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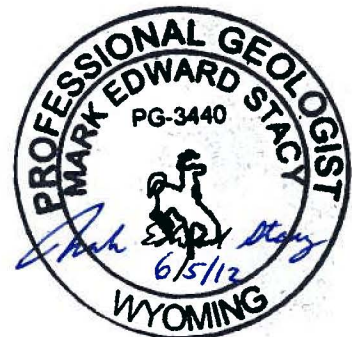
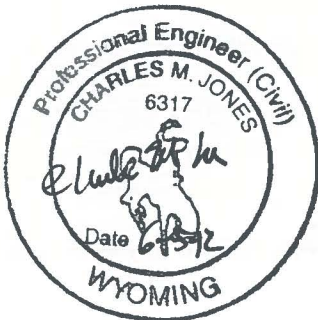
Cheyenne Belvoir Ranch Groundwater Level II

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1.0 Introduction

In 2009 with authorization from the 62nd Wyoming State Legislature, the Wyoming Water Development Commission (WWDC) retained Lidstone and Associates, Inc. (LA), to complete a Level II well siting and test well drilling project on the Belvoir Ranch (Ranch) for the Cheyenne Board of Public Utilities (BOPU), the project sponsor. LA teamed with AMEC Earth and Environmental (AMEC) and Zonge Geosciences (Zonge) to complete the exploration and development of the Casper Aquifer beneath the western portion of the Ranch.

The BOPU has had an interest in developing the water resources of the Casper Aquifer since at least the 1980s when Richter and Huntoon (1982) identified potential drill sites along both sides of the Laramie Range. The City of Cheyenne has not been alone in its interest. Earth Technology Corporation (1984) reviewed the east side of the Laramie Range west of Cheyenne and identified four potential areas that could be developed to support the U.S. Air Force. For the BOPU, Weston Engineering (1993) identified a number of potential Casper Aquifer development opportunities on both sides of the Laramie Range. Black and Veatch (1994) narrowed the BOPU's focus to four potential development sites along the east side of the Laramie Range, including Mesa Mountain, Granite Springs, Spottlewood Creek, and Horse Creek. Because it was the highest prioritized site, the BOPU initially pursued development of the Casper Aquifer at the Mesa Mountain site between 2003 and 2004, but did not complete test wells in the area (States West Water Resources Corporation, 2004). Due to the high cost of drilling access at Mesa Mountain, the BOPU shifted Casper Aquifer exploration efforts to the Ranch.

During the Paleozoic Ground Water Exploration Grant Project in 2005-2006, the completion of two 8 5/8-inch diameter test wells, Lone Tree No. 1 and Duck Creek No. 1, and one 4-inch diameter test well, Kennedy No. 2, demonstrated that the Casper Aquifer at the Ranch can yield significant volumes of groundwater to wells. Completing high capacity wells, however, is complicated by the complexity of the hydrogeology of the Casper Aquifer. Lone Tree No. 1 yielded up to 782 gallons per minute (gpm) of high quality groundwater (144 mg/L total dissolved solids (TDS)) during drilling and subsequent test pumping. In contrast, Duck Creek No. 1 yielded only 24 gpm during development and was not test pumped. The locations of these wells are shown on **Figure 1.1** along with the bedrock geology. Details on these three test wells are included in **Table 1.1**. The success of the Lone Tree No. 1 well, contrasted with the low yield of the Duck Creek No. 1 well, confirmed that the development of high capacity Casper Aquifer wells depends in part upon drilling through highly permeable, water bearing features on geologic structures. Locating the right spot on the structure is complicated by the fact that the Casper Aquifer is covered by overlying sedimentary rock units. As a result of the hydrogeologic differences LA observed within the Casper Aquifer between these wells, the full development potential of the aquifer remained uncertain at the conclusion of the 2005-2006 Groundwater Grant Project.

1.1 History and Project Background

The City of Cheyenne purchased the Ranch in June of 2003 with the intent to utilize the property for a variety of purposes, including the development of its water resources from both the High Plains and Casper Aquifers. Since 2004, the WWDC with the BOPU as the sponsor

has completed three studies to evaluate the water resources of the Ranch. These studies include:

1. Cheyenne Belvoir Ranch Level II Study, 2004-2007.
2. Belvoir Ranch High Plains Aquifer – White River Aquifer Ground Water Exploration Grant Project, 2006-2008.
3. Belvoir Ranch Paleozoic Ground Water Exploration Grant Project, 2005-2006.

