTS**

To date, no pump tests have been performed in the K Sand at SR-HUP. Based on input from PRI staff, the best analogy for the K Sand is the M Sand, which produces in MU 4 (Figure 1). The limited 2005 data from MU 4 indicate that, based on a thickness of 80 feet, the hydraulic conductivity of the M Sand is on the order of 1 ft/d and the storativity is approximately  $2.8 \times 10^{-4}$ .

Because of the relatively low hydraulic conductivity and the large distance over which the Southwest Area Pump Test must be conducted to comply with NRC requirements, PRI has elected to conduct the Pump Test in two parts. Additional detail is provided in the following section.

### **4.0 MONITORING WELL SELECTION and INSTALLATION**

To conduct the pump test in the Southwest Area, PRI plans to install two pumping wells in the K Sand (Figure 2). One well (SWPW-1) will be located in Section 18; the second pumping well (SWPW-2) will be located in Section 16. Underlying and overlying monitoring wells will be installed immediately adjacent (e.g., within 50 feet radially) to each pumping well (Figure 2).

The pumping and monitoring wells will be drilled and completed consistent with PRI's WDEQ/LQD permit. Drilling and completion information will be included in the Southwest Area pump test report.

At this time, PRI plans to pump the eastern-most pumping well (SWPW-2) first, and monitor water levels in the wells completed in Sections 16, 17, and 21. SWPW-1 will be pumped for the second test; monitor wells will include those in Sections 8, 17 and 18 (Figures 1 and 2).

Prior to starting the primary test, step-rate tests will be conducted in both pumping wells. Based on the results from the step-rate tests, the final design regarding pumping rate and duration will be determined.

### **5.0 TESTING EQUIPMENT and DESIGN**

The pump test will be performed using an electrical submersible pump powered by a portable generator. The pump will be set at an approximate depth of 760 feet (300 feet

below the typical static water level of 460 feet). Flow from the pump will be controlled with a manual valve and surface flow measured with a flow meter/totalizer. Discharge water will be land applied approximately 500 to 1,000 feet from the pumping well via a 2-inch diameter line.

Water levels in each observation well will be measured and recorded with either a Hermit datalogger and associated pressure transducers or integrated TROLL transducer/datalogger units manufactured by In-Situ, Inc. The automated equipment will be programmed prior to the test with an initial reference level (depth to water). Water levels will be recorded according to a pre-determined time schedule.

The pressure rating for the transducers/TROLLs will range from 10 to 100 psi, as warranted, for each monitoring location. Vented cables will be used to minimize the impact of barometric fluctuations. Barometric pressure also will be recorded throughout the testing period.

## **6.0 TESTING and ANALYTICAL PROCEDURES**

Prior to the pumping period, the testing equipment will be installed and checked for proper operation. To assess potential background fluctuations in groundwater levels, baseline level information will be collected during a 48- to 96-hour period prior to the pumping period.

The pumping well will be started and maintained at a constant rate (e.g., 35 gpm, subject to modification based on the step-test results) for an estimated period of 10 to 20 days. Preliminary estimates suggest a test of this rate and duration should result in a radius of influence on the order of 4,400 feet allowing the entire Southwest Area to be covered by two pumping wells:

Barring unexpected variations in hydrogeologic properties, a minimum drawdown of 1.0 to 2.0 feet will be considered "significant" with respect to demonstration of hydraulic connection between the pumping well and the production zone monitoring wells. At the end of the pumping period, monitoring will continue during recovery.

Conventional analytical techniques (i.e., log-log, semi-log, and distance-drawdown methods developed by Theis, Jacob, and Cooper and Jacob, respectively) will be used to evaluate the response of the aquifer to pumping and to assess the hydraulic characteristics of the K Sand. Theis recovery analyses will be performed on the pumping well, and if necessary, on some of the monitoring wells. Other analytical methods (e.g., Hantush, Neuman, etc.) will be employed for the monitoring wells if warranted. The analyses will be performed using the Aquifer Test software package (Waterloo Hydrogeologic, Inc.).

