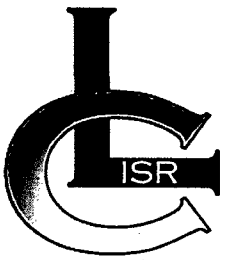
Petrotek

LOST CREEK REGIONAL HYDROLOGIC TESTING REPORT #1



10758 West Centennial Road, Suite 200
Ken Caryl Ranch, Colorado 80127 USA

LOST CREEK PROJECT, SWEETWATER COUNTY, WY

OCTOBER 2007

Prepared By:
Petrotek Engineering Corporation
10288 West Chatfield Ave., Suite 201
Littleton, Colorado 80127
Phone: (303) 290-9414
Fax: (303) 290-9580

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EXECUTIVE SUMMARY

- Lost Creek ISR, LLC (LC ISR. LLC) plans to develop and extract uranium from in-situ recovery (ISR) mine units within the HJ Horizon and, potentially, the UKM Sand of the Battle Spring Formation located at the Lost Creek Project Area (LCPA). To support State and Federal permit applications necessary for the project, LC ISR, LLC has completed the first of three regional pumping tests in the HJ Horizon, located on the north side of the Lost Creek Fault within the proposed Permit Area. For the 2007 hydrogeologic and mineral characterization program, LC ISR, LLC plans to install approximately 70 new wells in the LCPA. Approximately half of those wells were installed at the time of testing.

- Results from the pump test performed in the HJ Horizon north of the Lost Creek Fault have demonstrated hydraulic communication between the Production Zone (HJ Horizon) pumping well and the surrounding monitor wells north of the fault. Based on the wells installed to date, this test has also confirmed that the Lost Creek Fault, although slightly leaky, provides a significant barrier to groundwater flow with in the HJ Horizon. During the test, responses observed in the HJ Horizon on the south side of the fault were an order of magnitude less than those on the north. It appears that a transition zone of lower permeability exists on both sides of the fault. Additional data will be collected during the remaining testing scheduled in October 2007 to better define aquifer properties associated with the fault.

- The pump test results provide sufficient aquifer characterization of the HJ Horizon such that permitting can proceed and the HJ Horizon has sufficient transmissivity for ISR operations.

- Based on the limited data for the overlying and underlying aquifers, some responses were observed that coincide with the start and stop of the pumping well. The cause for these responses is unknown at this time. Geologic data indicate that the overlying and underlying confining shale units are continuous throughout the permit area. While LC ISR, LLC has undertaken an extensive abandonment program of historic wells, it is unknown whether these are responsible for the responses observed. Additional data will be collected during subsequent testing to better understand the integrity of the overlying and underlying confining shale units. Based on testing results to date, it is anticipated that any minor communication between the HJ Horizon and the overlying and underlying sands can be managed through operational practices, detailed monitoring, and engineering operations. In this regard, the potential communication observed at Lost Creek is much lower (e.g., five to ten times less) than has been observed in other ISR operations where engineering practices were successfully implemented to isolate lixiviant from overlying and underlying aquifers.

- Additional hydrostratigraphic characterization will be completed by the end of November to further characterize the flow regimes in the proposed Permit Area. Results of the additional testing will be used to enhance the current conceptual model.

1.0 INTRODUCTION

1.1 BACKGROUND

The Lost Creek Project Area (LCPA) is located in the northeastern portion of the Great Divide Basin of Wyoming, within Sweetwater County (Figure 1-1). LC ISR, LLC plans to develop and extract uranium from ISR mine units within the HJ Horizon and the UKM Sand of the Battle Spring Formation. This report provides a summary of the regional hydrogeologic testing conducted in the HJ Horizon during the months of June and July of 2007 at LCPA to support State and Federal permit applications necessary for the project.

The LCPA is located in all or parts of Sections 13 through 14, and 23 through 26 of T25N, R93W and Sections 16 through 21, and 29 through 31 of T25N, R92W. Figure 1-1 shows the LCPA and its relationship to the Great Divide Basin. Figure 1-2 presents the location of the pumping well and monitor wells used for this test.

There are no operational ISR operations within ten miles of the LCPA. COGEMA's Christensen Ranch and PRI's Smith-Highland Ranch uranium project are located approximately 150 miles to the northeast and east, respectively. The primary Production Zone at Lost Creek is the HJ Horizon that occurs between depths of 300 and 450 feet below ground surface, although typically the ore bearing sand is found in the middle portion of the HJ horizon.

In this area, water is beneficially used for livestock watering as well as for purposes related to mining (monitoring, test wells, dewatering, industrial, stock, reservoir supply, and miscellaneous). Currently, water is not used for domestic or irrigation purposes within two miles of the proposed Permit Area.

1.2 REGULATORY REQUIREMENTS

The objectives of the regional pumping test, as stated in the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) Chapter 11 (and associated guidelines) and Nuclear Regulatory Commission (NRC) NUREG 1569 (Section 2.7; Hydrology), are to:

1. Determine the hydrologic characteristics of the Production Zone Aquifer;
2. Demonstrate hydrologic communication between the Production Zone pumping well and the surrounding Production Zone monitor wells;
3. Assess the presence of hydrologic boundaries, if any, within the Production Zone Aquifer over the area evaluated by the Pump Test; and,
4. Evaluate the degree of hydrologic communication, if any, between the Production Zone and the overlying and underlying aquifers in the vicinity of the pumping well.

The testing procedures and results are presented and discussed in this report. It is noted that the regional pump test is not intended to replace mine unit-scale testing that is routinely conducted under WDEQ/LQD mine unit permit applications. Rather, the test is designed to obtain the requisite data required for characterization of the regional hydrology

at the LCPA in support of submitting an NRC Source Materials License application and a WDEQ/LQD Permit to Mine application.

1.3 PURPOSE AND OBJECTIVES

The purpose of this report is to demonstrate that the recently completed hydrologic test meets the requirements and objectives of WDEQ and NRC as previously stated. This report demonstrates that the HJ Horizon on the north side of the proposed Lost Creek Permit Area has been sufficiently evaluated with respect to hydrogeologic conditions and is suitable for ISR mining. This initial test was conducted within the HJ Horizon on the north side of the Lost Creek Fault. The Lost Creek Fault trends west-southwest across the LCPA. Potential production zones exist on both sides of the fault. A second test is scheduled for the HJ Horizon on the south side of the fault. Another test is scheduled within the deeper UKM Sand on the north side of the fault.

The objective of this report is to present the information required by WDEQ/LQD and NRC NUREG 1569 (Section 2.7; Hydrology) for a Hydrologic Test Report. In accordance with these regulations the following information is included:

- A description and maps of the proposed permit area;
- Geological cross-sections, including data from monitor wells and test holes;
- Isopach maps of the Production Zone, Overlying Confining Unit and Overlying Sands, and Underlying Confining Unit and Underlying Sands;
- Well completion reports;
- A description of hydrologic testing;
- Discussion of the hydrologic test results including raw pump test data, type curve matches, potentiometric surface maps, water level graphs, drawdown maps, and other hydrologic data with interpretation and conclusions, as appropriate; and,
- Verification, based on the test data, that: (1) the monitor wells are in communication with the Production Zone; and (2) there is adequate confinement between the HJ Horizon Production Zone and the overlying and underlying sands, LFG Sand and UKM Sand, respectively and (3) the Lost Creek Fault acts as a hydraulic barrier.

1.4 REPORT ORGANIZATION

This report includes eight sections, the first being this introduction. The site-specific hydrogeologic conditions are discussed in Section 2. Information related to the monitor well locations and completions is included in Section 3. Section 4 presents the hydrologic (pump) test design and procedures. Section 5 discusses the barometric effects on observed water levels. The test results are presented in Section 6. Analytical methods are presented in Section 7. Conclusions from the testing and analysis and references are included in Sections 8 and 9, respectively.

Field activities for the Lost Creek Pump Test were jointly performed by LC ISR, LLC,

Leppert & Associates, Inc. (LAI) and Petrotek Engineering Corporation (Petrotek) personnel. Geologic interpretations were performed by LC ISR, LLC geologists. Aquifer test analyses were performed and this report written by Petrotek.

2.0 SITE CHARACTERIZATION

2.1 HYDROSTRATIGRAPHY

The entire Permit Area is covered by the upper part of the Battle Spring Formation. The total thickness of the Battle Spring Formation under the Permit Area is about 3,200 ft. The Battle Spring Formation unconformably overlies the Fort Union Formation. LC ISR, LLC has employed the following nomenclature for the hydrostratigraphic units of interest within the Battle Spring Formation. The primary Production Zone is identified as the HJ Horizon. The HJ Horizon is subdivided into the Upper (UHJ), Middle (MHJ) and Lower (LHJ) Sands. The HJ Horizon is bounded above and below by aerially extensive confining units identified as the Lost Creek Shale and the Sage Brush Shale, respectively. Overlying the Lost Creek Shale is the FG Horizon. The deepest sand in the FG Horizon, the Lower FG (LFG) Sand, is the overlying aquifer to the HJ Production Zone (HJ Horizon). Beneath the Sage Brush Shale is the KM Horizon. The uppermost sand within the KM Horizon, designated the Upper KM (UKM) sand, is a secondary Production Zone and also the underlying aquifer to the Primary Production Zone (HJ Horizon). An unnamed shale unit separates the UKM and Middle KM (MKM) Sand. The MKM Sand is the underlying aquifer to the UKM Production Zone. The shallowest occurrence of groundwater within the Permit Area occurs within the DE Horizon, which is above the FG Horizon. Figure 2-1 depicts the hydrostratigraphic relationship of these units.

Thickness (isopach) maps of target production zones (HJ and UKM), as well as the shale units above HJ (Lost Creek Shale) and below HJ (Sage Brush Shale) are presented in Plates 2.6-2a through 2.6-2d of the NRC Technical Report (LC ISR, 2007).

2.2 OVERLYING UNITS: LFG SAND AND LOST CREEK SHALE

The overlying aquifer designated for this Pump Test is the LFG Sand, a member of the FG Horizon. The LFG Sand is continuous throughout the LCPA and ranges from 20 to 50 feet thick. The Lost Creek Shale is the confining layer that separates the overlying LFG Sand and Production Zone HJ Horizon. The Lost Creek Shale appears to be continuous throughout the Permit Area and ranges from 5 to 45 feet thick, with typical thickness of 10 to 25 feet.

2.3 PRODUCTION ZONE: HJ HORIZON

The Production Zone aquifer is designated as the HJ Horizon and includes the UHJ, MHJ and LHJ Sands. The HJ Horizon is continuous throughout the Permit Area with a total thickness ranging from 100 to 160 feet, and averages approximately 120 feet. As mentioned above, the majority of mineralization within the HJ Horizon occurs in the middle portion (MHJ). For purposes of this report and because no laterally extensive confining units have been observed between the UHJ, MHJ and LHJ Sands, discussions and analyses presented herein will focus on the HJ Horizon as a single hydrostratigraphic unit.

2.4 UNDERLYING UNITS: UNDERLYING SAGE BRUSH SHALE AND UKM SAND

The underlying aquifer is designated as the UKM Sand, a member of the KM Horizon. The total thickness of the UKM Sand is typically 30 to 60 feet and is continuous throughout the Permit Area. The Sage Brush Shale is the confining layer that separates the underlying UKM Sand and the Production Zone HJ Horizon. The Sage Brush Shale appears to be continuous throughout the Permit Area and ranges from 5 to 75 feet thick.

2.5 STRUCTURE

In the proposed Permit Area, the Battle Spring Formation dips to the west at a gentle rate of three degrees. A "scissor fault" that extends the length of the Permit Area from the west-southwest to the east-northeast has been identified and is referred to as the Lost Creek Fault. Maximum displacement of the fault at the west end of the Permit Area is around 45 feet, downthrown to the north; whereas the displacement on the east side of the Permit Area is about 80 feet with the downthrown side to the south. Near the middle of the Permit Area, at the hinge of the scissors fault, there is essentially no displacement.

2.6 PREVIOUS TESTING

Several historic pumping tests were conducted on the Lost Creek project in 1982 and 2006 to assess hydraulic characteristics of the Production Zone as well as overlying and underlying hydrostratigraphic units. Historic testing was performed by Hydro-Search Inc. (1982) and Hydro-Engineering, Inc. (2006). A summary of these tests is presented in Section 2.7 of the NRC Technical Report (LC ISR, LLC, 2007).

3.0 MONITOR WELL LOCATIONS, INSTALLATION, AND COMPLETION

3.1 WELL LOCATIONS

The majority of the LCPA monitor wells are located within the planned mine units of the proposed permit area. The monitor wells included in the pump test are shown on Figure 1-2.

3.2 WELL INSTALLATION AND COMPLETION

For this test, LC ISR, LLC installed 15 new wells (Figure 1-2), including 9 Production Zone (HJ Horizon) monitor wells, 2 Overlying (LFG Sand) monitor wells, 3 Underlying (UKM Sand) monitor wells, and LC19M (pumping well completed in the HJ Horizon). LC19M was located on the north side of the Lost Creek Fault and was installed specifically for use as a pumping well.

All of the wells used for this test are located in Sections 17, 18, 19 and 20, Township 25 North, Range 92 West (Figure 1-2), and were constructed with 4.5-inch nominal diameter casing. The wells were developed using standard water well construction techniques, including air lifting, pumping, swabbing, and/or surging. Completion information for each well is provided in Appendix A. Specific data related to well location, construction, completion interval, and initial water levels are provided in Table 3-1.

4.0 PUMP TEST DESIGN AND PROCEDURES

4.1 TEST DESIGN

As mentioned above, this is the first of three regional hydrologic tests to be conducted in the LCPA. This test, conducted from the HJ Horizon on the north side of the Lost Creek Fault, was designed to:

1. Demonstrate hydraulic communication between the Production Zone (HJ Horizon) pumping well and the surrounding monitor wells;

2. Assess the hydrologic characteristics of the Production Zone aquifer within the test area;

3. Evaluate the presence or absence of hydrologic boundaries in the Production Zone within the LCPA; and,

4. Demonstrate sufficient confinement between the Production Zone and the Overlying and Underlying aquifers for the purposes of ISR mining.

The general testing procedures were as follows:

- Install In-Situ Level TROLL data logging transducers (12 vented, 2 non-vented) in wells to record changes in water levels during tests. Verify setting depths and head readings with manual water level measurements.

- Measure and record background water levels and barometric pressure for a minimum of 48 to 96 hours prior to the test.

- Run the pumping well at a constant rate (or as close as practical).

- Record water levels and barometric pressure throughout background, pumping, and recovery periods.

4.2 PUMP TEST EQUIPMENT

The test was performed using a Grundfos 40S50-15, 5 hp, 460V, 3-phase electrical submersible pump powered by a portable diesel generator. The pump was set at a depth of 375 feet (approximately 85 feet off the bottom of pumping well [LC19M]). The static depth to water in LC19M was approximately 181 feet, providing for 194 feet of head above the pump. Flow from the pump was controlled with a manual gate valve. Surface flow monitoring equipment included a NUFLO™MCII totalizer (provided by LC ISR, LLC) and a SeaMetrics DL-75 Data Logger (provided by LAI). Per discussions with WDEQ/LQD, no Temporary Discharge Permit was required; discharge water was land applied approximately 300 feet downgradient of the pumping well via a manifold and 5 perforated 1" HDPE lines to minimize erosion.

Water levels in each well were measured and recorded with In-Situ Level TROLL transducer/dataloggers. The pressure rating for the transducers ranged from 15 to 100 psi. The transducers were programmed to record depth to water measurements at 10 minute intervals (during background monitoring, and the pumping and recovery periods). A

summary of the monitoring equipment used is presented in Table 4-1.

Petrotek personnel installed the monitoring equipment prior to testing and LAI assisted with day-to-day data downloads. Petrotek personnel verified the datalogger programming and equipment layout, and performed the step-test. Thereafter, LAI personnel collected the daily downloads and transferred the data to Petrotek for review/QA/QC for the duration of the long term pumping test. Table 4-2 contains the drawdown and responses observed for each well.

4.3 POTENTIOMETRIC SURFACES

Figure 4-1 presents potentiometric elevations the Production Zone (HJ Horizon) within the LCPA from water level measurements on June 27, 2007. Based on those data, the direction of groundwater flow within the HJ Horizon north of the fault is predominantly to the west with the ground water gradient at approximately 0.0039 ft/ft (20.6 ft/mile) as calculated from between wells HJMP-111 and HJMP-104. Based on the limited number of HJ wells on the south side of the fault, it appears that the direction of groundwater flow within the HJ Horizon is predominantly to the south-southwest. The steep gradient observed in the potentiometric surface from the north to the south side of the fault is most likely a manifestation of a lower permeability transition area associated with the fault smear zone and/or secondary faulting and fracturing near the fault. This is consistent with regional groundwater flow impacted by lower permeability zones studied and modeled by Freeze (1969). Although limited groundwater leakage occurs across the fault, the majority of groundwater flow on both sides of the fault appears to be generally parallel to the fault, to the west-southwest. Water level data used for preparation of this map are presented in Table 3-1.

For the Overlying (LFG Sand) aquifer, two monitor wells were monitored during this test (one on each side of the fault). Based on a distance of approximately 715 feet between LC18M (north of fault) and LC25M (south of fault), and a water level elevation difference of 11.5 feet (Table 3-1), the fault is a barrier to groundwater flow within the test area.

For the Underlying (UKM Sand) aquifer, three monitor wells were monitored (2 north and 1 south of fault). Based on the data in Table 3-1, it appears that the direction of groundwater flow north of the fault is in a westerly direction. The elevation of groundwater observed in the UKM Sand north of the fault is not significantly different when compared to the UKM elevation on the south (UKMP-102 is 1.7 feet higher than UKMP-101). Based on only two data points, it is not certain whether the fault is acting as a hydraulic barrier to flow within the UKM Sand.

Water level data collected from the LC18M (LFG), LC-19M (HJ) and LC20M (UKM) well cluster, indicate the potentiometric surface of the HJ Horizon (LC19M) is approximately 10.5 feet lower than the potentiometric surface of the overlying LFG Sand and suggests that the LFG Sand is not in hydraulic communication with the HJ Horizon, but has the potential to drain to it if an artificial pathway was created (improperly constructed well or improperly abandoned borehole). Additionally, the potentiometric surface of the HJ Horizon is approximately 21.6 feet higher than the potentiometric surface of the underlying UKM Sand at this location, also and suggesting that the HJ Horizon is not in hydraulic communication with the UKM Sand.

At the time of the HJ Horizon test on the north side of the fault, the drilling/monitor well

installation associated with characterization of the Overlying, Production Zone, and Underlying hydrostratigraphic units was approximately 50% complete. As such, a limited number of data points were available for the first test. As of this writing, all monitoring wells associated with characterization of all hydrostratigraphic units of interest have been drilled, installed and completed. Tests in the UKM Sand on the north side of the fault and HJ Horizon on the south side of the fault, respectively, are currently scheduled to commence in October 2007.

4.4 BACKGROUND MONITORING, TEST PROCEDURES AND DATA COLLECTION

The majority of the testing equipment (e.g., pump, flow meters, Level TROLLs) was installed and checked by Petrotek and LAI on June 22, 2007. A step-rate test was conducted on June 23, 2007.

The background-monitoring period followed the step test and ran for a period of 4.1 days. Water levels were recorded every 10 minutes during background monitoring.

In-Situ® Level TROLLS® were programmed to record water levels every 10 minutes during the pumping and recovery periods. Pumping rate data for this test is shown on Table 4-3. A CD containing the water level data for the step test, background monitoring, pumping, and recovery periods is included in Appendix D.

5.0 BAROMETRIC PRESSURE CORRELATIONS AND CORRECTIONS

5.1 MONITORING EQUIPMENT

As discussed earlier, twelve of the fourteen In-Situ Level TROLL transducers used were vented (gauged), while two were non-vented (absolute). The use of non-vented transducers requires post-test barometric corrections since they are not vented to the atmosphere. In-Situ has stated that if vented transducers are used, the vent eliminates the impact of barometric pressure on the sensor, which is correct. However, a change in water levels due to barometric changes will occur whether a vented sensor is used or not. Hence, use of vented equipment eliminates the barometric impact on the sensor, but does not correct the water level measurements for barometric effects on the aquifer. In this regard, the vented Level TROLLs are barometrically *compensated*, but not *corrected*. Hence, if significant variations in water levels are observed, the data require correction for fluctuations in water levels associated with changes in barometric pressure.

Data for two of the non-vented Level TROLL (absolute) transducers were corrected for changes in barometric pressure. In-Situ states that non-vented (absolute) transducers must be corrected for barometric pressure because the sensors are not barometrically compensated.

5.2 BAROMETRIC CORRECTIONS

To demonstrate the effect of barometric pressure on water levels for this pumping test, two different corrections were evaluated. The first correction was simply evaluating the data based on total head (i.e., the elevation of water in the well plus barometric pressure as feet of water), and normalizing the values to the initial barometric pressure at the start of each pump test. This correction is referred to as the Manual Correction. Example input parameters and calculations follow:

Input Parameters:

Initial water elevation (feet)
Initial barometric pressure (equivalent feet of water)
Barometric pressure at time X (feet of water)
Water elevation at time X

Manual Barometric Correction:

(Raw elevation + barometric pressure [ft H_2O]) - Initial Barometric Pressure [ft H_2O]

The second method employed to assess barometric impacts is referred to as BETCO (Sandia Corporation, 2005), which is a program that was developed to analyze barometric and tidal effects for the Waste Isolation Pilot Project (WIPP) in New Mexico. BETCO was developed as a method to remove water level fluctuations due to barometric pressure and earth tides through the application of a multiple regression analysis. The BETCO software is publicly available at http://www.sandia.gov/betco as freeware. To correct the data, water level, time, and barometric pressure are entered into the program. BETCO then calculates corrected water level values. Examples of the raw data versus the Manual and BETCO corrections for LC19M, HJMP-111 and HJMP-107 are presented in Figures 5-1, 5-2 and 5-3, respectively.

As shown in Figures 5-1 through 5-3, barometric pressure had a negligible impact on water levels as evidenced by comparing the raw data to the barometrically corrected data. Because of the minimal impact of barometric pressure on water levels prior to, during and after the pumping test, original, uncorrected data from the vented Level TROLLs were used in the analyses discussed below.

It is noted that the water levels in three wells (HJMP-110, HJMP-111 and HJT-104) dropped below the level of the TROLLs during the pumping period. As such, data from those wells were not valid for a short period of time. The TROLLs in those wells were lowered during the test and water level data adjusted accordingly.

6.0 TEST RESULTS

6.1 BACKGROUND TRENDS

As mentioned previously, water level stability data were collected prior to the start of the pump test. Plots of the background, pumping, and recovery data for all wells completed in the HJ Horizon are shown in Figures 6-1 through 6-10. Water level data for the overlying (LFG Sand) and underlying (UKM Sand) wells are presented in Figures 6-11 through 6-15. Water level vs. barometric pressure plots for all wells monitored during the test are presented in Appendix B.

In general, water levels in the HJ Horizon north of the fault were slightly increasing while water levels on the south side were decreasing. Background water levels in the LFG Sand and UKM Sand were trending downward on both sides of the fault prior to start of the test.

6.2 PUMP DURATION AND RATE

The test was started at 17:20 on June 27, 2007 and run for a period of 8,252 minutes. The pump was shut off at 10:51:30 on July 03, 2007. The average pumping rate during the test was 42.9 gallons per minute. It is noted that a false start occurred at 16:50 on June 27, 2007. This false start was attributed to field adjustments made to the discharge manifold to eliminate backpressure and achieve a higher pumping rate.

6.3 HJ HORIZON

As shown in Figure 6-16, significant drawdown was observed in all of the HJ Horizon monitor wells located on the north side of the fault after pumping LC19M at a constant rate of 42.9 gallons per minute for 5,282 minutes (5.73 days). Prior to shut-in of LC19M, drawdown observed in the pumping well was 93.3 feet. Observed drawdown in monitor wells located on the north side of the fault ranged from 21 to 40 feet. As mentioned above, the potentiometric level on the north side of the fault is approximately 15 feet higher on the north than the south side under static, non-pumping conditions. At monitor well HJT-104, located just north of the fault, approximately 40 feet of drawdown was observed. Accounting for the differences in water elevations between the north and south side of the fault, water on the north was lowered approximately 25 feet below the background elevation on the south. As such, significant hydraulic stress was applied to the north side of the fault. On the south side of the fault, minimum drawdown was observed and ranged from 1.3 to 5.7 feet. Based on the significant drawdown that occurred in the HJ Horizon north of the fault in response to pumping at LC19M and the minimal response to the HJ Horizon south of the fault during the test, the Lost Creek Fault is a significant barrier to groundwater flow in this area. The drawdown observed in wells south of the fault during the test, although minimal; suggests that some leakage across the fault occurs. The degree and significance of the leakage will be further investigated with additional regional and mine unit scale pump tests.

6.4 CONFINING UNITS

During the pumping test, small responses were observed from of the overlying wells LC18M and LC25M, and underlying UKMP-102, Figures 6-11, 6-12, and 6-14, respectively. The responses observed correlate with the start and stop of pumping from LCM19 in the HJ

Sand. After backing out the downward background trends, the responses ranged from about 0.2 to 0.8 feet. As previously stated, a declining trend in water level elevations in both the overlying and underlying aquifers was observed prior to the start of the test. Most of the wells showed an initial inverted response (increase in water level) at the start of the test and then resumed a gradual downward trend during the test. This phenomenon was also observed and noted by Hydro-Engineering during the 2006 pump tests. At this time, the cause of the observed responses is unknown. Thickness (isopach) maps of the shale units above HJ (Lost Creek Shale) and below HJ (Sage Brush Shale) as presented in Plates 2.6-6a and 2.6-6c of the NRC Technical Report (LC ISR, LLC 2007) indicate that the shales are continuous throughout the area. While LC ISR, LLC has aggressively pursued abandonment and re-plugging of historic wells, it is also possible that some form of communication could be related to abandoned wells.

Additional drilling and logging during 2007 and 2008 will provide a more detailed understanding of the stratigraphic section and confining units at the LCPA. Two additional pump tests are planned for 2007 in the HJ and KM Horizons, and additional hydrologic testing will be conducted for each mine unit. Future work will provide additional data with which to re-evaluate the responses in the underlying and overlying units observed during the recent testing. In this regard, it is anticipated that the overlying/underlying responses observed to date will be resolved and communication between the underlying and overlying aquifers, if significant, will be understood to a degree such that mining can proceed in accordance with NRC and WDEQ regulations.

7.0 ANALYTICAL METHODS

Drawdown data collected from the monitor wells were graphically analyzed to determine aquifer properties of Transmissivity and Storativity. The primary analysis method used was Theis (1935). The assumption used in this analysis was that the aquifer is confined and has a saturated thickness of 120 feet. The use of the Cooper & Jacob time-drawdown (1946) method was evaluated for the pump test data, however the criteria for using this method was only met at one location (observation well HJMP-110) 338 feet from the pumping well. A Theis Recovery (1935) analysis was performed for the pumping well. As noted, minor responses in observation wells across the fault were observed. However, the magnitude of those responses was so low that quantitative analyses were not performed. Water elevation plots for all the wells are presented in Appendix B.

The test data were analyzed using the Theis method because this method is mathematically valid for all distances and times. The significant assumptions inherent in this method include:

- The aquifer is confined and has apparent infinite extent;
- The aquifer is homogeneous and isotropic, and of uniform effective thickness over the area influenced by pumping;
- The piezometric surface is horizontal prior to pumping;
- The well is pumped at a constant rate;
- The pumping well is fully penetrating; and,
- Well diameter is small, so well storage is negligible.

These assumptions are reasonably satisfied, with the exception of the uniform thickness of the aquifer and infinite extent of the aquifer. Locally, the HJ Horizon at LCPA is not homogeneous and isotropic; however, over the scale of the pump test, it can be treated in this manner. As previously discussed, and verified with the pumping test, the fault acts as a significant hydraulic barrier to groundwater flow and therefore limits the effective extent of the aquifer. In this regard, water level responses from all the wells in the HJ Horizon likely are impacted by the fault. The Transmissivity (T) and hydraulic conductivity (K) results obtained from these analyses are likely to be lower than the actual values, yet will be representative of conditions that will be observed during mining in the vicinity of the fault.

Because none of the monitor wells were completed within the confining units, a Neuman-Witherspoon (1972) analysis was not performed. The software used to graphically analyze the data was AquiferTest Pro ver 3.5 (Waterloo Hydrogeologic, Inc., 2002).

Water level stability data collected during the pre-test and post-test periods along with barometric pressure (Appendix B) were used to assess the background trends. No significant recharge or trend corrections were warranted for any of the wells.

7.1 ANALYTICAL RESULTS

Transmissivity (T) results from the Theis analysis were calculated using both drawdown

and recovery portions of the test data. Average T results for the HJ Horizon Sand range from 30 to 75.5 ft^2/d, with an average T value of 61.2 ft^2/d (68.3 ft^2/d of the data from HJT-104, which are impacted by the transition zone associated with the fault, are not included). Based on an average thickness of 120 feet, the average hydraulic conductivity (K) is 0.51 ft/d (Table 5-1). Assuming a water viscosity of 1.35 cp (50 degrees F) and a density of 1.0, this equates to a permeability of approximately 250 millidarcies (md). Storativity (S) of the HJ Production Zone ranges from 6.6 E-05 to 1.5 E-04, with an average value of 1.1 E-04.

The Theis analysis of well HJT-104, located near the fault on the north side, was performed on the early to middle-time data to assess the effects of the fault as shown in Figure 7-1. The change in slope in the later time data is believed to be a manifestation of the recharge to the well resulting from leakage across the fault. A Transmissivity value of 30 ft^2/d was calculated for the early time data for HJT-104. The early time data represents near well aquifer characteristics, which supports the conceptual model of a transition zone of lower permeability near the fault mentioned previously. The conceptual model is further supported by the background potentiometric surface shown in Figure 4-1. Although the fault serves as a significant boundary to groundwater flow, there is hydraulic communication, albeit small.

Type curve matches for all of the HJ Horizon monitor wells included in the pump test are provided in Appendix C. Water level data for all monitor wells from background through pumping and recovery are included in Appendix D on a CD ROM.

7.2 DIRECTIONAL PERMEABILITY

The transmissivity results at LCPA correlate reasonably well with the thickness of the HJ Horizon and the permeability transition zone located near the fault (Figure 7-2). In general, higher T values are reported in the areas of thicker and/or cleaner sand, while lower T values are reported in areas of lower permeability near the fault transition zone. On a regional scale, the observed variation in T is not expected to significantly impact ISR mining and has no apparent regulatory implications. Further, field operations will be modified to achieve mine unit balance in light of the variation in T. The test data to date are limited and the issue of directional transmissivity will be further investigated during mine unit-scale testing required by NRC and WDEQ/LQD.

As discussed previously, the T results for the HJ Horizon on the north side of the fault obtained from the test are considered "effective" because of the barrier effect of the fault. Because of the fault, the aquifer is not infinite-acting. The T results are representative of the HJ Horizon on a regional scale, and directly apply to design calculations such as water balance. However, on a small scale, the actual transmissivity of the aquifer, without impacts from the fault, would be higher (e.g., by an approximate factor of 1.5 to 2.0). Similarly, the K results from this test (0.25 to 0.63 ft/d) are "effective". Actual K values on a small scale (e.g., pattern area) likely are on the order of 1.0 ft/d. This value would be most representative with regard to mine unit design and exterior monitor well spacing.

7.3 RADIUS OF INFLUENCE

Based on the limited drawdown response observed at HJT-105 (south of fault), test results suggest a radius of influence (ROI) of at least 1,100 feet (Figure 6-16). As noted previously, additional mine unit scale testing will be required prior to initiation of operations at Lost Creek.

8.0 SUMMARY AND CONCLUSIONS

- The HJ Horizon monitor wells and pumping well located on the north side of the fault are in hydraulic communication, demonstrating that the HJ Horizon Production Zone has hydraulic continuity. While minor communication was also demonstrated in the HJ Horizon south of the fault, the response was an order of magnitude smaller suggesting that the fault is a significant barrier to groundwater flow. Additional (mine unit) scale testing required by NRC and WDEQ will be designed to demonstrate communication throughout each mine unit between the pumping well(s) and the monitor well ring;

- On a regional scale, the HJ Horizon Sand north of the fault has been adequately characterized with respect to hydrogeologic conditions within the test area at LCPA. The pump test results demonstrate that the HJ Horizon has sufficient transmissivity for in-situ recovery mining operations. The pump test has provided sufficient aquifer characterization of the HJ Horizon such that permitting can proceed, and;

- Geological information suggests that the overlying and underlying shales are continuous throughout the test area. Minor responses were observed during the pump test and the cause of the responses is unknown at this time. Additional testing currently scheduled will provide additional information regarding the confining characteristics of the overlying and underlying shales.

9.0 REFERENCES

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Table 3-1
LC ISR, LLC
Lost Creek Regional Aquifer Test
Well Information

LC19M Test																
LocId	Test	Type Well	Completion Zone	GS Elevation	TOC Elevation	Easting (feet)	Northing (feet)	Top Underreamed Zone (ft bgs)	Bottom Underreamed Zone (ft bgs)	Distance from pumping well (feet)	Same side of fault as pumping well?	Casing I.D. (inches)	06/27/07 DTW	06/27/07 Elevation	DTW at End of Test	Water Elevation at End of Test
LC19M	North Test	PZ Pumping Well	HJ	6,949.32	6,950.52	743,383	535,317	412	463	0	—	4.5	180.08	6,770.44	273.40	6,677.12
HJMP-104	North Test	Prod. Zone Monitor	HJ	6,939.76	6,941.01	742,900	534,900	405	430	638	Yes	4.5	171.81	6,769.20	208.25	6,732.76
HJMP-110	North Test	Prod. Zone Monitor	HJ	6,945.95	6,947.14	743,700	535,200	430	475	338	Yes	4.5	174.89	6,772.25	215.37	6,731.77
HJMP-111	North Test	Prod. Zone Monitor	HJ	6,948.98	6,950.32	743,850	535,370	395	440	470	Yes	4.5	176.94	6,773.38	212.50	6,737.82
HJT-104	North Test	Prod. Zone Monitor	HJ	6,938.78	6,940.11	743,660	534,900	413	463	501	Yes	4.5	169.51	6,770.60	209.95	6,730.16
UKMO-102	North Test	Prod. Zone Monitor	HJ	6,940.33	6,940.79	744,150	535,160	377	408	783	Yes	4.5	165.15	6,775.64	186.69	6,754.10
HJMP-107	North Test	Prod. Zone Monitor	HJ	6,937.13	6,938.40	743,700	534,800	443	460	606	No	4.5	183.61	6,754.79	184.95	6,753.45
HJT-105	North Test	Prod. Zone Monitor	HJ	6,938.12	6,938.78	744,450	535,030	405	436	242	No	4.5	170.09	6,768.69	175.02	6,763.76
LC16M	North Test	Prod. Zone Monitor	HJ	6,934.76	6,936.38	744,553	534,811	410	467	1284	No	4.5	178.14	6,758.24	179.61	6,756.77
UKMO-101	North Test	Prod. Zone Monitor	HJ	6,940.57	6,942.48	744,100	534,940	465	485	810	No	4.5	177.59	6,764.89	183.30	6,759.18
LC20M	North Test	Underlying Monitor	UKM	6,949.27	6,950.64	743,383	535,331	511	543	14	Yes	4.5	202.36	6,748.28	203.23	6,747.41
UKMP-102	North Test	Underlying Monitor	UKM	6,940.87	6,942.03	744,150	535,150	485	505	785	Yes	4.5	190.68	6,751.35	191.83	6,750.20
UKMP-101	North Test	Underlying Monitor	UKM	6,940.26	6,941.75	744,100	534,930	540	572	815	No	4.5	192.13	6,749.62	192.66	6,749.09
LC18M	North Test	Overlying Monitor	LFG	6,948.43	6,949.03	743,368	535,316	290	332	15	Yes	4.5	168.04	6,780.99	169.14	6,779.89
LC25M	North Test	Overlying Monitor	LFG	6,935.00	6,936.52	743,397	534,601	316	349	697	No	4.5	167.05	6,769.47	168.60	6,767.92

Table 4-1
LC ISR, LLC
Lost Creek Regional Aquifer Test
Equipment Layout

LC19M Test			
Location	**Completion Interval**	**Monitoring Equipment**	**PSI Range**
HJMP-104	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
HJMP-107	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	15
HJMP-110	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
HJMP-111	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
HJT-104	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
HJT-105	HJ	In-Situ LevelTROLL 300A w/Hand Tag confirmation	30*
LC16M	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	15
LC19M	HJ	In-Situ LevelTROLL 300G w/Hand Tag confirmation	100
UKMO-101	HJ	Hand Tags Only	-----
UKMO-102	HJ	In-Situ LevelTROLL 300A w/Hand Tag confirmation	30*
LC20M	UKM	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
UKMP-101	UKM	In-Situ LevelTROLL 300G w/Hand Tag confirmation	15
UKMP-102	UKM	In-Situ LevelTROLL 300G w/Hand Tag confirmation	15
LC18M	LFG	In-Situ LevelTROLL 300G w/Hand Tag confirmation	30
LC25M	LFG	In-Situ LevelTROLL 300G w/Hand Tag confirmation	15

* - non-vented In-Situ LevelTROLL 300

Table 4-2
LC ISR, LLC
Lost Creek Regional Aquifer Test
Distances to Pumping Well and Observed Drawdown

LC19M Test

Start Date & Time: 6/27/07 17:20
End Date & Time: 7/3/07 10:51
Duration (minutes): 8,251.5
Ave. Pumping Rate: 42.9 gpm

Completion Type	Well No.	Distance from Pumping Well (feet)	Side of Fault	Drawdown Observed at End of Test (feet)	Respond to Pumping?
Pumping Well	LC19M	0	North	93.32	Yes
Production Zone Completions	HJMP-104	638	North	36.44	Yes
	HJMP-110	338	North	40.48	Yes
	HJMP-111	470	North	35.56	Yes
	HJT-104	501	North	40.44	Yes
	UKMO-102	783	North	21.54	Yes
	HJMP-107	606	South	1.34	Yes
	LC16M	1,284	South	1.47	Yes
	UKMO-101	810	South	5.71	Yes
	HJT-105	242	South	4.93	Yes
Overlying Completions	LC18M	15	North	1.10	Yes
	LC25M	697	South	1.55	Yes
Underlying Completions	LC20M	14	North	0.87	No
	UKMP-102	785	North	1.15	Yes
	UKMP-101	815	South	0.53	No

Table 4-3
LC ISR, LLC
Lost Creek Regional Aquifer Test
Flow Rate vs. Time:

LC19M Test												
DATE/TIME	MINUTES	INCREMENTAL MINUTES	TOTALIZER 1	TOTALIZER 2	T1 INCREMENTAL	T2 INCREMENTAL	CALC. T1 RATE	CALC. T2 RATE	CALC. T1T2 AVG	INSTANTANEOUS T1 RATE	INSTANTANEOUS T2 RATE	Comments
											----	
6/27/07 17:20	0	----	0	0	0	0	0.0	0.0	0.0	45.2	42.3	Pump on
6/28/07 9:15	955	955	42,152	40,303	42,152	40,303	44.1	42.2	43.2	45.2	42.1	
6/28/07 12:30	1,150	195	49,270	47,147	7,118	6,844	36.5	35.1	35.8	45.2	42.6	
6/28/07 15:50	1,350	200	57,953	55,478	8,683	8,331	43.4	41.7	42.5	45.0	42.3	
6/28/07 17:30	1,450	100	62,432	59,746	4,479	4,268	44.8	42.7	43.7	45.0	42.0	
6/29/07 10:30	2,470	1020	107,195	102,548	44,763	42,802	43.9	42.0	42.9	45.3	41.9	
6/29/07 16:42	2,842	372	123,466	118,215	16,271	15,667	43.7	42.1	42.9	45.4	42.7	
6/30/07 10:30	3,910	1068	168,436	161,301	44,970	43,086	42.1	40.3	41.2	44.5	42.3	
6/30/07 12:15	4,015	105	175,835	168352.0	7,399	7,052	70.5	67.2	68.8	45.5	42.2	Not sure why the bump in rate for this interval. Numbers presented correspond with field notes.
6/30/07 16:01	4,241	226	185,792	177881.0	9,957	9,529	44.1	42.2	43.1	44.4	42.1	
7/1/07 10:30	5,350	1109	234,953	224690.0	49,161	46,809	44.3	42.2	43.3	44.2	41.8	
7/1/07 15:01	5,621	271	246,738	235952.0	11,785	11,262	43.5	41.6	42.5	44.7	41.8	
7/2/07 12:20	6,900	1279	302,802	289390.0	56,064	53,438	43.8	41.8	42.8	44.7	41.8	
7/2/07 16:11	7,131	231	312,837	299025.0	10,035	9,635	43.4	41.7	42.6	44.7	41.8	
7/3/07 10:51	8,251.5	1120	362,039	346069.0	49,202	47,044	43.9	42.0	42.9	----	----	Pump off at 10:51:30 on 07/03/07
						Averages:	**43.9**	**41.9**	**42.9**	**44.9**	**42.1**	

Table 5-1
LC ISR, LLC
Lost Creek Regional Aquifer Test
Summary of Pump Test Results