In addition to the water available from the High Plains Aquifer, groundwater from the Casper Aquifer could help meet future water demand for the BOPU. This development could potentially be accomplished without adversely impacting downstream water users. For example, test pumping of the Lone Tree No. 1 well revealed no quantifiable impacts on the flow of nearby Granite Springs (Lidstone and Associates, 2008). Groundwater from the Casper Aquifer is also far removed from adjacent groundwater rights connected to the High Plains Aquifer, as well as surface water rights on the eastern end of the Ranch. Development of the Casper Aquifer demonstrates the city's good faith effort to find additional supplies beyond the Stage I and II surface water diversions from sources located on the western slope. Because it is hydrologically isolated from the former Atlas Site "D" Missile facility, groundwater from the Casper Aquifer is free of trichloroethene (TCE), which appears to be affiliated with the former missile site and has been migrating eastward through the High Plains Aquifer towards the BOPU's Borie Well Field (States West Water Resources Corporation, 2006; U.S. Army Corps of Engineers, 2006).

1.2 Authorization and Purpose

This Level II feasibility study was undertaken to further evaluate the water resource potential of the Casper Aquifer beneath the western third of the Ranch. With the geologic and hydrogeologic information acquired to date through the groundwater grant project, the full development potential of the Casper Aquifer at the Ranch had not been comprehensively assessed. The BOPU needs to know how much additional groundwater may be obtained from this aquifer south of the Lone Tree No. 1 well to make cost effective planning decisions.

The purposes of this project were to:

- ✓ Evaluate the groundwater production capabilities of the Casper Aquifer on the western side of Ranch.
- ✓ Identify potential drilling sites to develop the groundwater resources of this aquifer using available well completion methods.
- ✓ Drill test wells to evaluate Casper Aquifer yield and water quality, and to produce water for the BOPU.
- ✓ Develop and/or refine potential transmission line alternatives to deliver water from the Casper Aquifer to the BOPU's existing infrastructure.
- ✓ Prepare conceptual designs, cost estimates, financing and economic analysis of sufficient detail to move this project towards a Level III Construction phase, as warranted.

Within the available funding, LA was able to evaluate the Casper Aquifer and complete four 8 5/8-inch diameter test wells. These wells included Duck Creek 3-1, Lone Tree Fault 1-2, Goose Creek 2-2C, and Lone Tree Fault 1-5. A timeline of the exploration activities completed for this project is included in **Table 1.2**.

Based on the data from the six completed Casper Aquifer test wells, LA has reevaluated the geologic and hydrogeologic character of the aquifer on the Ranch. Alternatives for potential Casper Aquifer well fields have been identified, and conceptual designs are presented for wells, appurtenances, and transmission lines. Cost estimates in 2012 dollars are provided for the alternatives along with current BOPU financial planning, and estimates for future financing of the proposed alternatives.

1.3 Permitting and Environmental Authorization

To comply with state and federal law, LA acquired the necessary permits to drill the identified test well sites. U.W. 5 applications for test well drilling were submitted to the Wyoming State Engineer's Office (SEO). LA also prepared and submitted a Permit to Construct application to the Wyoming Department of Environmental Quality (DEQ) for all the test wells. Finally, an application for a WYPDES discharge permit for aquifer testing was submitted to DEQ. Copies of the approved permits are contained in **Appendix A**. Following completion of the wells, LA filed the appropriate forms, notices, and as-built plans with the respective agencies.

While a formal environmental report was not completed, LA submitted letters describing the proposed project to the appropriate agencies to gain National Environmental Policy Act clearance in case the BOPU chooses to pursue federal sources of funding for the project in the future. The letters were submitted to U.S. Fish and Wildlife, Wyoming State Historic Preservation Office, U.S. Army Corps of Engineers, DEQ–Air Quality Division, U.S. Department of Agriculture–NRCS, SEO, Laramie County Public Works, and DEQ–Water Quality Division. To address U.S. Fish and Wildlife concerns, a threatened and endangered species investigation was completed. For the Wyoming State Historic Preservation Office, a Class III cultural resource inventory was completed. Copies of the letters, agency responses, species report, and archeological reports are included in **Appendix B**.

