

ATTACHMENT MU1 4-1

WATER QUALITY RESULTS

**NOTE: ATTACHMENT MU1 4-3 PROVIDES THE ELECTRONIC VERSION OF
THIS ATTACHMENT IN THE FORMAT PRESENTED HERE AND IN WDEQ-
LQD'S PREFERRED FORMAT.**

ATTACHMENT MU1 4-3

MU1 GROUNDWATER LEVEL AND QUALITY DATA

(electronic data set)

“MU1_GW_Level_Data_Nov10.xls” provides the groundwater level data in the preferred format of WDEQ-LQD.

“MU1Tab_4_3_WaterLevel_Nov10.xls” is the electronic version of the hard-copy Table MU1 4-3.

“MU1_Lab_GWQ_Data.xls” provides the groundwater quality data in the preferred format of WDEQ-LQD.

“MU1Att4_1_WQ_Tables.xls” is the electronic version of the hard-copy Attachment MU1 4-1.

MU1
Volume 2 of 2
Replacement Pages

**LOST CREEK HYDROLOGIC
TESTING – MINE UNIT 1
NORTH AND SOUTH TESTS**



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LOST CREEK PROJECT, SWEETWATER COUNTY, WY

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(Revised November 2010)

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to the presence of the fault, actual K values are likely higher, on the order of approximately 1.0 to 2.0 ft/d. This range of K values would be most representative for estimating groundwater velocity and travel times with regard to mine unit design, exterior monitor well spacing, excursion control, and excursion recovery.

7.4 RADIUS OF INFLUENCE

7.4.1 NORTH TEST, PUMPING WELL PW-102

Based on the drawdown response observed at the outlying “ring” monitor wells during the north test, the minimum radius of influence (ROI) is greater than 2,600 feet. The ROI is not symmetrical with respect to the pumping well and is truncated due to the presence of the fault. The actual ROI of the test (extending away from the fault) was estimated utilizing distance-drawdown data (i.e., drawdown on an arithmetic scale and distance to the pumping well on a logarithmic scale) (Appendix F). From the distance-drawdown analysis, the ROI for the north test is estimated between 3,100 to 3,300 feet.

Minor drawdown responses in the HJ Horizon were observed on the southern side of the fault (see Table 4-3 and Figure 6-17) that ranged between 0.0 to 2.7 feet, and generally decreased with increasing distance to the pumping well. At distances greater than 2,000 feet, drawdown responses were less than 1 foot.

7.4.2 SOUTH TEST, PUMPING WELL PW-101

Based on the observed drawdown at the outlying “ring” monitor wells during the south test, the minimum ROI is greater than 2900 feet. As observed in the north test, the ROI is truncated by the fault. The actual ROI extending away from the fault was estimated between 3,200 to 3,500 feet utilizing distance-drawdown data (Appendix F).

Minor drawdown responses (less than 1 foot) were observed north of the fault (Table 4-4 and Figure 6-18). Drawdown at well HJT-104 was observed at 2.0 ft, but this well is located north and immediately adjacent to the fault, and only a distance of 400 feet from the pumping well.

7.5 COMPARISON TO PREVIOUS TESTING RESULTS

The following table presents a summary of all hydrologic testing performed in the HJ Horizon on both sides of the fault during 2007 and 2008. Results from the two mine-unit scale pump tests conducted in 2008 compare favorably to previous testing (2007) conducted on both sides of the fault. The table below also shows the larger area of investigation of the 2008 MU1 tests compared to the tests conducted in 2007.

Analytical results of aquifer properties from the MU1 tests were evaluated in observation wells located a distance of approximately three times that of the 2007 tests.

Test	North Regional Test #1	MU1 North Test	South Regional Test #2	MU1 South Test
Pumping Well	LC19M	PW-102	LC16M	PW-101
Date	June – July 2007	November 2008	October – November 2007	December 2008
Relationship to Fault	North	North	South	South
Farthest Observ. Well (feet)*	781	2569	866	2945
Test Duration (days)	5.7	2.0	5.5	2.9
Test Rate (gpm)	42.9	70.9	37.4	58.1
Range of T (ft ² /day)	30 – 76	51 – 104	57 – 110	69 – 129
Average T (ft ² /day)	61	79	76	93
Range of Storativity	$6.6 \times 10^{-5} - 1.5 \times 10^{-4}$	$5.4 \times 10^{-5} - 1.9 \times 10^{-4}$	$3.5 \times 10^{-5} - 9.1 \times 10^{-4}$	$3.6 \times 10^{-5} - 4.2 \times 10^{-4}$
Average Storativity	1.1×10^{-4}	9.3×10^{-5}	2.9×10^{-4}	1.1×10^{-4}