Following conclusion of the field activities and data analysis, a report that fully discusses the pump test objectives, procedures and results will be prepared by PRI and submitted to NRC and WDEQ/LQD for approval. The report will include discussion of: monitoring

well installation procedures and geologic data; background water-level trends; the hydrogeologic characteristics of the ore zone (K Sand); water-level responses in the K Sand; and if any, responses in the overlying and underlying aquifers. After review of the report, it is anticipated that a timely approval by NRC and LQD will enable PRI to proceed as scheduled with the planned Southwest Area development.

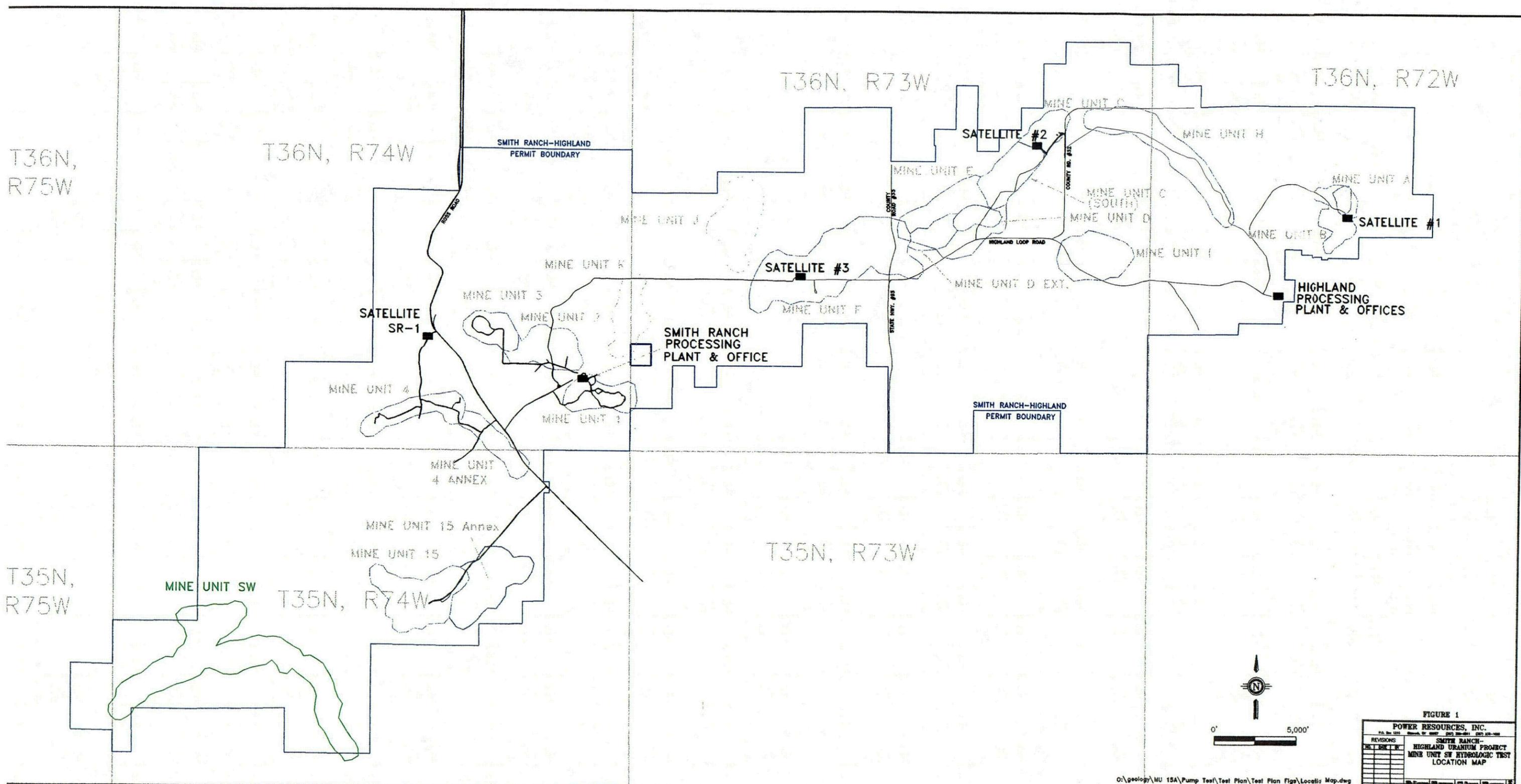


FIGURE 1

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396	11/20/34



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FIGURE,**

**THAT CAN BE VIEWED AT THE  
RECORD TITLED:**

**FIGURE 3**

**“SMITH RANCH - HIGHLAND  
URANIUM PROJECT**