2.0 Hydrogeologic Investigation and Well Siting

Based on the previous results of drilling and testing of the Lone Tree No. 1, Duck Creek No. 1, and Kennedy No. 2 wells, LA hypothesized that the Casper Aquifer at the Ranch was comprised of at least two hydraulically isolated hydrostructural compartments with different hydrogeologic properties and water quality characteristics. The first compartment, Lone Tree, was believed to extend roughly from Middle Crow Creek on the north to Lone Tree Creek Fault on the south. The second compartment, Duck Creek, extended from Lone Tree Creek Fault on the north to Spottlewood Fault on the south (States West Water Resources Corporation, 2006).

Within this hydrostructural context, the project team sought to identify well site locations that would yield significant quantities of Casper Aquifer groundwater to the test wells. Building upon the geologic data acquired in 2005, geologic and hydrogeologic field reconnaissance methods were utilized to determine the locations of geologic structures that could enhance the permeability and water transmitting capacity of the Casper Formation. With these features identified, the project team finalized the locations and orientations of surface exploratory geophysical lines. The geophysical exploration was intended to help develop a more thorough conceptual hydrogeologic model of the area, including the locations of concealed faults and folds, and to target areas on these structures that had the best potential for yielding large volumes of groundwater from the Casper Aquifer.

2.1 Belvoir Ranch Stratigraphy

Interpretation of the stratigraphy of the Ranch is complicated because the geologic formations and stratigraphic units of interest are largely covered by the Tertiary Ogallala and White River Formations. Below these two units, formations ranging from the Cretaceous Pierre Shale through the Precambrian Sherman Granite are present. The lithologic and hydrogeologic characteristics of these units are summarized in **Table 2.1** along with their average mapped thickness in the local area. Comparison of **Figure 1.1** with **Table 2.1** reveals that only the Tertiary cover, Casper and Cloverly Formations are exposed at land surface on the Ranch. Changes in the lithology of a few formations complicate the stratigraphic interpretation as different names are applied to several formations in this area along the Wyoming-Colorado state line. Correlative formation names are identified in **Table 2.1** for pertinent units.

Of the units listed in **Table 2.1**, the Triassic-Permian redbed sequence of the Chugwater, Goose Egg, and Satanka Formations plays a critical role at the Ranch. These units overlie the Casper Formation and generally act as confining layers that hydraulically separate the Casper Aquifer from the overlying High Plains Aquifer. All three of these units are composed of dark red siltstone, shale, and clayey siltstone, but can have relatively thick interbeds of either anhydrite or gypsum which can pinch out over short distances. The Forelle member of the Goose Egg Formation is the only marker bed in the redbed sequence and varies in its lithology. Due to conflicting reports in the published literature, the presence of the Satanka Formation and the variability in the lithology of this redbed section at the Ranch were not known prior to drilling.

The Casper Formation consists of two sequences that vary widely in lithology and thickness. As noted in **Table 2.1**, the upper Casper Formation consists of an interbedded sandstone and dolomitic limestone sequence correlative with the Ingleside Formation of northern Colorado.

Based on the literature, this unit varies in thickness locally from 198 to 895 feet, and is best highlighted by McGookey's (1952) measured sections between Granite Canyon in Wyoming and Boxelder Canyon in Colorado. This sequence is established in outcrops shown on **Figure 1.1**, and is best exposed in the watergap where Goose Creek crosscuts the formations and along the southern Union Pacific railroad line in Section 12, T12N, R70W. In contrast, the lower sequence of the Casper Formation consists primarily of dark reddish brown siltstone and is correlative with the Fountain Formation of northern Colorado. The lower Casper tends to be arkosic. Ver Ploeg and Boyd (2007) noted that it interfingers with the upper Casper, and such interfingering beds were observed in the Lone Tree No. 1 well. The thickness of this lower unit ranges from 100 to 725 feet in the area, and generally increases to the south across the state line. Based on geologic field reconnaissance, this lower unit is only exposed in the Union Pacific railroad cut of Section 11 of T12N, R70W.