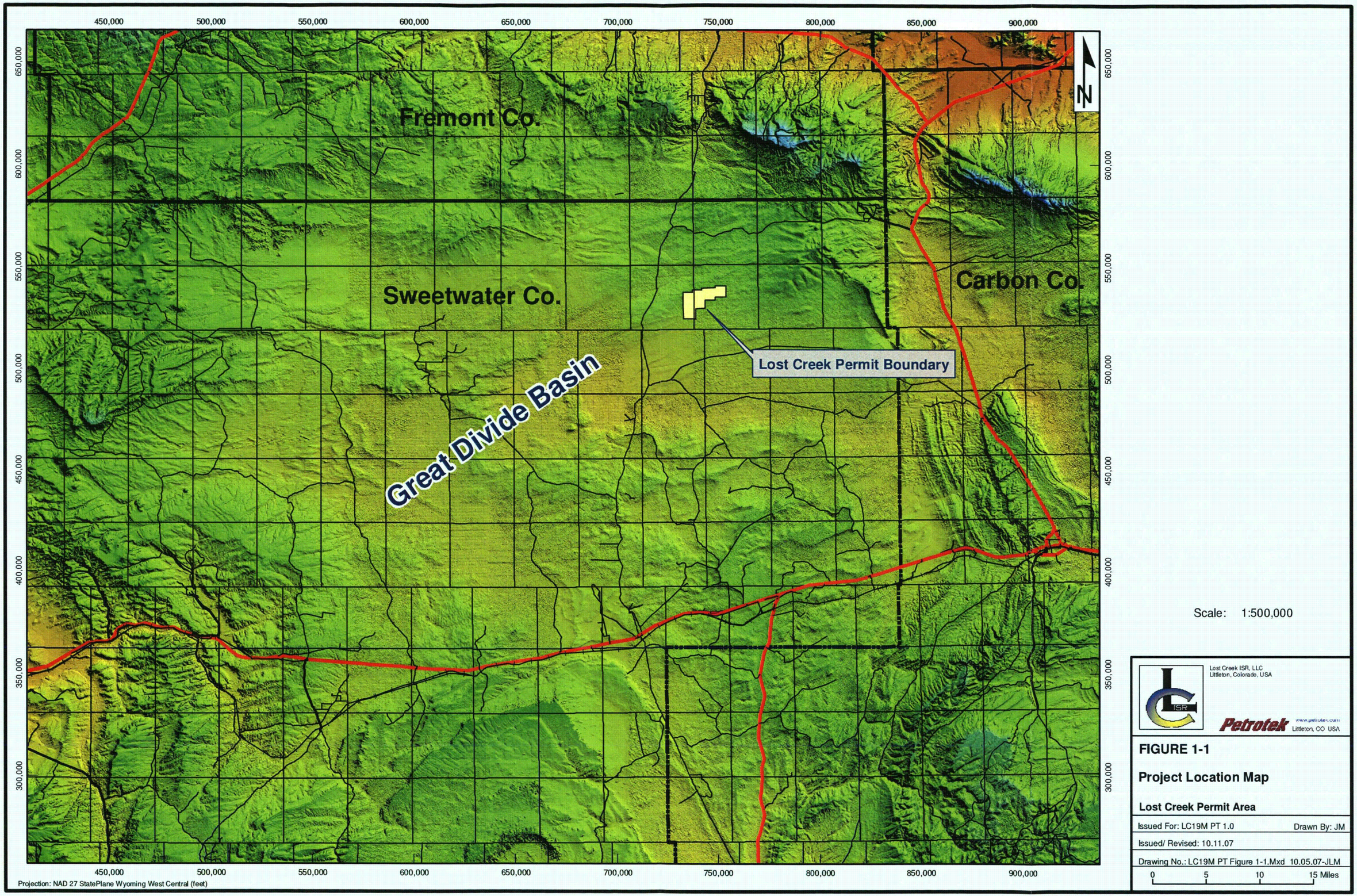
LC19M Test					
Well	Distance from Pumping Well (feet)	Analytical Results	Analytical Method: Theis Drawdown	Analytical Method: Theis Recovery	Averages
HJMP-104	638	Transmissivity (ft^2/day)	61.3	56.8	59.1
		Hyd. Cond. (ft/day)	5.1E-01	4.7E-01	4.9E-01
		Storativity	6.6E-05	-----	-----
HJMP-110	338	Transmissivity (ft^2/day)	66.4	63.0	64.7
		Hyd. Cond. (ft/day)	5.5E-01	5.3E-01	5.4E-01
		Storativity	1.3E-04	-----	-----
HJMP-111	470	Transmissivity (ft^2/day)	69.8	64.1	67.0
		Hyd. Cond. (ft/day)	5.8E-01	5.3E-01	5.6E-01
		Storativity	9.1E-05	-----	-----
HJT-104	501	Transmissivity (ft^2/day)	30.0	56.9	43.5
		Hyd. Cond. (ft/day)	2.5E-01	4.7E-01	3.6E-01
		Storativity	9.6E-05	-----	-----
UKMO-102	783	Transmissivity (ft^2/day)	75.5	76.9	76.2
		Hyd. Cond. (ft/day)	6.3E-01	6.4E-01	6.4E-01
		Storativity	1.5E-04	-----	-----
LC19M	Pumping Well	Transmissivity (ft^2/day)	-----	56.7	-----
		Hyd. Cond. (ft/day)	-----	4.7E-01	-----
		Storativity	-----	-----	-----

Average Transmissivity (ft^2/day) =	61.18
Average Hyd. Cond. (ft/day) =	0.51
Average Storativity =	1.1E-04

Table 5-2
LC ISR, LLC
Lost Creek Regional Aquifer Test
Summary of Transmissivity Results

LC19M Test	
Well	Theis Transmissivity (ft^2/d)
HJMP-104	59.1
HJMP-110	64.7
HJMP-111	67.0
HJT-104	43.5
UKMO-102	76.2
LC19M	56.7

Average T = 63.3 ft^2/day



Scale: 1:500,000

Lost Creek ISR, LLC
Littleton, Colorado, USA

Petrotek www.petrotek.com Littleton, CO USA

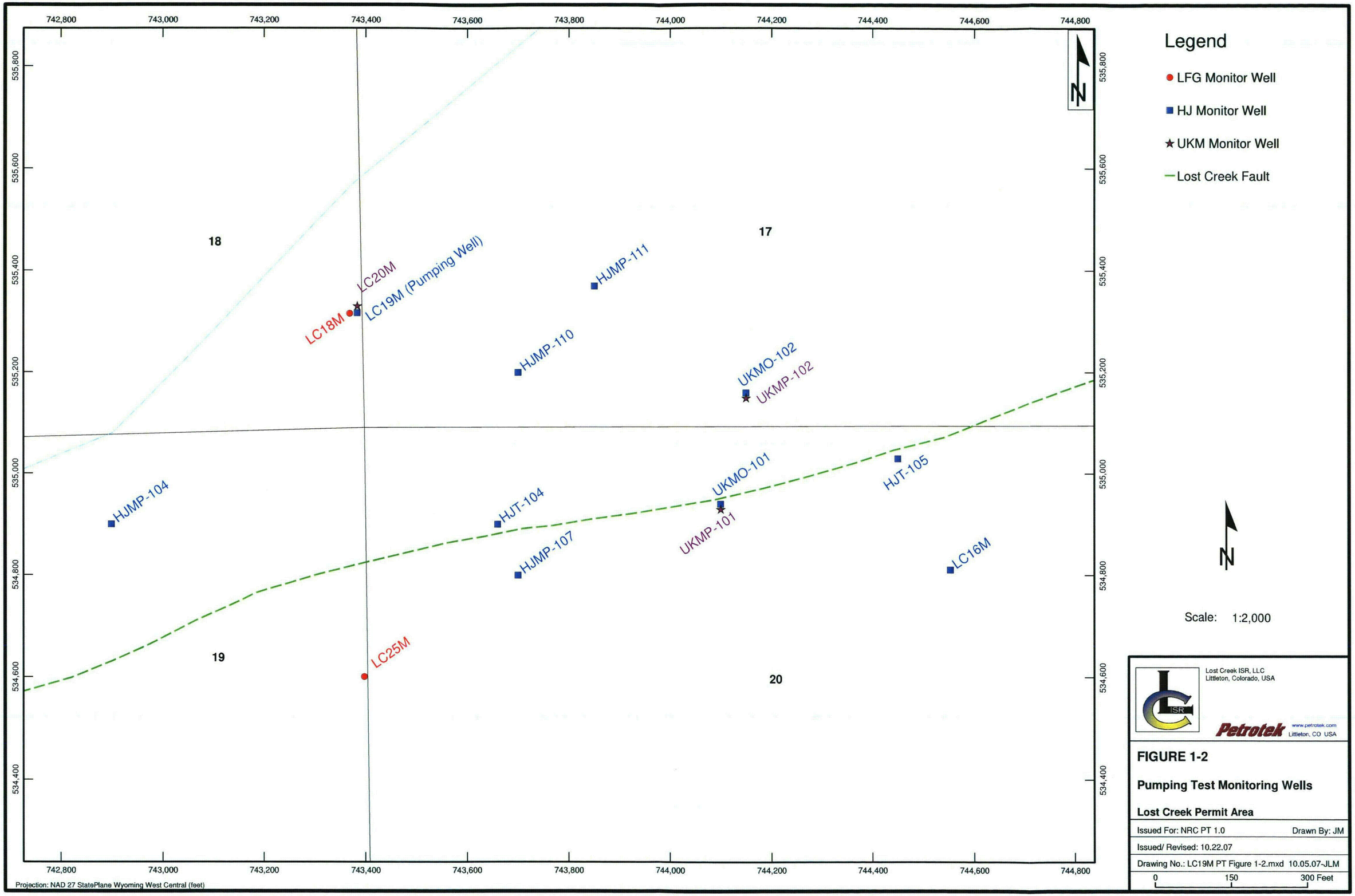
FIGURE 1-1

Project Location Map

Lost Creek Permit Area

Issued For: LC19M PT 1.0	Drawn By: JM
Issued/ Revised: 10.11.07	
Drawing No.: LC19M PT Figure 1-1.Mxd 10.05.07-JLM	

0 5 10 15 Miles



Legend

- LFG Monitor Well
- HJ Monitor Well
- UKM Monitor Well
- Lost Creek Fault

N

Scale: 1:2,000

Lost Creek ISR, LLC
Littleton, Colorado, USA

Petrotek www.petrotek.com Littleton, CO USA

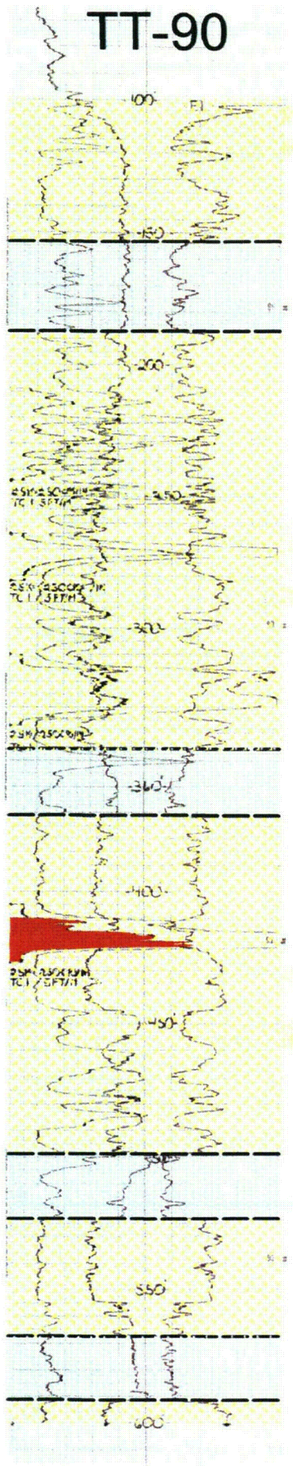
FIGURE 1-2

Pumping Test Monitoring Wells

Lost Creek Permit Area

Issued For: NRC PT 1.0	Drawn By: JM
Issued/ Revised: 10.22.07	
Drawing No.: LC19M PT Figure 1-2.mxd 10.05.07-JLM	

0 150 300 Feet



DE Horizon

DE - Alternating very fine, course-grained sandstone, mudstone and siltstone. Minor host for uranium mineralization.

Shale Horizon

FG Horizon
(Overlying Aquifer)

FG - Lenticular arkosic sandstones with intervals of mudstone and siltstone. Categorized as suspended load facies. Cut and fill channels not as prominent as in HJ horizon. Minor host for uranium mineralization.

LC Shale
(Overlying Confining Unit)

LCS - Shale horizon separating FG from HJ; a virtually continuous aquiclude in Lost Creek area.

Mineralization

HJ Horizon
(Production Zone Aquifer)

HJ - Course-grained arkoses with minor matrix. Very thin lenticular intervals of fine sands. Cut and fill channels are prominent. Mixed load facies. Major host to uranium mineralization, especially in middle parts.

SB Shale
(Underlying Confining Unit)

SB Shale - Shale/mudstone separating HJ from UKM Sand. Continuous throughout Permit Area.

UKM Sand
(Underlying Aquifer)

UKM - Generally massive, coarse-grained sandstone with lenticular fine sand intervals. Mixed load facies. Host to significant uranium mineralization.

NN Shale

NN Shale - No Name Shale, separating UKM Sand from MKM Sand.

MKM Sand

MKM Sand - Similar to the UKM Sand.

Lost Creek ISR, LLC
Littleton, Colorado, USA

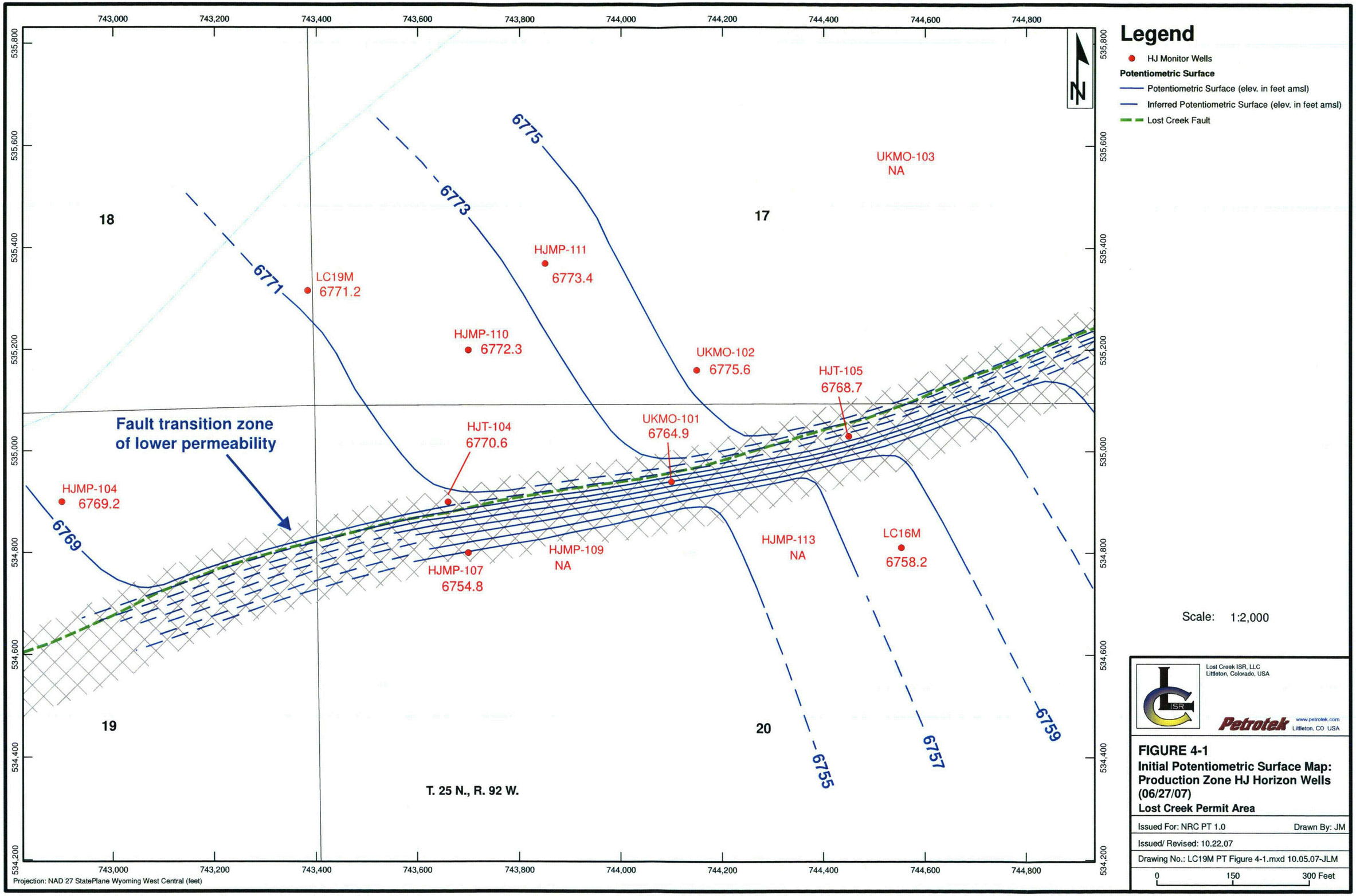
Petrotek www.petrotek.com Littleton, CO USA

FIGURE 2-1

Lost Creek Hydrostratigraphic Units

Lost Creek Permit Area

Issued For: LC19M PT 1.0	Drawn By: JM
Issued/ Revised: 10.03.07	
Drawing No.: LC19M PT Figure 2-1.mxd 10.03.07-JLM	



Legend

- HJ Monitor Wells

Potentiometric Surface

- Potentiometric Surface (elev. in feet amsl)
- Inferred Potentiometric Surface (elev. in feet amsl)
- Lost Creek Fault

Scale: 1:2,000

Lost Creek ISR, LLC
Littleton, Colorado, USA

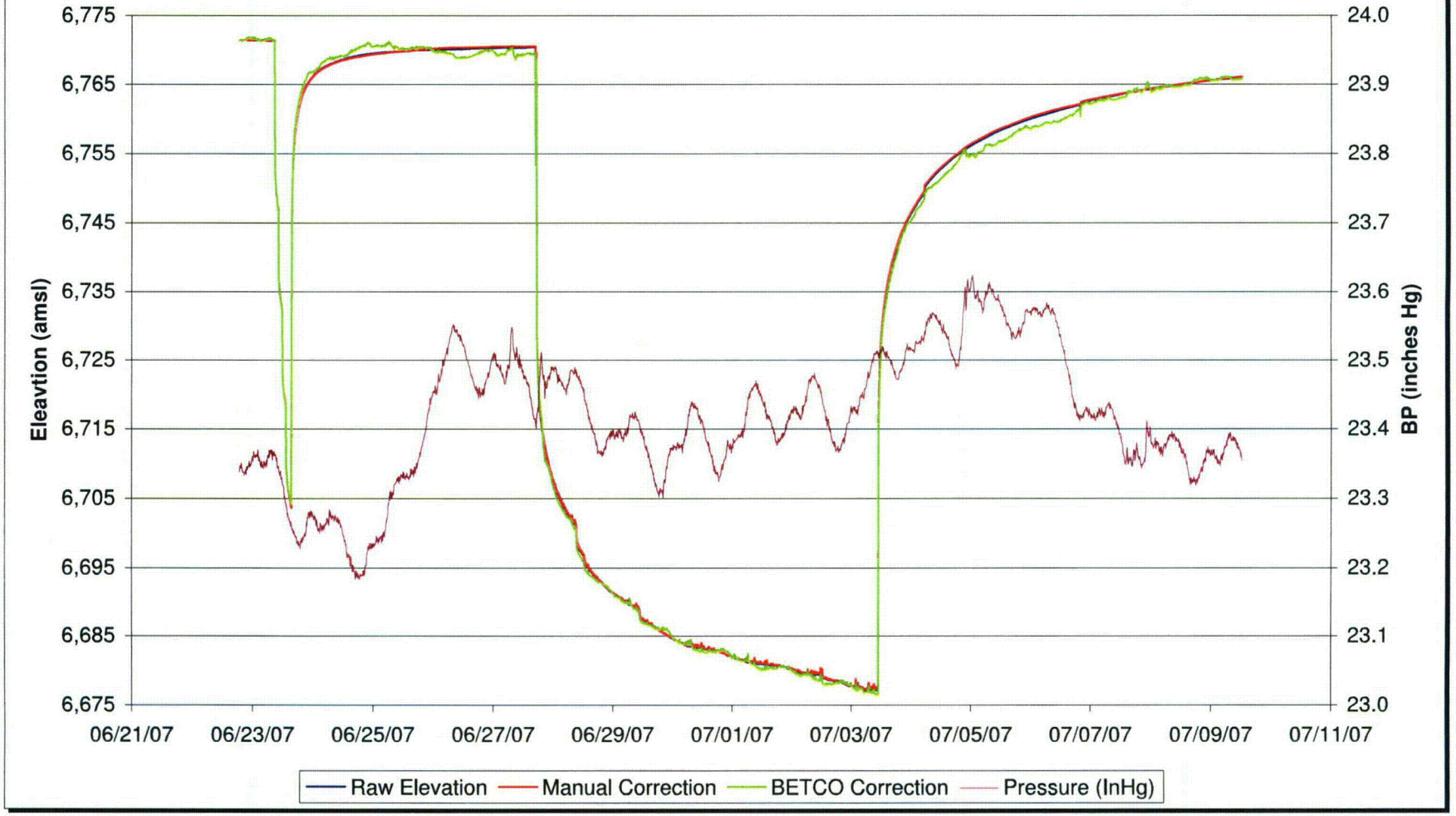
Petrotek www.petrotek.com Littleton, CO USA

FIGURE 4-1
Initial Potentiometric Surface Map: Production Zone HJ Horizon Wells (06/27/07)
Lost Creek Permit Area

Issued For: NRC PT 1.0	Drawn By: JM
Issued/ Revised: 10.22.07	
Drawing No.: LC19M PT Figure 4-1.mxd 10.05.07-JLM	

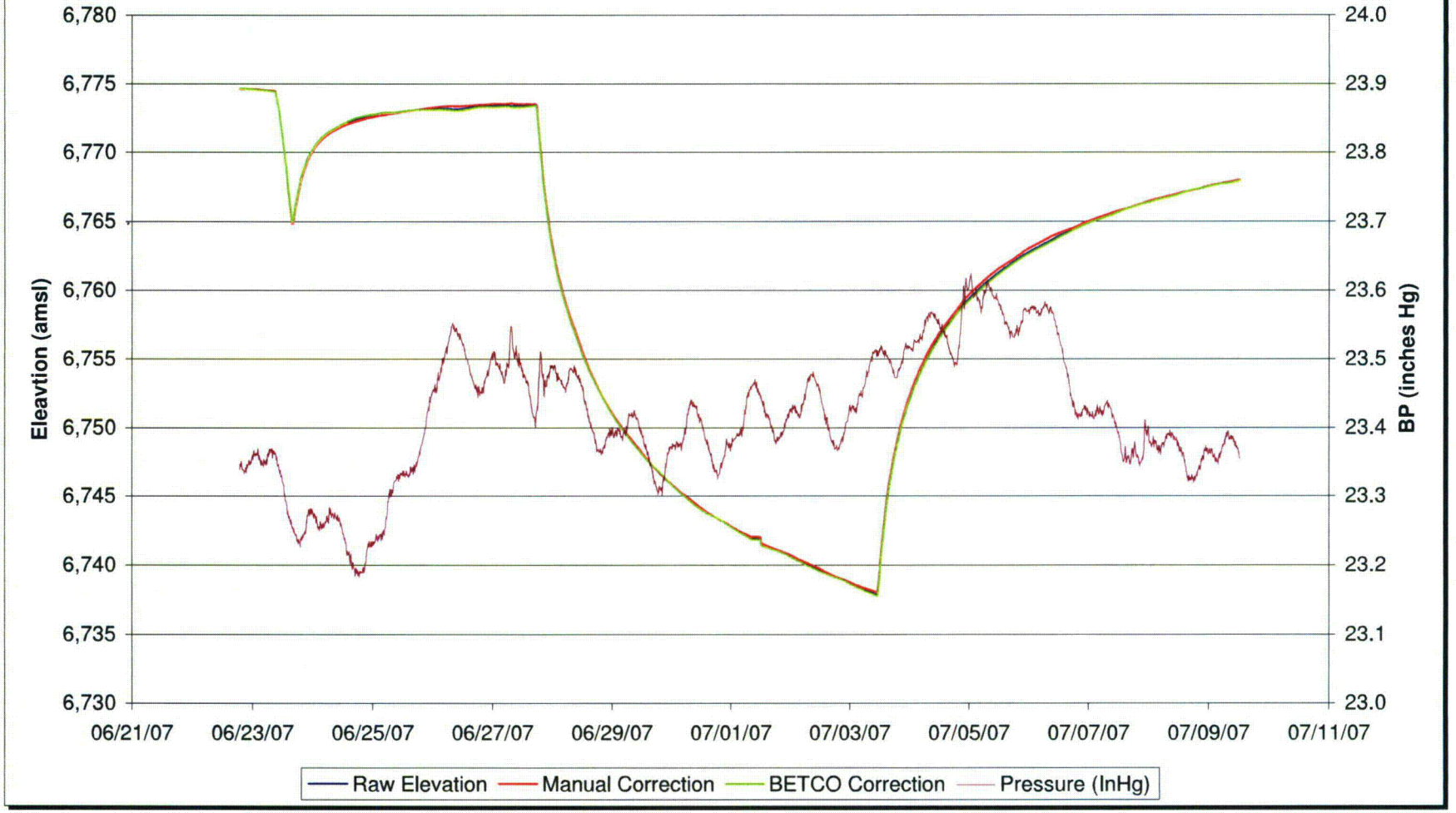
0 150 300 Feet

Figure 5-1
Comparison of Barometric Corrections to Drawdown Observed at LC19M (pumping well)
North of Lost Creek Fault



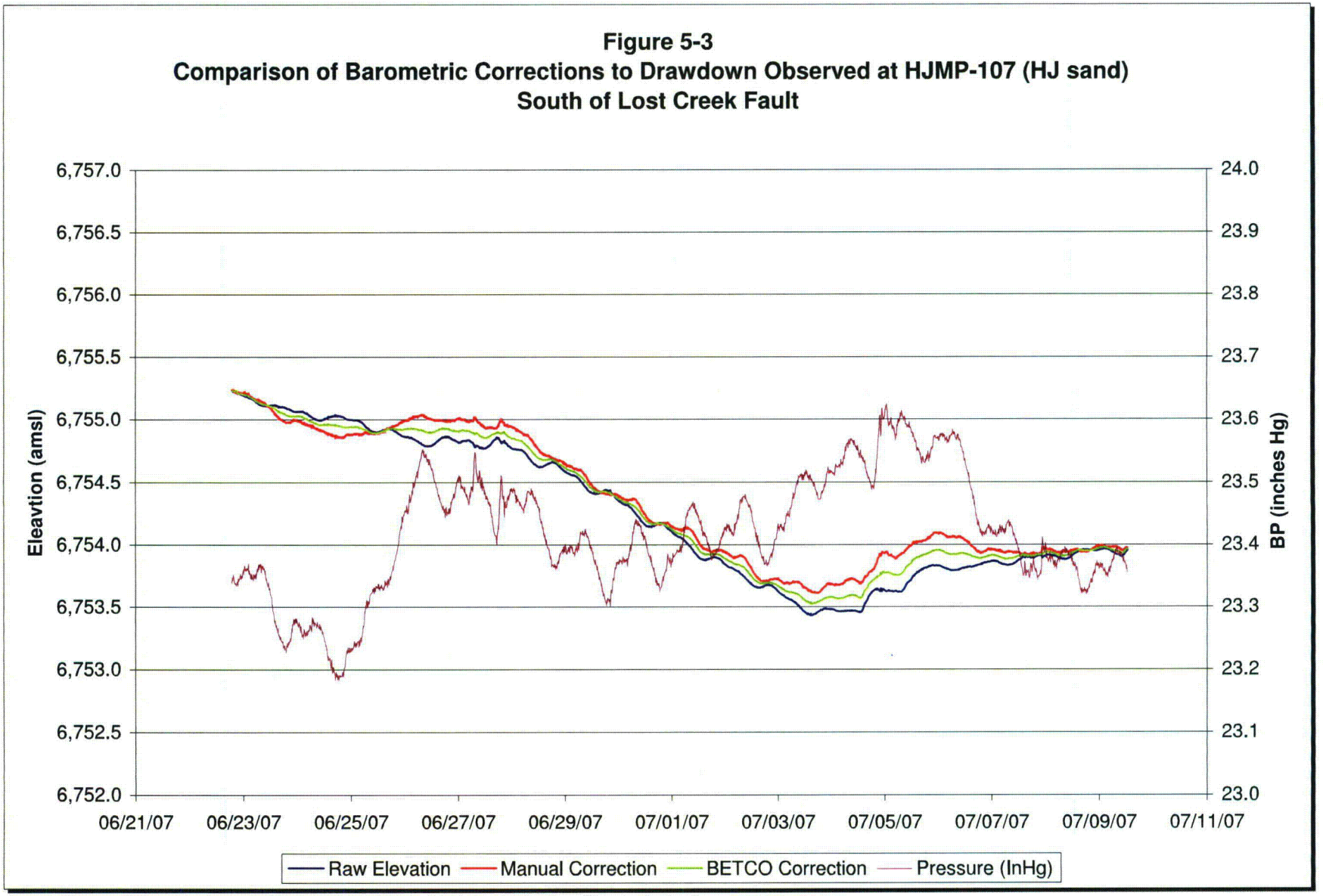
Select BP Corrections.xls

Figure 5-2
Comparison of Barometric Corrections to Drawdown Observed at HJMP-111 (HJ sand)
North of Lost Creek Fault



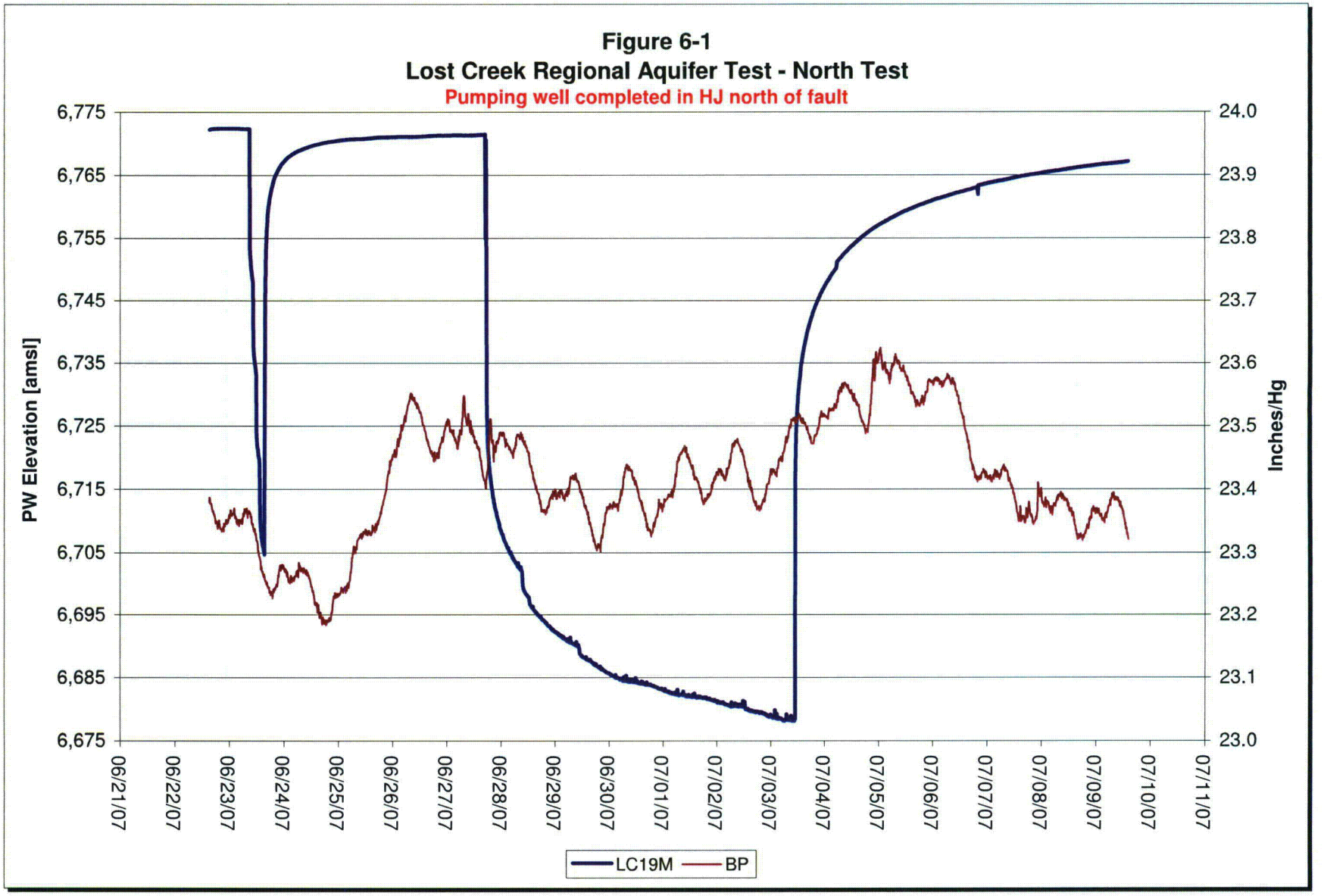
Select BP Corrections.xls

Figure 5-3
Comparison of Barometric Corrections to Drawdown Observed at HJMP-107 (HJ sand)
South of Lost Creek Fault



Select BP Corrections.xls

Figure 6-1
Lost Creek Regional Aquifer Test - North Test
Pumping well completed in HJ north of fault



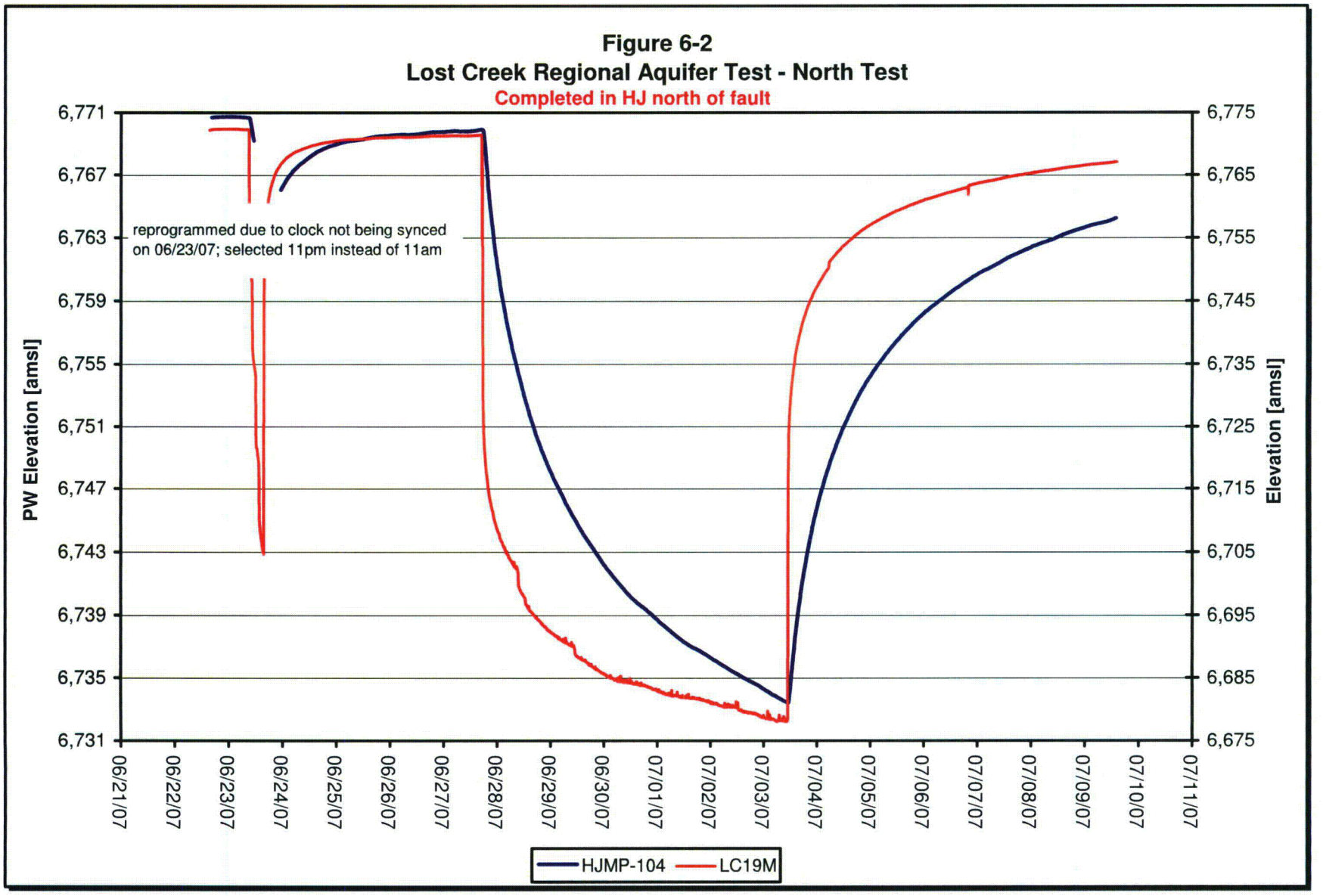
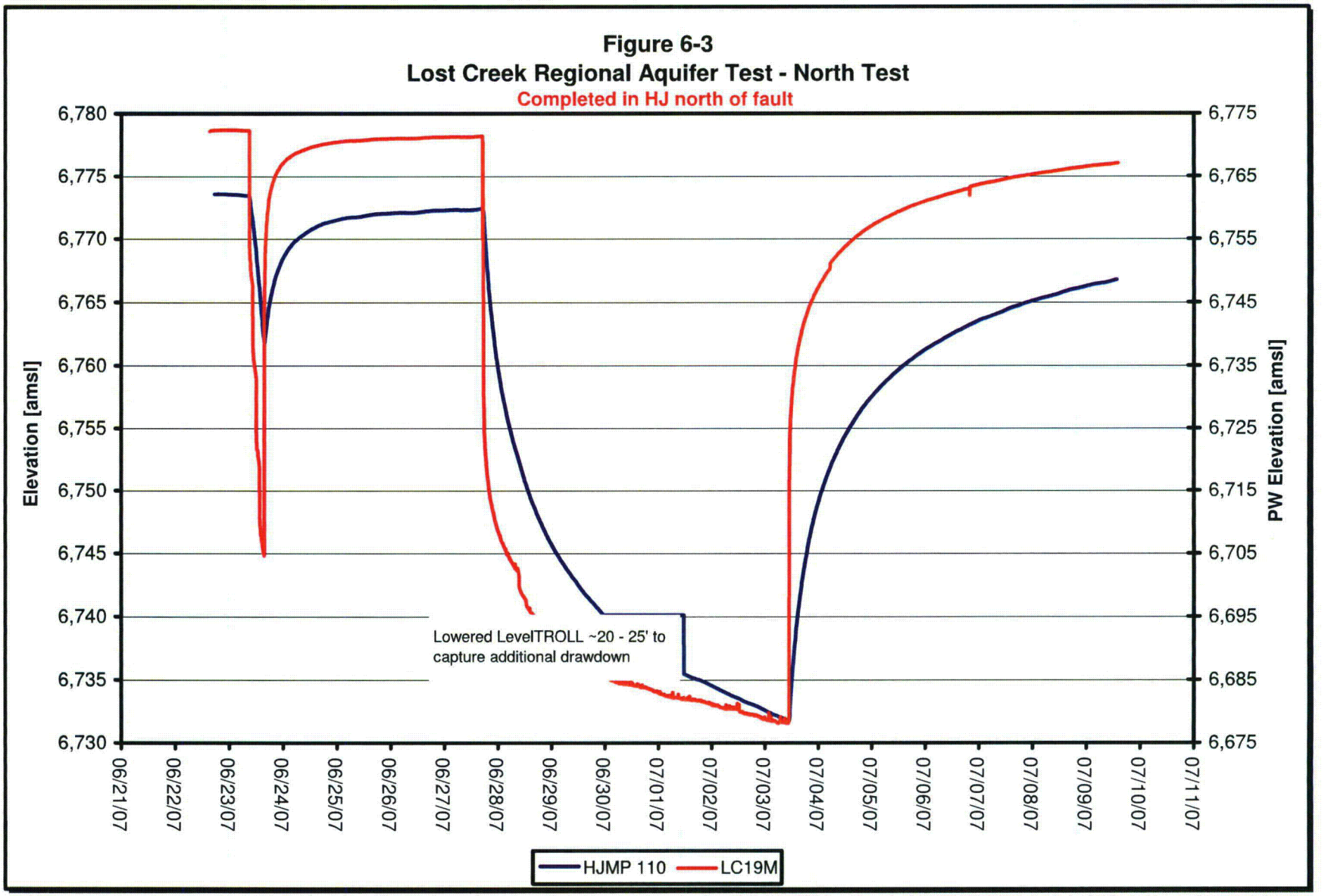


Figure 6-2
Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
PW Elevation [amsl]
Elevation [amsl]
6,771
6,767
6,763
6,759
6,755
6,751
6,747
6,743
6,739
6,735
6,731
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
reprogrammed due to clock not being synced
on 06/23/07; selected 11pm instead of 11am
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJMP-104
LC19M