**MINE UNIT SW**

**GEOLOGIC CROSS SECTION**

**A - A’**

**LOOKING NORTH”**

**WITHIN THIS PACKAGE**

**D-01**

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**FIGURE 4**

**“SMITH RANCH - HIGHLAND  
URANIUM PROJECT**

**MINE UNIT SW**

**GEOLOGIC CROSS SECTION**

**B - B’**

**LOOKING NORTH”**

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**D-02**

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**FIGURE 4a**

**“SMITH RANCH - HIGHLAND  
URANIUM PROJECT**

**MINE UNIT SW**

**GEOLOGIC CROSS SECTION**

**B' - B”**

**LOOKING NORTH”**

**WITHIN THIS PACKAGE**

**D-03**

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**FIGURE 5**

**“SMITH RANCH - HIGHLAND  
URANIUM PROJECT**

**MINE UNIT SW**

**GEOLOGIC CROSS SECTION**

**1 - 1'**

**LOOKING EAST”**

**WITHIN THIS PACKAGE**

**D-04**

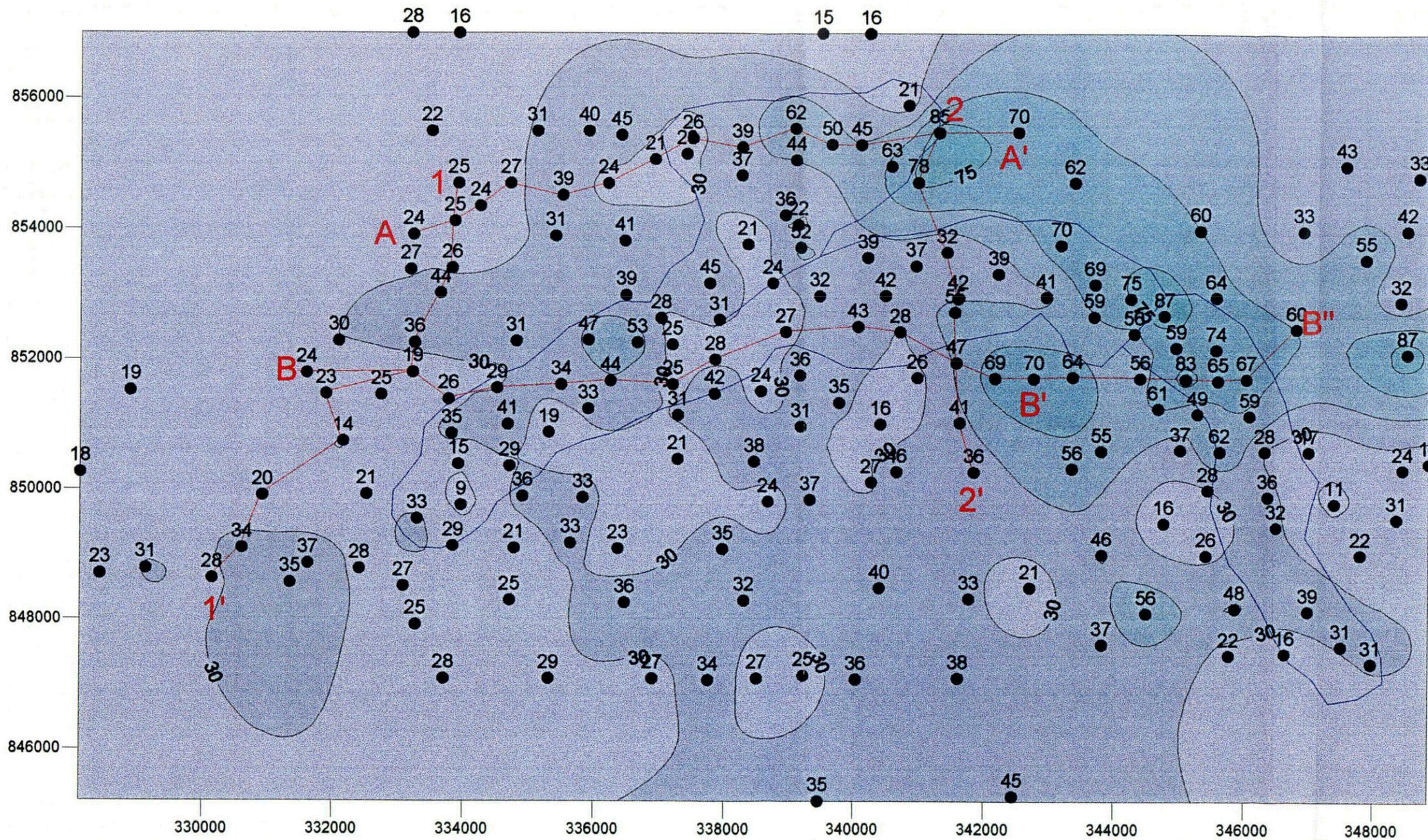
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FIGURE,  
THAT CAN BE VIEWED AT THE  
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FIGURE 6  
“SMITH RANCH - HIGHLAND  
URANIUM PROJECT  
MINE UNIT SW  
GEOLOGIC CROSS SECTION  
2 - 2'  
LOOKING EAST”**