2.2 Casper Aquifer Geologic and Hydrogeologic Setting

Within the larger framework of the Laramie Range, Blackstone (1996) noted that these mountains are "a large, faulted, eastward verging double-plunging asymmetrical foreland uplift" whose east flank is bounded by a series of westward dipping thrust faults and asymmetric folds. South of the Ranch in T11 and 12N, R69 and 70W of northern Colorado, Blackstone (1996) indicates that thrust faulting of the Precambrian severs the Casper Formation approximately six miles east of the mountain front. Near the range front, he showed some minor backthrust faulting and associated folding. North of The Ranch, Blackstone (1996) presented two cross sections. His cross section through the Borie Oilfield in T13N, R68W included a westward dipping thrust fault underlying the oilfield, approximately seven miles east of the mountain front, and some minor range parallel folding near the mountain front. Farther north at Mesa Mountain in T15N, R70W, Blackstone (1996) and Brady (1949) reported the mountain is underlain by range front, westward dipping, imbricate thrust faults that have severed the Casper Formation across both faults. This interpretation was based upon oil test well drilling because there is no surface expression of one of the two thrust faults due to Tertiary cover.

The Casper Formation on the west end of the Ranch lies between Blackstone's southern and northern cross sections, and outcrops between Precambrian igneous and metamorphic rocks to the west, and the Tertiary Ogallala Formation to the east, as shown on **Figure 1.1**. In this area, the project team identified several major structural features that could have enhanced the permeability of the Casper Formation. Field geologic mapping of the Casper Formation revealed this unit has been folded by the Granite Springs Anticline, Duck Creek Anticline, and Spottlewood Anticline, and faulted transversely by the Lone Tree Creek Fault and Spottlewood Fault. These faults had been mapped into the Precambrian to the west by Houston and Marlatt (1997). While these features are evident in outcrop, their eastward down dip expression is concealed by the overlying Ogallala Formation. Based on evidence from the Cloverly Formation outcrop in Section 30, T13N, R69W, LA hypothesized that a north-south trending structure, Goose Creek Anticline, may be present in this area as depicted on **Figure 1.1** and Figure 16 of the groundwater exploration grant report (States West Water Resources Corporation, 2006). Courtright and Braddock (1989) mapped a similar range front parallel structure in Section 31 of T12N, R69W just a few miles south of the Ranch.

The hydrogeology of the Casper Aquifer is a function of lithology; geologic structure; the intensity, alignment, timing, and manifestation of structural deformation; and recharge conditions. The Casper Aquifer consists of saturated portions of the upper Casper Formation. Based on the data obtained from 2005 through the Level II field investigation, the Casper Aquifer appeared to have been compartmentalized by faulting, and primarily discharged groundwater (rejected recharge) through Granite Springs (States West Water Resources Corporation, 2006). As observed in the drilling and 30-day test pumping of Lone Tree No. 1 (Lidstone and Associates, 2008), the permeability of the aquifer appears to have been enhanced along the crests of anticlinal or monoclinal folds through extensional fracturing and dissolution tube development. Low permeability of the Casper Aquifer is encountered in areas where intergranular permeability is predominant, such as at Duck Creek No. 1 which yielded only 24 gpm during development. The Casper Aquifer also has been affected by the permeability and locations of boundary structures, such as Lone Tree Creek Fault or the thrust fault east of Lone Tree No. 1 that may represent an impermeable boundary (States West Water Resources Corporation, 2006).

With respect to recharge, the aquifer is replenished through infiltrating precipitation, and significantly, by stream losses over Casper Formation outcrops. The surface flows of Lone Tree, Goose, and Duck Creeks on the Ranch disappear into, or are significantly diminished by, the Casper Formation at sinks. The sinks are permeable caverns of sufficient size and can accept all or significant stream flow. Based on stream gaging up and downstream of the sink on Lone Tree Creek, Lidstone and Associates (2008) noted that the Lone Tree Creek Sink can accept a flow of approximately 1.7 cubic feet per second (cfs). Lowry and Crist (1967) documented that Duck Creek and Goose Creek recharged the aquifer at least 0.22 and 0.06 cfs, respectively, but without measurable flow downstream of the sink, the total amount these sinks could accept was not quantified. Based on analysis of the stream catchments above the respective sinks, the Casper Aquifer within the Lone Tree hydrostructural compartment receives the most recharge from its 17,853 acre drainage area. Within the Duck Creek hydrostructural compartment, the aquifer receives recharge from both 8,133 acres upstream of Duck Creek Sink and 3,393 acres upstream of Goose Creek Sink. An ephemeral drainage, Spottewood Creek has a very limited catchment area of only 968 acres, and as such is hypothesized to provide only minimal recharge.