Figure 6-3
Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault



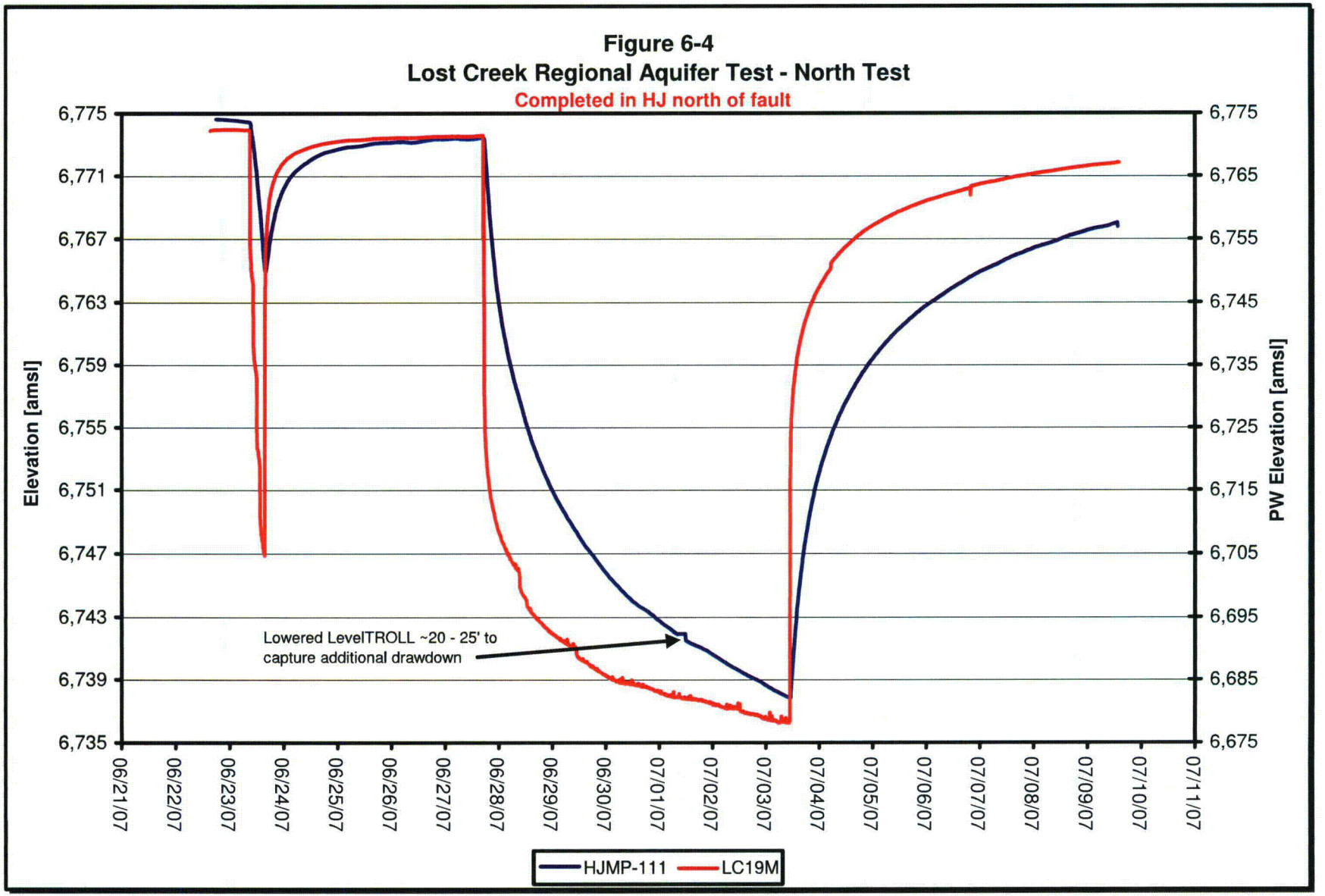


Figure 6-4
Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
Elevation [amsl]
PW Elevation [amsl]
6,775
6,771
6,767
6,763
6,759
6,755
6,751
6,747
6,743
6,739
6,735
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
Lowered LevelTROLL ~20 - 25' to
capture additional drawdown
HJMP-111
LC19M

Figure 6-5
Lost Creek Regional Aquifer Test - North Test

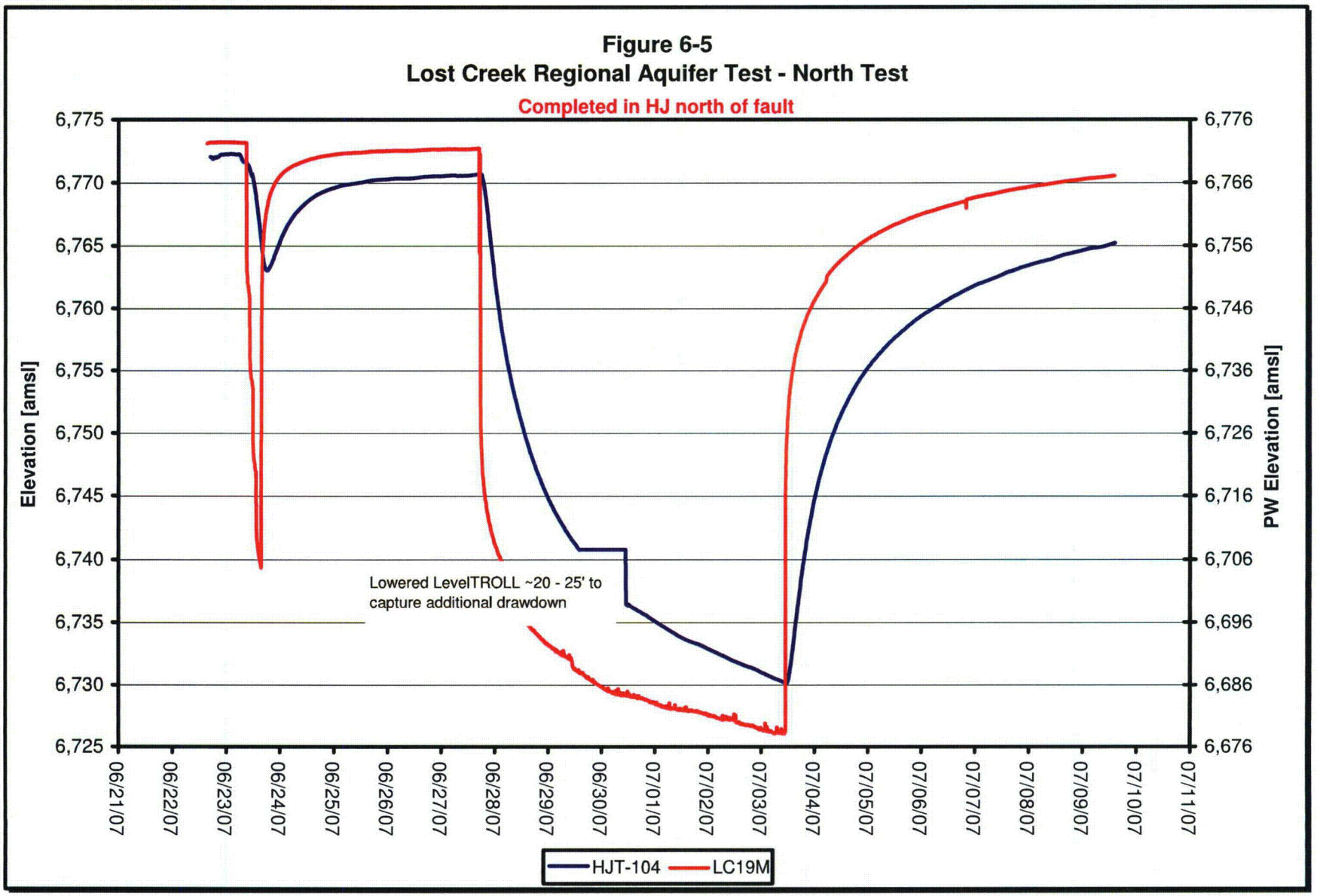
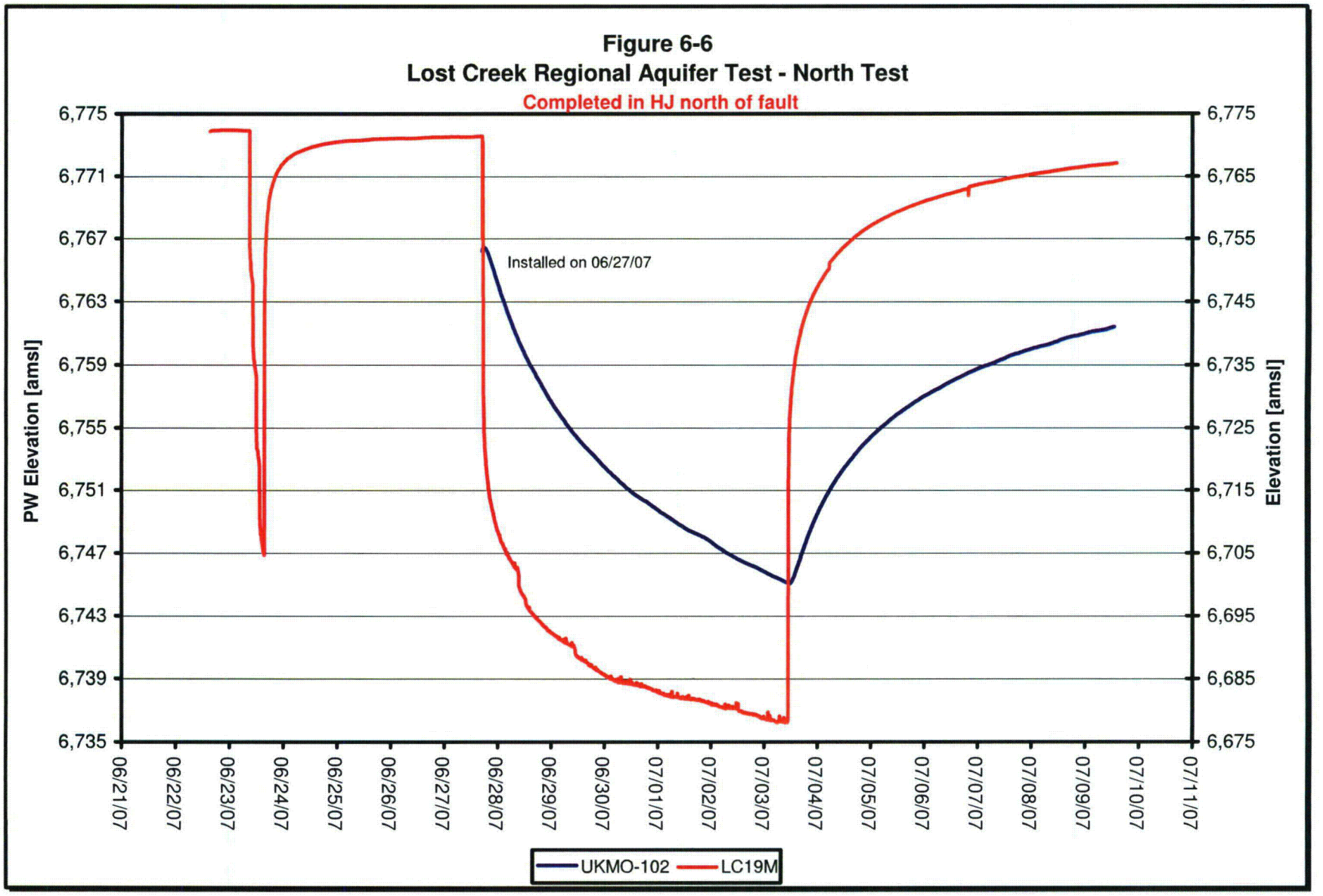


Figure 6-6
Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault



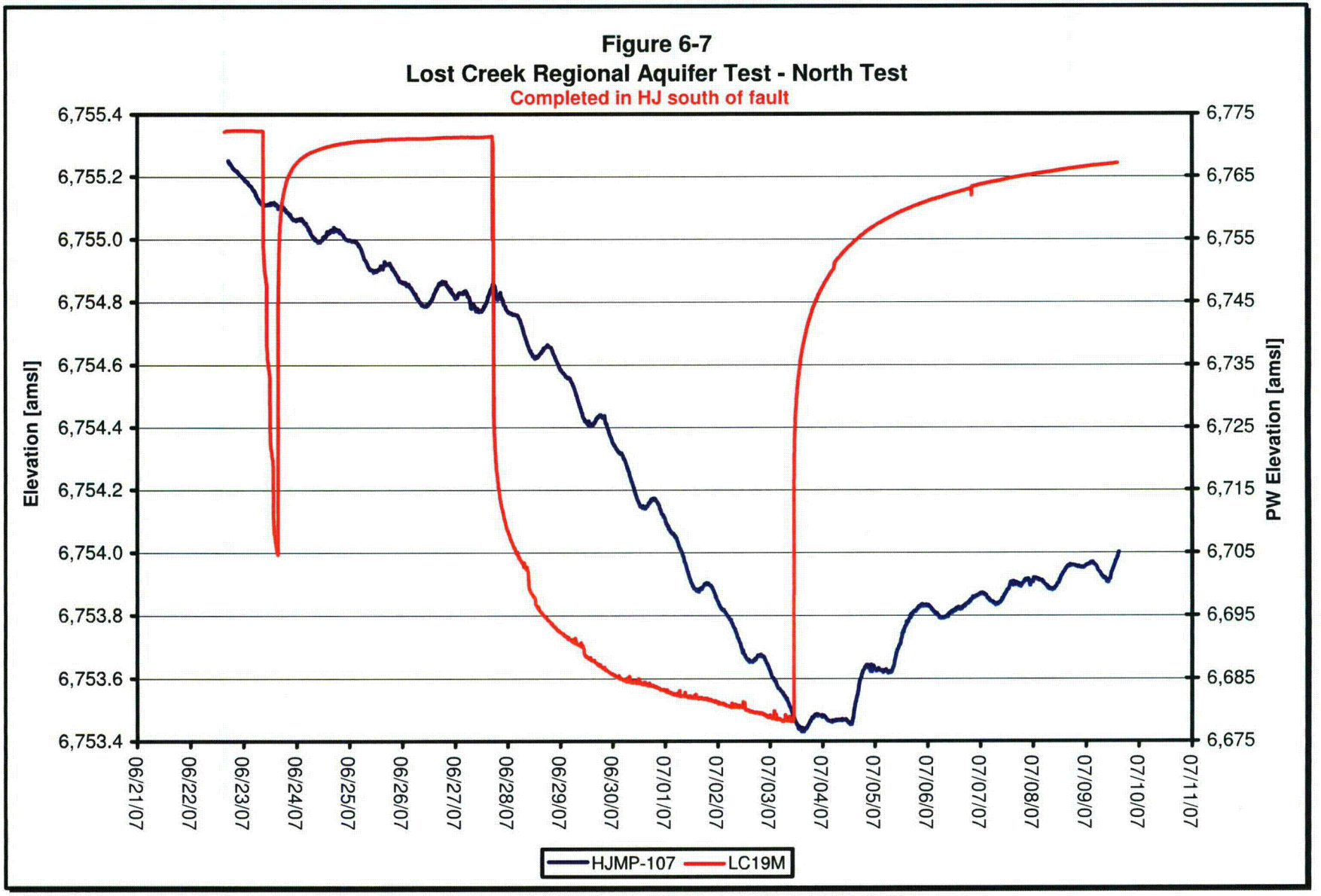
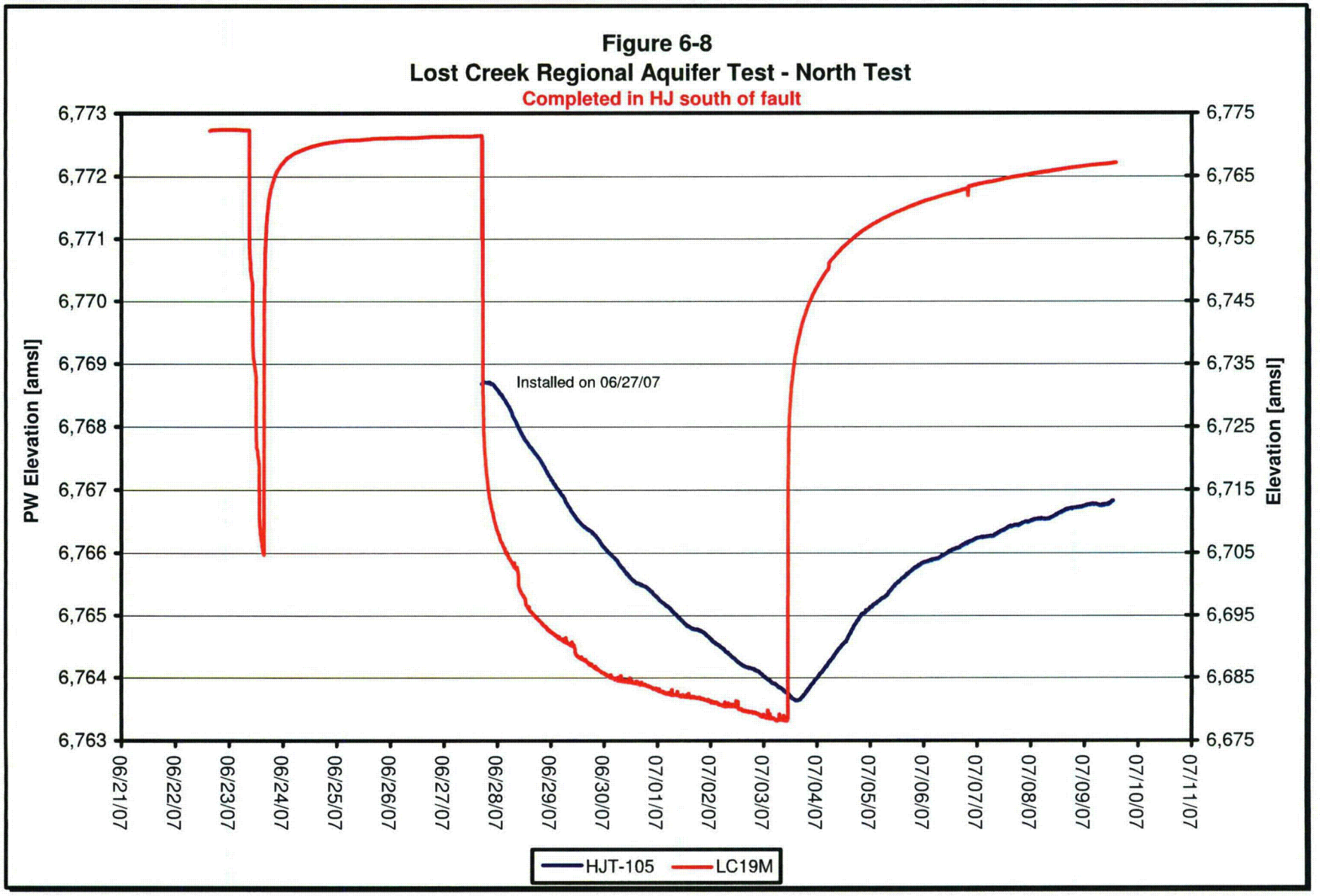


Figure 6-7
Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
Elevation [amsl]
PW Elevation [amsl]
6,755.4
6,755.2
6,755.0
6,754.8
6,754.6
6,754.4
6,754.2
6,754.0
6,753.8
6,753.6
6,753.4
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJMP-107
LC19M

Figure 6-8
Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault



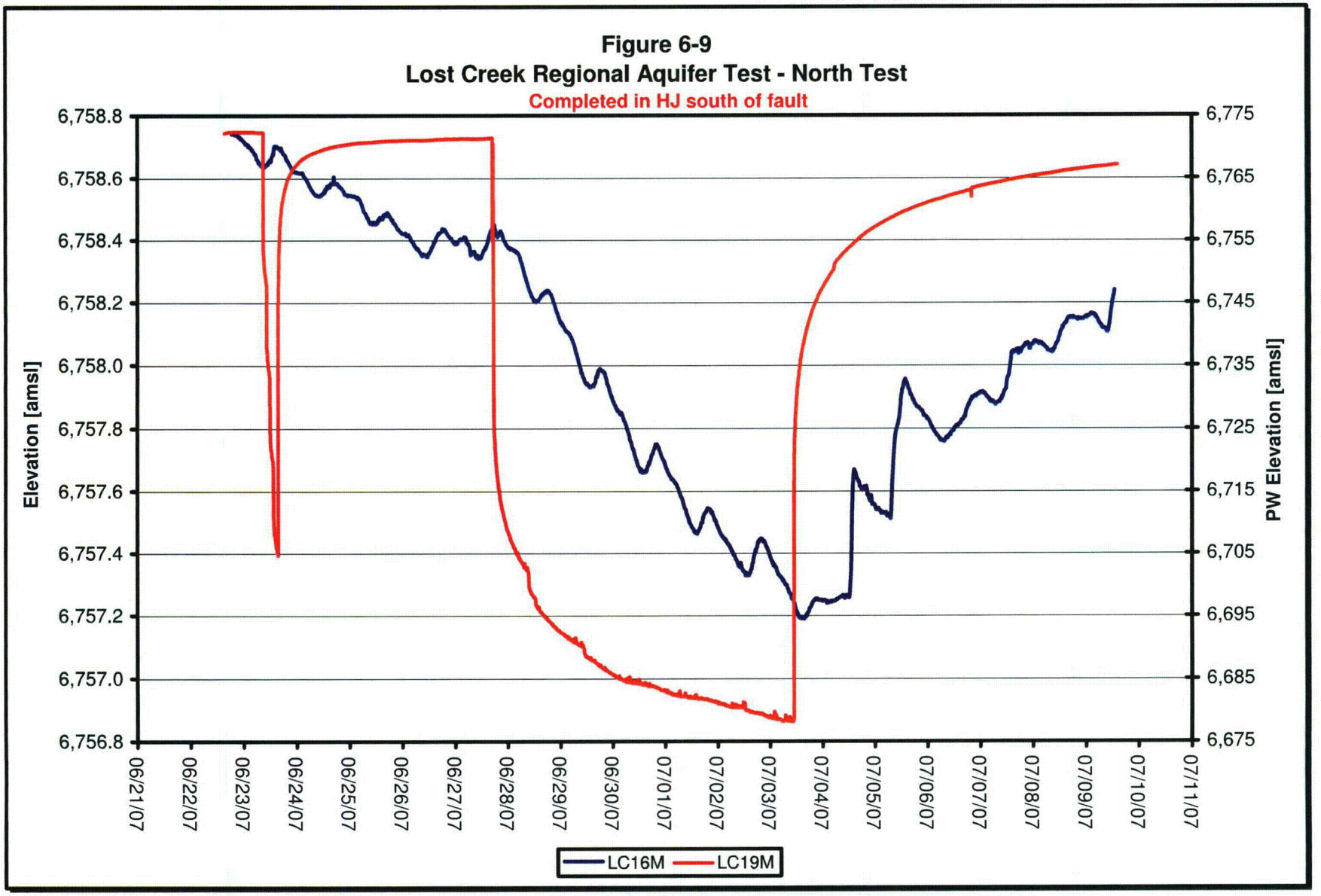
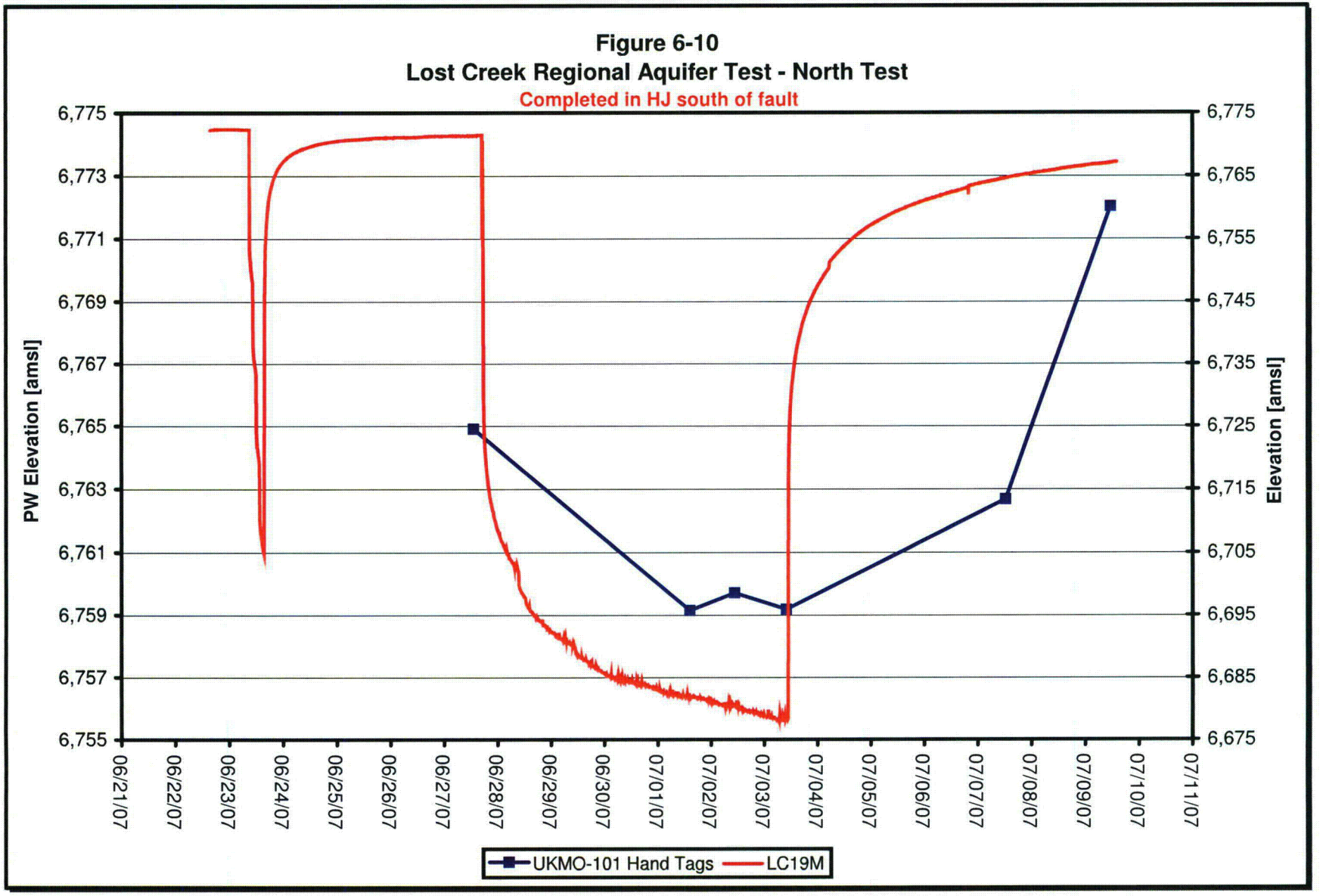


Figure 6-9
Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
Elevation [amsl]
PW Elevation [amsl]
6,758.8
6,758.6
6,758.4
6,758.2
6,758.0
6,757.8
6,757.6
6,757.4
6,757.2
6,757.0
6,756.8
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
LC16M
LC19M

Figure 6-10
Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault



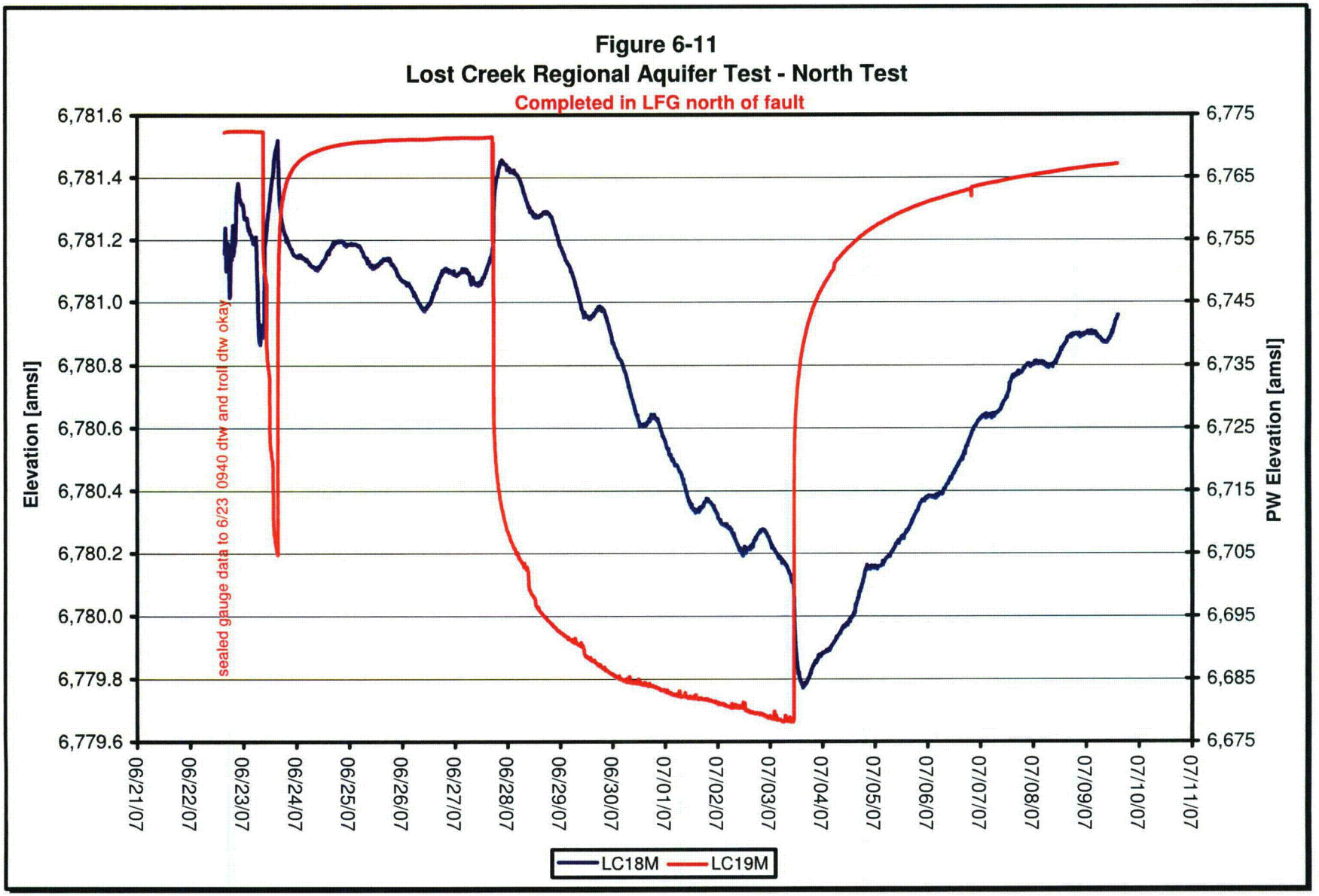


Figure 6-11
Lost Creek Regional Aquifer Test - North Test
Completed in LFG north of fault
Elevation [amsl]
PW Elevation [amsl]
6,781.6
6,781.4
6,781.2
6,781.0
6,780.8
6,780.6
6,780.4
6,780.2
6,780.0
6,779.8
6,779.6
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
sealed gauge data to 6/23 0940 dtw and troll dtw okay
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
LC18M
LC19M

Figure 6-12
Lost Creek Regional Aquifer Test - North Test
Completed in LFG south of fault

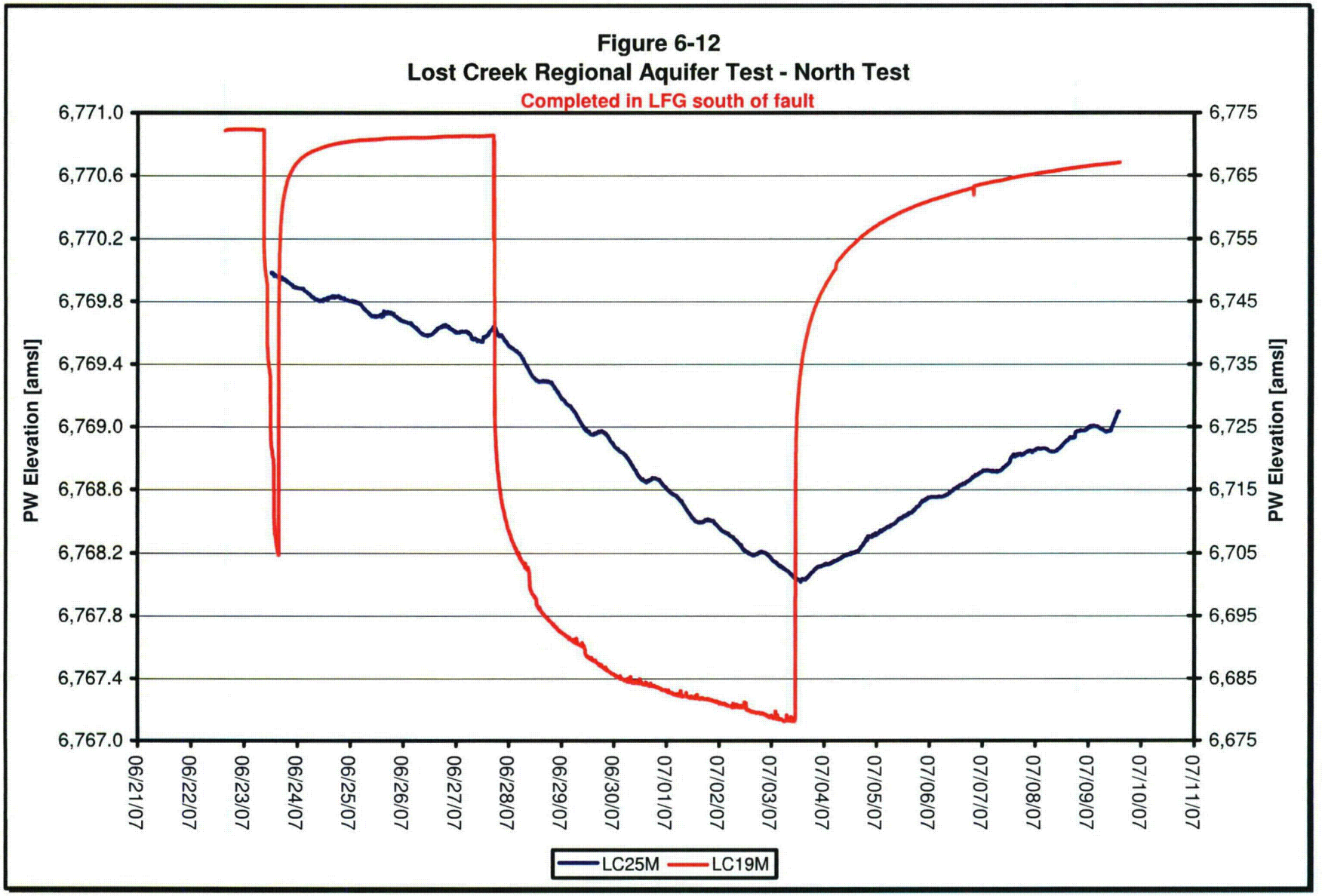
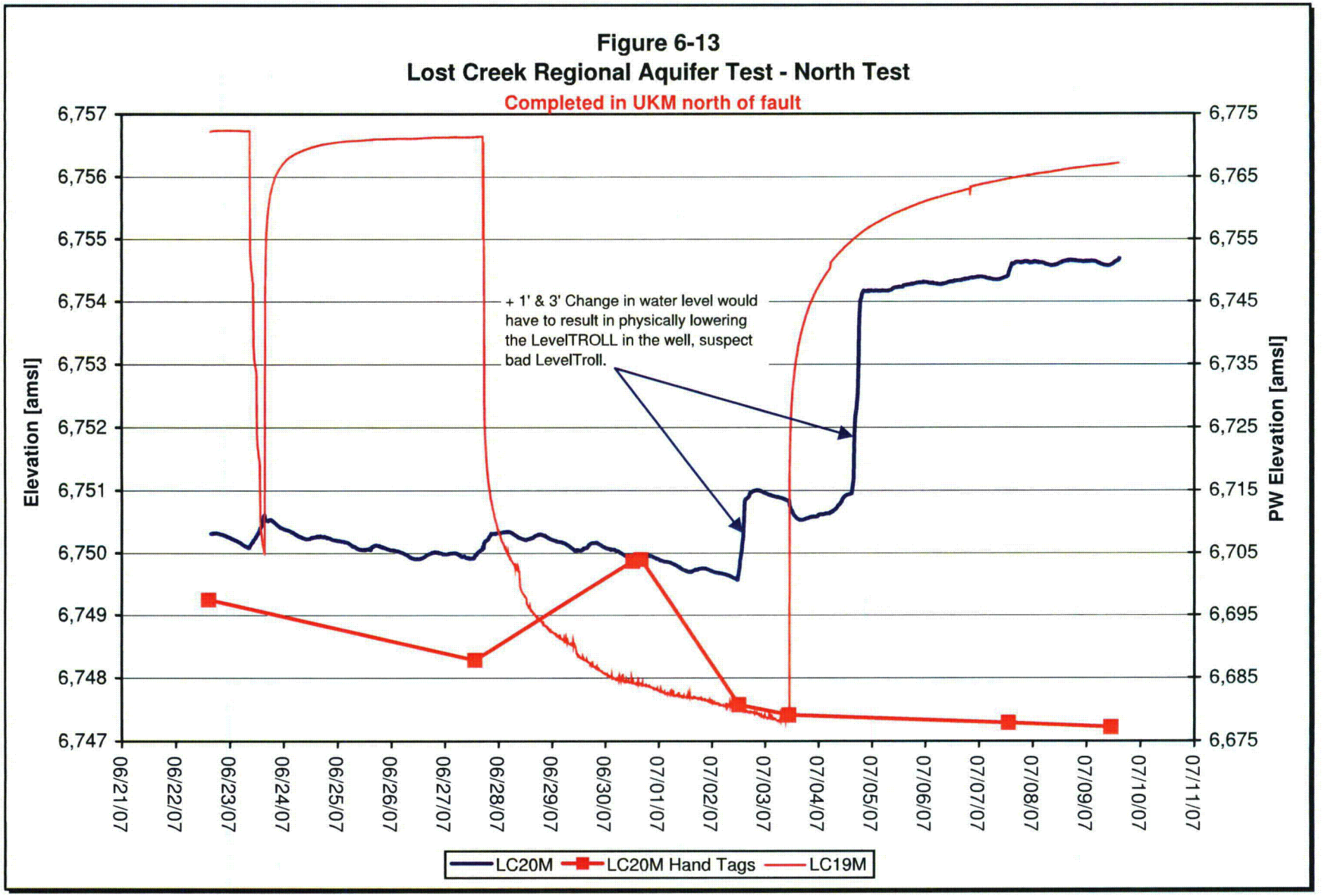


Figure 6-13
Lost Creek Regional Aquifer Test - North Test
Completed in UKM north of fault