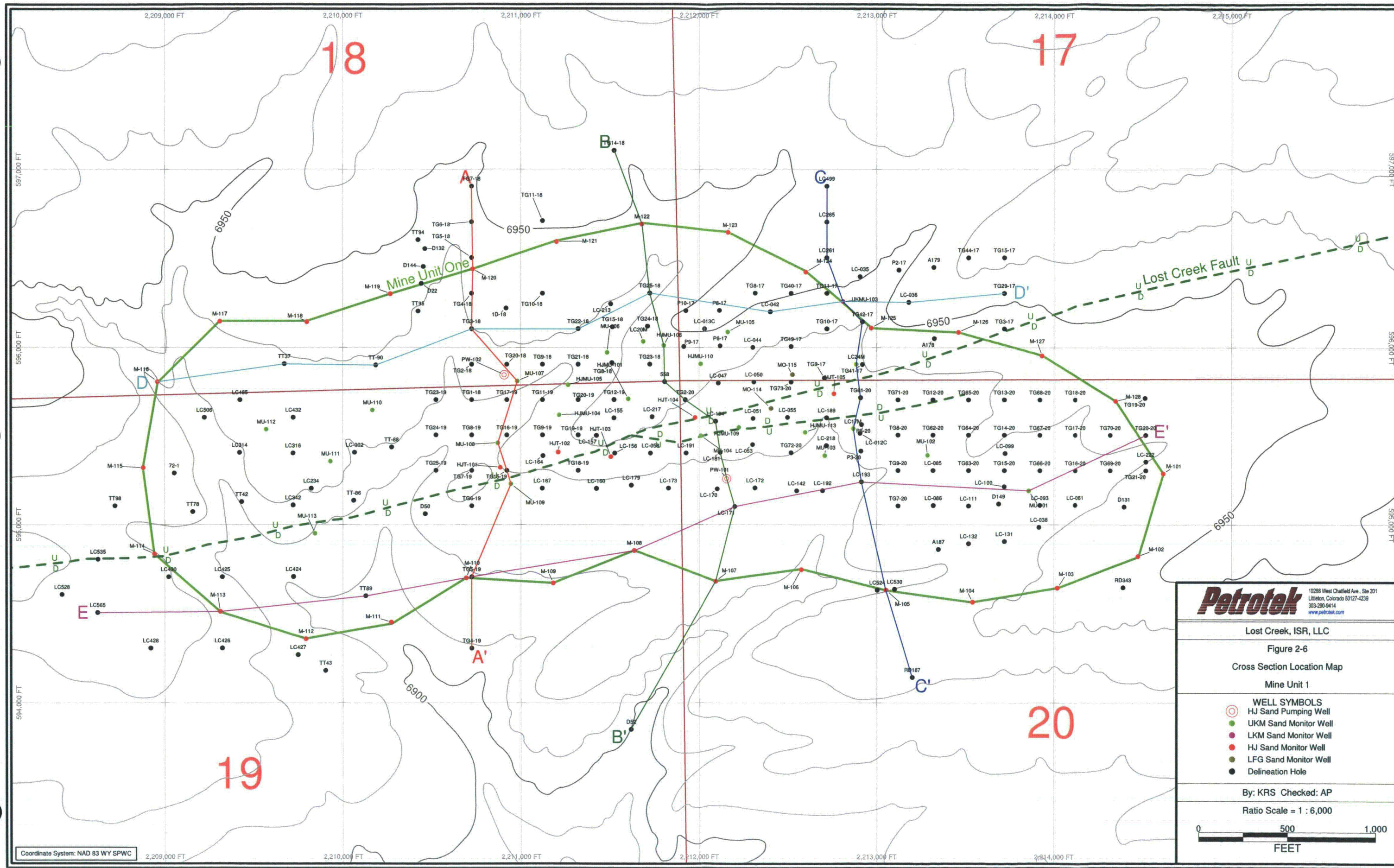
* Distance from farthest observation well to pumping well, on the same side of the fault.

8.0 SUMMARY AND CONCLUSIONS

- The results of the MU1 north and south pump tests conducted on both sides of the Lost Creek Fault demonstrate that the HJ Horizon monitor wells and pumping wells (for the north and south sides of the fault) are in hydraulic communication. Minor communication was observed across the fault during both tests, but responses were an order of magnitude smaller, suggesting that the fault is a partial barrier to groundwater flow within the HJ Horizon. Data from the south test also indicates that the splay to the south of the Lost Creek Fault is a minor barrier to groundwater flow.
- On a regional scale, the HJ Horizon on both sides of the Lost Creek Fault has been adequately characterized with respect to hydrogeologic conditions within MU1. Results of the MU1 tests demonstrate that the HJ Horizon has sufficient transmissivity for in-situ recovery mining operations.
- Geological information suggests that the overlying and underlying shales are continuous throughout MU1. Minor responses (order of magnitude or less in relation to responses in wells completed in the HJ Horizon) were observed during the pump test. Communication observed in the LFG and UKM Sands is similar to the responses observed at other ISR facilities where engineering practices are successfully implemented to isolate lixiviant from overlying and underlying aquifers.
- LC ISR is conducting a program of locating, plugging and abandonment of historic wells within MU1 to mitigate the potential for hydraulic communication through improperly abandoned wells.
- The observed response during the north test at well MU-108 (completed in the underlying UKM Sand) of 24.7 feet of drawdown was due to damage of the casing and annular seal during well completion. Drilling records indicate that the underreamer bit was not fully closed upon withdrawal into the casing. This well was subsequently plugged and abandoned and additional pump testing conducted within the underlying aquifer confirmed the abandonment was successful, as an immediately adjacent well to MU-108 completed in the HJ Horizon did not respond to pumping.