2.3 Geophysical Analysis

Based on the hydrogeologic fieldwork, the following structures appeared to have enhanced the permeability and yield potential of the Casper Aquifer: Granite Springs Anticline, Lone Tree Creek Fault, Goose Creek Anticline, Duck Creek Anticline, and Spottewood Anticline. With these areas identified, the project team developed a geophysical alignment rationale to establish a basis for completing a series of seismic reflection and electrical resistivity surveys. The surveyed locations of these lines are shown on **Figure 2.1**. Initially interpreted seismic and resistivity data for each line are presented in **Appendix C**. The rationale for the orientation of each line was as follows:

Lone Tree Creek Fault (Line 1)

Aligned slightly oblique to Lone Tree Creek Fault, this line was intended to:

- ✓ Assess the offset, dip, and direction/orientation of the Lone Tree Creek Fault.
- ✓ Identify potential drilling depths to fully penetrate the Casper Aquifer on the interpreted hanging wall side of the fault.
- ✓ Assess potential fracture enhancement due to flexure and faulting.
- ✓ Evaluate the north end of the Goose Creek structure as well as its flexure and trend.

Goose Creek Structure (Line 2)

Set approximately perpendicular to the axis of the inferred Goose Creek Anticline, Line 2 was intended to:

- ✓ Evaluate folding and extensional fracture development along the inferred Goose Creek Anticline and Syncline pair.
- ✓ Identify, if possible, the location, orientation, and offset along potential sub-fold faulting and its hydrogeologic impact.
- ✓ Identify potential drilling depths to fully penetrate the Casper Aquifer on Goose Creek Anticline.

Duck Creek Structure (Line 3)

Aligned obliquely to the axis of Duck Creek Anticline, the intent of this line was to:

- ✓ Evaluate folding and extensional fracture development across the Duck Creek structural axes near the Duck Creek No. 1 well.
- ✓ Identify potential drilling depths to fully penetrate Casper Aquifer and delineate areas of enhanced permeability.

Spottlewood Structure (Line 4)

Set perpendicular to the axis of Spottlewood Anticline, this line was intended to:

- ✓ Evaluate extensional fracture development, deformation, and folding across the Spottlewood Anticline and Syncline pair.
- ✓ Identify potential drilling depths to fully penetrate the Casper Aquifer and delineate structural permeability enhancement near these structures.
- ✓ Assess the impact of Spottlewood Fault, if present, and its potential hydrogeologic role.

Lone Tree Creek (Line 5)

Set parallel to the axis of Granite Springs Anticline, the Lone Tree Creek line was intended to:

- ✓ Define the eastern limit of the Lone Tree hydrostructural compartment and identify, if possible, the location, orientation, and offset along a potential range bounding and underlying thrust fault.
- ✓ Identify potential drilling depths to fully penetrate the Casper Aquifer on the hanging wall side of the potential fault.
- ✓ Assess potential fracture enhancement associated with Granite Springs Anticline.

2.3.1 Geophysical Data Acquisition

The geophysical investigation and data acquisition on these five lines were conducted in two phases. In order to image subsurface structures that contained groundwater, Zonge acquired a combination of seismic reflection and electrical resistivity data. The intent of combining seismic and electrical techniques was to: 1) provide a degree of confidence on where to place test wells based on structures identified by the geologic and geophysical data; and 2) to identify and estimate target drilling depths to intersect water-bearing strata based on the electrical data.

2.3.2 Seismic Reflection

Phase 1 of the data acquisition incorporated existing geologic information, available deep oil exploration seismic data, and additional field geologic mapping. These historic data were integrated with published structural and stratigraphic information and were ultimately used to design a high-resolution seismic reflection survey. The seismic budget provided for acquisition, processing, and interpretation of approximately 7.5 miles of reflection data. Reflection data were acquired over the five specific geologic structures shown on **Figure 2.1** to further identify unknown structural elements and locate deformation zones within the Casper Formation that would indicate potential fracturing.