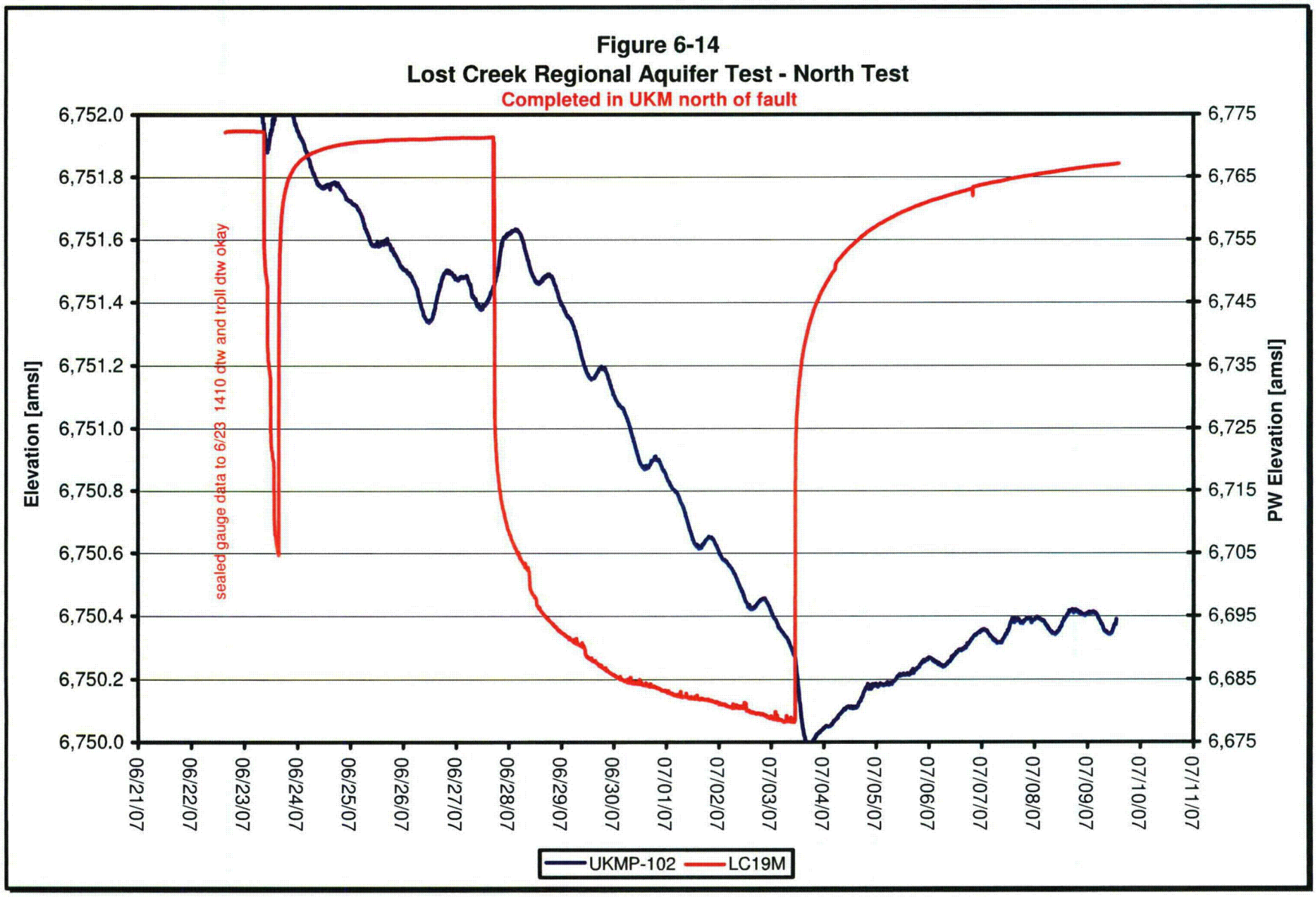
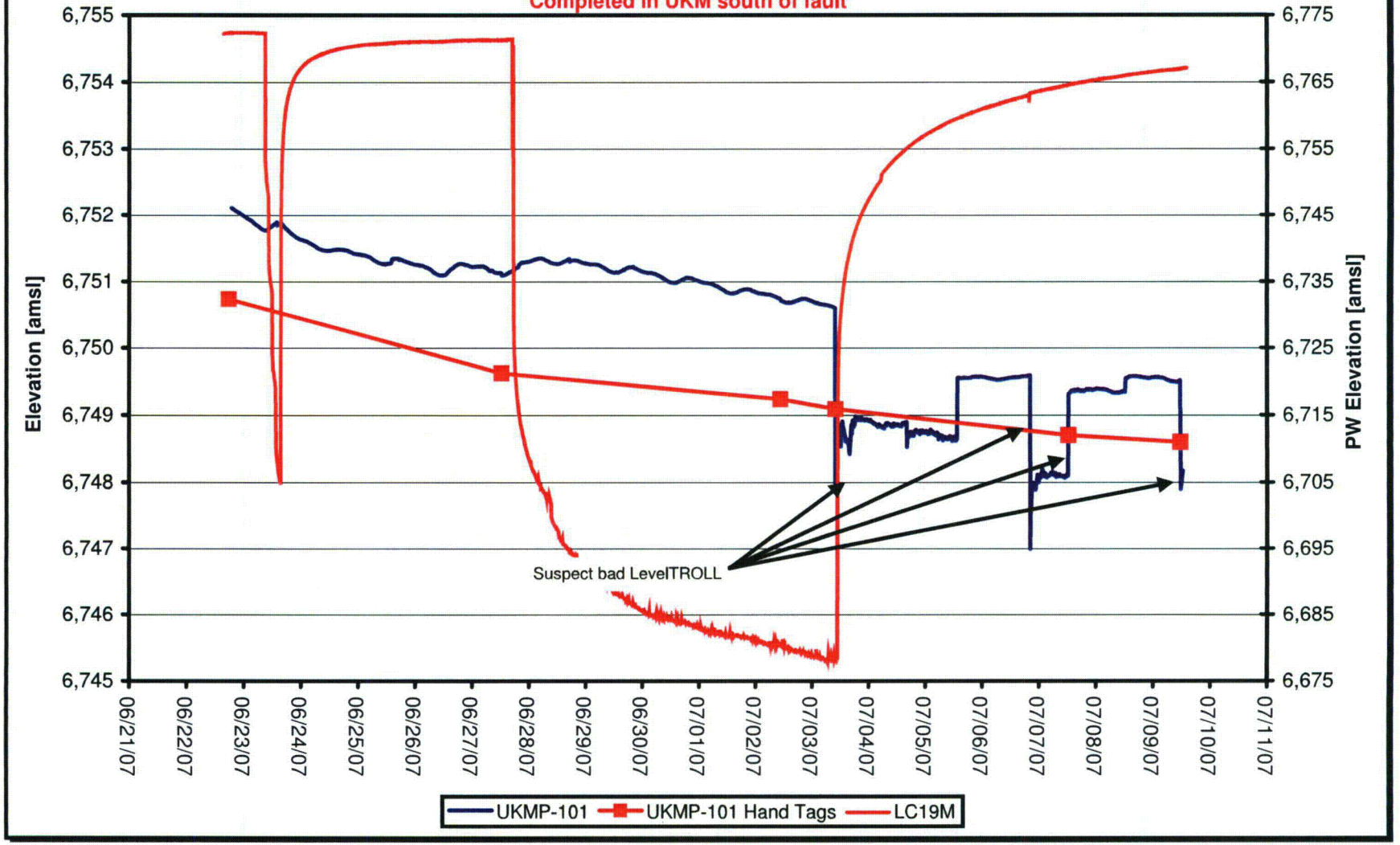
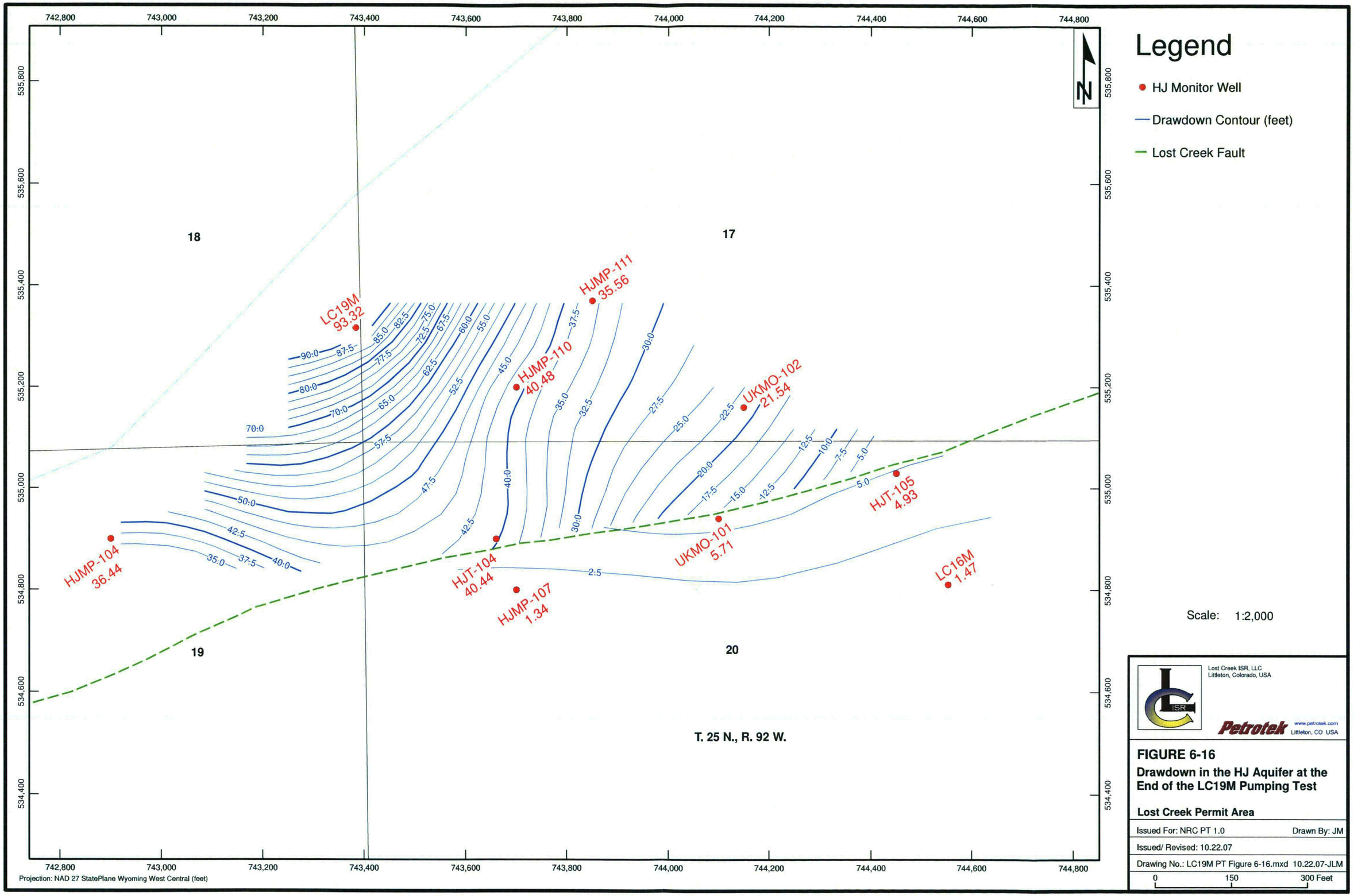


Figure 6-14
Lost Creek Regional Aquifer Test - North Test
Completed in UKM north of fault
Elevation [amsl]
PW Elevation [amsl]
6,752.0
6,751.8
6,751.6
6,751.4
6,751.2
6,751.0
6,750.8
6,750.6
6,750.4
6,750.2
6,750.0
6,775
6,765
6,755
6,745
6,735
6,725
6,715
6,705
6,695
6,685
6,675
sealed gauge data to 6/23 1410 dtw and troll dtw okay
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
UKMP-102
LC19M

Figure 6-15
Lost Creek Regional Aquifer Test - North Test
Completed in UKM south of fault





Legend

- HJ Monitor Well
- Drawdown Contour (feet)
- Lost Creek Fault

Scale: 1:2,000

Projection: NAD 27 StatePlane Wyoming West Central (feet)

Lost Creek ISR, LLC
Littleton, Colorado, USA

Petrotek www.petrotek.com Littleton, CO USA

FIGURE 6-16

Drawdown in the HJ Aquifer at the End of the LC19M Pumping Test

Lost Creek Permit Area

Issued For: NRC PT 1.0	Drawn By: JM
Issued/ Revised: 10.22.07	
Drawing No.: LC19M PT Figure 6-16.mxd 10.22.07-JLM	

0 150 300 Feet

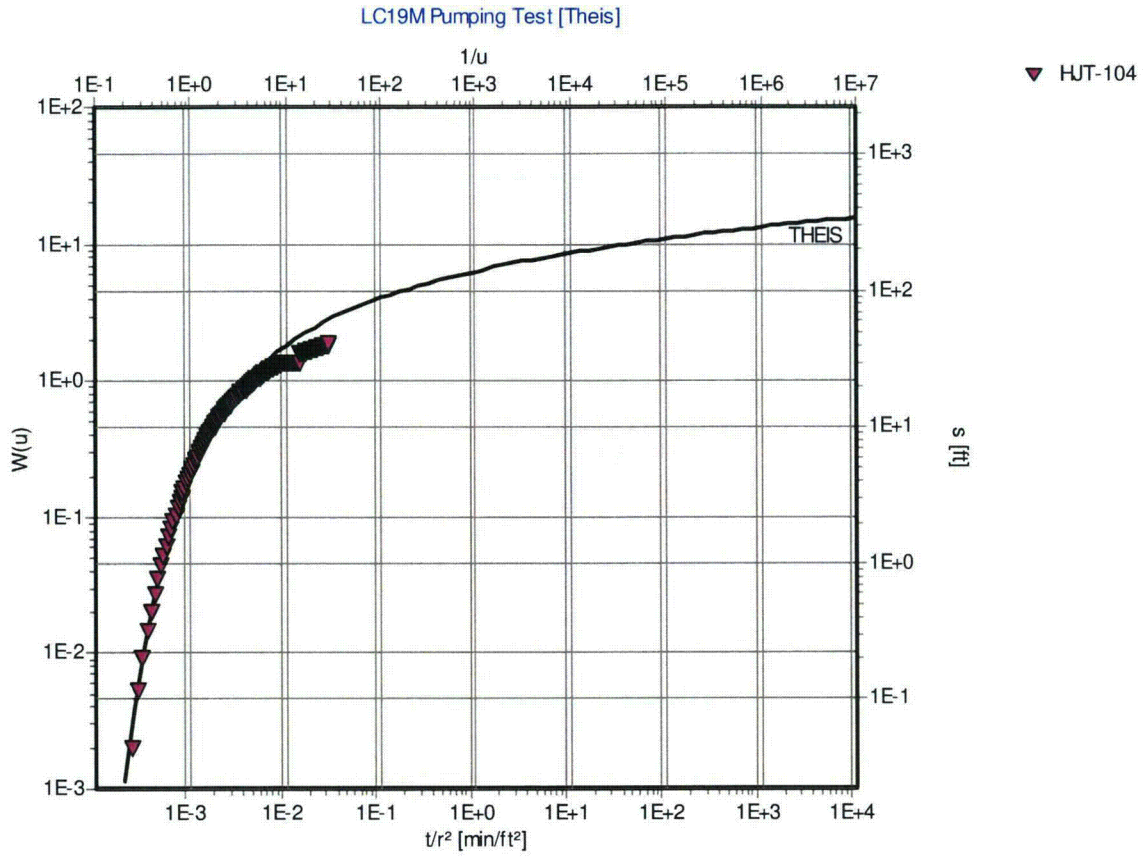
Petrotek
10288 West Chatfield Avenue • Suite 201 • Littleton, Colorado 80127-4239 USA
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

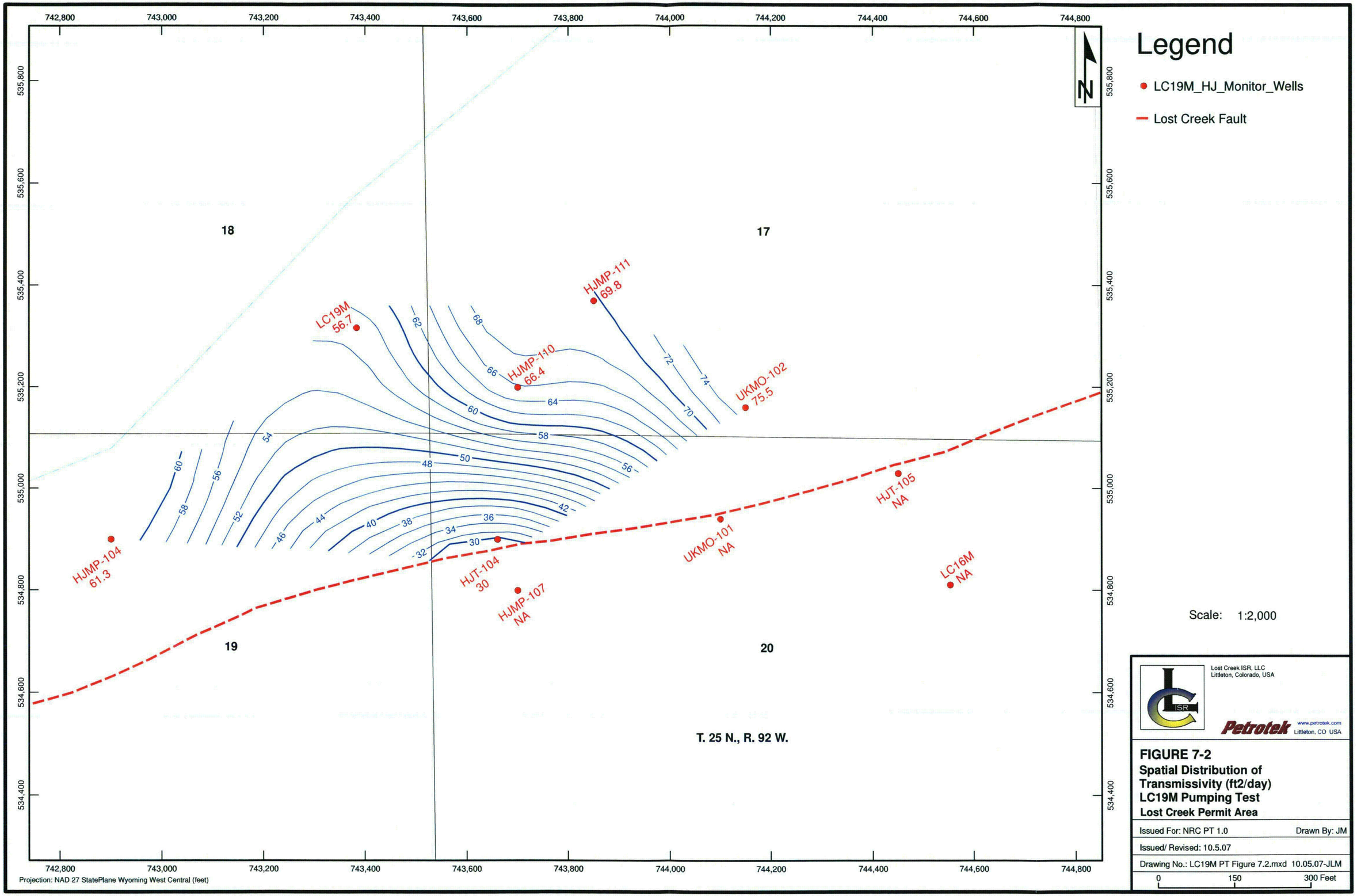
Analysis Results:	Transmissivity:	3.00E+1 [ft²/d]	Conductivity:	2.50E-1 [ft/d]
	Storativity:	9.58E-5		
Test parameters:	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault. Early to middle time data was used for match due to effects of Fault on later time data.

Figure 7-1
HJT-104 Theis Analysis

Evaluated by: KRS

Evaluation Date: 10/3/2007



Legend

- LC19M_HJ_Monitor_Wells
- Lost Creek Fault

Scale: 1:2,000

Lost Creek ISR, LLC
Littleton, Colorado, USA

Petrotek www.petrotek.com Littleton, CO USA

FIGURE 7-2
Spatial Distribution of Transmissivity (ft2/day) LC19M Pumping Test
Lost Creek Permit Area

Issued For: NRC PT 1.0	Drawn By: JM
Issued/ Revised: 10.5.07	
Drawing No.: LC19M PT Figure 7.2.mxd 10.05.07-JLM	

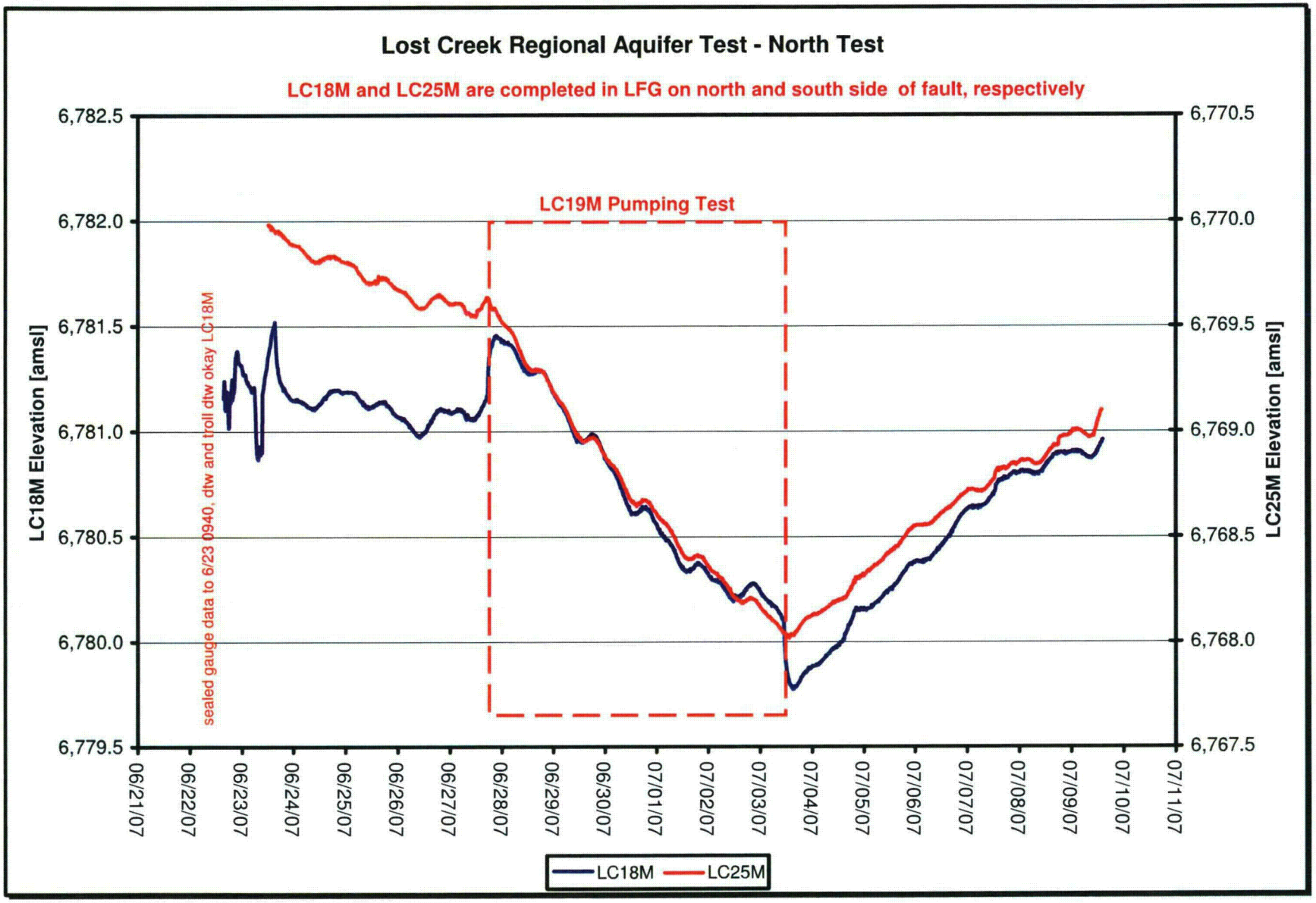
0 150 300 Feet

APPENDIX A
COMPLETION REPORTS

Appendix A
LC ISR, LLC
Lost Creek Regional Aquifer Test
Well Completion Information

Well Name	Sand	Northing	Easting	Driller	Driller TD	Logger TD	Deviation	Deviation Direction	Grouted Interval	Casing ID (inches)	Cased to	Underreamed Interval	Screen Length	Total Length scm, Jc, Kp	J-Collar Used?	# K-packers	Setting Depth
HJT-104	HJ	534,900	743,660	KE Taylor Drilling Inc.	460.0	462.8	1.5	135.2 SSE	N/A	4.5	410	410-460	50	57	Yes	2	403
HJT-105	HJ	535,030	744,450	KE Taylor Drilling Inc.	850.0	849.4	26.7	215.0 SW	438-850	4.5	407	407-438	30	35	Yes	2	403
HJMP-104	HJ	534,900	742,900	KE Taylor Drilling Inc.	430.0	430.1	2.5	095.8 ESE	N/A	4.5	402	402-430	30	34	Yes	2	396
HJMP-107	HJ	534,800	743,700	KE Taylor Drilling Inc.	464.0	461.9	9.7	272.6 W	N/A	4.5	423	423-460	40	45	Yes	2	416
HJMP-110	HJ	535,200	743,700	KE Taylor Drilling Inc.	476.0	475.1	3.3	340.9 NNW	N/A	4.5	431	431-476	45	47	Yes	2	430
HJMP-111	HJ	535,370	743,850	KE Taylor Drilling Inc.	440.0	440.7	1.2	205.7 SW	N/A	4.5	393	393-440	47	50	Yes	2	388
UKMO-101	HJ	534,940	744,100	KE Taylor Drilling Inc.	487.4	487.4	2.2	359.4 N	N/A	4.5	465	465-487	25	27	Yes	2	460
UKMO-102	HJ	535,160	744,150	KE Taylor Drilling Inc.	420.0	419.9	4.9	324.3 NNW	N/A	4.5	379	379-420	40	45	Yes	2	379
LC19M	HJ	743,383	535,317	KE Taylor Drilling Inc.	463.0	455.3	1.7	282.3 W	N/A	4.5	412	412-463	Open Hole	N/A	N/A	N/A	N/A
LC16M	HJ	744,553	534,811	KE Taylor Drilling Inc.	472.0	470.9	10.7	289.2 WNW	N/A	4.5	410	410-467	Open Hole	N/A	N/A	N/A	N/A
LC18M	LFG	743,368	535,316	KE Taylor Drilling Inc.	350.0	347.5	3.7	303.2 WNW	N/A	4.5	290	290-332	Open Hole	N/A	N/A	N/A	N/A
LC25M	LFG	743,397	534,601	KE Taylor Drilling Inc.	380.0	380.0	N/A	N/A	N/A	4.5	316	316-349	Open Hole	N/A	N/A	N/A	N/A
UKMP-101	UKM	534,930	744,100	KE Taylor Drilling Inc.	575.0	570.0	5.0	005.5 N	N/A	4.5	547	547-575	30	33	Yes	2	545
UKMP-102	UKM	535,150	744,150	KE Taylor Drilling Inc.	498.0	499.9	2.3	350.0 NNW	N/A	4.5	475	475-498	20	24	Yes	2	472
LC20M	UKM	743,383	535,331	KE Taylor Drilling Inc.	543.0	541.3	7.2	219.1 SW	N/A	4.5	511	511-543	Open Hole	N/A	N/A	N/A	N/A

APPENDIX B
WATER LEVEL ELEVATIONS VS BAROMOETRIC PRESSURE


Lost Creek Regional Aquifer Test - North Test
LC18M and LC25M are completed in LFG on north and south side of fault, respectively
LC19M Pumping Test
sealed gauge data to 6/23 0940, dtw and troll dtw okay LC18M
LC18M Elevation [amsl]
LC25M Elevation [amsl]
6,782.5
6,782.0
6,781.5
6,781.0
6,780.5
6,780.0
6,779.5
6,770.5
6,770.0
6,769.5
6,769.0
6,768.5
6,768.0
6,767.5
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
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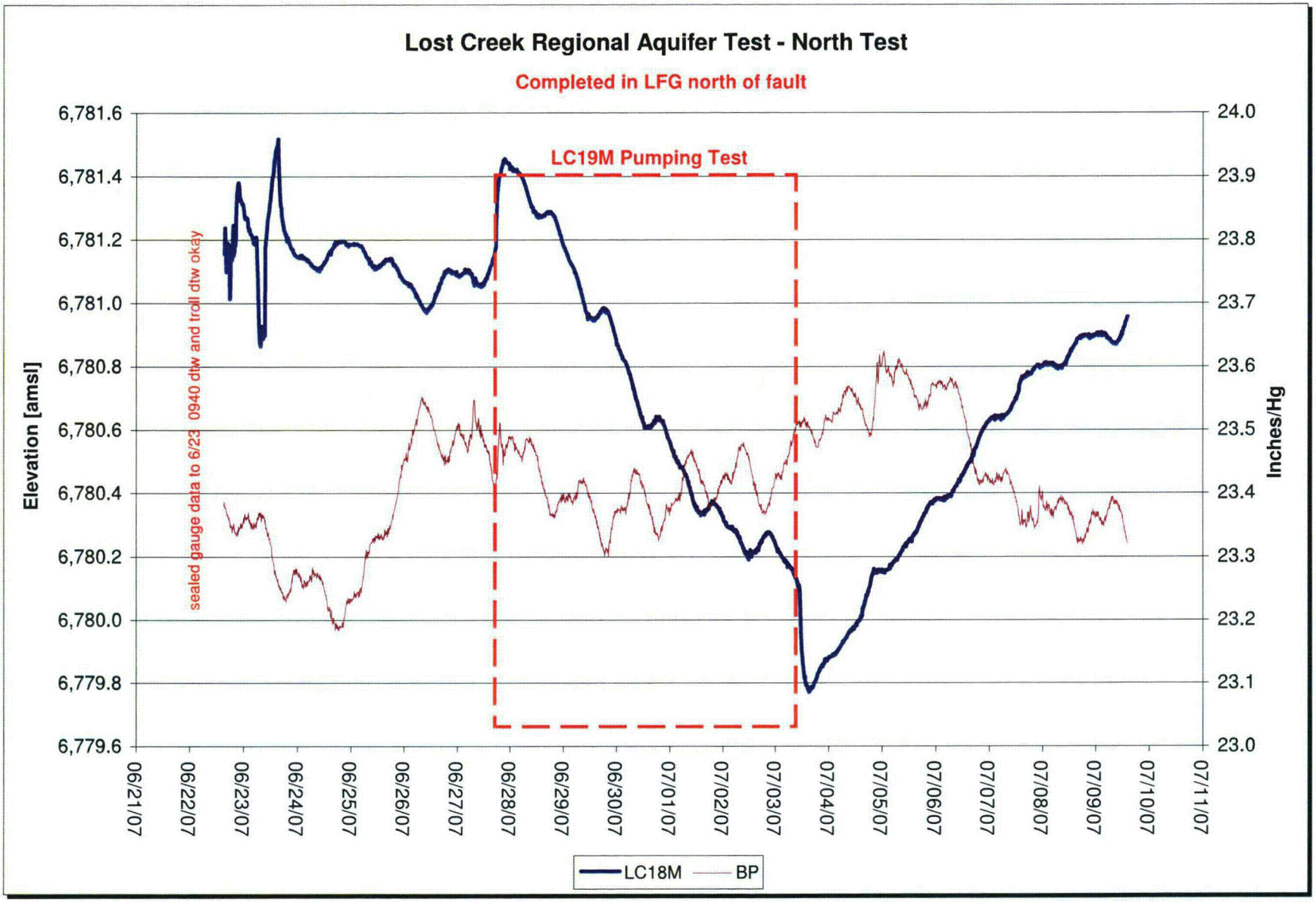
07/08/07
07/09/07
07/10/07
07/11/07
LC18M
LC25M


Lost Creek Regional Aquifer Test - North Test
Completed in LFG north of fault
LC19M Pumping Test
sealed gauge data to 6/23 0940 dtw and troll dtw okay
Elevation [amsl]
Inches/Hg
6,781.6
6,781.4
6,781.2
6,781.0
6,780.8
6,780.6
6,780.4
6,780.2
6,780.0
6,779.8
6,779.6
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
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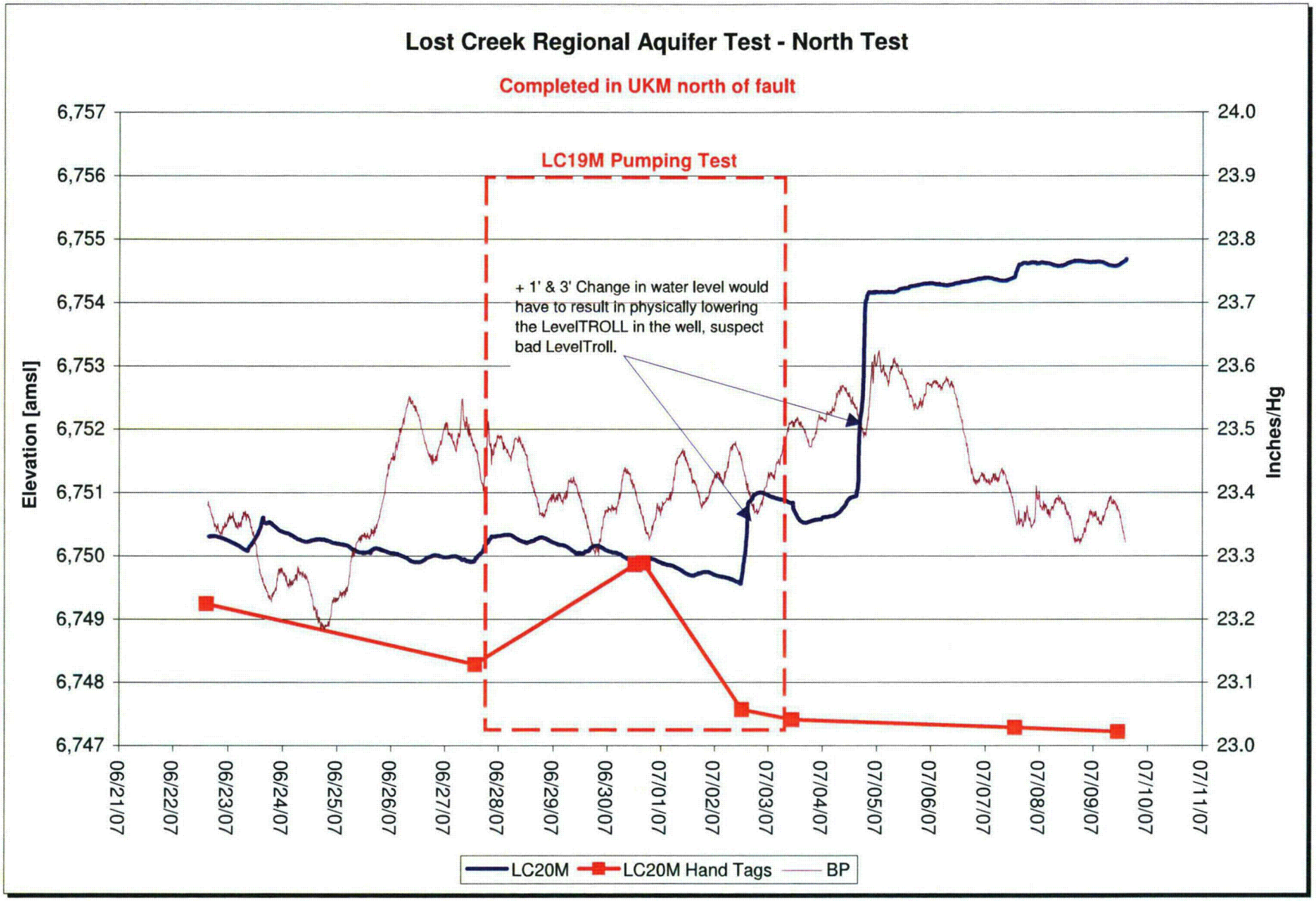
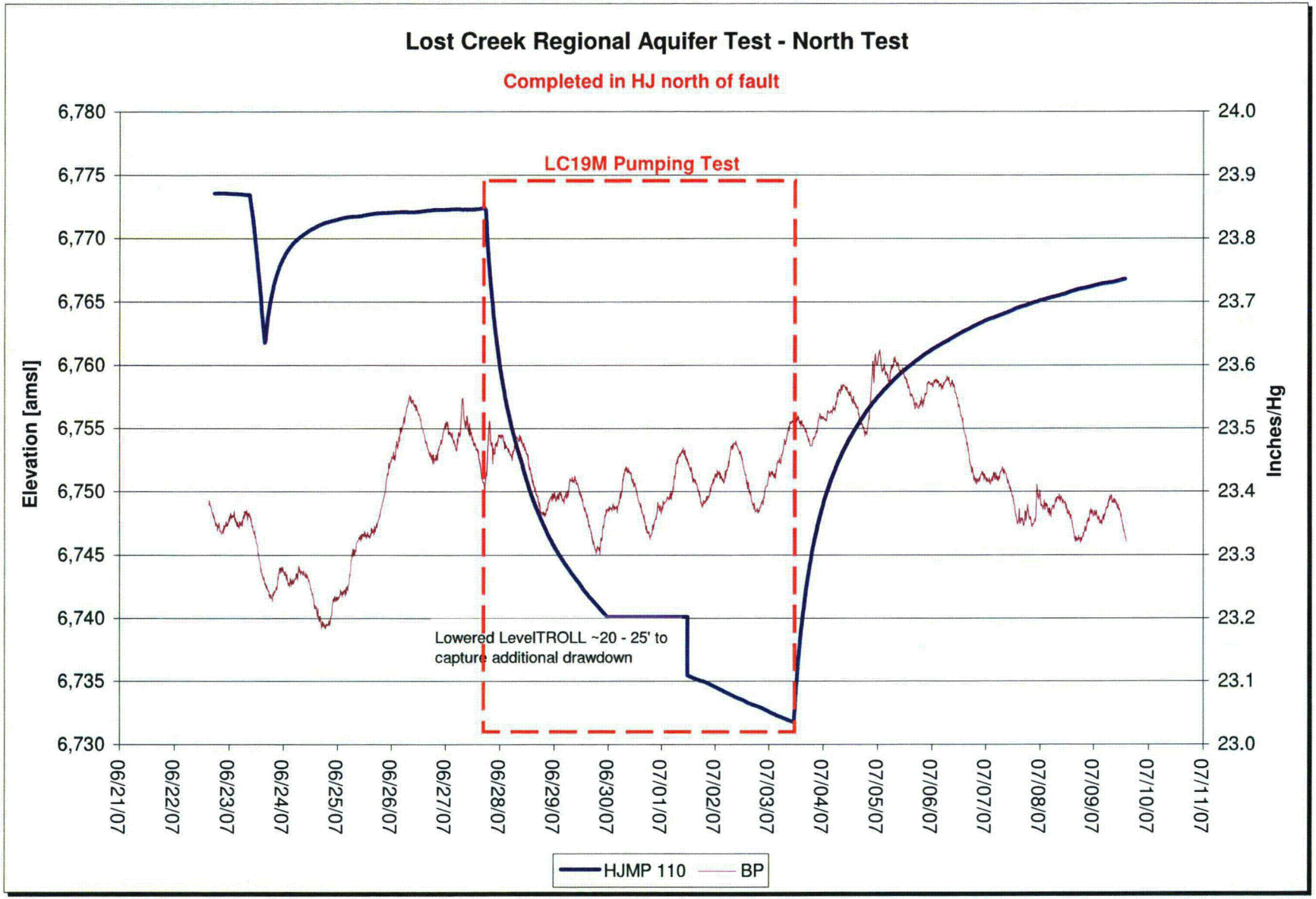
07/09/07
07/10/07
07/11/07
LC18M
BP


