ADDENDUM 2.7-E
HISTORICAL HYDROGEOLOGIC INTEGRITY EVALUATION

GE/HY 9342
Hydrol 9345
9347

HYDROGEOLOGIC INTEGRITY EVALUATION
OF THE
RENO CREEK PROJECT AREA
Campbell County, Wyoming

VOLUME I

CONFIDENTIAL

November 1982

Rocky Mountain Energy
Technical Services
Broomfield, Colorado 80020

C O N F I D E N T I A L

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OF THE
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HYDROGEOLOGIC INTEGRITY EVALUATION

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HYDROGEOLOGIC INTEGRITY EVALUATION
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Appendix

Volume II

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Appendix B	Well Construction Summaries
Appendix C	Well Data Summaries
Appendix D	Aquifer Test Data Sheets and Plots
Appendix E	Water Level Data

SUMMARY AND RECOMMENDATIONS

A hydrogeologic study was conducted at the Reno Creek uranium project site during the spring and summer of 1982. Solution mining is the proposed mining method. The purpose of the study was to evaluate the characteristics of aquifers and aquitards overlying and underlying the mineralized host sand layers, and to define potential problems that might be associated with incomplete production zone confinement of solution mining fluids (lixiviant). During the study, no major hydrologic fatal flaws were discovered that should prevent or compromise an ISL mining operation at Reno Creek.

The integrity study investigated whether the exploration drill holes that were drilled prior to enactment of the drill hole abandonment regulations had naturally sealed themselves. If not sealed then the holes could serve as conduits allowing the mining solution lixiviant to move into overlying or underlying water-bearing strata.

A detailed hydrogeologic evaluation of the project drilling data which was done in April 1982 identified two spatially distinct hydrogeologic conditions within the project area; these being the unconfined and confined character of the ore host sand. This evaluation focused on the hydraulic relationship of the overlying and underlying water-bearing sand units to the ore host sand.

To address the potential hydraulic connection issue, detailed maps of the areal extent and thicknesses of the upper and lower sand units, and the interbedded mudstones were constructed. The evaluation showed that an upper sand unit was present over most of the north mine block area (see Drawing Number 05-GE-001), but completely absent in the southern mine block area. The upper sand unit in fact outcrops between the northern and southern mine block areas. A hydrogeologic summary identifying the areal extent of each of these units was made for

each integrity study area prior to developing a testing program. The details are summarized in Drawing Numbers 05-GE-071 through 05-GE-065 which identify the sand and mudstone units. With this information in hand, a field study program was developed and then initiated in April 1982.

As part of the field study, 33 old exploration holes were reentered to check for closure due to the swelling of selective mudstone layers. Twenty-four new monitor/test wells were constructed, 18 of which were pump- and/or injection-tested.

During reentry of the old holes, obstructions were generally encountered at the A, B, C, E, and G mudstone horizons in the north mine block area (see Figure 1). A bottom hole inflatable packer was set above each of these obstruction horizons as encountered and pressure-tested to see what hydrostatic pressure the obstruction could withhold.

In the northern mine block area, the A-mudstone unit consistently withheld surface gauge hydrostatic pressures of 120 to 150 psi without bleeding off. Similar results for the B and C mudstone units were observed but at somewhat lower pressures.

In the southern mine block area, where the upper sand unit is absent, the holes were usually open down to the E-mudstone horizon. The static water level in this area typically resides within the E horizon; consequently, it appears that without a source of groundwater to saturate the A, B, and C mudstone horizons, the holes will remain open indefinitely.

Sampling of the obstruction material for analysis was attempted but not always successfully. Visual inspection of recovered obstruction material showed it to have a high clay content.

Monitor test wells were constructed into the upper sand layer and into the mineralized sandstone strata. The potentiometric water levels of these units differ from that of the adjacent units. The general rule is that the upper sandstone unit has a higher static water level than the first ore sandstone unit (sands #1 to #4) which in turn has a higher static level than the underlying mineralized sandstone unit (sand #5). The difference in heads between the ore sandstone and the #5 sand unit is greatest in the south mine block area which is closer to the formation's outcrop and recharge areas. This head differential decreases uniformly in a northerly direction. This decrease is attributable to equilibration of pressure differentials across the aquiclude (G-mudstone) that separates the first ore sandstone unit (#1, #2, #3, #4) from the second sand unit (#5). Pump test results have shown that these two units are hydraulically connected and should, therefore, be treated as one hydrologic unit. The head differential between the ore sandstone and the overlying upper sandstone is significant. This is taken as partial evidence that the two water-bearing strata are hydrologically separate in the project area.