Drilling and geologic data from the Lone Tree No. 1, Kennedy No. 2, and Duck Creek No. 1, as well as the available geophysical logs from the area, were used for calibration and verification purposes prior to acquisition. Based on the geologic setting, structural style and objective of identifying specific drill targets, the reflection survey was conducted using a very tight source/receiver spacing of approximately 33 feet (10m). Normal spacing for oil and gas exploration is 200 feet or 66m. Reflection data were collected utilizing a rolling-receiver recording array in a split-spread configuration with lines sourced on the half station (i.e., between the receivers). A Seistronix ES-6 seismograph was used for recording, and deployed an efficient radio-triggered, environmentally sensitive source truck, the Digipulse 1180. No explosives were used for this acquisition. All receiver (i.e., geophone) points were surveyed using a Leica RTK GPS system for sub-meter accuracy. The selected field configuration of source and receiver points, as well as the impulsive source, yielded good resolution of faults (i.e., location and attitude) and structure (e.g., folding) along the west side of the Ranch.

2.3.3 Electrical Resistivity - CSAMT

Phase 2 of the geophysical data acquisition deployed a deep electrical resistivity method to identify water-bearing structures and refine drill targets. The Phase 2 survey design was based on the results of Phase 1 preliminary processing, as well as previous results from time-domain electromagnetics (TDEM) and electrical resistivity tomography (ZETA) performed by Zonge in 2005 at the former Atlas Site "D" Missile facility. Phase 2 acquisition consisted of 7.5 line miles of resistivity data collected along each of the five seismic reflection lines. Additionally, data along two short lines (Lines 6 & 7) were acquired to evaluate and enhance the area south of the Lone Tree Creek Line 5.

Resistivity data were acquired using the Controlled Source Audio-frequency MagnetoTellurics (CSAMT) technique. CSAMT is a high-resolution electromagnetic sounding technique that used fixed grounded dipoles located about 2.5 to 3 miles from the artificial (controlled) source. The

electric field was acquired on several dipoles simultaneously along each line, producing 2-dimensional profiles. The CSAMT investigation at the Ranch utilized a dipole (station) spacing of 25 feet, and the signal source was a Zonge GGT-10 transmitter, which is a current-controlled transmitter capable of 10kW output.

Observed resistivity values obtained from the CSAMT method relate to geology, hydrology and chemistry of the formations beneath the area of investigation. Primary factors affecting resistivity include rock or sediment porosity, pore fluids, the presence of certain mineral assemblages, and the presence of unique groundwater chemistry (e.g., alkali or high-TDS water). For hydrological investigations, CSAMT data may provide critical information about geologic structure, lithology, water table trends, and trends in pore fluid salinity or contaminant concentrations.

2.3.4 Initial Hydrogeophysical Interpretation

The interpretation of the processed seismic lines factored in the complex local and regional structural style of folding and faulting presented in Section 2.2. The integration of seismic reflection and electrical resistivity data identified discrete structural features and associated conductive zones, respectively. Potential, prospective Casper Aquifer targets were identified by combining existing hydrogeologic field mapping with the subsurface geophysical interpretations. Each line is discussed in the context of that integration in the following sections. The surveyed locations of the geophysical lines are shown on **Figure 2.1**. Initially interpreted seismic and resistivity data for each line are presented in **Appendix C**.

The project team developed a decision matrix that provided the basis for selecting initial drilling prospects along each of the five lines. After results from the combination of the two geophysical techniques were merged and interpreted, the potential prospects were ranked on the basis of their geologic structure, fractured character, and their low resistivity. In addition to structural deformation, “bright spots” in the seismic sections (interpreted areas of intense fracturing) and low resistivity areas within the resistivity sections within the interpreted Casper Formation section were considered the key to developing large volumes of water from the Casper Aquifer. Geologic and hydrogeologic data, particularly water levels measured in the existing Casper Aquifer test wells, were also factored in the matrix.

2.3.4.1 Lone Tree Creek Fault (Line 1)

Approximately 6,725 feet long, the Lone Tree Creek Fault line succeeded in imaging the Lone Tree Creek Fault around CSAMT station 650, and provided indications of potential geologic structures on the northeast end of the line. Both the electrical resistivity and seismic reflection sections for this line are included in **Appendix C**. These structures did not appear to be related to the inferred Goose Creek Anticline and were interpreted to represent local faulting within the section. Overall, the seismic interpretation indicated that the top of the Casper Formation was substantially deeper in the middle of this line than on each end, and indicated the structure in the area is complex. The seismic and CSAMT data for this line exhibited less correlation than they did on other lines.