Lost Creek Regional Aquifer Test - North Test
Completed in UKM north of fault
LC19M Pumping Test
+ 1' & 3' Change in water level would have to result in physically lowering the LevelTROLL in the well, suspect bad LevelTroll.
Elevation [amsl]
Inches/Hg
6,757
6,756
6,755
6,754
6,753
6,752
6,751
6,750
6,749
6,748
6,747
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
LC20M
LC20M Hand Tags
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
LC19M Pumping Test
Lowered LevelTROLL ~20 - 25' to capture additional drawdown
Elevation [amsl]
Inches/Hg
6,780
6,775
6,770
6,765
6,760
6,755
6,750
6,745
6,740
6,735
6,730
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
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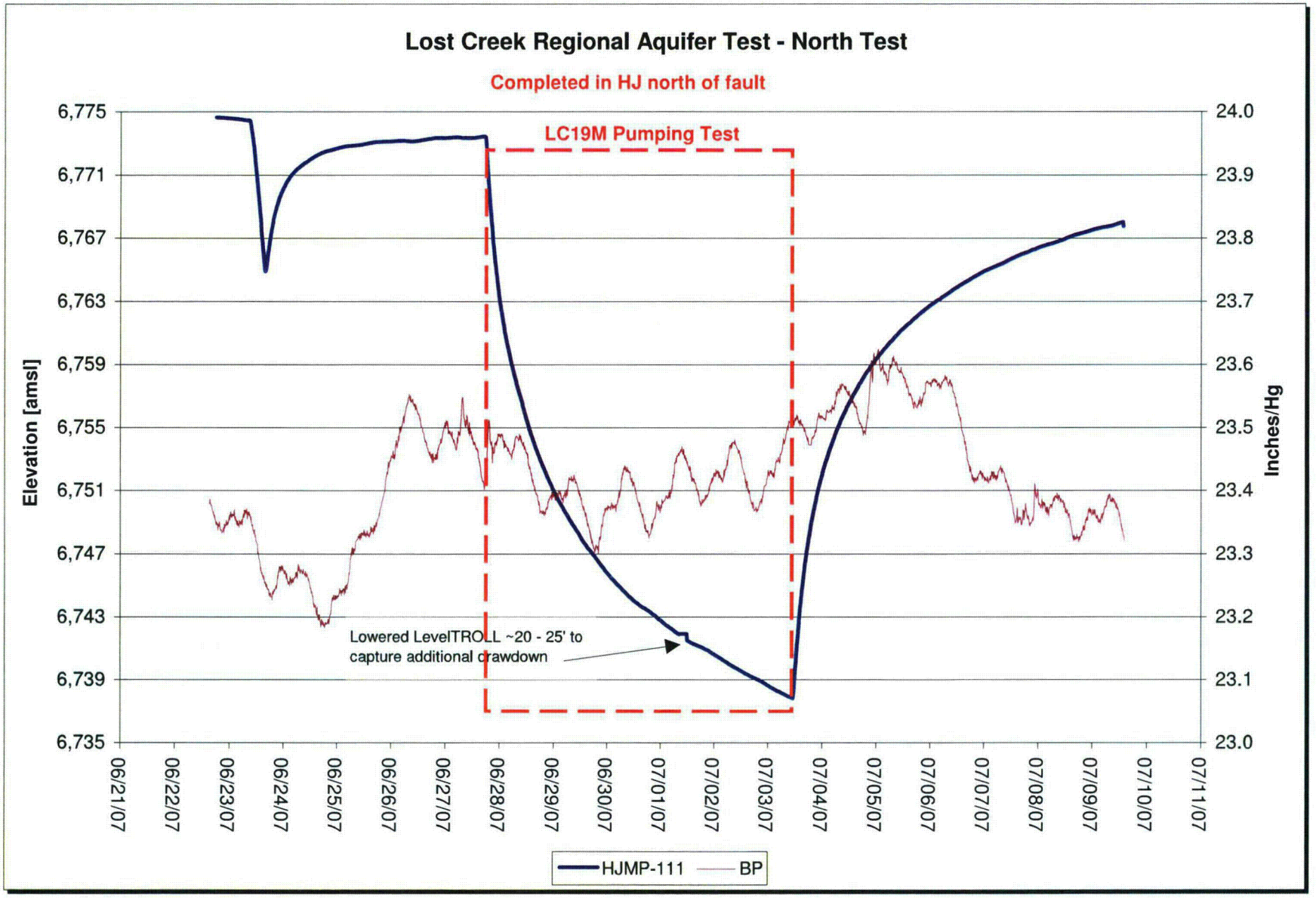
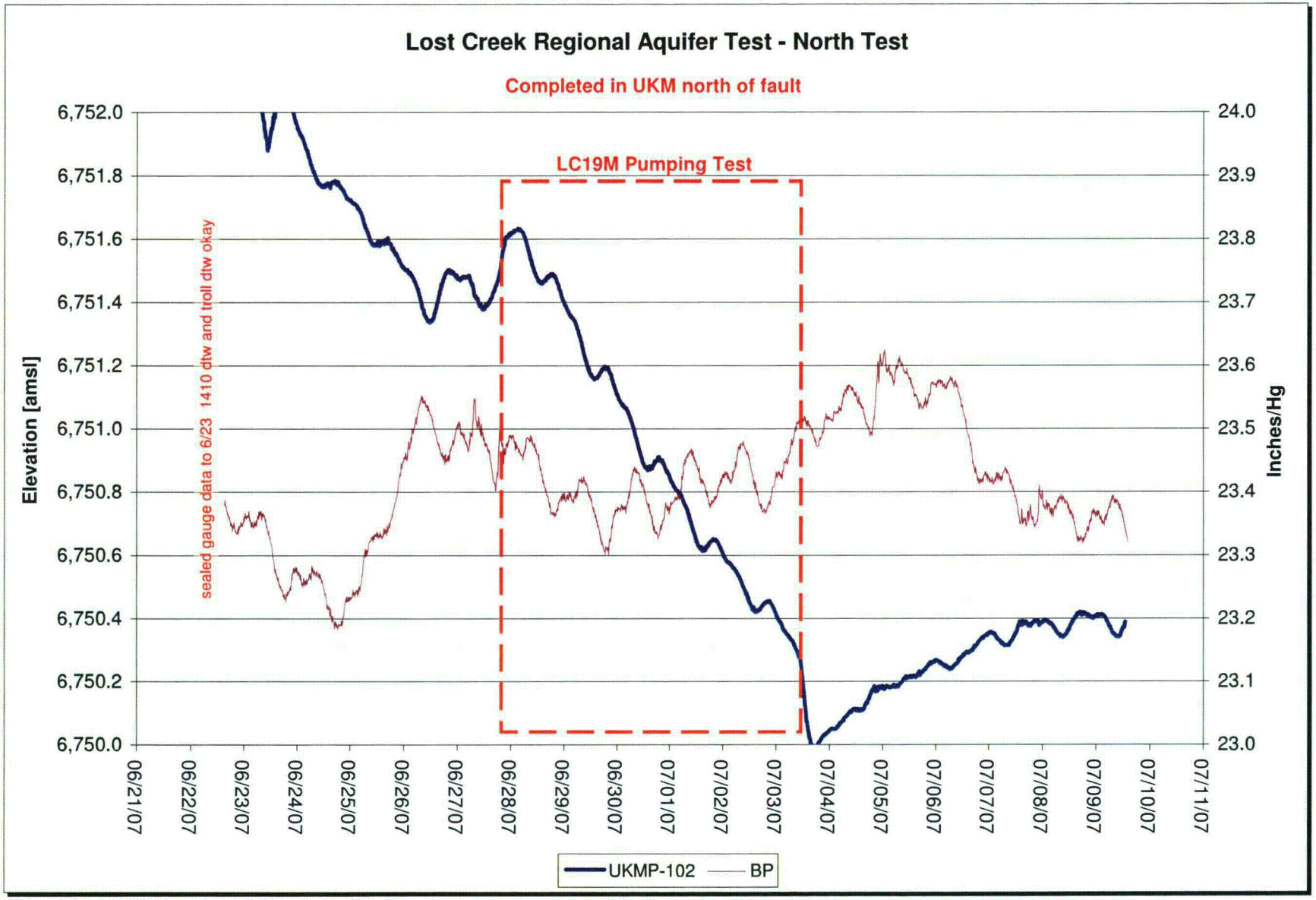
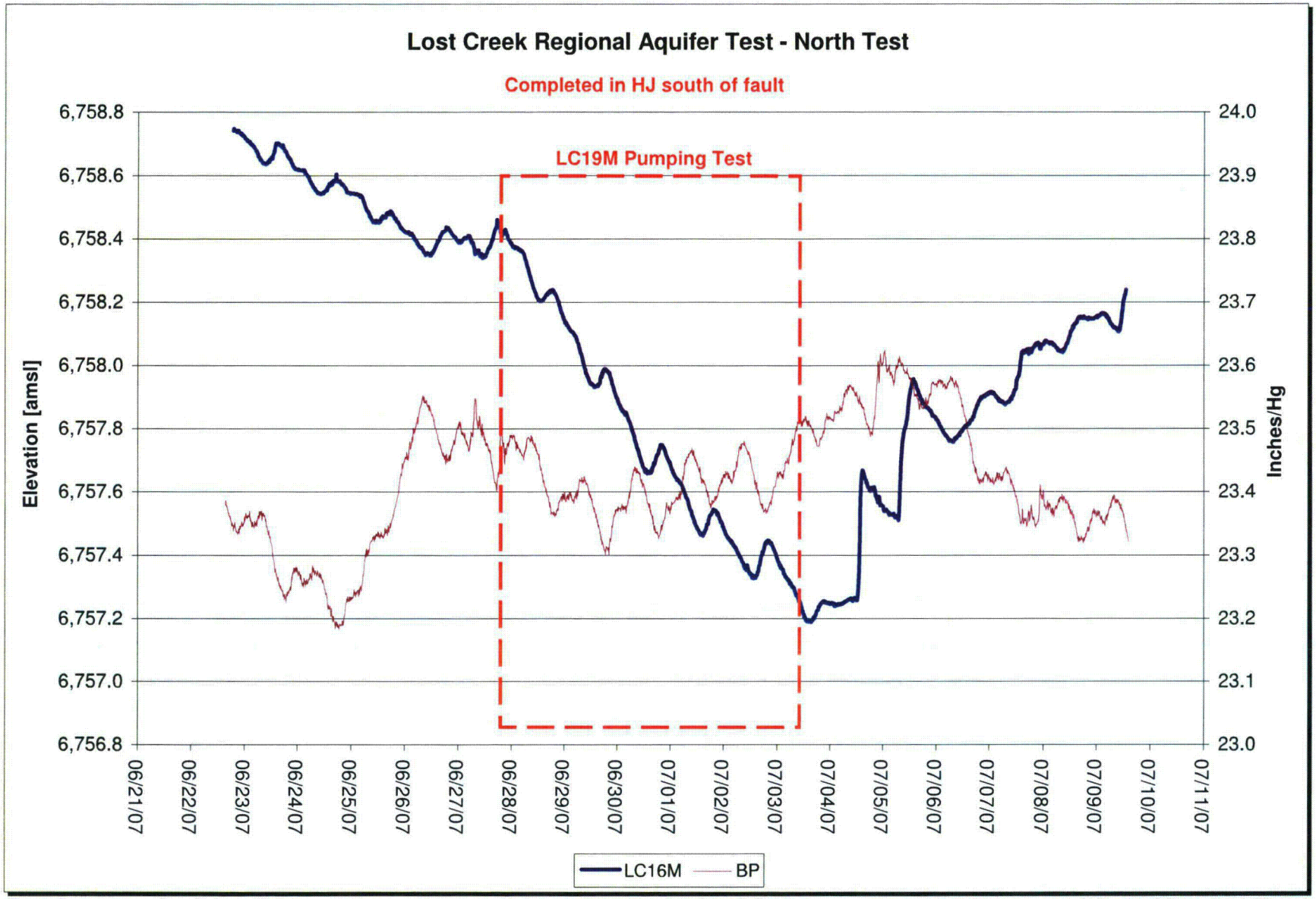
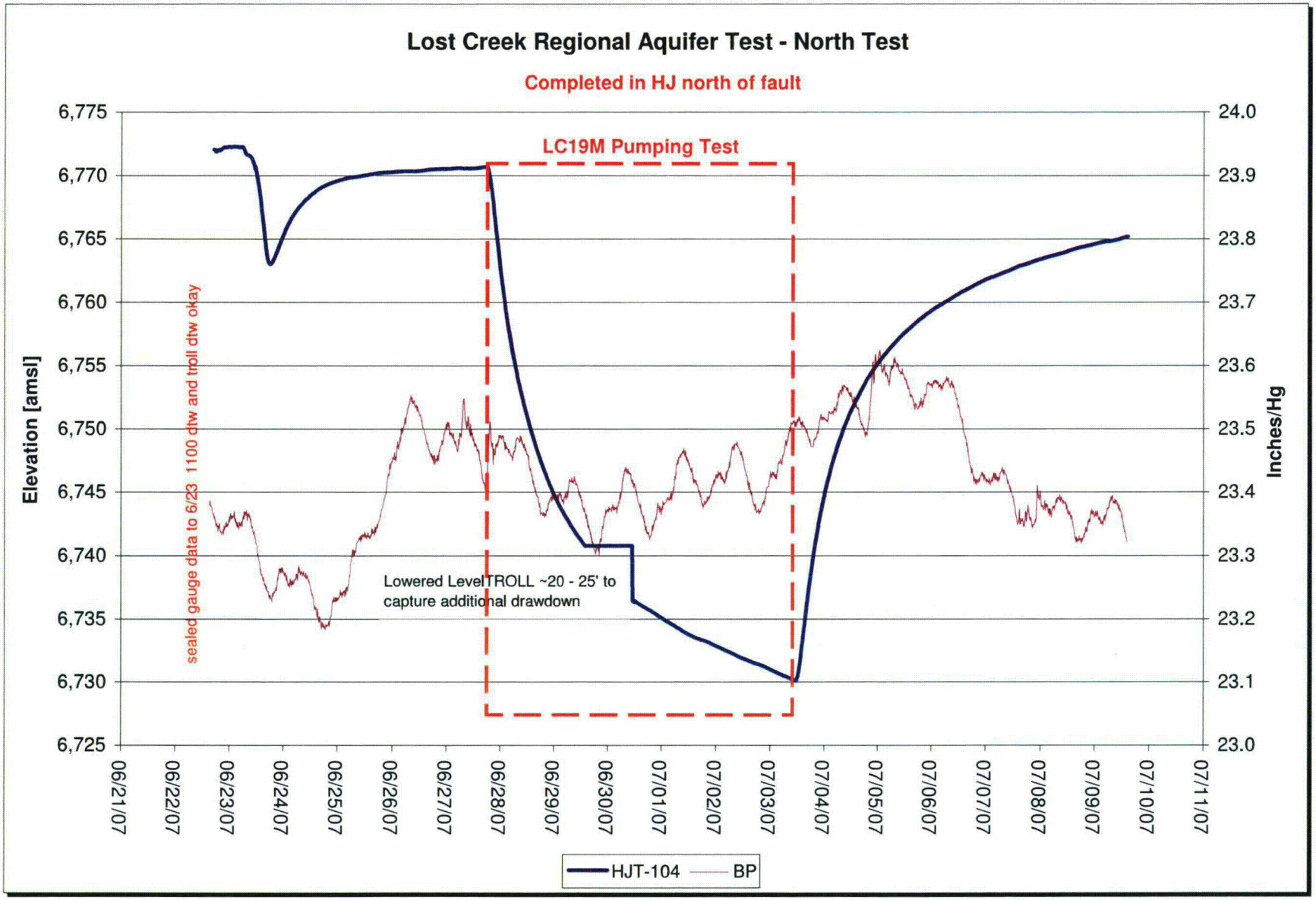
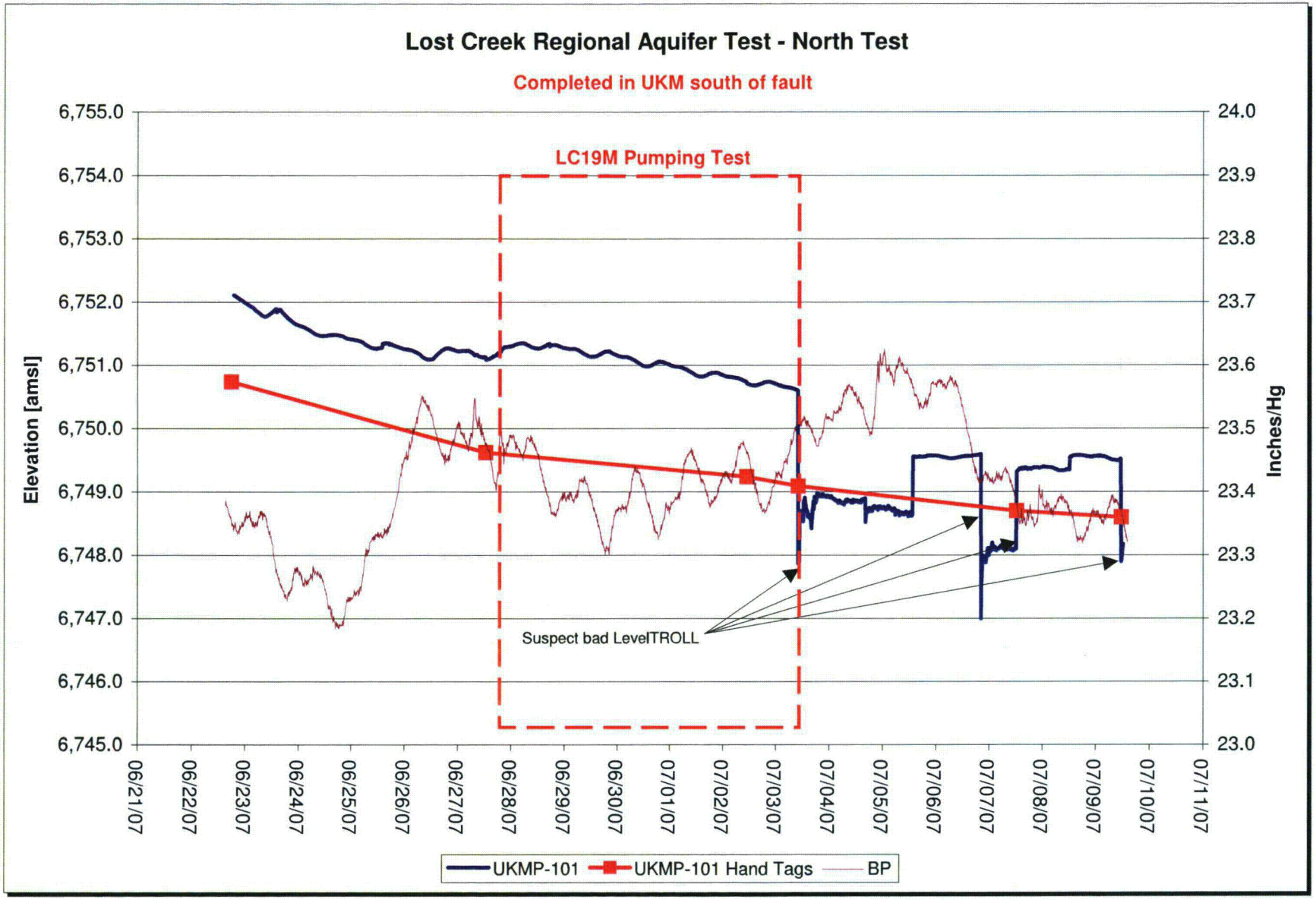
07/09/07
07/10/07
07/11/07
HJMP 110
BP

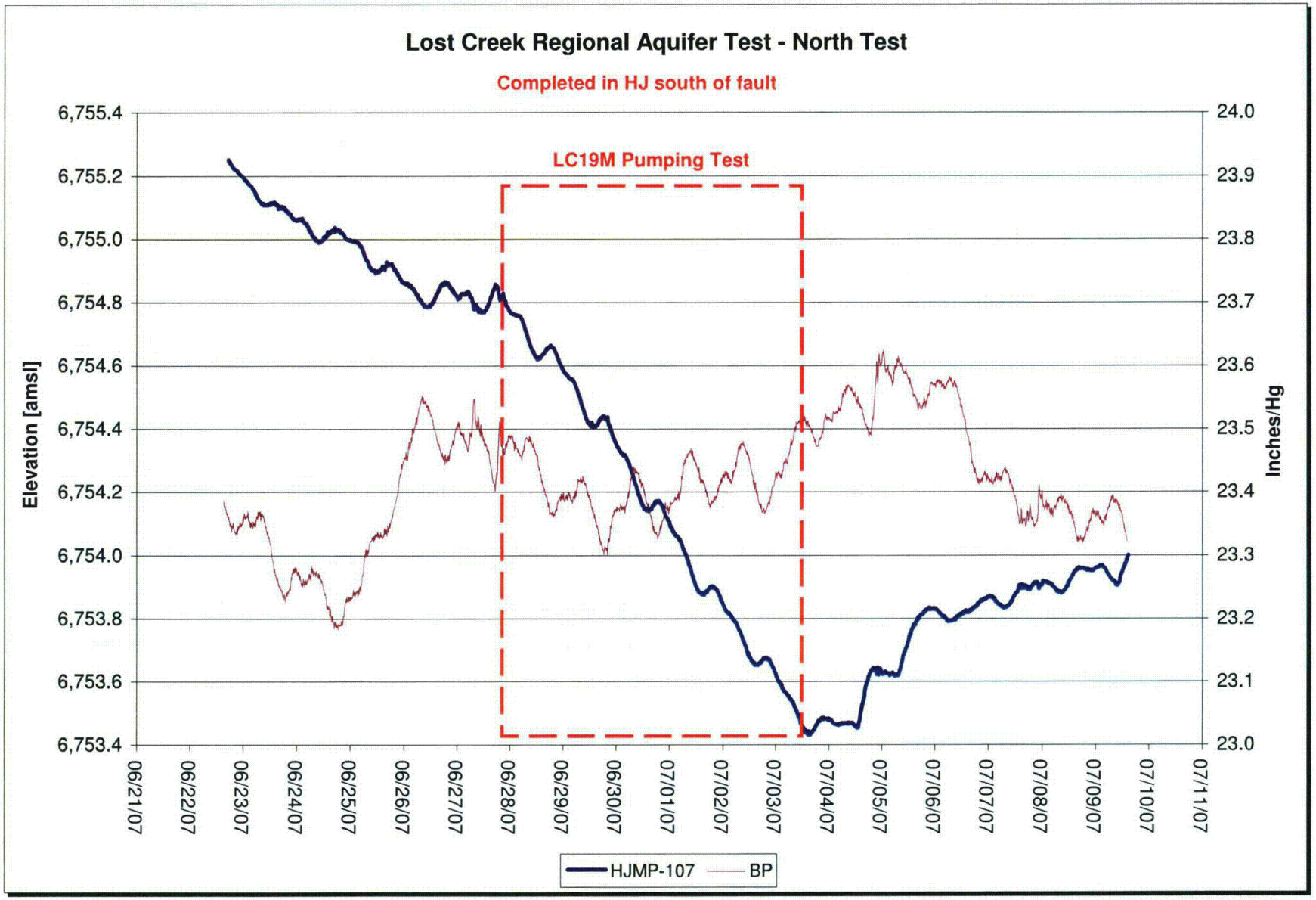

Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
LC19M Pumping Test
Lowered LevelTROLL ~20 - 25' to capture additional drawdown
Elevation [amsl]
Inches/Hg
6,775
6,771
6,767
6,763
6,759
6,755
6,751
6,747
6,743
6,739
6,735
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJMP-111
BP

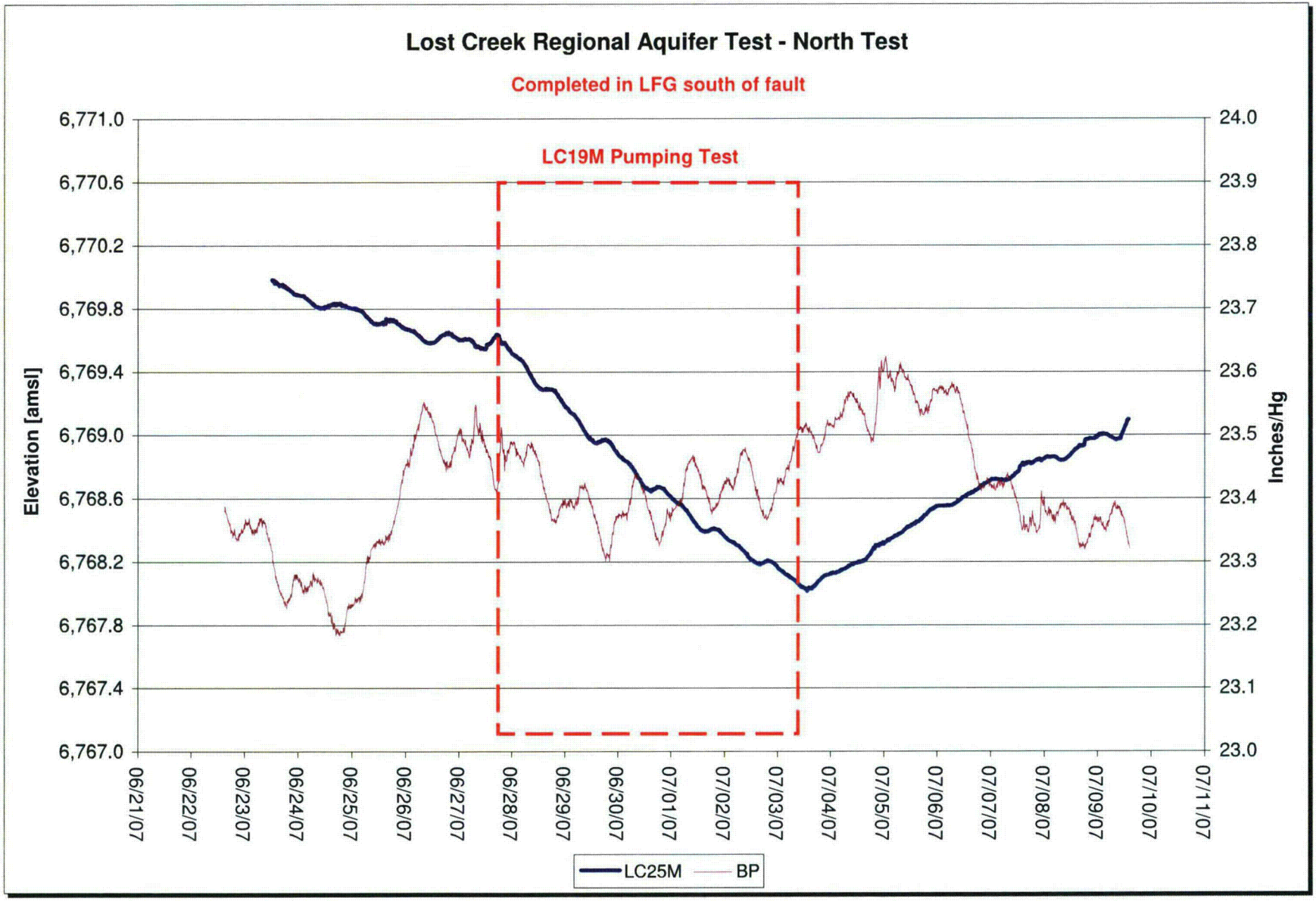

Lost Creek Regional Aquifer Test - North Test
Completed in UKM north of fault
LC19M Pumping Test
sealed gauge data to 6/23 1410 dtw and troll dtw okay
Elevation [amsl]
Inches/Hg
6,752.0
6,751.8
6,751.6
6,751.4
6,751.2
6,751.0
6,750.8
6,750.6
6,750.4
6,750.2
6,750.0
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
UKMP-102
BP

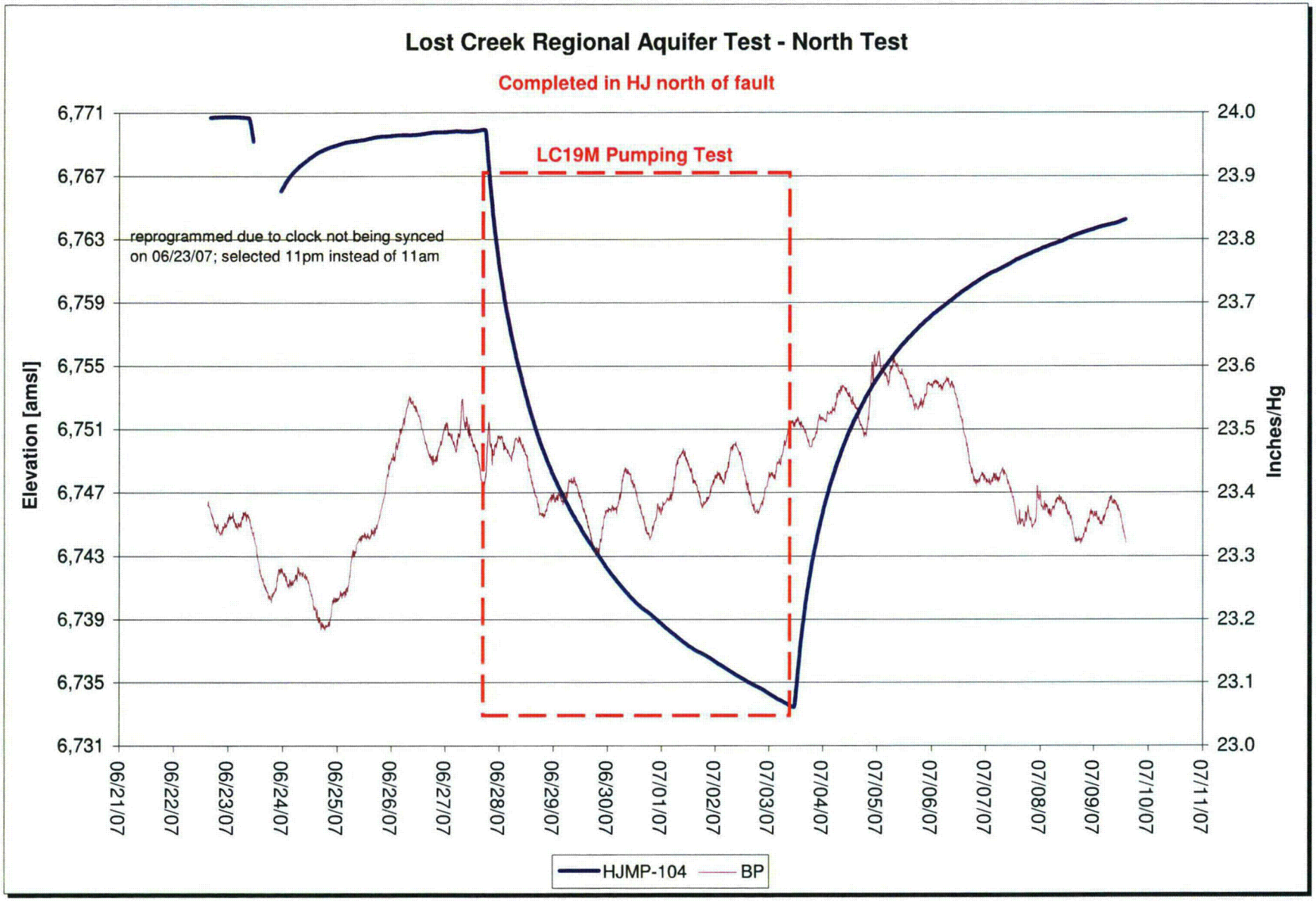

Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
LC19M Pumping Test
Elevation [amsl]
Inches/Hg
6,758.8
6,758.6
6,758.4
6,758.2
6,758.0
6,757.8
6,757.6
6,757.4
6,757.2
6,757.0
6,756.8
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
LC16M
BP

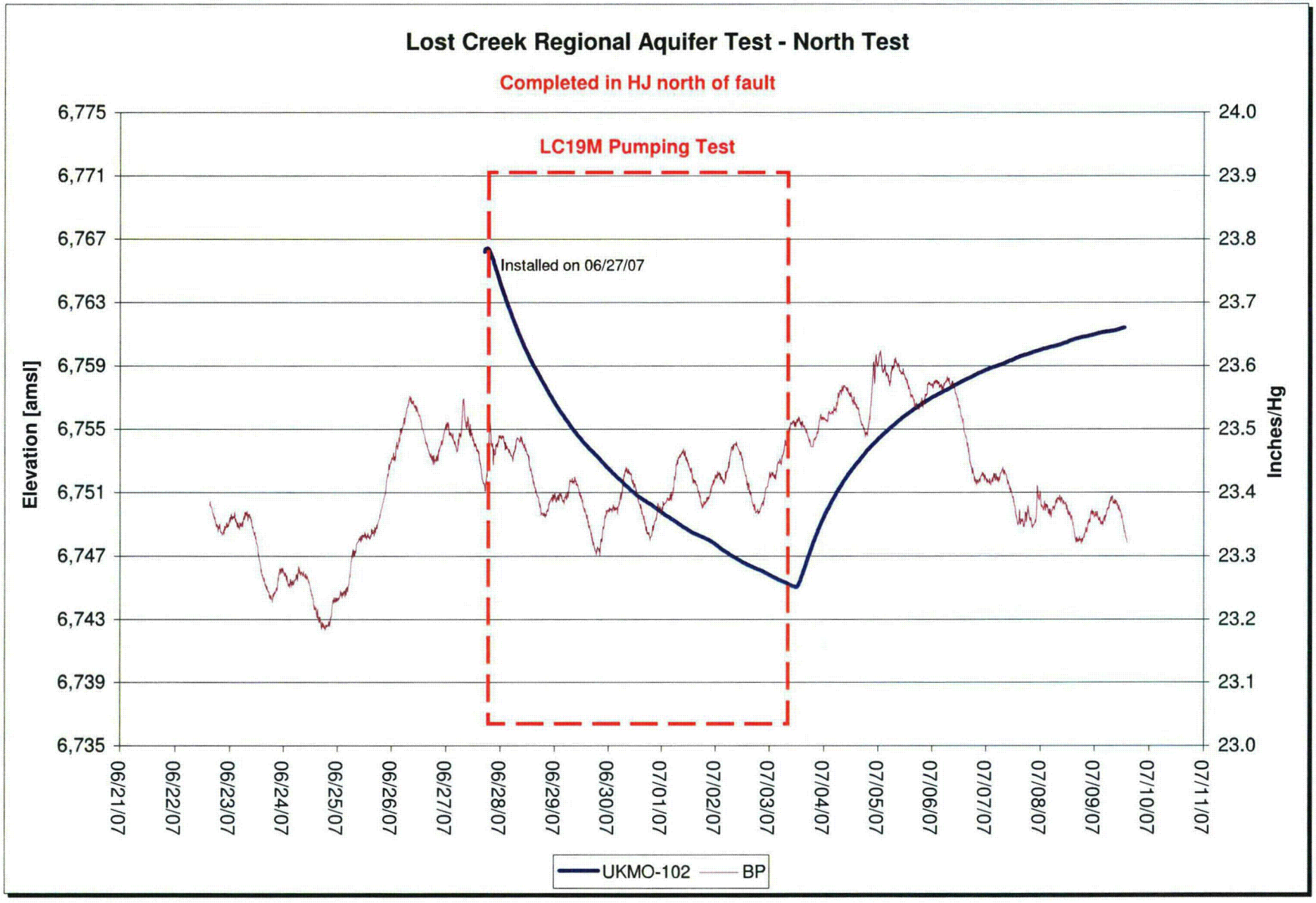

Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
LC19M Pumping Test
sealed gauge data to 6/23 1100 dtw and troll dtw okay
Lowered LevelTROLL ~20 - 25' to capture additional drawdown
Elevation [amsl]
Inches/Hg
6,775
6,770
6,765
6,760
6,755
6,750
6,745
6,740
6,735
6,730
6,725
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJT-104
BP


Lost Creek Regional Aquifer Test - North Test
Completed in UKM south of fault
LC19M Pumping Test
Suspect bad LevelTROLL
Elevation [amsl]
Inches/Hg
6,755.0
6,754.0
6,753.0
6,752.0
6,751.0
6,750.0
6,749.0
6,748.0
6,747.0
6,746.0
6,745.0
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
UKMP-101
UKMP-101 Hand Tags
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
LC19M Pumping Test
Elevation [amsl]
Inches/Hg
6,755.4
6,755.2
6,755.0
6,754.8
6,754.6
6,754.4
6,754.2
6,754.0
6,753.8
6,753.6
6,753.4
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJMP-107
BP


Lost Creek Regional Aquifer Test - North Test
Completed in LFG south of fault
LC19M Pumping Test
Elevation [amsl]
Inches/Hg
6,771.0
6,770.6
6,770.2
6,769.8
6,769.4
6,769.0
6,768.6
6,768.2
6,767.8
6,767.4
6,767.0
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
LC25M
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
LC19M Pumping Test
reprogrammed due to clock not being synced on 06/23/07; selected 11pm instead of 11am
Elevation [amsl]
Inches/Hg
6,771
6,767
6,763
6,759
6,755
6,751
6,747
6,743
6,739
6,735
6,731
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
HJMP-104
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ north of fault
LC19M Pumping Test
Installed on 06/27/07
Elevation [amsl]
Inches/Hg
6,775
6,771
6,767
6,763
6,759
6,755
6,751
6,747
6,743
6,739
6,735
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
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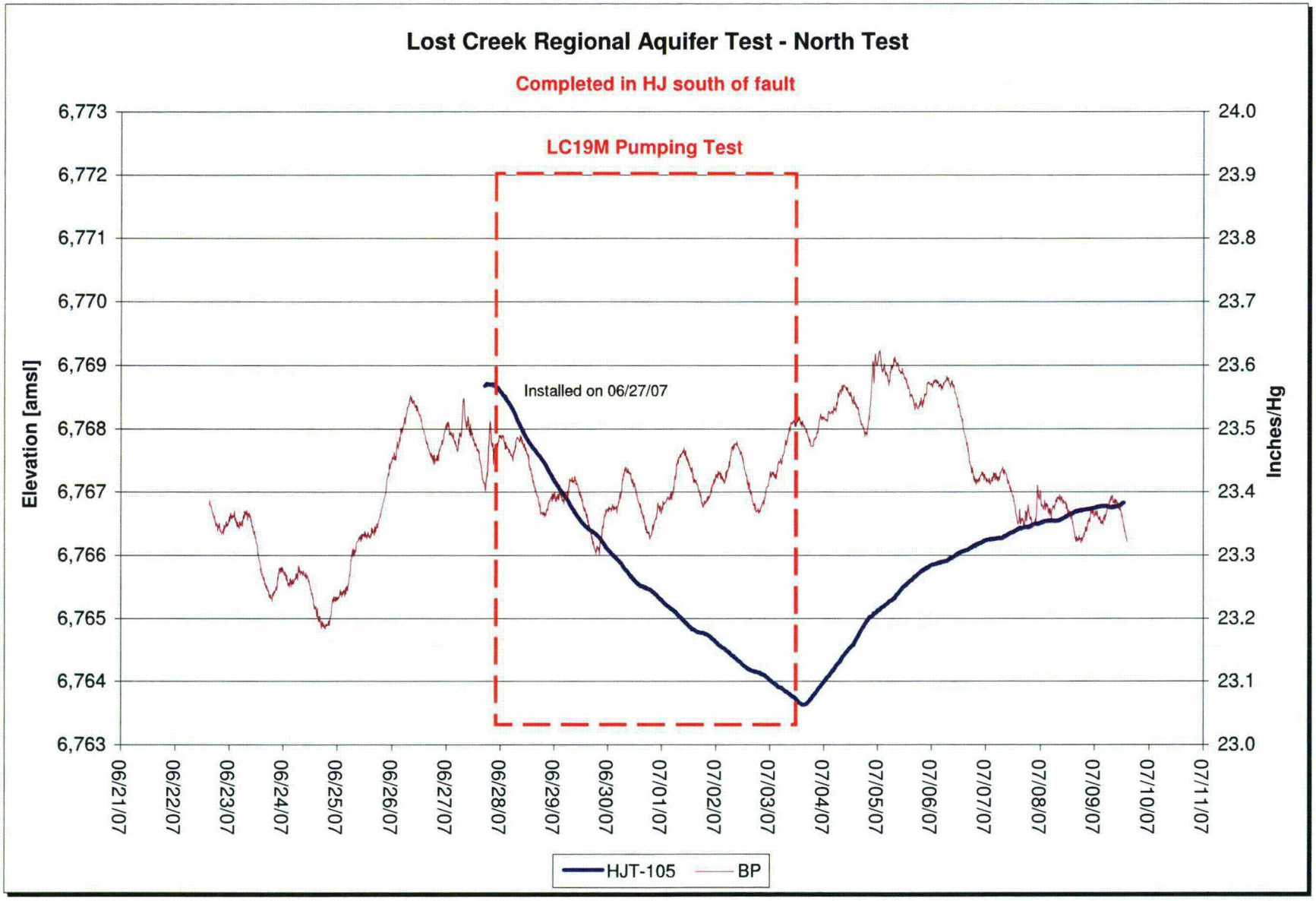
07/09/07
07/10/07
07/11/07
UKMO-102
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
LC19M Pumping Test
Installed on 06/27/07
Elevation [amsl]
Inches/Hg
6,773
6,772
6,771
6,770
6,769
6,768
6,767
6,766
6,765
6,764
6,763
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
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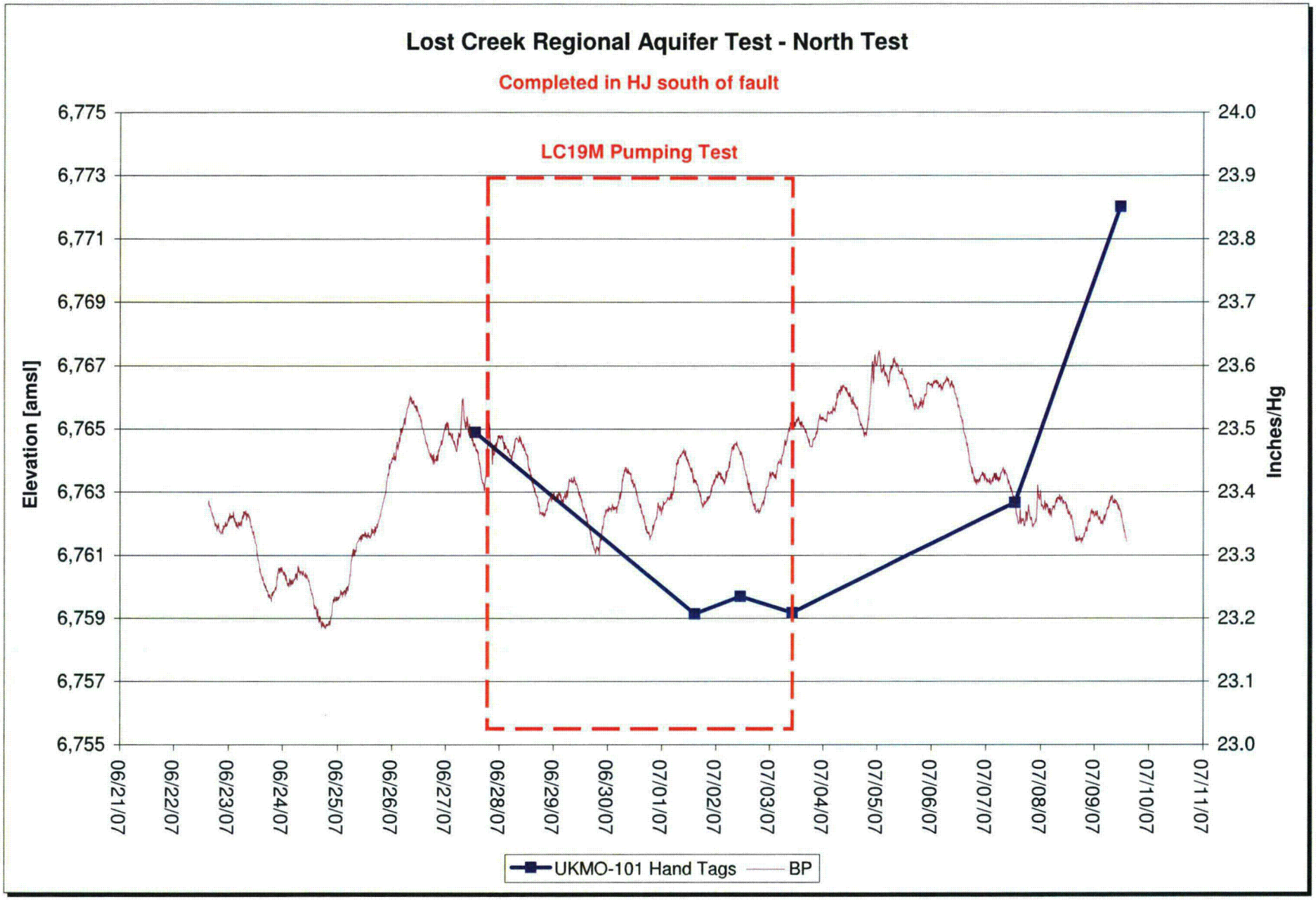
07/10/07
07/11/07
HJT-105
BP


Lost Creek Regional Aquifer Test - North Test
Completed in HJ south of fault
LC19M Pumping Test
Elevation [amsl]
Inches/Hg
6,775
6,773
6,771
6,769
6,767
6,765
6,763
6,761
6,759
6,757
6,755
24.0
23.9
23.8
23.7
23.6
23.5
23.4
23.3
23.2
23.1
23.0
06/21/07
06/22/07
06/23/07
06/24/07
06/25/07
06/26/07
06/27/07
06/28/07
06/29/07
06/30/07
07/01/07
07/02/07
07/03/07
07/04/07
07/05/07
07/06/07
07/07/07
07/08/07
07/09/07
07/10/07
07/11/07
UKMO-101 Hand Tags
BP