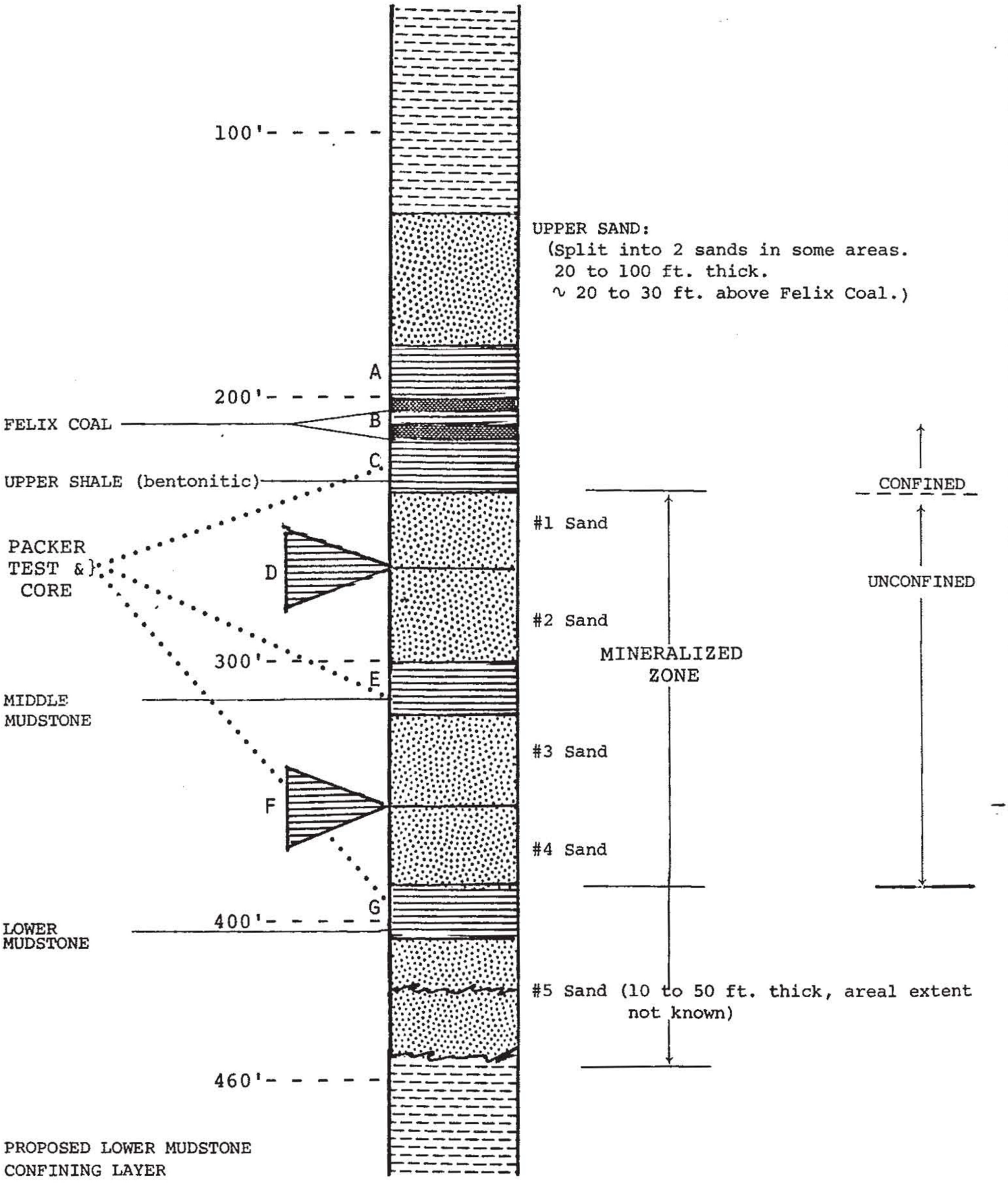
Select monitor wells were pump-tested to define aquifer parameters. Table 4 summarizes the results for the testing program which shows that the range of hydraulic conductivity values for each of the individual water-bearing units is fairly narrow. However, there is variation between units; specifically, the first ore sandstone unit has hydraulic conductivity values which are an order of magnitude larger than the values for the second ore sand sequence unit. The #5 sand sequence exhibits aquifer characteristics more representative of a mudstone. Visual inspection of the #5 sand unit showed an interstitial matrix of mud which has significiantly decreased the permeability of this unit. The upper sandstone unit had the widest range of hydraulic conductivity values but the mean value is about the same as the mean for the ore sandstone unit.