West of Lone Tree Creek Fault, the interpreted thrust fault (black line) that approaches the surface near the southwestern end of the line does not appear anomalously conductive, but a

conductive anomaly is evident in the shallow data where that fault should intersect the surface at approximately CSAMT station 225.

The left lateral, strike-slip Lone Tree Creek Fault at CSAMT station 650 does not have a corresponding conductivity anomaly at depth beneath this area. This condition is either due to the highly resistive basement granite not being saturated, or the width of the fault structure not being significant enough to be resolved with the field parameters used for the CSAMT survey. The CSAMT field procedures were designed to image deep, and as such may have been too wide to see a narrow conductive feature that would be associated with a structure like this strike-slip fault.

Northeast of Lone Tree Creek Fault, the line exhibits several low resistivity zones particularly on the northeast end where they are associated with potentially multiple faults (orange and black lines). The low resistivities in this area suggested that the Casper Formation, which appeared to shallow on that end, may be very fractured, perhaps containing more groundwater.

As shown on **Figure 2.1**, five prospective Casper Aquifer targets were identified on this line. Lone Tree Fault 1-1 (CSAMT station 375, **Appendix C**) would test the steep easterly dips in the hanging wall of the Lone Tree Creek Fault on the southwesterly third of the line. Lone Tree Fault 1-2 (CSAMT station 650) would test the highly fractured, strike-slip Lone Tree Creek Fault zone. Lone Tree Fault 1-3 (CSAMT station 975) and 1-4 (CSAMT station 1275) were projected to test low resistivity areas and “bright spots” within the interpreted Casper Formation section. Lone Tree Fault 1-5/1-6 (CSAMT station 1775-1925) was designed to test the low resistivity area, and potentially fractured and faulted northeastern end of the line.

2.3.4.2 Goose Creek Structure (Line 2)

Approximately 8,550 feet long, the Goose Creek structure line revealed no evidence of a Goose Creek Anticline/Syncline pair, but did reveal evidence of backthrusting adjacent to the range front along with basinward faulting and areas of low resistivity within the interpreted Casper Formation section. Both the electrical resistivity and seismic reflection sections for this line are included in **Appendix C**. Similar to the Line 1 CSAMT data, the thrust fault (purple/dark blue line) imaged in the seismic section is not anomalously conductive itself, but there is a conductive anomaly associated with it at the location where it would intersect the surface (centered at approximately CSAMT station 375). A second significant fault (red line, CSAMT station 1925) is interpreted to the east. This feature or one along the very end of the section (CSAMT station 2475) may be a southeastward expression of the Lone Tree Creek Fault.

In general, the CSAMT data on this line show higher conductivity material on the eastern end of the line relative to the west. This is consistent with other lines, which indicate that the formations above the Casper are generally higher conductivity than the Casper Formation. The thin, conductive horizontal layer (in the material above the Casper) that is seen in the upper 250 feet on all of the other lines is only seen on this line east of CSAMT station 1425. With the exception of the eastern part of Line 5, the eastern half of Line 2 has high conductivities extending deeper than on any other line. The more conductive zones observed above the interpreted Casper Formation top are interpreted to be due to the high salinity water present in overlying formations.

As shown on **Figure 2.1**, five prospective Casper Aquifer targets were also identified on this line. Goose Creek 2-1 (CSAMT station 675) and 2-2 (CSAMT station 1275) were proposed to test the productivity of the interpreted Casper Formation section in the hanging wall of the backthrust fault in areas of seismic “bright spots” and low resistivity. Goose Creek 2-3 (CSAMT station 1800) and 2-4 (CSAMT station 1925) would target deep, associated low resistivity zones and seismic “bright spots” adjacent to the interpreted strike-slip fault zone. Goose Creek 2-5 (CSAMT station 2125) would test the Casper Formation east of the large fault and its lowest resistivity feature.