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**D-05**



# M SAND



- Cross Section Outline
- Monitor Well Outline
- Contour Line /w Thickness

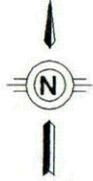
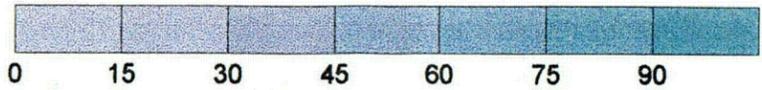
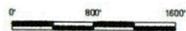
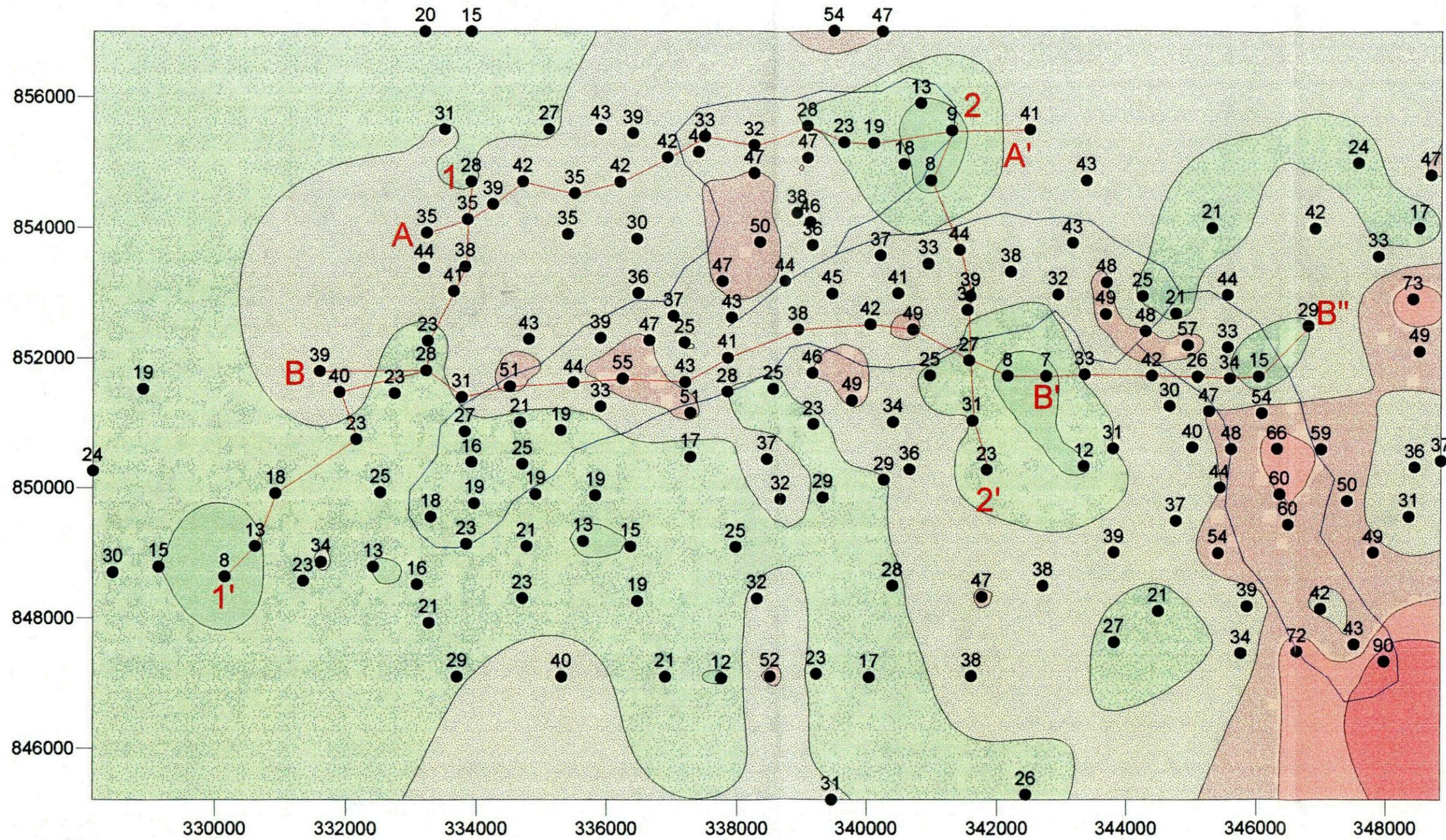