Figure 1

RENO CREEK INTEGRITY

Generalized Hydrostratigraphic Section

Geophysical Logs: Gamma-Gamma, Gamma-Density, S.P., Resistance, Caliper, Neutron-Neutron Porosity, Resistivity, Standard Deviation

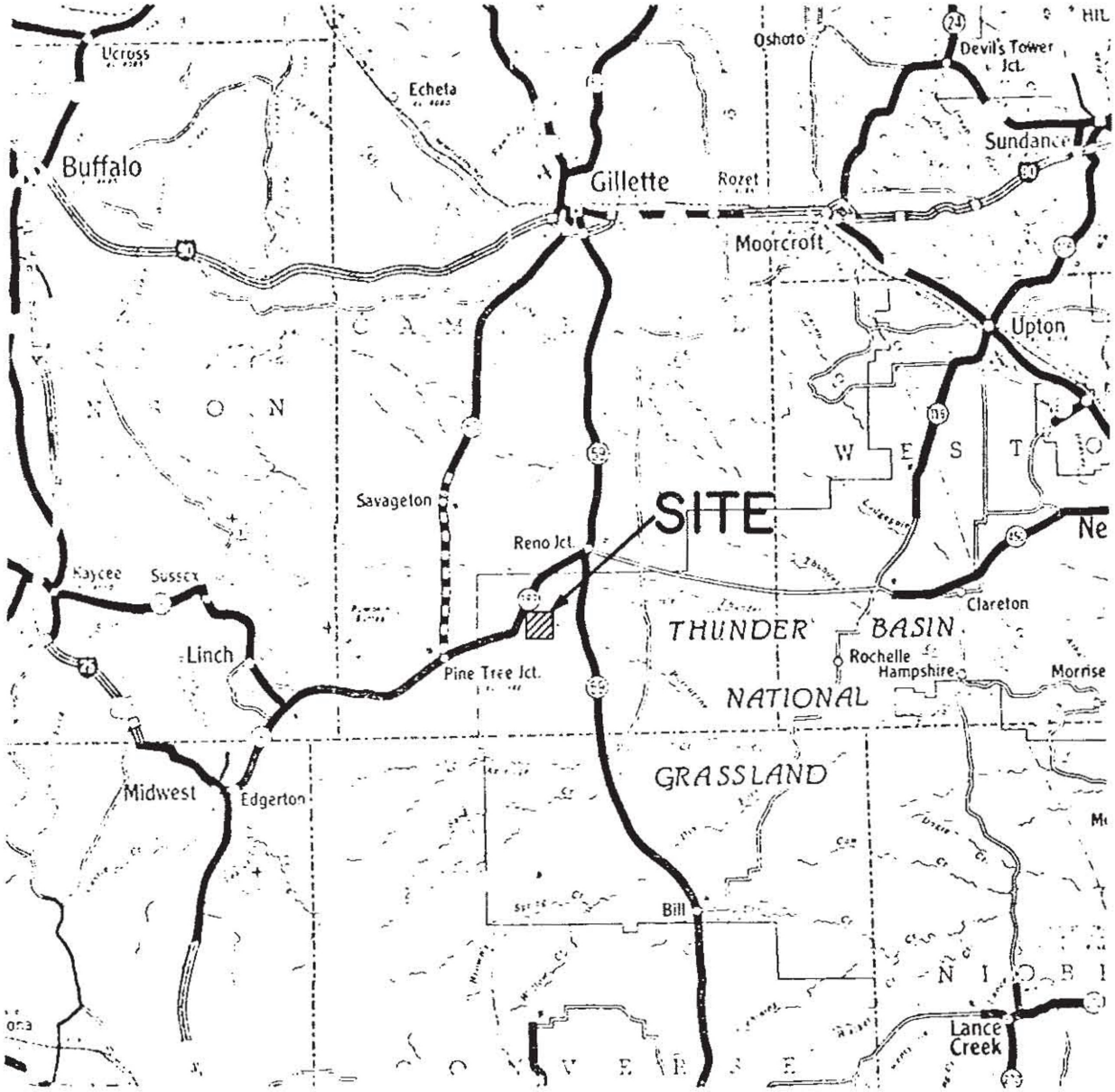


Transmissibility of the first ore sandstone is good, thus indicating that lateral solution control should not be a problem during future ISL mining. A good aquitard overlies the host sand which should prevent movement of ISL solutions up into the upper sandstone horizon. Migration of leach solution into the low permeability material (#5 sand sequence) at the base of the host sand should be minimized to the extent possible. Solution control can be optimized by careful construction, completion, and operation of future wells in order to limit vertical migration of lixiviant within the host aquifer.

It has been shown that the #5 sand is not the next underlying aquifer as originally hypothesized. Consequently, further study to define and delineate a deeper underlying aquifer, as required by the Wyoming DEQ, is needed.

It is recommended that any further definition or refinement of aquifer properties and hydrostatic head levels be done in conjunction with pre-mine site evaluation and environmental baseline programs.