APPENDIX C
TYPE CURVE MATCHES

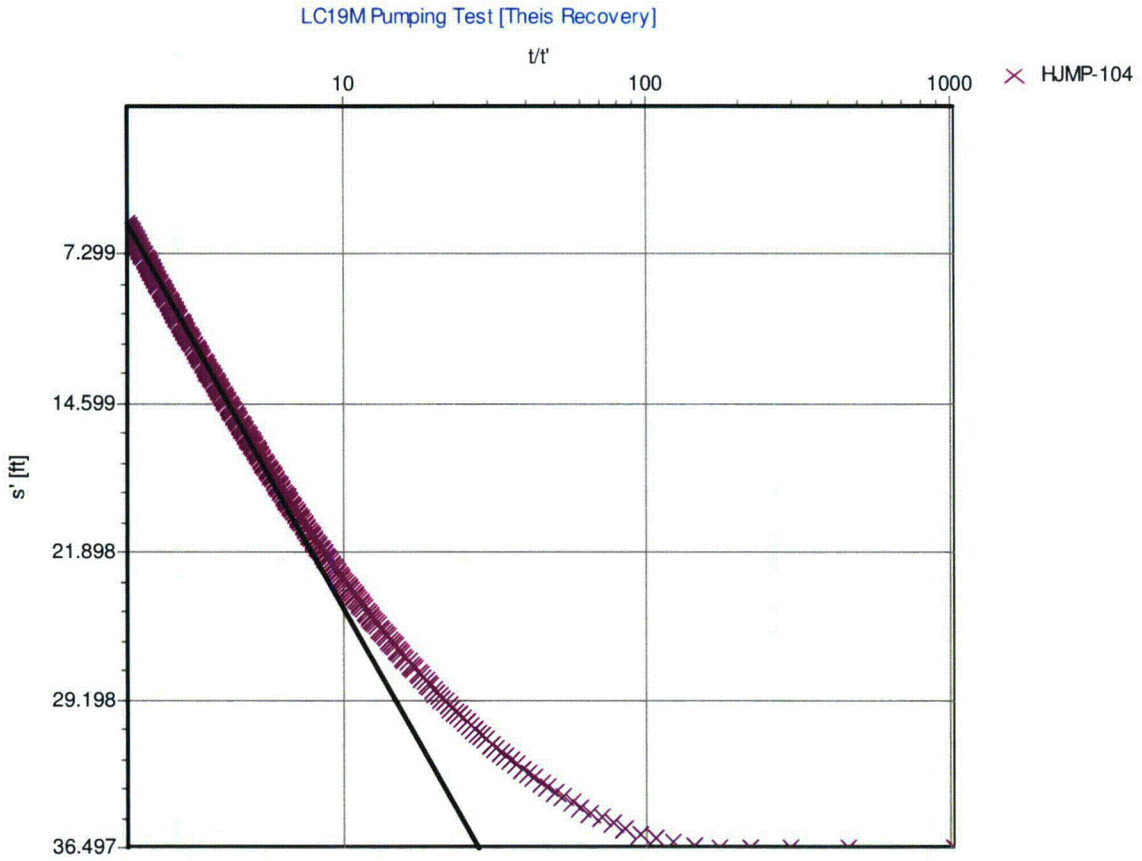
Petrotek
10288 West Chatfield Avenue • Suite 201 • Littleton, Colorado 80127-4239 USA
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:				
	Transmissivity:	5.68E+1 [ft²/d]	Conductivity:	4.74E-1 [ft/d]

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/28/2007

Petrotek
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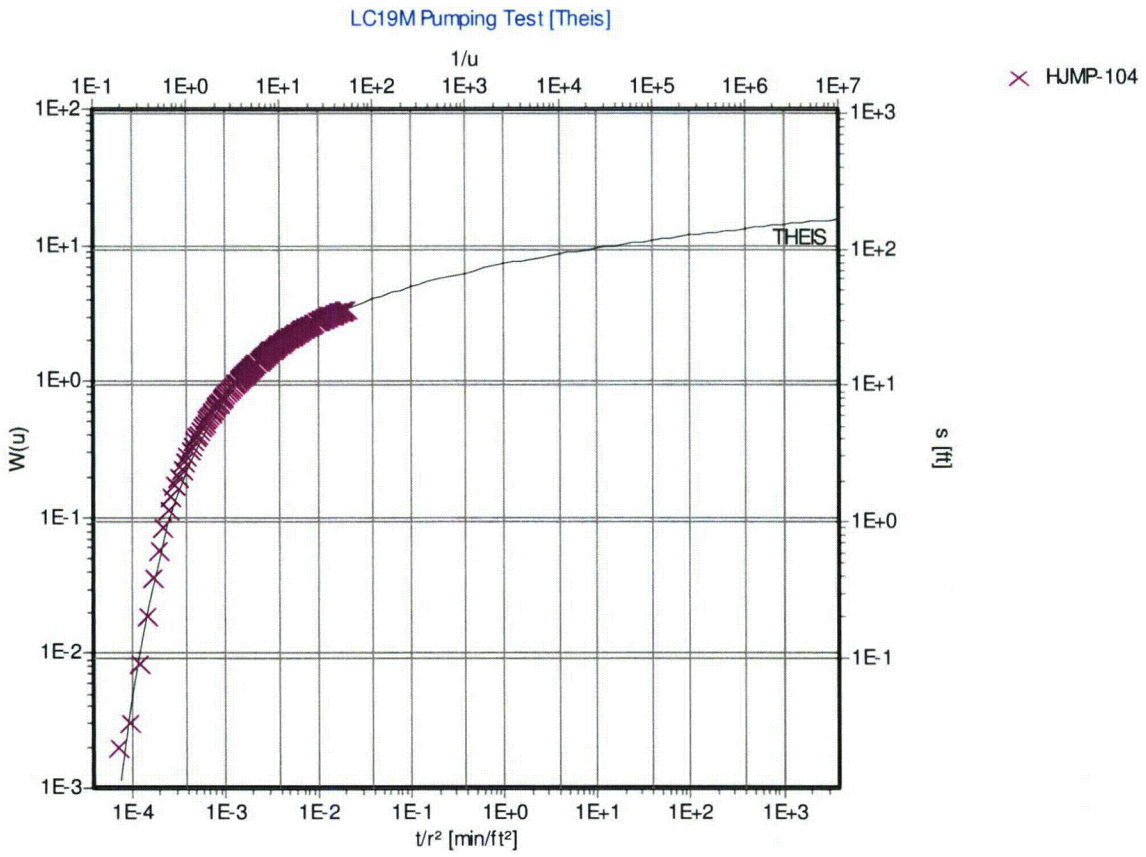
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

Analysis Results:	Transmissivity:	6.13E+1 [ft²/d]	Conductivity:	5.11E-1 [ft/d]
	Storativity:	6.63E-5		
Test parameters:	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: EPL

Evaluation Date: 7/5/2007

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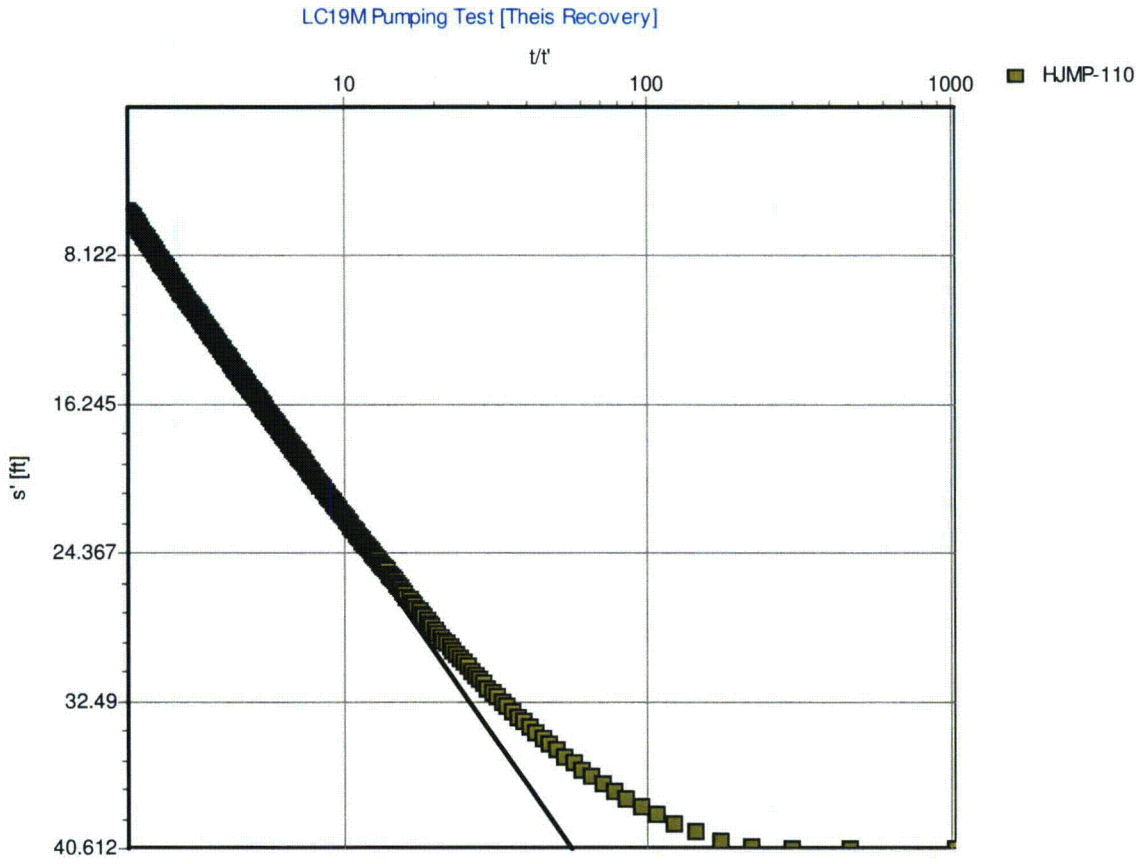
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:				
	Transmissivity:	6.30E+1 [ft²/d]	Conductivity:	5.25E-1 [ft/d]

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/28/2007

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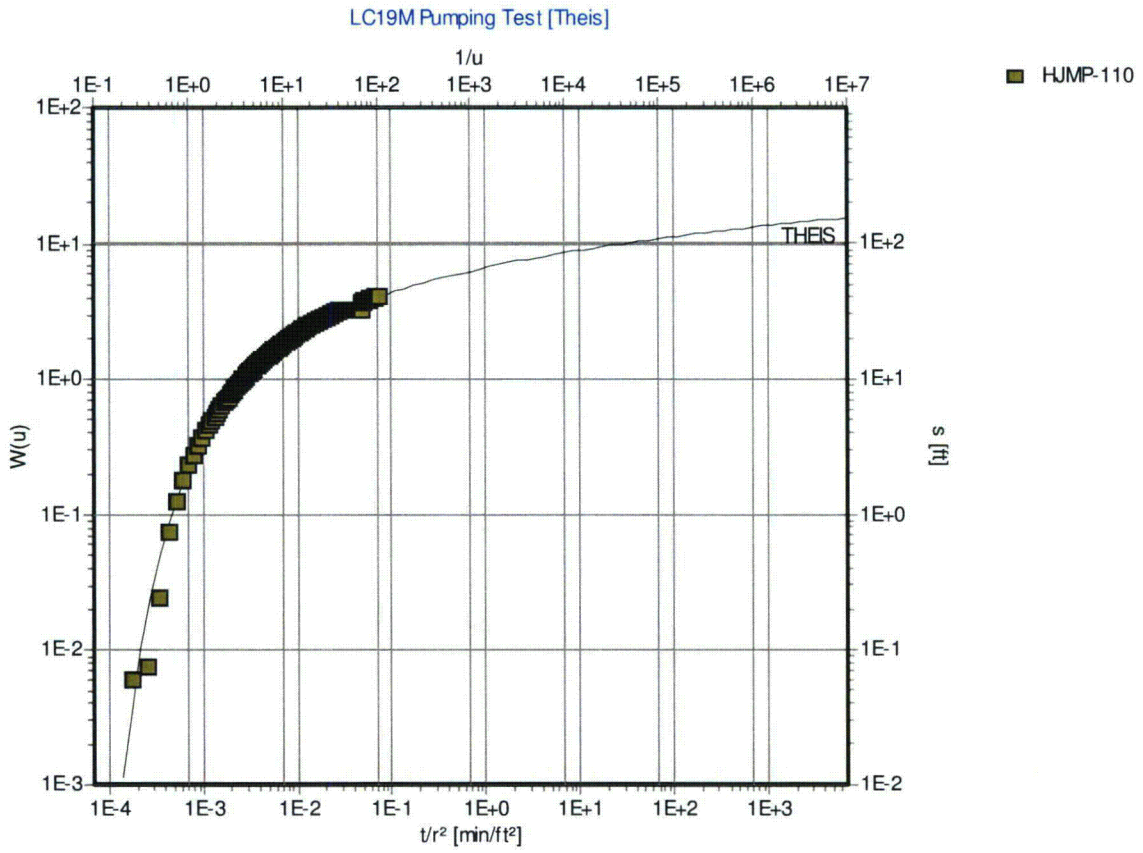
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

Analysis Results:				
	Transmissivity:	6.64E+1 [ft²/d]	Conductivity:	5.53E-1 [ft/d]
	Storativity:	1.27E-4		

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: EPL

Evaluation Date: 7/5/2007

Petrotek
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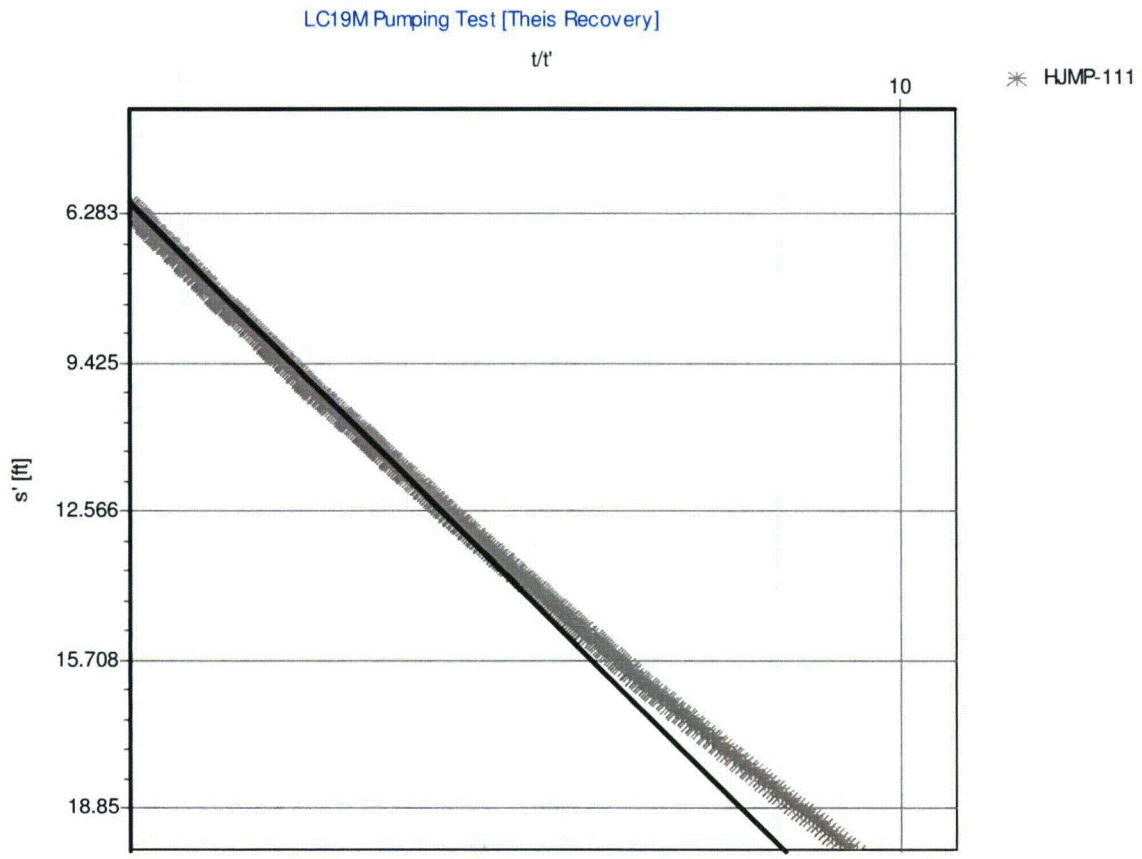
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:	Transmissivity:	6.41E+1 [ft²/d]	Conductivity:	5.34E-1 [ft/d]

Test parameters:	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/28/2007

Petrotek
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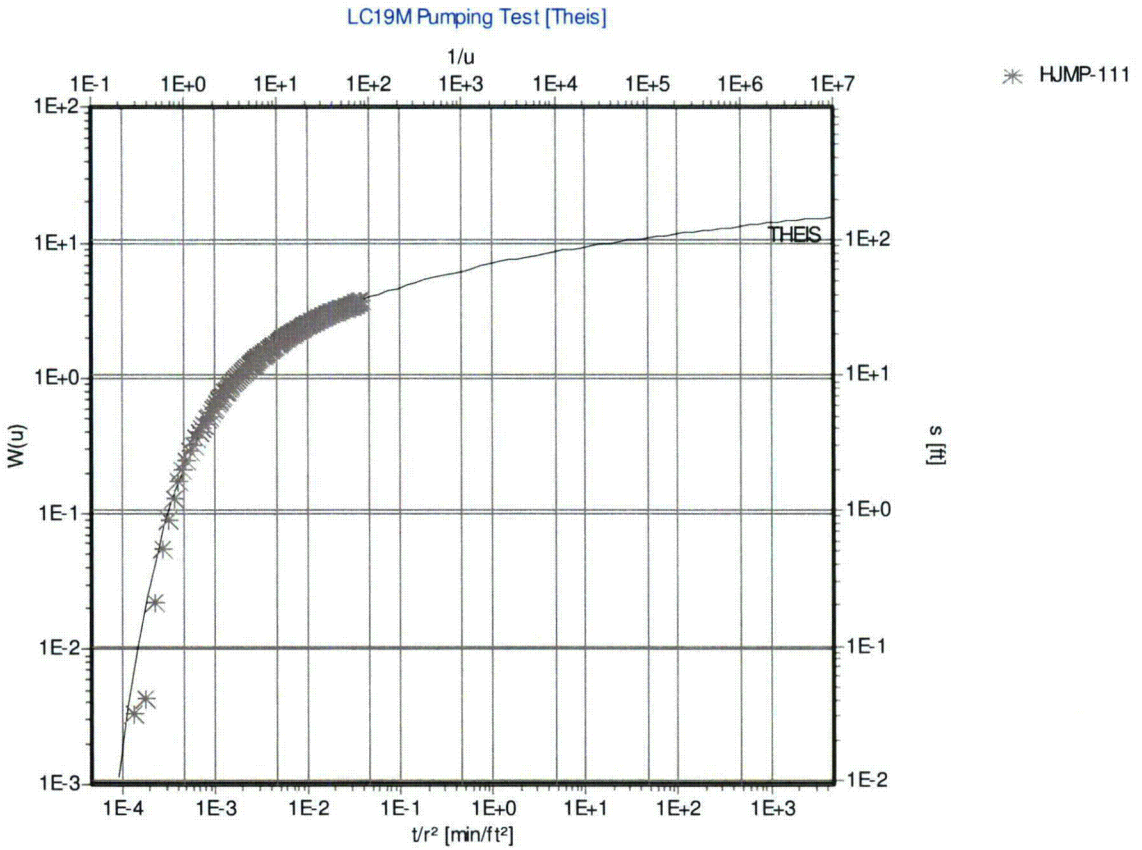
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

Analysis Results:	Transmissivity:	6.98E+1 [ft²/d]	Conductivity:	5.81E-1 [ft/d]
	Storativity:	9.13E-5		
Test parameters:	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: EPL

Evaluation Date: 7/5/2007

Petrotek
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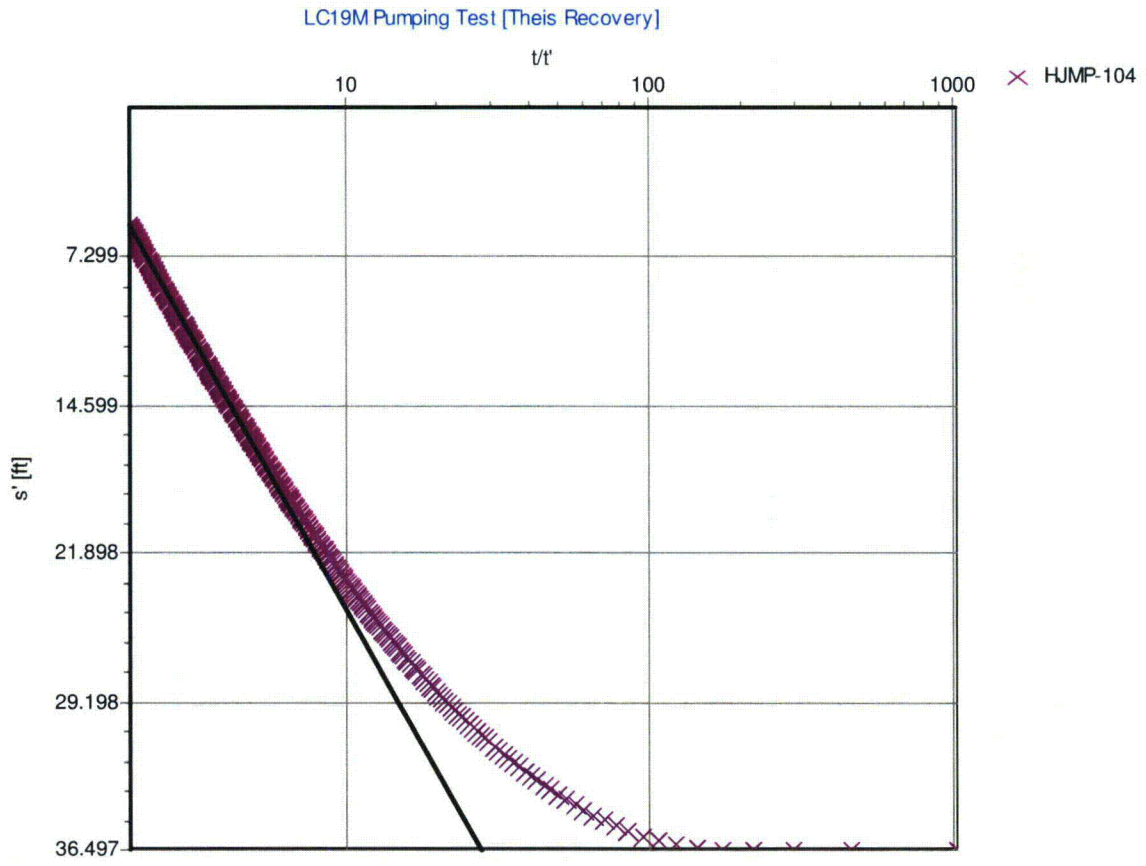
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:				
	Transmissivity:	5.68E+1 [ft²/d]	Conductivity:	4.74E-1 [ft/d]

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/28/2007

Petrotek
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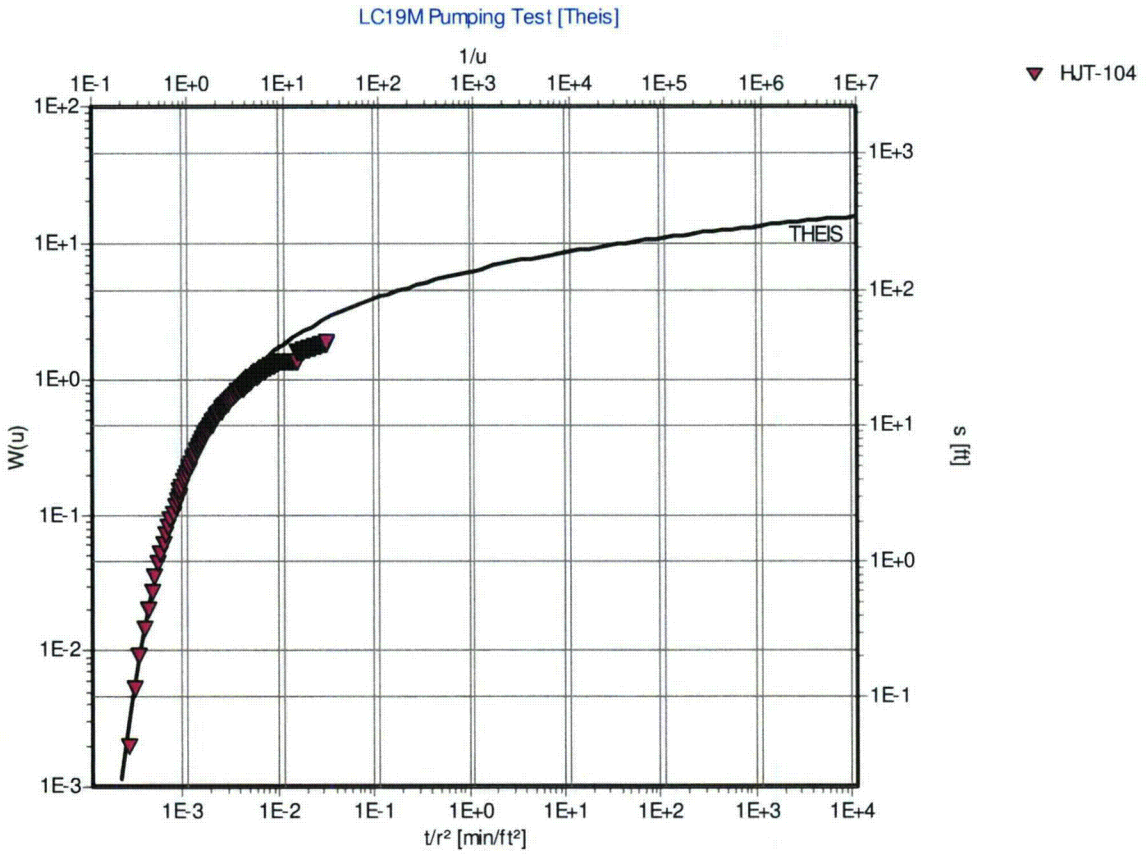
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

Analysis Results:	Transmissivity:	3.00E+1 [ft²/d]	Conductivity:	2.50E-1 [ft/d]
	Storativity:	9.58E-5		
Test parameters:	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault. Early to middle time data was used for match due to effects of Fault on later time data.

Evaluated by: KRS

Evaluation Date: 10/3/2007

Petrotek
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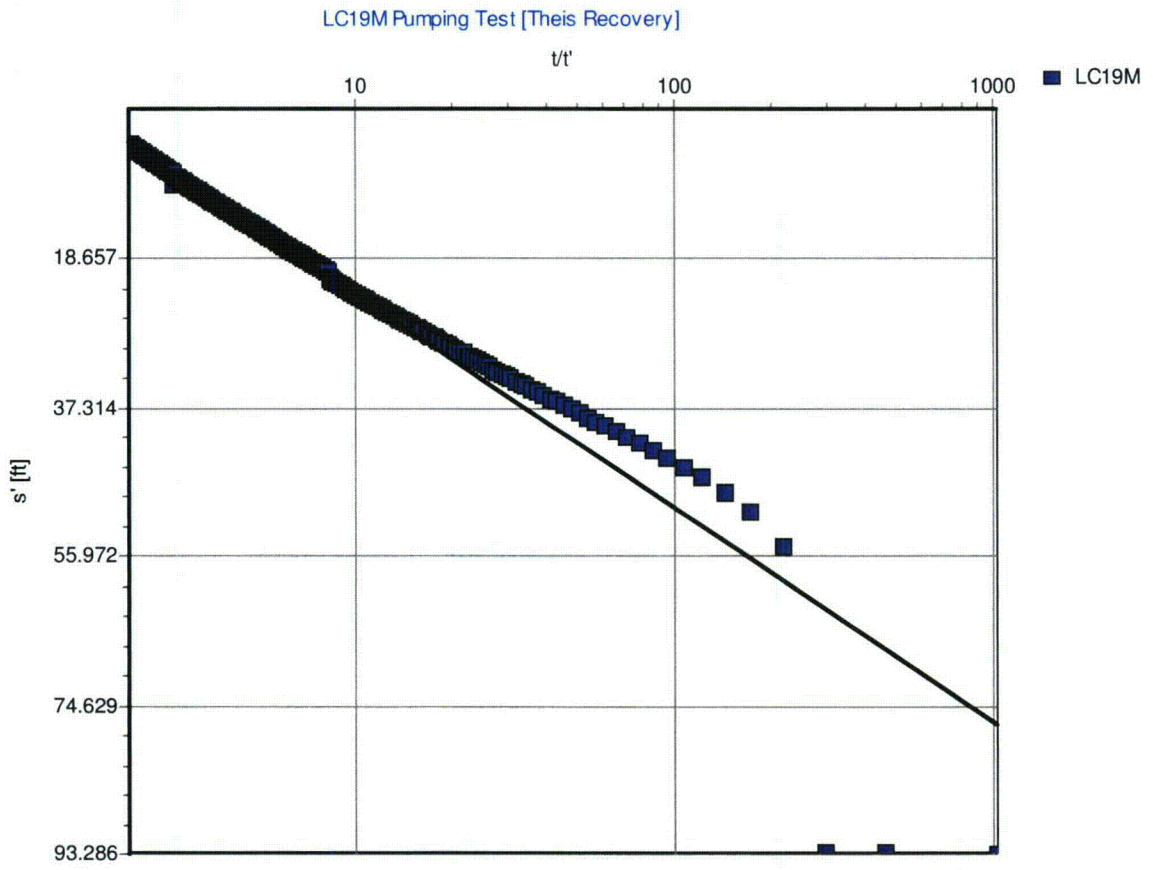
Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:				
	Transmissivity:	5.67E+1 [ft²/d]	Conductivity:	4.73E-1 [ft/d]

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ pumping well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/20/2007

Petrotek
10288 West Chatfield Avenue • Suite 201 • Littleton, Colorado 80127-4239 USA
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

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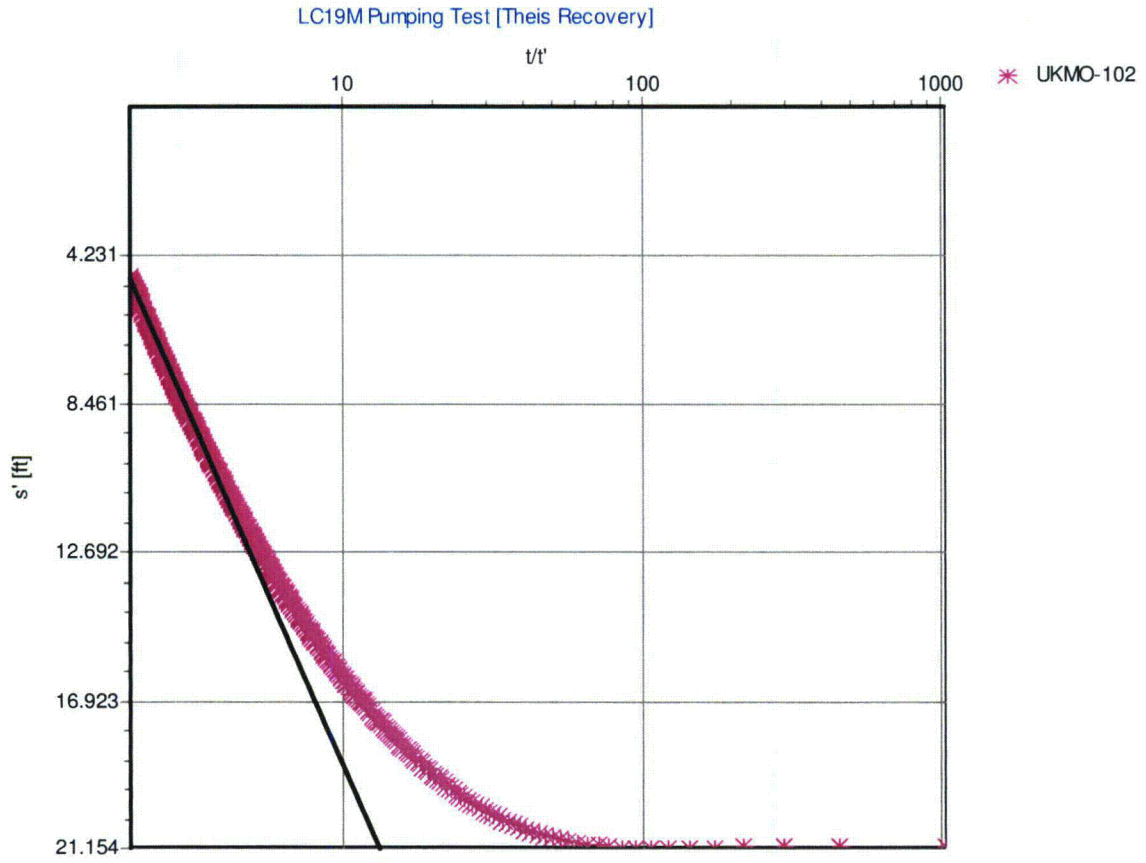


Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis Recovery**

Analysis Results:				
	Transmissivity:	7.69E+1 [ft²/d]	Conductivity:	6.41E-1 [ft/d]

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		
	Pumping Time	8252 [min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/28/2007

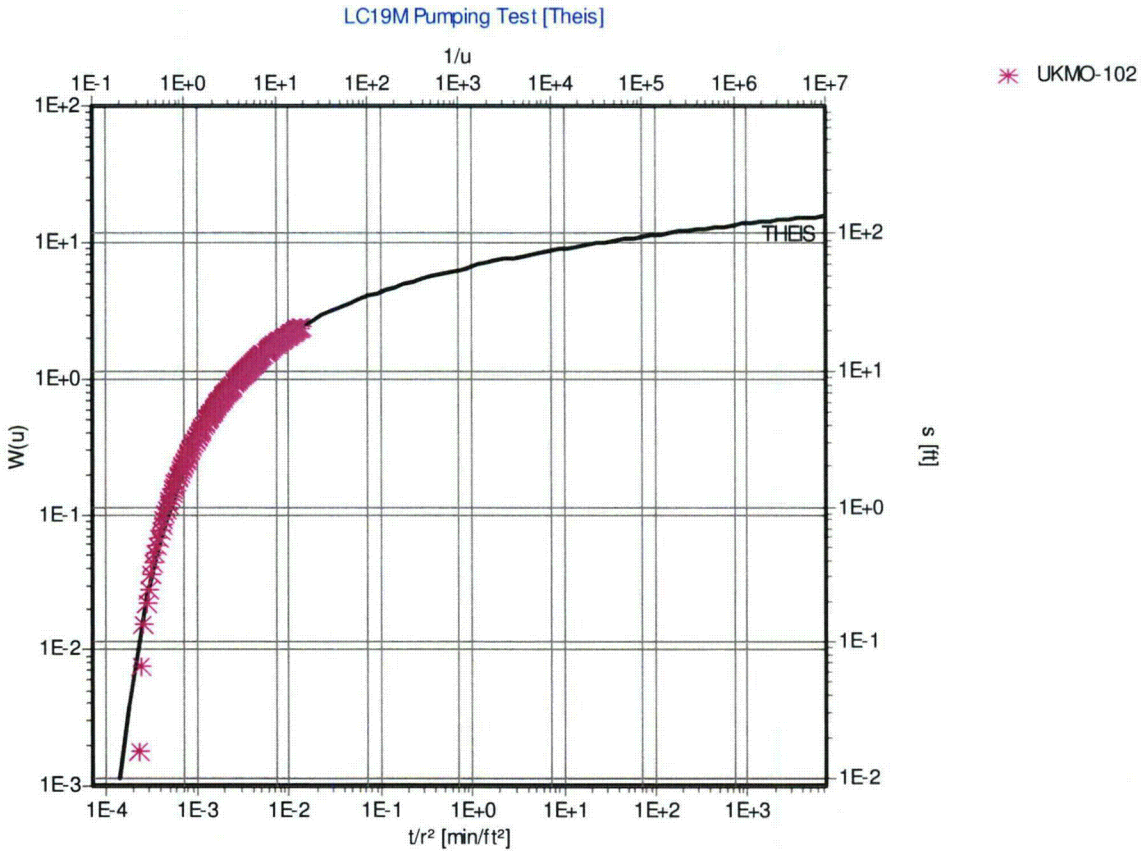
Petrotek
10288 West Chatfield Avenue • Suite 201 • Littleton, Colorado 80127-4239 USA
303-290-9414 • 303-290-9580 (fax) • www.petrotek.com

Pumping Test Analysis Report

Project: Lost Creek LC19M Pumping Test 2007

Number: 315-4

Client: LC ISR, LLC



Pumping Test: **LC19M Pumping Test**

Analysis Method: **Theis**

Analysis Results:				
	Transmissivity:	7.55E+1 [ft²/d]	Conductivity:	6.29E-1 [ft/d]
	Storativity:	1.52E-4		

Test parameters:				
	Pumping Well:	LC19M	Aquifer Thickness:	120 [ft]
	Casing radius:	0.1875 [ft]	Confined Aquifer	
	Screen length:	51 [ft]		
	Boring radius:	0.4 [ft]		
	Discharge Rate:	42.9 [U.S. gal/min]		

Comments: HJ observation well located on north side of Lost Creek Fault.

Evaluated by: KRS

Evaluation Date: 9/20/2007

APPENDIX D
WATER LEVEL DATA (CDROM)

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3.6 Ecology

The Permit Area is located in the Wyoming Basin ecoregion (Chapman, 2004) at an elevation of approximately 7,000 ft amsl. With approximately 260 feet of relief, sub-zero winter temperatures, and less than ten inches of annual precipitation, vegetation development and species diversity are limited.

The information in this section is based on field surveys conducted in 2006 and 2007 as well as on existing reports and databases of state and federal agencies. The abundance, habitat requirements, seasonal fluctuations, and distribution of species were evaluated. Species of particular interest included:

- threatened or endangered species, and Migratory Birds of High Federal Interest (MBHFI);
- commercially or recreationally valuable species;
- species affecting the well-being of species of special concern;
- species critical to the structure and function of the ecological system; and
- biological indicator species of radionuclides or chemical pollutants in the environment.

Appropriate state and federal agencies, including WDEQ, WGFD, BLM, US Fish and Wildlife Service (FWS), were consulted on the scope of work for the proposed ecological surveys and presence or absence of species of special concern.

3.6.1 Vegetation

Within the Permit Area, two vegetation types, dominated by big sagebrush, were identified and mapped (**Figure 3.6-1**). The Upland Big Sagebrush Shrubland type dominates the flat upland areas and the gentle slopes (**Figure 3.6-2**). The Lowland Big Sagebrush Shrubland type occurs in deeper soils along the gently sloped, south-facing ephemeral dry washes (**Figure 3.6-3**).

During the 2006 growing season, a vegetation survey was conducted within the area originally planned for the Permit Area. Prior to commencing field work in 2006, WDEQ reviewed and accepted the study design (Moxley, M. Lander Field Office Supervisor, WDEQ-LQD Lander Field Office. Personal communication. June 2006).

Once the vegetation types were identified and delineated, each of the types was sampled with 20 transects (a total of 40 transects) using a point-intercept approach to obtain vegetation cover and species diversity data. Vegetation cover observations were made on a species basis. Observations were also made for cover by litter and bare soil.

Observations on species diversity were obtained by recording all the species that occurred along and within 3.3 feet (one meter) of each 82-foot (25-meter)-long transect. The two vegetation types are fairly homogeneous, but the overall species diversity is relatively low (58 species were observed and are presented in **Table 3.6-1**). The absence of perennial streams, minimal topographic variation, and limited annual precipitation tend to restrict the overall species diversity. In general, the vegetation of the Permit Area is typical and representative of most of the region.

The planned Permit Area was expanded in early 2007, and the vegetation survey was extended to include the Permit Area expansion during the 2007 growing season. Field work for 2007 consisted of preparing and field checking a vegetation map of the Permit Area expansion. Since the vegetation types that occurred in the Permit Area expansion were the same as those in the original Permit Area, no additional sampling was conducted. This approach was deemed to be acceptable to WDEQ (Moxley, M. Lander Field Office Supervisor, WDEQ-LQD Lander Field Office. Personal communication. April 2007).

In the section that follows, each of the vegetation types is described based on data collected in June 2006 and on general observations made during various site visits in 2006 and 2007.

3.6.1.1 Upland Big Sagebrush Shrubland

The Upland Big Sagebrush Shrubland type covers most of the Permit Area (approximately 85 percent of the total Permit Area). It covers flat areas and the gently sloping south-facing slopes, and its development is not affected by the gentle topography that characterizes the Permit Area. The percent slope of this type ranges from zero to six percent. Soils throughout the upland areas are mostly shallow and coarse textured. The only environmental settings in the Permit Area that do not support the Upland Big Sagebrush Shrubland type are the areas along the drainages where the Lowland Big Sagebrush Shrubland type grows in the deeper soils that characterize the bottomland areas.

The major species in this type is big sagebrush, which occurs at a mean absolute cover of 14 percent, and accounts for 54 percent of the cover by all species. Sandberg bluegrass *(Poa secunda)*, needle-and-thread grass *(Stipa comata)*, Indian ricegrass *(Oryzopsis hymenoides)*, and thickspike wheatgrass *(Agropyron dasystachyum)* occur as the most prevalent perennial grass species. Together, these four species had a mean cover of eight percent and accounted for 31 percent of the cover by all species. Cushion plants are common in this vegetation type, but collectively accounted for only six percent of the cover by all species. Even though the mean cover values for these species are low, they

were commonly encountered along all the sample transects. The mean total vegetation cover in this type was 26 percent, the cover by litter and rock combined was 22 percent, the bare soil cover was 52 percent, and the total ground cover (vegetation plus litter and rock) was 48 percent. The percent cover by bare soil is a reflection of the sparseness of the vegetation in the Upland Big Sagebrush Shrubland type. Even though there is a considerable amount of bare soil, the vegetation development is very homogeneous across the upland parts of the Permit Area. In general, vegetation development in the region is restricted because of the limited amount of annual precipitation.

Shrubs are abundant in this vegetation type. Big sagebrush occurred at a density of 12,332 individuals per acre (about three per square meter) and rabbitbrush *(Chrysothamnus viscidiflorus)* occurred at a density of 1,490 individuals per acre (0.4 per square meter). While these shrub species occur at high densities, none of the plants are tall. In general, most of the plants are less than 20 inches (0.5 meters) in height and many are less than ten inches (25 centimeters) in height. Semi-shrubs are also common in these upland areas. The total density for semi-shrub species was 2,583 individuals per acre (0.64 per square meter) with winterfat *(Ceratoides lanata)* and prickly gilia *(Leptodactylon pungens)* occurring as the most prevalent of the semi-shrub species.

In all, 36 species were observed in this type (**Table 3.6-1**), with a mean density of about 2.8 species per 100 square feet (about 15 species per 50 square meters).