FIGURE 7

<b>POWER RESOURCES, INC.</b>					
<small>P.O. Box 1210 Glenrock, WY 82637 (307) 398-6541 (307) 235-1628</small>					
<b>REVISIONS</b>		SMITH RANCH-HIGHLAND URANIUM PROJECT MINE UNIT SW PUMP TEST REPORT			
NO.	DATE	BY			
			ISOPACH MAP: OVERLYING M SAND AND PROBABLE MONITOR RING		
<small>PORTIONS OF SECTIONS 7, 8, 16, 17, 18, 19, 20, 21, T. 35N., R. 74W. AND SECTIONS 13 &amp; 24, T. 35N., R. 75W.</small>					
<small>DRG. BY:</small>	<small>DATE:</small>	<small>APP. BY:</small>	<small>DATE:</small>	<small>DRG. NO.:</small>	<small>REV. NO.:</small>
<small>DRG. BY:</small>	<small>DATE:</small>	<small>APP. BY:</small>	<small>DATE:</small>	<small>DRG. NO.:</small>	<small>REV. NO.:</small>
<small>DRG. BY:</small>	<small>DATE:</small>	<small>APP. BY:</small>	<small>DATE:</small>	<small>DRG. NO.:</small>	<small>REV. NO.:</small>

# L SHALE



-  Cross Section Outline
-  Monitor Well Outline
-  Contour Line  
/w Thickness

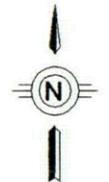
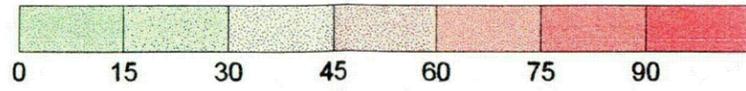


FIGURE 8

POWER RESOURCES, INC.			
P.O. Box 1210, Glenrock, WY 82637 (307) 358-6541 (307) 235-1628			
REVISIONS		SMITH RANCH-HIGHLAND URANIUM PROJECT	
NO.	DATE	BY	MINE UNIT SW PUMP TEST REPORT
			ISOPACH MAP: L SHALE CONFINING UNIT
			AND PROBABLE MONITOR RING
PORTIONS OF SECTIONS 7, 8, 16, 17, 18, 19, 20, 21, T. 35N., R. 74W.			
AND SECTIONS 13 & 24, T. 35N., R. 75W.			
DESIGNED BY	DATE	APPROVED BY	DATE
DRAWN BY	DATE	SCALE	FILE