9.0 REFERENCES

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Lost Creek, ISR, LLC

Figure 2-6
Cross Section Location Map
Mine Unit 1

WELL SYMBOLS
HJ Sand Pumping Well
UKM Sand Monitor Well
LKM Sand Monitor Well
HJ Sand Monitor Well
LFG Sand Monitor Well
Delineation Hole

By: KRS Checked: AP

Ratio Scale = 1 : 6,000

0 500 1,000
FEET

Coordinate System: NAD 83 WY SPWC

MU-109

Lost Creek ISR, LLC
WELL COMPLETION REPORT

MU-109

WELL # MU-109 SEO # 187658 Date Drilled: 7/29/08

Location: E 2,210,944 / N 595,230 (NAD 83)

Ground Elev: 6932.0' Measure Point Elev: 6932.78'

TD: 570' Hole Dia.: 7-7/8"

CASED to: 550' Casing: PVC SDR17 ID: 4.5" OD: 5"

GROUT: Portland Cement - Type I/II
Pumped thru casing, displaced to surface with water

COMPLETION Aquifer: UKM Sand

Static Water Level: Depth 194' Elev: 6738' (avg.)

UNDERREAM: Blade Dia: 10"

Intervals: from 525' to 545' / length 20'
from _____ to _____ / length _____

SCREEN LINER ASSEMBLY

Description	Depth		Elev.		Length
	From - To		From - To		
K-packer	518'		6414'		
Screen	525'	545'	6407'	6387'	20'

SCREEN SPECIFICATIONS:

Slot: 0.020" Composition 3" PVC

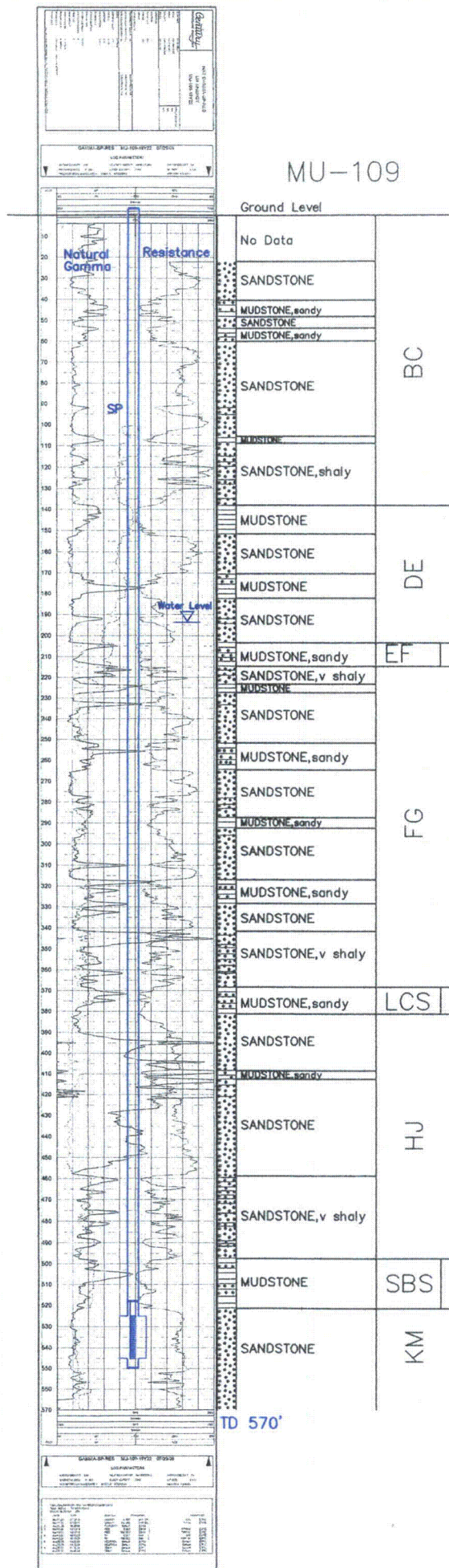
FILTER PACKING:

Volume: _____ (bags)(ft³) Sand Specs. _____

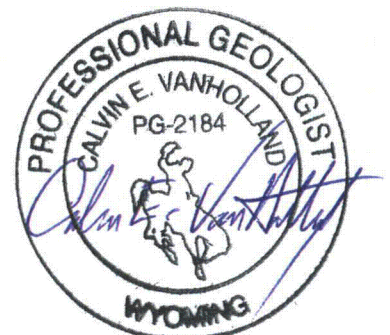
Method: N/A

WELL STIMULATION: Method Airlift

Yield: Good / Moderate / Poor



MU-109



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LITTLETON, COLORADO, USA**

**PLATE MU1 5-2
MU1 FAULT STITCH CROSS SECTIONS**

LOST CREEK PERMIT AREA

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**PLATE MU1 5-3
MU1 FAULT STITCH CROSS SECTIONS**

LOST CREEK PERMIT AREA

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