05-GE-072



REFERENCE

OFFICIAL HIGHWAY MAP OF WYOMING, WYOMING STATE HIGHWAY COMMISSION, DATED 1974.

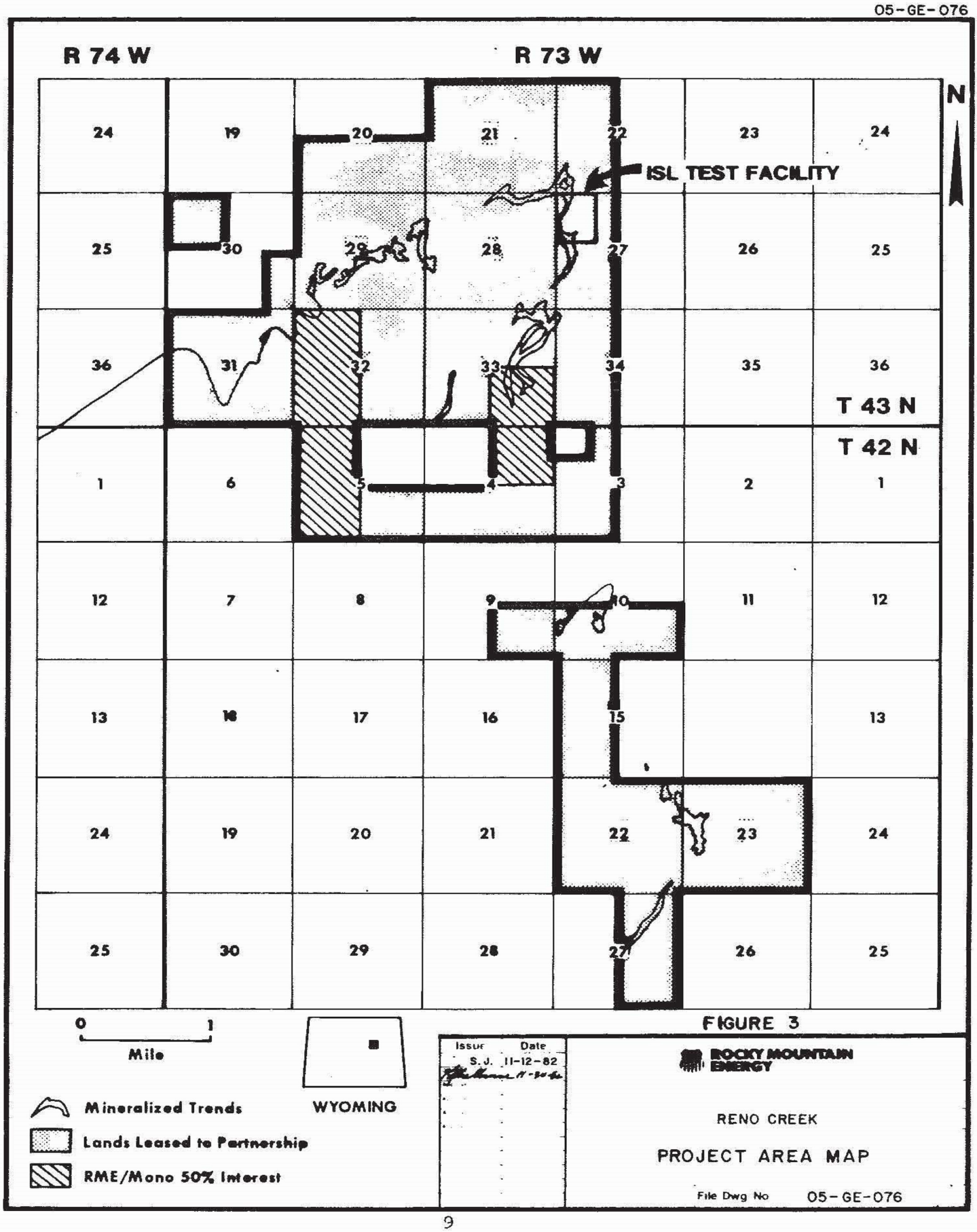
N

0 5 10 20

SCALE: 1" = APPROX. 18 MILES

ROCKY MOUNTAIN ENERGY COMPANY
4704 HARLAN STREET, DENVER COLORADO 80212

RENO CREEK	REV.
SITE LOCATION MAP	
DATE: 11-9-82 | DRAWN BY: VLS | FIGURE 2	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ISL TEST FACILITY
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WYOMING
Mineralized Trends
Lands Leased to Partnership
RME/Mono 50% Interest
Issue Date
S.J. 11-12-82
ROCKY MOUNTAIN ENERGY
RENO CREEK
PROJECT AREA MAP
File Dwg No 05-GE-076

FIGURE 3