3.6.1.2 Lowland Big Sagebrush Shrubland

The Lowland Big Sagebrush Shrubland type of the Permit Area occurs along and immediately adjacent to the ephemeral drainages that cross the Permit Area from north to south. Overall, this type covers approximately 15 percent of the total Permit Area. The soils along the drainages tend to be deeper than those on the adjacent uplands and, thereby, have the potential for holding more moisture than the upland areas. The increased potential soil moisture allows for more growth by big sagebrush, so that the individual shrubs growing along the drainages tend to be much larger than the shrubs growing on the upland areas. Along some of the drainages, there are individual big sagebrush plants that are more than 6.6 feet (two meters) tall and have stem diameters greater than 8 inches (20 centimeters). The slope measurements along the sampled transects in this type ranged between zero and three percent; all the transects were either flat or had a southerly aspect component.

The major species in this type is big sagebrush, which occurred at a mean cover of 31 percent and accounted for 72 percent of the cover by all species. Rabbitbrush had a mean cover of three percent and accounted for eight percent of the total vegetation cover. These two dominant shrub species tend to overwhelm the vegetation to the degree that

herbaceous species account for only limited amounts of cover in this type. All native perennial grasses combined had a mean cover of seven percent (16 percent of the total vegetation cover) with Sandberg bluegrass *(Poa secunda)*, thickspike wheatgrass *(Agropyron dasystachyum)*, and squirreltail grass *(Sitanion longifolium)* occurring as the most prevalent perennial grass species. Forb species occur throughout this type, but all occurred at mean cover values that were less than one percent. As a group, all forbs and cushion plants accounted for approximately three percent of the total vegetation cover. The mean total vegetation cover in this type was 43 percent, the cover by litter and rock combined was 34 percent, the bare soil cover was 23 percent, and the total ground cover (vegetation plus litter and rock) was 77 percent. Overall, the vegetation cover in the Lowland Big Sagebrush Shrubland type was 17 percent greater than the cover in the Upland Big Sagebrush Shrubland type.

Shrubs are abundant in this vegetation type. Big sagebrush occurred at a density of 14,417 individuals per acre (3.6 per square meter), and rabbitbrush *(Chrysothamnus viscidiflorus)* occurred at a density of 2,591 individuals per acre (0.6 per square meter). Semi-shrubs occur in this type, but the overall densities are lower than the densities for semi-shrubs in the upland areas. The total density for semi-shrub species was 235 individuals per acre (0.1 per square meter), with prickly gilia *(Leptodactylon pungens)* occurring as the most common of the semi-shrub species.

In all, 43 species were observed in this type (**Table 3.6-1**) with a mean density of about 2.4 species per 100 square feet (12.8 species per 50 square meters).

3.6.1.3 Threatened, Endangered and Special Concern Plant Species

As defined by WDEQ-Land Quality Division (LQD) Guideline No. 2, a literature review was conducted to identify species of special concern, prohibited and restricted noxious weeds, and selenium indicators that could be present within the Permit Area. The review identified several species that occur within the general region.

Threatened and endangered species of the region include the blowout penstemon (*Penstemon haydenii*) and the desert yellowhead (*Yermo xanthocephalus*). Descriptions of these species are provided below.

- Blowout penstemon: This is the only endangered plant species in Wyoming and is known from an area south of the Ferris Mountains, in northwestern Carbon County (Fertig, 2000). While the species is known to occur on a site approximately 32 miles east-northeast of the Permit Area, it is unlikely to occur in the Permit Area. Blowout penstemon grows exclusively in sand blowout

areas, a habitat type absent in the Permit Area. The site south of the Ferris Mountains is the only known location for the species in Wyoming. The only other known populations of blowout penstemon occur in similar sand blowout habitats in northwestern Nebraska.

- Desert yellowhead: This is a threatened species in Wyoming, occurring in southern Fremont County in the Beaver Rim Area, approximately 45 miles northwest of the Permit Area. This species was first discovered in 1990. Its only known population occurs in the Beaver Rim Area. The species appears to be restricted to surface outcrops of Miocene ash deposits. The known populations occur in an area of approximately 42 acres; however, plants occur on only approximately eight acres within the overall distribution area. Studies conducted subsequent to the 1990 discovery have not identified any other localities of the species (Heidel, 2002).

An additional 12 rare plant species are known to occur in Sweetwater County (**Table 3.6-2**). During the vegetation surveys, special consideration was given to these species of special concern and micro-environments capable of supporting these species. However, no species of special concern were observed within the Permit Area.

3.6.1.4 Weeds and Selenium Indicator Species

Overall, the Permit Area has very few weeds due to the remoteness of the site and the limited amount of past disturbance, other than two-track roads and drill sites (**Section 3.3.3**) that has occurred in the area. A list of the prohibited and restricted weeds is provided in **Table 3.6-3**. Only one listed restricted noxious weed species, tansy mustard, was observed within the Permit Area. Scattered individuals of tansy mustard *(Descurainia pinnata)* were observed in the Lowland Big Sagebrush Shrubland. No areas dominated by weedy species were observed within the Permit Area. Selenium indicator species were not observed on-site, and none of the soils of the Permit Area are considered seleniferous.

3.6.2 Aquatic Life and Wetlands

After conducting field investigations and research, aquatic life and wetlands were determined to not exist within the boundaries of the Permit Area. Surface water may be present seasonally, but does not sustain aquatic life or wetland species.

3.6.3 Wildlife

Wildlife inventories of the Permit Area were conducted in 2006 and 2007. Wildlife inventories were designed to provide baseline data for permitting the ISR Project and to ensure that wildlife species and habitats are afforded adequate protection during construction, operations, and restoration. Data collection included file searches of state and federal agency documents, and field surveys for raptors, sage grouse, and breeding birds. Wildlife studies focused on threatened and endangered (T&E) species, MBHFI, raptors, sage grouse leks and nesting habitat, breeding bird surveys, and Pygmy rabbits, as well as a general wildlife inventory of the Permit Area.

For most surveys, the study area was the same as the Permit Area. In order to identify the off-site habitat and individuals that could be affected by Project activities, the study area for sage grouse included an additional two-mile perimeter, and the study area for raptors included an additional one-mile perimeter. Land ownership of the study area is under the jurisdiction of BLM and the State of Wyoming.

The dominant vegetation type within the Permit Area is big sagebrush. The elevation ranges from 6,790 feet to 7,050 feet. The topography is characterized by rolling plains with small, ephemeral drainages dissecting the area. There are no perennial water sources within the study area. Crook Well Reservoir, a stock pond located in Section 16 of Township 25 North, Range 92 West, was dry during the 2006 field survey and contained a small amount of water during the spring of 2007. The entire Permit Area covers approximately 4,220 acres.

The field surveys and reports specific to the Project were completed by Eric Berg, Cecily Mui, Ray Fetherman, Troy Gerhardt, Dennis Buechler, and Eric Fetherman, who are all qualified wildlife biologists or ecologists. Personnel contacted from WGFD include Greg Hiatt (2006, 2007) and Reg Rothwell (2006). Mary Jennings with FWS was also contacted. The interviewed BLM personnel were Rhen Etzelmiller (2006, 2007) and Frank Blomquist (2006). Regular Project briefings were held during the baseline surveys, and BLM and WDEQ-LQD staffs were updated with the progress of the wildlife surveys.

3.6.3.1 Wildlife Habitat Description

The wildlife habitat in the Permit Area is predominantly big sagebrush shrublands (**Figure 3.6-1**). Other wildlife habitats include cushion plant communities, small isolated patches of grassland, and disturbed lands. The big sagebrush shrublands were divided into two different types: Upland Big Sagebrush Shrubland and Lowland Big Sagebrush Shrubland.

The Upland Big Sagebrush Shrubland wildlife habitat (**Figure 3.6-2**) is generally found on flat and rolling hills. This habitat is important for pronghorn antelope, mule deer, sage grouse, white-tailed prairie dogs, and reptiles. Raptors often hunt in big sagebrush shrubland habitat, and sage grouse leks are typically located on ridge tops that are dominated by cushion plant communities.

The Lowland Big Sagebrush Shrubland wildlife habitat (**Figure 3.6-3**) is found along drainages in areas with relatively steep slopes. This habitat type has significantly more vegetation cover than the Upland Big Sagebrush Shrubland. The Lowland Big Sagebrush Shrubland wildlife habitat also provides important cover for resident and migratory birds, reptiles, and small mammals. The taller big sagebrush provides nesting sites for raptors and critical forage for ungulates and sage grouse during winters with extreme snowfall.

Species Lists

A list of wildlife species that potentially occur in the Permit Area is provided in **Table 3.6-4**. A total of 224 wildlife species potentially occur in the Permit Area. Of these, 164 species are birds, 51 species are mammals, four species are amphibians, and five species are reptiles. Species that are known to exist in the study area, from observation or the presence of identifying signs, are denoted with an asterisk in **Table 3.6-4**.

3.6.3.2 Methods

File and Data Searches

Locations of raptor nest sites, sage grouse leks, prairie dog towns, big game ranges, and T&E species were obtained from GIS data from the BLM and WGFD. WGFD publications and the computerized WGFD Wildlife Observation System (WOS) of the Permit Area were reviewed (**Attachment 3.6-1**) along with FWS publications.

A copy of the Sweetwater Uranium Facility Environmental Report (Shepherd Miller, Inc., 1994) that covered a study area southwest of the Permit Area was also reviewed. The Shepherd Miller study was used as an initial survey reference for the area for T&E plant and animal species, big game ranges, sage grouse leks, and raptor nest sites.

Field Surveys

Field surveys for sage grouse leks, raptor nest sites, and breeding birds were completed in the Permit Area between early April and October 2006; additional sage-grouse-lek and nesting raptor surveys were completed during the spring of 2007. Pygmy rabbit surveys were completed during June and July of 2007. The presence of other wildlife species or

their identifying signs were also recorded, and all observed species are included in **Table 3.6-4**. Breeding bird surveys were conducted within the Permit Area; surveys for raptor nests and sage grouse also included one- and two-mile buffer areas, respectively. Pygmy rabbit surveys were conducted in random transects within the Permit Area.

General field surveys were completed by traversing the Permit Area and the surrounding area in a high-wing aircraft, four-wheel drive vehicles, and on foot. Binoculars and spotting scopes were used for observations. Specific survey methods for individual species or groups of species are presented in **Attachment 3.6-2**. Wildlife surveys were completed according to a work plan developed in consultation with the WGFD, WDEQ, and BLM. The scope of field work was finalized in consultation with BLM in Rawlins, Wyoming, in February and March of 2006 (BLM, 2006). The field survey protocols were consistent with recommendations from both BLM and WGFD (**Attachment 3.6-3**).

3.6.3.3 Results

The following sections provide the results from the file searches and field studies, along with relevant figures, tables, and maps. **Table 3.6-4** provides a list of wildlife species that have the potential of occurring in the study area. **Attachment 3.6-1** includes the WGFD WOS record of wildlife species previously observed in the Permit Area.

Big Game

Specific big game surveys were not required for the Project (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006); however, the relative abundance of big game observations during the course of field work was recorded and is presented in **Table 3.6-5**.

Pronghorn, mule deer, and elk were the only big game animals recorded in the Permit Area during field observations in 2006 and 2007. WGFD observations in **Attachment 3.6-1** indicate that pronghorn are the most abundant big game species in the study area. Pronghorn use of the study area, as determined by WGFD and BLM, is shown on **Figure 3.6-4**. The Permit Area is classified as Winter/Yearlong Range. Winter/Yearlong Range is the area where a population of animals makes general use of the habitat on a year-round basis, and there is a significant influx of animals between December and April. The study area comprises a portion of the Red Desert Antelope Herd Unit (WGFD Hunt Area 61). Based on the most current Annual Big Game Herd Unit Job Completion Reports (JCRs) (WGFD 2006a), the Red Desert Antelope Herd had a five-year (2000 through 2005) average population of 14,454 pronghorns.

A map of mule deer use of the study area is presented in **Figure 3.6-5**. The Permit Area is out of mule deer range. Areas described as "out of range" contain few animals or the available habitat is of limited importance to the species.

Elk use of the study area is mapped in **Figure 3.6-6**. Elk likely use the Permit Area as transitional range while moving to other areas. The 2005 WGFD data defines the seasonal range of the elk to be outside of the Permit Area. The 2007 WGFD Herd Unit Data describes two herds, the Shamrock Elk Herd Unit (#643) and the Steamboat Elk Herd Unit (#426), as being situated on or near the Permit Area.

The Permit Area is classified as out of moose range (as determined by WGFD and BLM; **Figure 3.6-7**); no moose or sign of moose were observed in the study area.

Upland Game Birds

Field surveys of upland game birds focused on sage grouse strutting grounds, also known as leks. All known strutting grounds were inventoried, and the entire study area within two miles of the Permit Area was searched for additional leks. Three aerial surveys were completed for new leks during April of 2006 and 2007. In addition, ground surveys of new leks were completed by driving on roads within the study area and listening for booming sage grouse. Aerial surveys were completed by flying north-south transects in a fixed-wing aircraft at an altitude of 330 to 490 feet (100 to 150 meters) above ground level, with a transect spacing of about 0.6 miles (one kilometer). Lek attendance surveys, which document the number of male sage grouse observed at each lek, were completed on the ground three times for each known lek during April of 2006 and 2007. Sage grouse brood surveys were not required by BLM and WGFD (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006).

Sage grouse and mourning doves were the only upland game birds noted in the study area. Sage grouse may inhabit the area year-long, but mourning doves are migrants and only inhabit the area from spring into early fall. No active sage grouse leks were located in the Permit Area. The Crooked Well Lek, which is a known strutting ground along the northeast boundary of the Permit Area (Township 25 North, Range 92 West, Section 16), was inactive during three site visits in April 2006 (**Figure 3.6-8**). Four males were observed on the lek on April 4, 2007, but no sage grouse were present in the other two lek surveys; therefore, it is considered inactive. No other birds were observed on the lek during 2007. Six active leks were located within the two-mile buffer zone. The locations and lek attendance of these leks are presented in **Figure 3.6-8** and **Table 3.6-6**.

Five of the six active leks had been previously mapped by WGFD. The Discover 2 Lek, located in Township 25 North, Range 93 West, Section 23, approximately 0.7 miles west

of the Permit Area, is a newly mapped active lek. It appears to be a satellite of the previously mapped Discover Lek, 0.5 miles to the west. The Prospect South Lek (Township 25 North, Range 92 West, Section 3, Southwest Quarter) is located approximately 0.75 miles south of the Prospect Lek. These are new leks not previously mapped by WGFD or located during the 2006 surveys. The Green Ridge Satellite Lek is located approximately 0.2 miles west of the Green Ridge Lek. At undisturbed leks, attendance ranged from 17 to 126 males during the April 2006 survey. The most highly frequented leks in 2006 and 2007 were Sand Gully (58 to 126 males), Discover (19 to 69 males), and Prospect (41 to 64 males). All sage grouse leks occurred in association with Upland Big Sagebrush Shrubland communities in areas with cushion plants, blowouts and bare ground. The Sooner and Sooner Oil leks were also counted in 2007 because they are located near off-site transportation routes that may be used by the Project.

Raptors

A raptor nest survey of the entire Permit Area and a one-mile buffer zone was conducted in April and June of 2006, and April, May and June of 2007. The survey provided status updates on nests previously identified by BLM and WGFD and a survey for new nests. Surveys were conducted on foot or using four-wheel-drive vehicles; additional surveys were completed by air while looking for sage grouse leks. Raptor observations were made using binoculars and a high-powered spotting scope. Nest site activity and production surveys were conducted according to protocols vetted by the BLM, Rawlins District (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006). Special attention was made to avoid disturbance of any active nests while completing the wildlife surveys.

Agency files were reviewed for data on raptor nests in the area. File searches identified 12 previously documented raptor nests within a one-mile buffer zone of the Permit Area. The status of these nests is presented in **Table 3.6-7** and the locations are presented in **Figure 3.6-9**.

No active raptor nests occur within the Permit Area. Nest FH25921601 was an active ferruginous hawk's nest on an artificial nest structure, which was in excellent condition in previous visits. However, in 2007, Nest FH25921601 was in poor condition, and inactive on multiple visits in 2006 and 2007. One raptor nest was found within the one-mile buffer zone. Nest AFH25921004 was occupied by a pair of ferruginous hawks and was in excellent condition and located on top of artificial nest platforms. Nest AFH25921004 had two or three chicks in the nest when it was last observed on June 15, 2006. Seven other nests that had been previously documented by BLM in the one-mile buffer zone surrounding the Permit Area (**Table 3.6-7** and **Figure 3.6-9**) were not located during the 2006 and 2007 surveys. Global Positioning System (GPS) units were used to visit the

sites of these nests, but none were located. No new raptor nests were identified during the 2006 or 2007 field surveys.

Several other raptor species were recorded within the study area, but nests were not documented. These species include the Swainson's hawk, red-tailed hawk, northern harrier, golden eagle, kestrel, prairie falcon, and turkey vulture. While the conditions are present for the northern harrier and American kestrel nests within the Permit Area, specific nest sites were not located. Northern goshawk, merlin, and peregrine falcons were not observed in the study area.

Waterfowl and Shorebirds

Specific waterfowl and shorebird surveys were not required by the BLM, Rawlins District (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006). One shorebird species was observed during bird and wildlife surveys, which is noted in the species list of **Table 3.6-4**. Most recorded waterfowl and shorebird species are designated "uncommon" to "fairly common" in the region.

In the study area, habitat for waterfowl and shorebirds is sparse. The man-made Crooked Well Reservoir was dry during the 2006 field survey and contained a small amount of water during the spring of 2007. Waterfowl and shorebird species would be expected in the Permit Area during migrations in the spring and fall, with additional use in the summer months. Late fall and winter use of the Permit Area by waterfowl and shorebirds is believed to be very limited.

Passerine and Breeding Birds

A breeding bird survey of all representative habitats of the Permit Area was conducted during the peak of the nesting season in June 2006, using methods recommended in WDEQ-LQD Wildlife Guideline No. 5 Wildlife (1994). Surveys took place in the morning between 0500 to 0930 hours. One 3,280-foot (1,000-meter) transect was established in each habitat within the Permit Area. In Upland Big Sagebrush Shrubland, 328-foot- (100-meter-) wide belt transects were walked, and all birds that were heard or observed were recorded. In riparian zones, where limited habitat size precluded 3,280-foot- (1,000-meter-) wide transects, point transects with 328-foot- (100-meter-) wide spacing were surveyed for five minutes; all birds heard or observed within 164 feet (50 meters) were recorded.

All avian species observed are documented in the species list in **Table 3.6-4**. A total of 31 passerine species were recorded during surveys. The most common species in the Permit Area were the horned lark, Brewer's sparrow, and sage sparrow.

Species observed in the Upland Big Sagebrush Shrubland habitat were similar to species observed in the Lowland Big Sagebrush Shrubland habitats. There were 12 breeding species seen in each of the big sagebrush habitats during breeding bird surveys.

Migratory Birds of High Federal Interest

MBHFI and other wildlife species were inventoried during all site visits. This was accomplished by searching all suitable or potentially suitable habitats and recording all species encountered.

Several MBHFI species are known to occur in the region (**Attachment 3.6-4**). Level I MBHFI species are described by FWS as in need of conservation, while Level II MBHFI species are described as in need of monitoring. Level I MBFHI species in the region include the bald eagle, ferruginous hawk, Swainson's hawk, peregrine falcon, burrowing owl, sage grouse, mountain plover, Brewer's sparrow, and sage sparrow. Of these, the ferruginous hawk, sage grouse, Brewer's sparrow, and sage sparrow were documented in the Permit Area; the mountain plover and burrowing owl have been noted in adjacent areas (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006).

Level II species documented in the Permit Area include the sage thrasher, loggerhead shrike, vesper sparrow, and lark sparrow. Level II MBHFI species known to exist in the region, but not documented in the study area, include the merlin, Cassin's kingbird, sage thrasher, black-billed cuckoo, loggerhead shrike, and lark bunting.

The ferruginous hawk nests in the study area were previously discussed in this section. Sage grouse mating and nesting in the study area and their strutting grounds were previously discussed in this section as well. The breeding Brewer's sparrow and sage sparrow were found throughout the big sagebrush habitats of the Permit Area. The breeding sage thrasher, loggerhead shrike, vesper sparrow, and lark sparrow were also located within the Permit Area.

No mountain plover were observed on or near the Permit Area during spring and early summer of the 2006 and 2007 field studies. The Permit Area was evaluated for mountain plover habitat. The extensive tall shrub cover and absence of grassland or open shrub habitats make the Permit Area poorly suited to the mountain plover. Small open areas (grassland and disturbed blowouts) do occur in the Permit Area, but are isolated. Mountain plover prefer open grasslands, bare ground, disturbed areas, prairie dog colonies and sparse shrubland habitats for nesting. Good potential mountain plover habitat occurs a few miles to the south and west of the Permit Area. However, since no good potential mountain plover habitat exists in the study area and no mountain plover

were observed during other field studies, it is unlikely that mountain plovers inhabit the Permit Area.

Other Mammals

All mammal species and identifying signs observed during the field studies were recorded and are documented on the species list in **Table 3.6-4**. A total of 19 mammal species were recorded in the study area. The most common species seen were the white-tailed jackrabbit, desert cottontail, Wyoming ground squirrel, thirteen-lined ground squirrel, deer mouse, and meadow vole. The coyote was the most abundant predator. The majority of mammalian species were observed in big sagebrush habitats.

Two wild horse HMAs overlap with the Permit Area. The Permit Area is within the Stewart Creek HMA and the Lost Creek HMA. Horses were seen in all habitats of the study area.

Aerial and ground surveys of the entire Permit Area were used to locate prairie dog towns. There were no active colonies in the Permit Area.

T&E and State-Listed Species of Concern

Threatened, endangered, and candidate wildlife species surveys were completed during all site visits by searching suitable habitats for the target species. The specific survey techniques used to identify each species and their potential of occurrence in the Permit Area are included in **Table 3.6-8**.

The bald eagle (threatened) and black-footed ferret (endangered) are the only federally listed or candidate species that may occur in the vicinity of the Permit Area (FWS, 2006). Bald eagle nesting habitat does not exist within the study area, but they might be found in the Permit Area during migration. The bald eagle has not been recorded in the study area (**Attachment 3.6-1**).

A black-footed ferret survey was not required, since black-footed ferrets live exclusively in prairie dog colonies, which are not present within the Permit Area.

The state-listed wildlife species (WGFD, 2005a, 2005b) not included under other wildlife categories, and their probability of occurrence in the Permit Area, are listed in **Table 3.6-9**. State-listed species that may occur in the Permit Area are classified as Native Species Status (NSS) 2, 3, or 4 (WGFD, 2005a). Status 2 species have declining populations that are threatened with extirpation, and have restricted or vulnerable habitat. These species may also be sensitive to human disturbance or have significant habitat loss. Status 3 species have: 1) populations that are restricted or declining with the threat of extirpation,

2) habitat that is restricted or vulnerable, or 3) a wide distribution and unknown population, with significant habitat loss. Status 4 species have: 1) populations that are restricted or declining with stable habitat, 2) widely distributed stable populations with restricted habitat that are sensitive to human disturbance, or 3) stable or increasing populations with significant loss of habitat.

Listed waterfowl and shorebird species such as the American white pelican, upland sandpiper, and long-billed curlew, and passerines, such as McCown's longspur, chestnut-collared longspur, and bobolink, are unlikely to be in the Permit Area, because there is no suitable habitat for these species; they may pass through the Permit Area during migration. The sage thrasher, Brewer's sparrow, and sage sparrow (all NNS4 species) were observed in the Permit Area. Suitable habitat exists for the willow lark bunting, though this species was not observed.

State-listed mammal species that may occur in the Permit Area have been classified as Native Species Status 2, 3, or 4 (WGFD, 2005b). Several listed shrew and bat species, such as the dwarf shrew, vagrant shrew, hoary bat, and silver-haired bat, have ranges that include the Permit Area. There is no suitable habitat in the study area, so they are unlikely to be present. Suitable roosting habitats for the western small-footed myotis, little brown myotis, long-legged myotis, big brown bat, Townsend's big-eared bat, and pallid bat might be found in rock crevices, rock outcrops, or trees near the Stratton Rim to the north of the Permit Area. These species could also potentially roost in the vertical walls of eroded streambeds in the Permit Area. None of these species was observed in the Permit Area. The state-listed olive-backed pocket mouse and prairie vole were not observed in the Permit Area. Suitable habitat exists in the Permit Area, and these species are known to be in the region (WGFD, 2004a).

Surveys were conducted for Pygmy rabbits (NNS3 species). Pygmy rabbits were observed in the Permit Area during the summer of 2007. Based on these surveys Pygmy rabbits occur in all Lowland Big Sagebrush Shrubland habitats (**Figure 3.6-1**). Scat, burrows, and individual Pygmy rabbits were observed along every transect within the Lowland Big Sagebrush Shrubland habitats of the study area.

Reptiles and Amphibians

Specific reptile and amphibian surveys were not required for the Project (Etzelmiller, R. Wildlife Biologist, BLM. Personal communication. February 2006; Blomquist, F. Wildlife Biologist, BLM. Personal communication. February 2006). Several species were observed during general surveys, as noted in **Table 3.6-4**. These included the greater short-horned lizard, prairie rattlesnake, and western terrestrial garter snake.

Fish

The Permit Area is predominately dry shrubland, and there is no aquatic habitat for most of the year. The Crooked Well Reservoir is an ephemeral stock pond that is dry except for a short period of time after spring snowmelt. No fish or other aquatic life occur.

N

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA

Legend

- Lowland Big Sagebrush
- Upland Big Sagebrush
- Lost Creek Permit Area

FIGURE 3.6-1
VEGETATION
Lost Creek Permit Area

Issued For: NRC ER — Drawn By: EB

Issued/Revised: 10.16.07

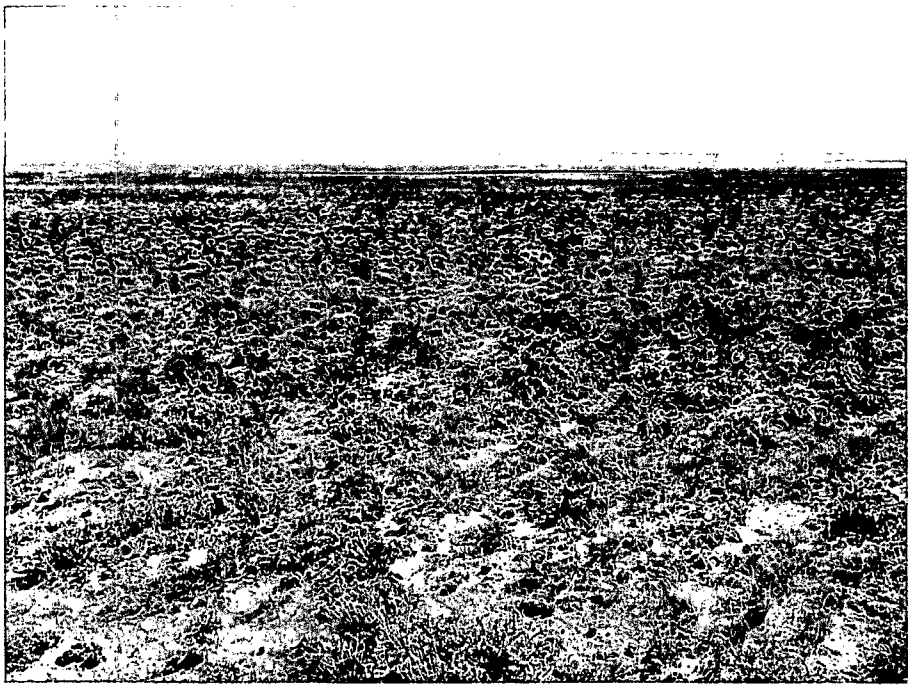
Drawing No: NRC-ER-3.6-1-10.16.07-EJS

0 — 0.5 Miles

T25N- R93W-36

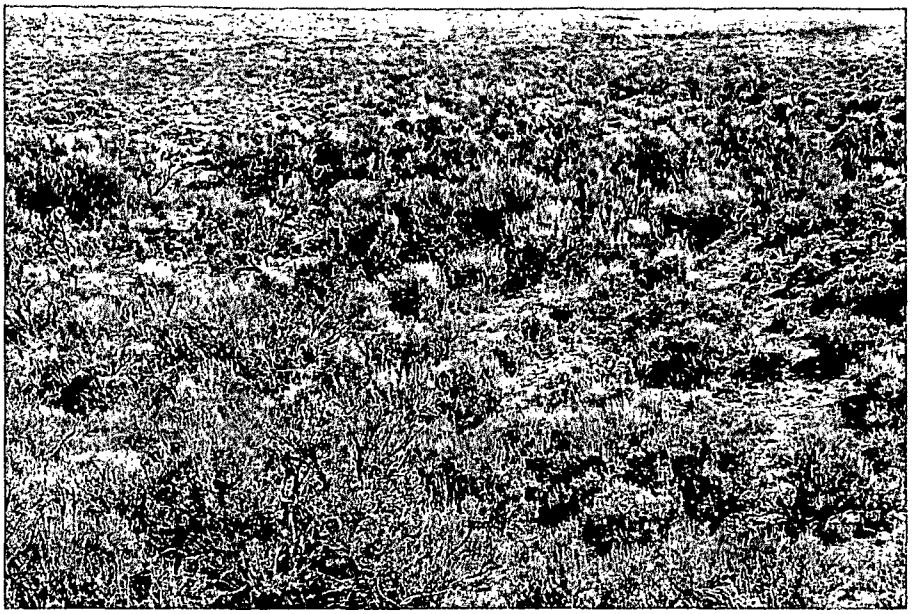
T25N- R92W-31

Figure 3.6-2 Upland Big Sagebrush Shrubland

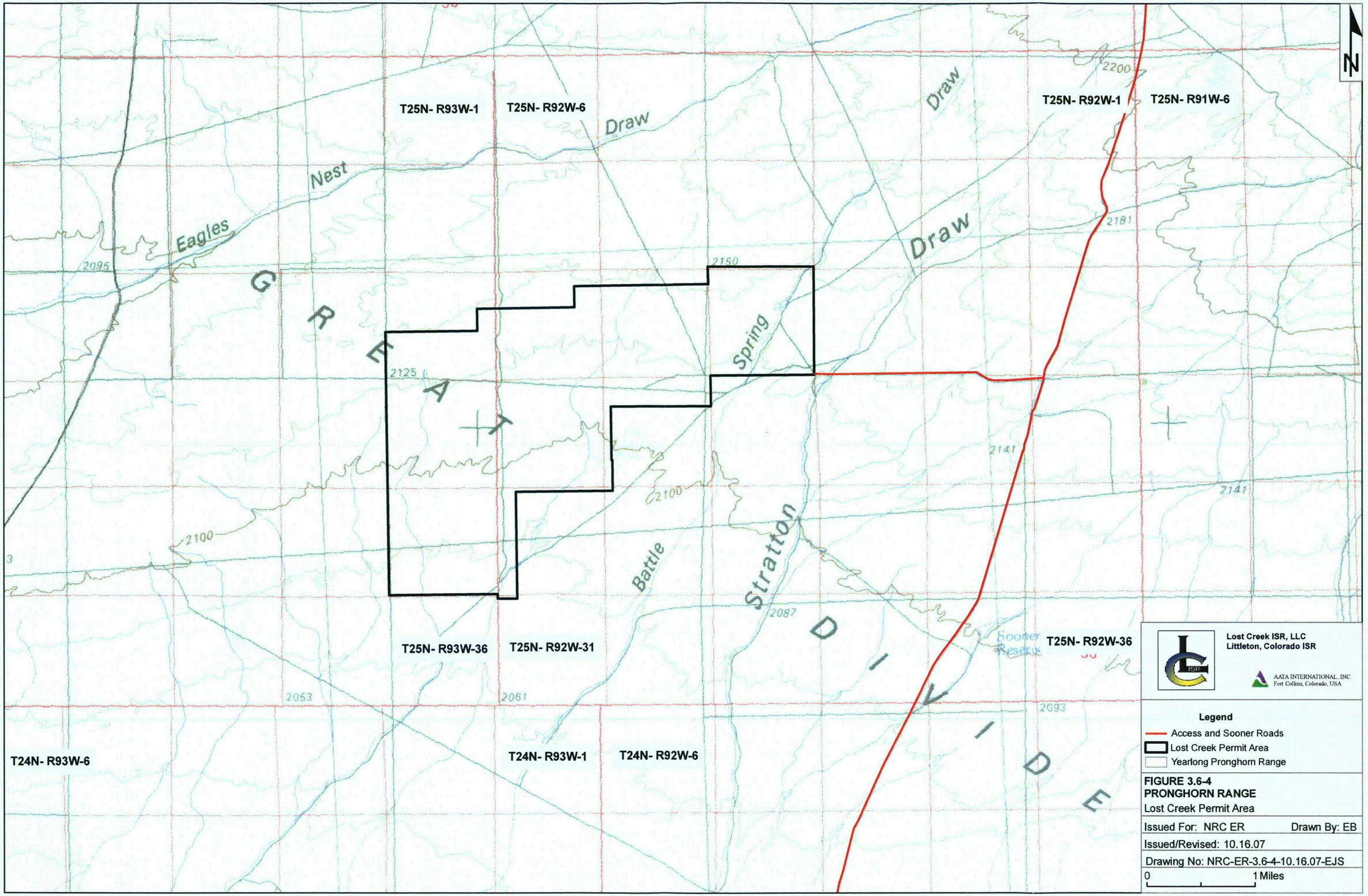


June 2006

Figure 3.6-3 Lowland Big Sagebrush Shrubland



June 2006


T25N- R93W-1
T25N- R92W-6
T25N- R92W-1
T25N- R91W-6
T25N- R93W-36
T25N- R92W-31
T25N- R92W-36
T24N- R93W-6
T24N- R93W-1
T24N- R92W-6
Draw
Nest
Eagles
Spring
Battle
Stratton
Sooner Reserv
GREAT DIVIDE
2095
2100
2125
2150
2181
2200
2141
2087
2053
2061
2093
N
Lost Creek ISR, LLC
Littleton, Colorado ISR
AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA
Legend
Access and Sooner Roads
Lost Creek Permit Area
Yearlong Pronghorn Range
FIGURE 3.6-4
PRONGHORN RANGE
Lost Creek Permit Area
Issued For: NRC ER
Drawn By: EB
Issued/Revised: 10.16.07
Drawing No: NRC-ER-3.6-4-10.16.07-EJS
0
1 Miles

T25N- R93W-1

T25N- R92W-6

T25N- R92W-1

T25N- R91W-6

T25N- R93W-36

T25N- R92W-31

T25N- R92W-36

T24N- R93W-6

T24N- R93W-1

T24N- R92W-6

Draw

Nest

Eagles

Spring

Battle

Stratton

Sooner Reserv

2200

2181

2150

2125

2141

2100

2087

2095

2053

2061

2093

GRANGER DIVIDE

N

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA

Legend

- Access and Sooner Roads
- Out of Mule Deer Range
- Lost Creek Permit Area

FIGURE 3.6-5
MULE DEER RANGE
Lost Creek Permit Area

Issued For: NRC ER Drawn By: EB

Issued/Revised: 10.16.07

Drawing No: NRC-ER-3.6-5-10.16.07-EJS

0 1 Miles

T25N- R93W-1

T25N- R92W-6

T25N- R92W-1

T25N- R91W-6

T25N- R93W-36

T25N- R92W-31

T25N- R92W-36

T24N- R93W-6

T24N- R93W-1

T24N- R92W-6

Draw

Nest

Eagles

Draw

Draw

Spring

Battle

Stratton

G R E A T

D I V I D E

2200

2181

2150

2095

2125

2141

2141

2100

2100

2087

2053

2061

2093

N

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA

Legend

- Access and Sooner Roads
- Lost Creek Permit Area

Elk Herd Name

- Shamrock
- Steamboat

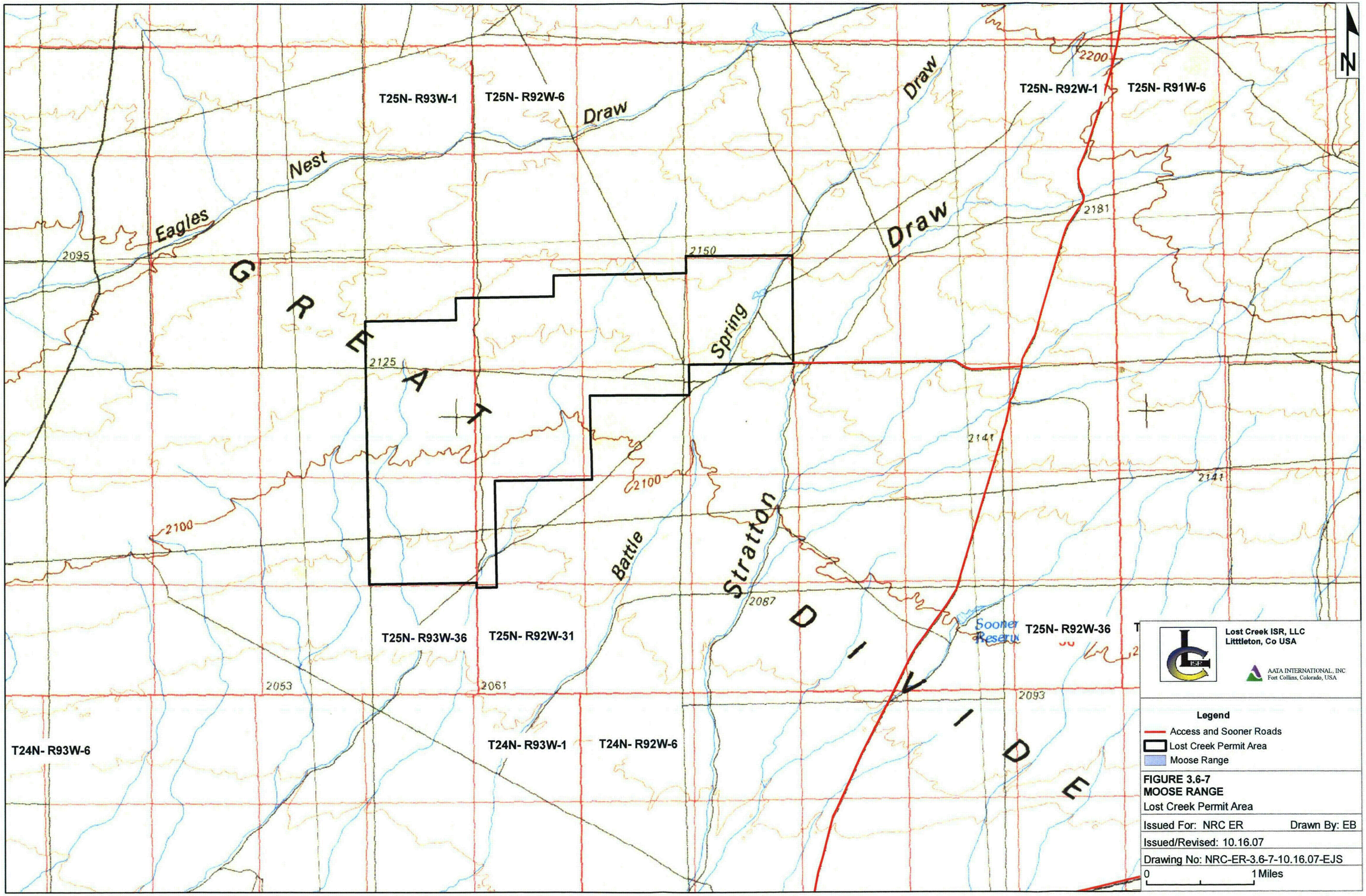
FIGURE 3.6-6
ELK RANGE
Lost Creek Permit Area

Issued For: NRC ER Drawn By: EB

Issued/Revised: 10.16.07

Drawing No: NRC-ER-3.6-6-10.16.07-EJS

0 1 Miles


N
T25N- R93W-1
T25N- R92W-6
T25N- R92W-1
T25N- R91W-6
Draw
Nest
Eagles
Draw
Draw
2200
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2095
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2125
GRAY
Spring
2141
2141
2100
2100
Battle
Stratton
DIVIDE
2087
T25N- R93W-36
T25N- R92W-31
T25N- R92W-36
Sooner
Reserv
2053
2061
2093
T24N- R93W-6
T24N- R93W-1
T24N- R92W-6
Lost Creek ISR, LLC
Littleton, Co USA
AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA
Legend
Access and Sooner Roads
Lost Creek Permit Area
Moose Range
FIGURE 3.6-7
MOOSE RANGE
Lost Creek Permit Area
Issued For: NRC ER
Drawn By: EB
Issued/Revised: 10.16.07
Drawing No: NRC-ER-3.6-7-10.16.07-EJS
0
1 Miles

Sand Gully
Prospects
Eagles Nest Draw
Prospects South
Draw
Nest
Eagles
Draw
Draw
2200
2181
2095
2150
Green Ridge
Green Ridge Satellite
Crooked Well
Spring
GREAT
Discover
Discover 2
2125
2141
2100
2100
Southland Well
Battle
Stratton
2087
DIVIDE
Sooner Reservoir
36
31
36
2053
2061
2093
6
1
6
Sooner Oil
Minex West
Sooner
3

N

Lost Creek ISR, LLC
Littleton, Colorado USA

AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA

Legend

- Occupied Sage Grouse Lek
- Unoccupied Sage Grouse Lek
- Access and Sooner Roads
- Lost Creek Permit Area
- 0.25-mile buffer (Jul 16 - Feb 28)
- 2-mile buffer (Mar 1 - Jul 15)

FIGURE 3.6-8
SAGE GROUSE LEKS
Lost Creek Permit Area

Issued For: NRC ER Drawn By: EB

Issued/Revised: 10.16.07

Drawing No: NRC-ER-3.6-8-10.16.07-EJS

0 1 Miles

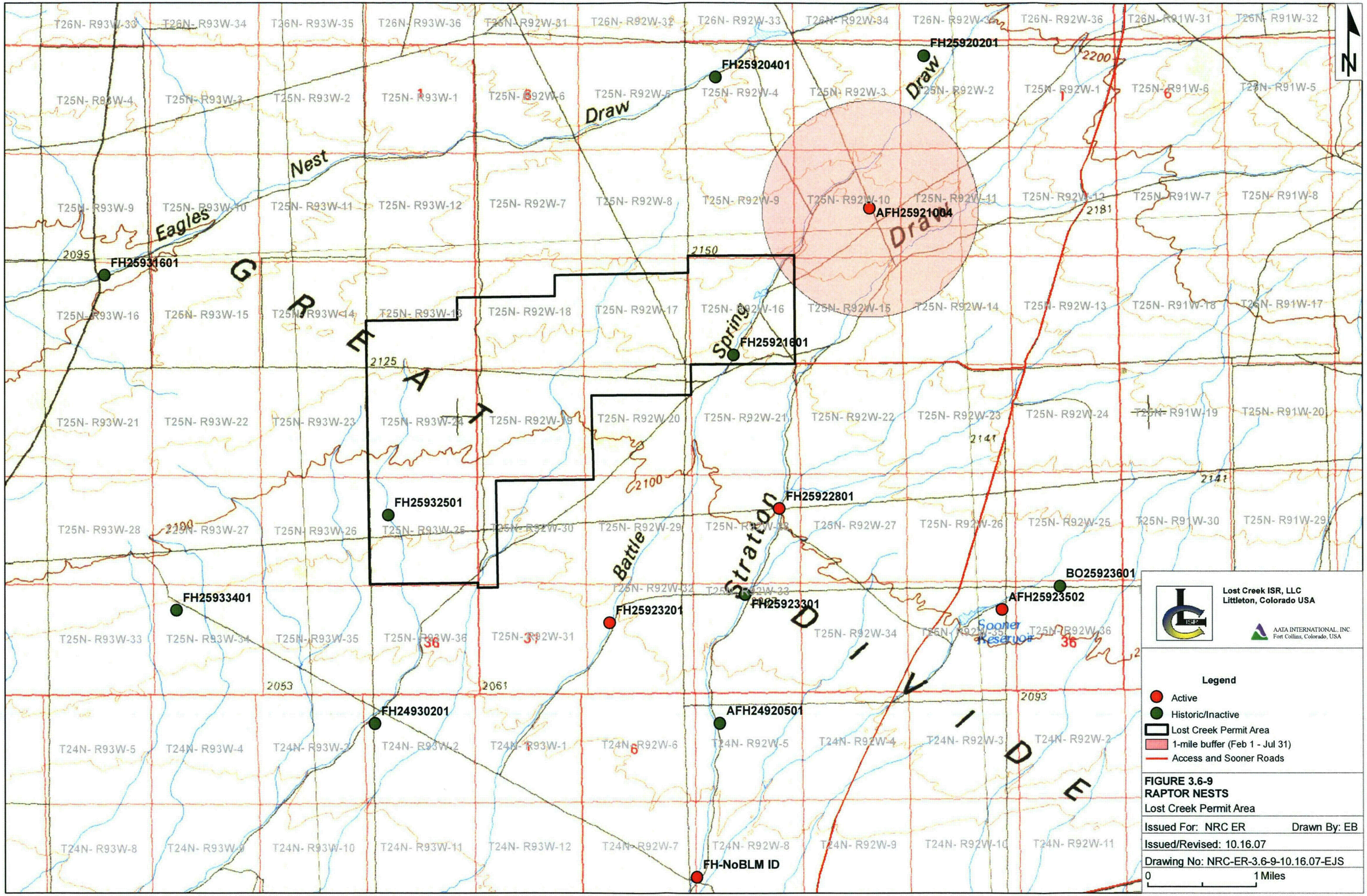
FH25920201
FH25920401
Draw
Nest
Eagles
AFH25921004
FH25931601
GRANT
FH25921601
Spring
FH25932501
FH25922801
Battle
Station
BO25923601
AFH25923502
FH25933401
FH25923201
FH25923301
Sooner Reservoir
FH24930201
AFH24920501
FH-NoBLM ID
Lost Creek ISR, LLC
Littleton, Colorado USA
AATA INTERNATIONAL, INC
Fort Collins, Colorado, USA
Legend
Active
Historic/Inactive
Lost Creek Permit Area
1-mile buffer (Feb 1 - Jul 31)
Access and Sooner Roads
FIGURE 3.6-9
RAPTOR NESTS
Lost Creek Permit Area
Issued For: NRC ER
Drawn By: EB
Issued/Revised: 10.16.07
Drawing No: NRC-ER-3.6-9-10.16.07-EJS
0
1 Miles

Table 3.6-1 Summary of Vegetation Data (Page 1 of 2)

Scientific Name	Common Name	Lost Creek Permit Area	
		Upland Big Sagebrush Shrubland	Lowland Big Sagebrush Shrubland
ANNUAL FORBS			
Alyssum desertorum	Desert Alyssum		x
Chenopodium album	Goosefoot		x
Chenopodium leptophyllum	Narrowleaf Goosefoot		x
Cordylanthus ramosus	Cordylanthus		x
Cryptantha minima	Small Cryptantha		x
Descurainia pinnata	Tansy Mustard		x
Gayophytum ramossissimum	Gaywings		x
Lupinus kingii	Annual Lupine	x	
Microsteris micrantha	Microsteris		x
Navarettia breweri	Navarettia		x
Polygonum aviculare	Devil's Shoestrings		x
Polygonum sawatchense	Sawatch Knotweed		x
Sisymbrium altissimum	Tumbling Hedge Mustard		x
PERENNIAL FORBS			
Allium textile	Prairie Onion	x	x
Antennaria rosea	Pussytoes		x
Arabis sp.	Rockcress	x	x
Astragalus mollissimus	Woolly Milkvetch	x	
Astragalus sericoleucus	Silky Milkvetch	x	
Crepis occidentalis	Hawksbeard		x
Cryptantha thrysiflora	Cryptantha	x	
Erigeron pumilus	Fleabane	x	
Hymenoxis acaulis	Stemless Actinea	x	
Lomatium orientale	Bisquitroot	x	
Machaeranthera canescens	Machaeranthera	x	
Sedum lanceolatum	Stonecrop	x	
Senecio integerrimus	Groundsel		x
Trifolium gymnocarpon	Hollyleaf Clover	x	x

Table 3.6-1 Summary of Vegetation Data (Page 2 of 2)

Scientific Name	Common Name	Lost Creek Permit Area	
		Upland Big Sagebrush Shrubland	Lowland Big Sagebrush Shrubland
COOL SEASON PERENNIAL GRASSES AND GRASSLIKE PLANTS			
Agropyron dasystachyum	Thickspike Wheatgrass	x	x
Agropyron smithii	Western Wheatgrass		x
Agropyron spicatum	Bluebunch Wheatgrass	x	x
Carex douglasii	Douglas Sedge		x
Carex eleocharis	Spikerush Sedge		x
Elymus cinereus	Great Basin Wildrye		x
Hordeum jubatum	Foxtail Barley		x
Koeleria macrantha	Prairie Junegrass	x	x
Muhlenbergia richardsonis	Mat Muhly		x
Oryzopsis hymenoides	Indian Ricegrass	x	x
Poa secunda	Sandberg Bluegrass	x	x
Sitanion longifolium	Squirreltail Grass	x	x
Stipa comata	Needle-and-thread Grass	x	x
Stipa lettermannii	Lettermann Needlegrass		x
CUSHION PLANTS			
Arenaria hookeri	Hooker's Sandwort	x	x
Astragalus spatulatus	Spatulate Leaf Milkvetch	x	
Eriogonum acaule	Stemless Buckwheat	x	x
Eriogonum ovalifolium	Oval Leaved Buckwheat	x	x
Haplopappus acaulis	Stemless Goldenweed	x	
Paronychia sessiliflora	Nailwort	x	
Phlox hoodii	Hood's Phlox	x	x
SEMI-SHRUBS			
Artemisia frigida	Fringed Sagewort	x	
Artemisia spinescens	Bud Sage	x	
Ceratoides lanata	Winterfat	x	x
Gutierrezia sarothrae	Broom Snakeweed	x	
Leptodactylon pungens	Leptodactylon	x	x
SHRUBS			
Artemisia tridentata	Big Sagebrush	x	x
Chrysothamnus nauseosus	Rubber Rabbitbrush	x	x
Chrysothamnus viscidiflorus	Rabbitbrush	x	x
CACTUS			
Opuntia polyacantha	Plains Prickly Pear Cactus	x	x
LICHEN			
Parmelia chlorochroa (lichen)	Parmelia	x	x

Table 3.6-2 Rare Plant Species (Page 1 of 2) *

Scientific Name	Common Name	Local Distribution	Heritage [1]/ State Rank [2]	Federal Status [3]
Artemisia biennis var *diffusa*	Mystery Wormwood	Central Sweetwater Co.	G5T1Q/S1	C2
Asclepias uncialis	Dwarf Milkweed	Northwestern Sweetwater Co.	G3/SH	C2, S-R2
Astragalus jejunus var. *jejunus*	Starveling Milkvetch	Eastern and Western edges of Sweetwater Co.	G3T1/S1	C2
Astragalus proimanthus	Precocious Milkvetch	Extreme southwestern Sweetwater Co.	G1/S1	C2
Cirsium ownbeyi	Ownbey's Thistle	South-central Sweetwater Co.	G3/S1	C2
Descurainia torulosa	Wyoming Tansy Mustard	South-central Sweetwater Co.	G1/S1	C2, S-R2, S-R4
Lesquerella macrocarpa	Large-fruited Bladderpod	North-central Sweetwater Co.	G2/S2	C2
Oryzopsis contracta	Contracted Indian Ricegrass	Northeast, northwest and southwest Sweetwater Co.	G3/S3	C2
Penstemon acaulis var *acaulis*	Stemless Beardtongue	Extreme southwestern Sweetwater Co.	G3/S1	C2, S-R4
Penstemon gibbensii	Gibben's Beardtongue	Extreme southeastern Sweetwater Co.	G1/S1	C2
Phlox opalensis	Opal Phlox	Central part of western Sweetwater Co.	G1/S1	C2
Thelesperma caespitosum	Green River Greenthread	Southwestern Sweetwater Co.	G1/S1	C2, S-R4

* (USGS, 2006b)

[1] **Heritage Rank Codes:**

G1: Critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (Critically endangered throughout its range).

G2: Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

G3: Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences. (Threatened throughout its range).

Table 3.6-2 Rare Plant Species (Page 2 of 2)

G4: Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
T1: The variety is critically imperiled globally because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction (Critically endangered throughout its range).
Q: Indicates uncertainty about taxonomic status.

[2] **State Rank Codes:**

S1: Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state).
S2: Imperiled in state because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extirpation from the state (Endangered or threatened in state).
S3: Rare in state (21 to 100 occurrences)
SH: Of historical occurrence, not documented in Wyoming since 1920.

[3] **Federal Status Codes:**

C2: Notice of Review, Category 2: taxa for which current information indicates that proposing to list as endangered or threatened is possible, but appropriate or substantial biological information is not on file to support an immediate rulemaking.
S: Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:
a. Significant current or predicted downward tends in population numbers or density.
b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
R: Forest Region

Table 3.6-3 Prohibited and Restricted Noxious Weeds *

Scientific Name	Common Name	Lost Creek Permit Area	
		Upland Big Sagebrush Shrubland	Lowland Big Sagebrush Shrubland
PROHIBITED NOXIOUS (DESIGNATED WEEDS)			
Agropyron repens	Quackgrass		
Arctium minus	Common Burdock		
Cardaria draba	Hoarycress		
Cardaria pubescens	Hoarycress		
Carduus acanthoides	Plumeless Thistle		
Carduus nutans	Musk Thistle		
Centaurea maculosa	Spotted Knapweed		
Centaurea repens	Russian Knapweed		
Chrysanthemum leucanthemum	Ox-eye Daisy		
Cirsium arvense	Canada Thistle		
Convolvulus arvensis	Field Bindweed		
Cynoglossum officinale	Hound's Tongue		
Euphorbia esula	Leafy Spurge		
Franseria discolor	Skeletonleaf Bursage		
Isatis tinctoria	Dyer's Woad		
Lepidium latifolium	Perennial Pepperweed		
Linaria dalmatica	Dalmatian Toadflax		
Linaria vulgaris	Butter and Eggs		
Onopordum acanthium	Scotch Thistle		
Sonchus arvensis	Perennial Sowthistle		
RESTRICTED NOXIOUS (DESIGNATED WEEDS)			
Ambrosia psilostachya	Western Ragweed		
Avena fatua	Wild Oats		
Centaurea diffusa	Diffuse Knapweed		
Centaurea solstitialis	Yellow Starthistle		
Chorispora tenella	Blue Mustard		
Cucusta spp.	Dodder		
Descurainia pinnata	Tansy Mustard		x
Glycyrrhiza lepidota	Wild Licorice		
Iva axillaris	Poverty Sumpweed		
Lactuca pulchella	Blue Lettuce		
Plantago lanceolata	English Plantain		
Sphaerophysa salsula	Austrian Peaweed		
Tanacetum vulgare	Tansy		
Tribulus terrestris	Puncture Vine		

* (WDEQ-LQD, 1997)

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 1 of 6) *

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
BIRDS				
Pied-billed Grebe	*Podilymbus podiceps*	Fairly Common		
Eared Grebe	*Podiceps nigricollis*	Uncommon		
American White Pelican	*Pelecanus erythrorhynchos*	Fairly Common	NSS3	
Great Blue Heron	*Ardea herodias*	Uncommon	NSS4	
Snowy Egret	*Egretta thula*	Rare	NSS3	
Black-crowned Night-Heron	*Nycticorax nycticorax*	Uncommon		
Canada Goose	*Branta canadensis*	Uncommon		x
Green-winged Teal	*Anas crecca*	Uncommon		
Mallard	*Anas platyrhynchos*	Fairly Common		x
Northern Pintail	*Anas acuta*	Uncommon	NSS3	
Gadwall	*Ana strepera*	Uncommon		
Blue-winged Teal	*Anas discors*	Fairly Common		
Cinnamon Teal	*Anas cyanoptera*	Fairly Common		
Northern Shoveler	*Anas clypeata*	Uncommon		
American Wigeon	*Anas americana*	Uncommon		
Canvasback	*Aythya valisineria*	Rare	NSS3	
Redhead	*Aythya americana*	Rare	NSS3	
Common Goldeneye	*Bucephala clangula*	Uncommon		
Bufflehead	*Bucephala albeola*	Uncommon		
Hooded Merganser	*Lophodytes cucullatus*	Uncommon		
Common Merganser	*Mergus merganser*	Fairly Common		
Ruddy Duck	*Oxyura jamaicensis*	Uncommon		
Turkey Vulture	*Cathartes aura*	Common		x
Osprey	*Pandion haliaetus*	Rare		
Bald Eagle	*Haliaeetus leucocephalus*	Unknown	MBHFI, FT, NSS2	
Northern Harrier	*Circus cyaneus*	Common		x
Sharp-shinned Hawk	*Accipiter striatus*	Uncommon		x
Cooper's Hawk	*Accipiter cooperii*	Uncommon		
Northern Goshawk	*Accipiter gentilis*	Uncommon	SSS, NSS4	
Swainson's Hawk	*Buteo swainsoni*	Common	BCC, MBHFI, NSS4	x
Red-tailed Hawk	*Buteo jamaicensis*	Common		x
Ferruginous Hawk	*Buteo regalis*	Common	BCC, MBHFI, SSS, NSS3	x
Rough-legged Hawk	*Buteo lagopus*	Common		x
Golden Eagle	*Aquila chrysaetos*	Common	BCC	x
American Kestrel	*Falco sparverius*	Common		x
Merlin	*Falco columbarius*	Unknown	MBHFI, NSS3	
Prairie Falcon	*Falco mexicanus*	Uncommon	BCC	x
Peregrine Falcon	*Falco peregrinus*	Unknown	BCC, MBHFI, SSS, NSS3	
Sage Grouse	*Centrocercus urophasianus*	Common	MBHFI, SSS, NSS2	x
Sora	*Porzana carolina*	Uncommon		
American Coot	*Fulica americana*	Uncommon		
Sandhill Crane	*Grus canadensis*	Rare	NSS3	
Killdeer	*Charadrius vociferus*	Common		x
Mountain Plover	*Charadrius montanus*	Unknown	BCC, MBHFI, SSS, NSS4	
American Avocet	*Recurvirostra americana*	Uncommon		
Greater Yellowlegs	*Tringa melanoleuca*	Uncommon		
Lesser Yellowlegs	*Tringa flavipes*	Uncommon		
Spotted Sandpiper	*Actitis macularia*	Fairly Common		

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 2 of 6)

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
Upland Sandpiper	*Bartramia longicauda*	Rare	BCC, MBHFI, NSS4	
Long-billed Curlew	*Numenius americanus*	Uncommon	BCC, MBHFI, SSS, NSS3	
Marbled Godwit	*Limosa fedoa*	Rare	BCC	
Wilson's Snipe	*Gallinago delicata*	Fairly Common		
Wilson's Phalarope	*Phalaropus tricolor*	Uncommon	BCC	
Franklin's Gull	*Larus pipixcan*	Uncommon		
Ring-billed Gull	*Larus delawarensis*	Uncommon		
California Gull	*Larus californicus*	Uncommon		
Rock Dove	*Columba livia*	Common		
Band-tailed Pigeon	*Columba fasciata*	Unknown		
Mourning Dove	*Zenaida macroura*	Abundant		x
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Rare	MBHFI	
Great Horned Owl	*Bubo virginianus*	Fairly Common		
Snowy Owl	*Nyctea scandiaca*	Unknown		
Western Burrowing Owl	*Athene cunicularia*	Uncommon	MBHFI, SSS, NSS4	
Long-eared Owl	*Asio otus*	Uncommon		
Short-eared Owl	*Asio flammeus*	Uncommon	MBHFI, NSS4	
Common Nighthawk	*Chordeiles minor*	Common		
Common Poorwill	*Phalaenoptilus nuttallii*	Uncommon		
White-throated Swift	*Aeronautes saxatalis*	Uncommon		
Broad-tailed Hummingbird	*Selasphorus platycercus*	Rare		
Rufous Hummingbird	*Selasphorus rufus*	Rare		
Downy Woodpecker	*Picoides pubescens*	Uncommon		
Hairy Woodpecker	*Picoides villosus*	Rare		
Northern Flicker	*Colaptes auratus*	Uncommon		
Western Wood-Pewee	*Contopus sordidulus*	Fairly Common		
Empidonax Species	*Empidonax spp.*	Common		
Willow Flycatcher	*Empidonax traillii*	Fairly Common	NSS3	
Hammond's Flycatcher	*Empidonax hammondii*	Uncommon		
Gray Flycatcher	*Empidonax wrightii*	Common		
Dusky Flycatcher	*Empidonax oberholseri*	Common		
Say's Phoebe	*Sayornis saya*	Common		
Cassin's Kingbird	*Tyrannus vociferans*	Uncommon	MBHFI	
Western Kingbird	*Tyrannus verticalis*	Common		
Eastern Kingbird	*Tyrannus tyrannus*	Fairly Common		
Horned Lark	*Eremophila alpestris*	Abundant		x
Tree Swallow	*Tachycineta bicolor*	Fairly Common		
Violet-green Swallow	*Tachycineta thalassina*	Fairly Common		
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	Fairly Common		
Bank Swallow	*Riparia riparia*	Common		
Cliff Swallow	*Petrochelidon pyrrhonota*	Common		
Barn Swallow	*Hirundo rustica*	Fairly Common		
Steller's Jay	*Cyanocitta stelleri*	Uncommon		
Pinyon Jay	*Gymnorhinus cyanocephalus*	Rare		
Clark's Nutcracker	*Nucifraga columbiana*	Fairly Common		
Black-billed Magpie	*Pica pica*	Abundant		
American Crow	*Corvus brachyrhynchos*	Fairly Common		x
Common Raven	*Corvus corax*	Abundant		x
Black-capped Chickadee	*Poecile atricapillus*	Uncommon		
Mountain Chickadee	*Poecile gambeli*	Uncommon		
Red-breasted Nuthatch	*Sitta canadensis*	Fairly Common		

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 3 of 6)

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
White-breasted Nuthatch	*Sitta carolinensis*	Rare		
Brown Creeper	*Certhia americana*	Uncommon		
Rock Wren	*Salpinctes obsoletus*	Common		
House Wren	*Troglodytes aedon*	Uncommon		
Western Bluebird	*Sialia mexicana*	Rare		
Mountain Bluebird	*Sialia currucoides*	Common		
Townsend's Solitaire	*Myadestes townsendi*	Uncommon		
Veery	*Catharus fuscescens*	Uncommon		
Swainson's Thrush	*Catharus ustulatus*	Uncommon		
Hermit Thrush	*Catharus guttatus*	Uncommon		
American Robin	*Turdus migratorius*	Common		x
Gray Catbird	*Dumetella carolinensis*	Uncommon		
Northern Mockingbird	*Mimus polyglottos*	Uncommon		
Sage Thrasher	*Oreoscoptes montanus*	Common	MBHFI, SSS, NSS4	x
European Starling	*Sturnus vulgaris*	Fairly Common		
Bohemian Waxwing	*Bombycilla garrulus*	Uncommon		
Cedar Waxwing	*Bombycilla cedrorum*	Uncommon		
Northern Shrike	*Lanius excubitor*	Uncommon		
Loggerhead Shrike	*Lanius ludovicianus*	Common	BCC, MBHFI, SSS	x
Warbling Vireo	*Vireo gilvus*	Uncommon		
Yellow Warbler	*Dendroica petechia*	Fairly Common		
Yellow-rumped Warbler	*Dendroica coronata*	Fairly Common		
American Redstart	*Setophaga ruticilla*	Uncommon		
Northern Waterthrush	*Seiurus noveboracensis*	Rare		
MacGillivray's Warbler	*Oporornis tolmiei*	Uncommon		
Common Yellowthroat	*Geothlypis trichas*	Uncommon		
Yellow-breasted Chat	*Icteria virens*	Uncommon		
Western Tanager	*Piranga ludoviciana*	Uncommon		
Black-headed Grosbeak	*Pheucticus melanocephalus*	Rare		
Blue Grosbeak	*Guiraca caerulea*	Rare		
Lazuli Bunting	*Passerina amoena*	Uncommon		
Indigo Bunting	*Passerina cyanea*	Unknown		
Green-tailed Towhee	*Pipilo chlorurus*	Common		
Spotted Towhee	*Pipilo maculatus*	Fairly Common		
American Tree Sparrow	*Spizella arborea*	Uncommon		x
Chipping Sparrow	*Spizella passerina*	Uncommon		x
Clay-colored Sparrow	*Spizella pallida*	Rare		x
Brewer's Sparrow	*Spizella breweri*	Common	BCC, MBHFI, SSS, NSS4	x
Vesper Sparrow	*Pooecetes gramineus*	Common	MBHFI	x
Lark Sparrow	*Chondestes grammacus*	Common	MBHFI	x
Sage Sparrow	*Amphispiza belli*	Fairly Common	MBHFI, SSS, NSS4	x
Lark Bunting	*Calamospiza melanocorys*	Common	MBHFI, NSS4	
Savannah Sparrow	*Passerculus sandwichensis*	Uncommon		
Grasshopper Sparrow	*Ammodramus savannarum*	Uncommon	MBHFI, NSS4	
Song Sparrow	*Melospiza melodia*	Uncommon		
White-crowned Sparrow	*Zonotrichia leucophrys*	Uncommon		
Dark-eyed Junco	*Junco hyemalis*	Common		
McCown's Longspur	*Calcarius mccownii*	Uncommon	BCC, MBHFI, NSS4	
Chestnut-collared Longspur	*Calcarius ornatus*	Unknown	MBHFI, NSS4	
Snow Bunting	*Plectrophenax nivalis*	Unknown		

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 4 of 6)

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
Bobolink	*Dolichonyx oryzivorus*	Rare	MBHFI, NSS4	
Red-winged Blackbird	*Agelaius phoeniceus*	Abundant		
Western Meadowlark	*Sturnella neglecta*	Abundant		x
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Rare		
Brewer's Blackbird	*Euphagus cyanocephalus*	Abundant		
Common Grackle	*Quiscalus quiscula*	Fairly Common		
Brown-headed Cowbird	*Molothrus ater*	Fairly Common		
Bullock's Oriole	*Icterus bullockii*	Rare		
Gray-crowned Rosy Finch	*Leucosticte tephrocotis*	Fairly Common		
Cassin's Finch	*Carpodacus cassinii*	Uncommon		
House Finch	*Carpodacus mexicanus*	Uncommon		
Red Crossbill	*Loxia curvirostra*	Uncommon		
Pine Siskin	*Carduelis pinus*	Uncommon		
American Goldfinch	*Carduelis tristis*	Fairly Common		
House Sparrow	*Passer domesticus*	Uncommon		

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 5 of 6)

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
MAMMALS				
Masked Shrew	*Sorex cinereus*	Fairly Common		
Pygmy Shrew	*Sorex hoyi*	Rare		
Dusky Shrew	*Sorex monticolus*	Fairly Common		
Dwarf Shrew	*Sorex nanus*	Rare	NSS3	
Vagrant Shrew	*Sorex vagrans*	Rare	NSS3	
Western Small-footed Myotis	*Myotis ciliolabrum*	Uncommon	NSS3	
Long-eared Myotis	*Myotis evotis*	Uncommon	SSS	
Little Brown Myotis	*Myotis lucifugus*	Fairly Common	NSS3	
Long-legged Myotis	*Myotis volans*	Unknown	NSS2	
Hoary Bat	*Lasiurus cinereus*	Rare	NSS4	
Silver-haired Bat	*Lasionycteris noctivagans*	Uncommon	NSS4	
Big Brown Bat	*Eptesicus fuscus*	Fairly Common	NSS3	
Townsend's Big-eared Bat	*Plecotus townsendii*	Rare	SSS, NSS2	
Pallid Bat	*Antrozous pallidus*	Rare	NSS2	
Pygmy Rabbit	*Brachylagus idahoensis*	Common	SSS, NSS3	x
Desert Cottontail	*Sylvilagus audubonii*	Common		x
Mountain Cottontail	*Sylvilagus nuttallii*	Fairly Common		
White-tailed Jackrabbit	*Lepus townsendii*	Common		x
Least Chipmunk	*Tamias minimus*	Common		x
Wyoming Ground Squirrel	*Spermophilus elegans*	Common		x
Thirteen-lined Ground Squirrel	*Spermophilus tridecemlineatus*	Common		x
White-tailed Prairie Dog	*Cynomys leucurus*	Uncommon	SSS, NSS4	
Northern Pocket Gopher	*Thomomys talpoides*	Common		
American Beaver	*Castor canadensis*	Common		
Olive-backed Pocket Mouse	*Perognathus fasciatus*	Common	NSS3	
Ord's Kangaroo Rat	*Dipodomys ordii*	Common		x
Western Harvest Mouse	*Reithrodontomys megalotis*	Uncommon		
Deer Mouse	*Peromyscus maniculatus*	Abundant		x
Northern Grasshopper Mouse	*Onychomys leucogaster*	Fairly Common		
Bushy-tailed Woodrat	*Neotoma cinerea*	Fairly Common		
House Mouse	*Mus musculus*	Uncommon		
Long-tailed Vole	*Microtus longicaudus*	Fairly Common		
Montane Vole	*Microtus montanus*	Common		
Prairie Vole	*Microtus ochrogaster*	Fairly Common	NSS3	
Sagebrush Vole	*Lemmiscus curtatus*	Fairly Common		
Western Jumping Mouse	*Zapus princeps*	Uncommon		
Common Porcupine	*Erethizon dorsatum*	Uncommon		
Coyote	*Canis latrans*	Abundant		x
Red Fox	*Vulpes vulpes*	Common		x
Raccoon	*Procyon lotor*	Rare		x
Long-tailed Weasel	*Mustela frenata*	Fairly Common		x
Black-footed Ferret	*Mustela nigripes*	Unknown	FE/NSS1	
American Badger	*Taxidea taxus*	Common		x
Western Spotted Skunk	*Spilogale gracilis*	Unknown		
Striped Skunk	*Mephitis mephitis*	Common		x
Mountain Lion	*Felis concolor*	Uncommon		
Bobcat	*Lynx rufus*	Fairly Common		x
American Elk	*Cervus elaphus*	Common		x
Mule Deer	*Odocoileus hemionus*	Abundant		x
Pronghorn	*Antilocapra americana*	Common		x
Feral Horse	*Equus caballus*	Common		x

Table 3.6-4 Wildlife Species Observed or Potentially Occurring in the Permit Area (Page 6 of 6)

Common Name	Scientific Name	Abundance Code [1]	Status [2]	Confirmed on Site
AMPHIBIANS				
Tiger Salamander	*Ambystoma tigrinum*	Fairly Common		
Great Basin Spadefoot Toad	*Spea intermontana*	Unknown	SSS	
Western Chorus Frog	*Pseudacris triseriata*	Unknown		
Northern Leopard Frog	*Rana pipiens*	Rare	SSS	
REPTILES				
Northern Sagebrush Lizard	*Sceloporus graciosus*	Common		
Greater Short-horned Lizard	*Phrynosoma hernandesi*	Common		x
Great Basin Gopher Snake	*Pituophis catenifer*	Rare		
Western Terrestrial Garter Snake	*Thamnophis elegans*	Fairly Common		x
Prairie Rattlesnake	*Crotalus viridis*	Uncommon		x

* (Wyoming Game and Fish Department, 2005)

[1] **Abundance Codes**

Abundant - A species that inhabits much of the preferred habitat within its range. The species or its sign is typically encountered while using survey techniques that could be expected to indicate its presence.

Common - A species that inhabits much of the preferred habitat within its range. The species or its sign is usually encountered while using survey techniques that could be expected to indicate its presence.

Uncommon - A species that is common only in limited areas within its range or is found throughout its range in relatively low densities. Intensive surveying is usually required to locate the species or its sign.

Rare - A species that occupies only a small percentage of the preferred habitat within its range or is found throughout its range in extremely low densities. The species or its sign is seldom encountered while using survey techniques that could be expected to indicate its presence.

Unknown - Insufficient information is available to determine abundance. Species is difficult to observe without specialized survey techniques.

[2] **Status**

Federal – Endangered Species Act

FT - Federally listed threatened species

Federal – Migratory Bird Treaty Act

BCC - Birds of Conservation Concern species identified by the USFWS as those migratory non-game birds that without additional conservation actions are likely to become candidates for listing under the Endangered Species Act.

Federal – Migratory Birds of High Federal Interest in Wyoming

MBHFI - Listed utilized by the USFWS, Wyoming Field Office for reviews concerning existing or proposed coal mine leased land.

BLM – Special Status Species

SSS - BLM Special Status Species are species protected under the Endangered Species Act and those designated by the State Director as Sensitive. Sensitive species are those under status review by the FWS/National Marine and Fisheries Service (NMFS), or whose numbers are declining so rapidly that Federal listing may become necessary, or with typically small or widely dispersed populations, or those inhabiting ecological refugia or other specialized or unique habitats. The minimum level of policy protection for these designated sensitive species will be the same as policy for candidate

State – Native Species Status

NSS1 - Native Species Status 1 - Populations are greatly restricted or declining, extirpation appears possible and on-going significant loss of habitat.

NSS2 - Native Species Status 2 - Populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance.

NSS3 - Native Species Status 3 - Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance.

NSS4 - Native Species Status 4 - Populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted.

Table 3.6-5 Relative Abundance of Big Game Observations

Month	Species	Habitat Type	
		Upland Sagebrush	Lowland Sagebrush
March	Pronghorn	High	High
March	Elk	Low	Low
April	Pronghorn	High	High
June	Pronghorn	Medium	Medium
July	Mule Deer	Low	--
July	Elk	Low	--
July	Pronghorn	Medium	Medium

Table 3.6-6 Sage Grouse Lek Counts

Lek	Location	Lek Attendance 2006															
		April 8				April 13 & 14				April 20 & 21				April 29			
		Male	Female	Unknown	Total	Male	Female	Unknown	Total	Male	Female	Unknown	Total	Male	Female	Unknown	Total
Crooked Well	T25N R92W Section 16	0	2	0	2	0	0	0	0	0	0	0	0	--	--	--	--
Discover	T25N R93W Section 22	59	30	3	92	19	23	4	46	69	10	0	79	--	--	--	--
Discover 2	T25N R93W Section 23	--[1]	--	--	--	17	14	0	31	22	10	0	32	29	6	0	35
Eagles Nest Draw	T25N R93W Section 01	57	37	7	101	8	6	4	18	6	2	0	8	--	--	--	--
Green Ridge	T25N R92W Section 14	40	45	0	85	61	38	0	99	39	11	0	50	--	--	--	--
Prospects	T26N R92W Section 34	41	29	0	70	41	12	0	53	64	14	0	78	--	--	--	--
Sand Gully	T26N R93W Section 36	99	8	9	116	126	62	30	218	97	23	0	120	--	--	--	--

Lek	Location	Lek Attendance 2007											
		April 3 and 4				April 10 and 11				April 17 and 18			
		Male	Female	Unknown	Total	Male	Female	Unknown	Total	Male	Female	Unknown	Total
Crooked Well	T25N R92W Section 16	4	0	0	4	0	0	0	0	0	0	0	0
Discover	T25N R93W Section 22	15	19	0	34	23	0	0	23	19	7	0	26
Discover 2	T25N R93W Section 23	2	0	0	2	3	0	0	3	12	0	0	12
Eagles Nest Draw	T25N R93W Section 01	13	6	0	19	22	3	0	25	6	4	0	10
Green Ridge Satellite	T25N R92W Section 14	--	--	--	--	8	0	0	8	5	0	0	1
Green Ridge	T25N R92W Section 14	62	17	0	79	73	4	0	77	82	13	0	95
Prospects	T26N R92W Section 34	66	15	0	81	59	6	0	66	64	15	0	79
Prospects South	T25N R92W Section 03	0	0	0	0	7	0	0	7	10	0	0	10
Sand Gully	T26N R93W Section 36	108	18	0	136	58	30	0	88	88	13	0	102
Sooner	T24N R92W Section 9	28	6	0	34	36	0	36	0	32	0	0	32
Sooner Oil	T24N R92W Section 4	0	0	0	0	0	0	0	0	0	0	0	0

[1] -- Not Surveyed on the date shown.

Table 3.6-7 Raptor Nest Locations

Nest ID Number	Species	Claim Area	PLSS Location	UTM Location	Nest Status	Nest Substrate	Nest Condition	Notes
FH25921001	Ferruginous Hawk	Lost Creek	T25N R92W SENW Section 10	0268009E 4670752N	Gone	--	Gone	Historic nest first observed 1976
FH25921002	Ferruginous Hawk	Lost Creek	T25N R92W NWSW Section 10	0267800E 4670534N	Gone	--	Gone	Historic nest first observed 1976
FH25921003	Ferruginous Hawk	Lost Creek	T25N R92W CSE Section 10	0268722E 4670325N	Gone	--	Gone	First observed in 1989
AFH25921004	Ferruginous Hawk	Lost Creek	T25N R92W NWSE Section 10	0268595E 4670503N	Active	Artifical Nest Structure	Good	Within 1-mile buffer
FH25921501	Ferruginous Hawk	Lost Creek	T25N R92W NWSW Section 15	0268071E 4668399N	Gone	--	Gone	Historic nest first observed 1976
FH25921502	Ferruginous Hawk	Lost Creek	T25N R92W NENE Section 15	0269053E 4669519N	Gone	--	Gone	Historic nest first observed 1976
FH25921601	Ferruginous Hawk	Lost Creek	T25N R92W SESW Section 16	0266480E 4668397N	Inactive Dilapidated	Sagebrush	Poor	Stick nest, in claim area
FH25922101	Ferruginous Hawk	Lost Creek	T25N R92W SENE Section 21	0267316E 4667392N	Gone	--	Gone	Historic nest first observed 1976
FH25922801	Ferruginous Hawk	Lost Creek	T25N R92W SENE Section 28	0267066E 4665882N	Active	Artifical Nest Structure	Good	Outside 1-mile buffer
FH25923201/AFH25923203	Ferruginous Hawk	Lost Creek	T25N R92W SWNW Section 32	0264483E 4664481N/ 0264660E 4664493N	Active	Artifical Nest Structure	Good	Outside 1-mile buffer
FH25923202	Ferruginous Hawk	Lost Creek	T25N R92W NENW Section 32	0264575E 4664572N	Gone	--	Gone	
No BLM ID Assigned	Ferruginous Hawk	Lost Creek	T24N R92W NWSW Section 8	0265632E 4660464N	Active	Artifical Nest Structure	Good	Outside 1-mile buffer

Table 3.6-8 T & E Wildlife Species Potentially Occurring in the Permit Area

Species	Status	Survey Techniques	Potential Occurrence
Birds			
Bald Eagle	Threatened	Raptor nest surveys and other spring surveys completed 2006 and 2007.	Unlikely except as migrant through the area. Preferred habitat characteristics are lacking in permit area.
Mammals			
Black-footed Ferret	Endangered	Aerial and ground surveys found no habitat (active prairie dog colonies).	No active prairie dog colonies in or near claim area.

Table 3.6-9 Wildlife Species of Special Concern (Page 1 of 2)

Species	Status [1]	Preferred Habitat	Potential Occurrence	Identified on the Permit Site
Birds				
American White Pelican	NSS3	Big rivers, lakes, reservoirs, estuaries, islands, peninsulas	Unlikely	
Great Blue Heron	NSS4	Wetlands, water banks, rivers, lakes, fields, meadows	Present	
Snowy Egret	NSS3	Marshes, water banks, and shallow rivers, lakes, ponds	Possible	
Northern Pintail	NSS3	Riparian/wetlands, rivers, lakes,ponds in grasslands, fields, boreal forest	Likely	
Canvasback	NSS3	Riparian/wetlands, big rivers, lakes,	Present	
Redhead	NSS3	Wetlands, lakes, rivers	Likely	
Sandhill Crane	NSS3	Wetlands, grasslands, banks of rivers, lakes, ponds	Possible	
Upland Sandpiper	NSS4	Fen, cropland, grassland, fields	Unlikely	
Long-billed Curlew	NSS3	Wetland/riparian, grassland, meadows	Unlikely	
Western Burrowing Owl	NSS4	Grasslands, deserts, and savannas in burrows	Likely	
Short-eared Owl	NSS4	Wetland, fen, grassland, cropland,	Possible	
Willow Flycatcher	NSS3	Riparian, shrubland, woodland	Possible	
Sage Thrasher	NSS4	Desert, shrubland, sagebrush plains	Present	
Brewer's Sparrow	NSS4	Desert, shrubland, sagebrush plains	Present	
Sage Sparrow	NSS4	Desert, shrubland, sagebrush	Present	
Lark Bunting	NSS4	Cropland, desert, grassland,	Likely	
Grasshopper Sparrow	NSS4	Grasslands, fields, savanna	Present	X
McCown's Longspur	NSS4	Cropland, grassland	Unlikely	
Chestnut-collared Longspur	NSS4	Cropland, desert, grassland	Unlikely	
Bobolink	NSS4	Wetland, cropland, grassland	Unlikely	

Table 3.6-9 Wildlife Species of Special Concern (Page 2 of 2)

Species	Status [1]	Preferred Habitat	Potential Occurrence	Identified on the Permit Site
Mammals				
Dwarf Shrew	NSS3	Wetlands in alpine, scree, conifer forest, grassland, shrubland, woodland	Possible	
Vagrant Shrew	NSS3	Wetland/riparian, fen, conifer forest, woodland, grassland, field, shrubland	Possible	
Western Small-footed Myotis	NSS3	Roost in rock crevices, caves, tunnels, under boulder, loose bark, buildings, mines in desert, badland, semiarid habitat	Possible	
Little Brown Myotis	NSS3	Roost in buildings, caves, hollow trees in fens, wetland/riparian, forests, shrublands, woodlands	Possible	
Long-legged Myotis	NSS2	Roosts in caves, mines, buildings, rock crevices, under bark, hollow trees in riparian, desert, forest, woodland	Possible	
Hoary Bat	NSS4	Roasts in tree foliage, rock crevices, tree trunks and cavities in riparian, conifer forest, woodland	Unlikely	
Silver-haired Bat	NSS4	Tree cavities of conifer forest adjacent to lakes, ponds, streams	Unlikely	
Big Brown Bat	NSS3	Roost in buildings, trees, rock crevices, tunnels, caves in woodlands and conifer forests	Possible	
Townsend's Big-eared Bat	NSS2	Roost in caves, mines, buildings, tree cavities in conifer forest, woodland sagebrush, riparian	Possible	
Pallid Bat	NSS2	Roost in rock crevices in desert and grasslands	Possible	
Pygmy Rabbit	NSS3	Burrows in dense big sagebrush and	Present	X
Olive-backed Pocket Mouse	NSS3	Burrows in cropland, grassland, shrubland	Likely	
Prairie Vole	NSS3	Burrows in grasslands, fields,	Likely	

[1] State – Native Species Status

NSS1 - Native Species Status 1 - Populations are greatly restricted or declining, extirpation appears possible and on-going significant loss of habitat.

NSS2 - Native Species Status 2 - Populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance.

NSS3 - Native Species Status 3 - Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance.

NSS4 - Native Species Status 4 - Populations are greatly restricted or declining, extirpation appears possible; habitat is stable and not restricted.