2.3.4.3 Duck Creek Structure (Line 3)

Approximately 10,350 feet long, the Duck Creek structure line revealed both the Duck Creek Anticline and its syncline. Both the electrical resistivity and seismic reflection sections for this line are included in **Appendix C**. This line intersects Line 2 near the northeastern end of the line, and the data at the intersection show good agreement. Based on the almost-horizontal orientation of the layering in the seismic, this line and Line 4 are very similar with respect to the seismic data. In the CSAMT, however, there are several differences. The material above the Casper is very similar in conductivity on both lines, but the Casper has noticeably higher conductivity on Line 3 when compared to Line 4.

Line 3 CSAMT data demonstrate a weak change toward higher conductivities in the Casper toward the center of Line 3, and this change seems to correlate with the fact that the stratigraphy identified in the seismic data beneath this line has the appearance of a shallow anticline. The base of the top unit of the Casper and the base of the second unit of the Casper are both deepest near the middle of the line; coincidentally, this is where higher conductivities in the Casper are observed from the CSAMT data along with several faults that may have fractured the Casper. This central, higher conductivity part of Line 3 may be correlative to the higher conductivities observed beneath the eastern part of Line 2, discussed above.

Based on the CSAMT data, and like Lines 1 and 2, the thrust fault itself is not anomalously conductive, but higher conductivities are seen at the surface at the location where the thrust fault should intersect the surface. The higher conductivities obtained here are not as strong as beneath Lines 1 and 2, but are evident.

Four prospective Casper Aquifer targets were identified on this line, as shown on **Figure 2.1**. Duck Creek 3-1 (CSAMT station 1525, **Appendix C**) would test the low resistivity, seismic “bright spot” or fractured feature in the center of the line. Duck Creek 3-2 (CSAMT station 1125) and 3-3 (CSAMT station 775) would investigate the fractured, conductive features associated with the small antithetic horse-tail thrust faults seen on the southeast side of the line on the flank of Duck Creek Anticline. Duck Creek 3-4 (CSAMT station 350) would test a fractured, conductive feature along the interpreted Duck Creek anticlinal crest on the end of the line.

2.3.4.4 Spottlewood Structure (Line 4)

Approximately 7,750 feet long, the Spottlewood structure line revealed both the Spottlewood Anticline and Syncline, as well as numerous associated faults. However, it did not appear that the Spottlewood Fault was present along this line. Both the electrical resistivity and seismic reflection sections for this line are included in **Appendix C**. Very little significant change in

conductivity is seen laterally beneath this line. Like the other lines, decreasing conductivities are seen at depth into the Casper Formation. The four faults on this line do not have significant offset of layers within the Casper and none of the faults appear anomalously conductive. Only the northernmost fault (below station CSAMT 2175) looks to have an increase in conductivity, although even this is not a strong anomaly. In general, the Spottlewood structure appeared less attractive for groundwater development.

Nevertheless, three prospective Casper Aquifer targets were identified on the Spottlewood line, as shown on **Figure 2.1**. Spottlewood 4-1 (CSAMT station 2175, **Appendix C**) targeted the northernmost fault, and was the location that looked the best of the three based on the CSAMT data. Spottlewood 4-2 (CSAMT station 300) and 4-3 (CSAMT station 25) would test two conductive features on the southeast end of the line.

2.3.4.5 Lone Tree Creek (Line 5)

Approximately 7,100-feet long, the Lone Tree Creek line imaged the westward dipping, range bounding thrust fault; minor faults in the hanging wall; and possibly a large backthrust fault adjacent to the range front. Both the electrical resistivity and seismic reflection sections for this line are included in **Appendix C**. This 'dip' line shows good correlation between the seismic structures, the CSAMT conductivity data, and the previous geologic interpretation based on Lone Tree No. 1 and Kennedy No. 2 test well data. In general, it is also consistent with both seismic and electrical data seen on the other four geophysical lines. The western part of the line, where the Casper is quite shallow, displays lower conductivity than the eastern part of the line; this is consistent with conductivities on the other lines. Near the center of the line (approximately CSAMT station 1025), the geologic interpretation and the seismic data indicate a thinning of the Tertiary formation cover, and the CSAMT data do show the conductive material thinning in that location. East of station 1025, the Casper is probably too deep to be detected with the CSAMT, and the higher conductivities extend very deep on this half of the line. This condition appears to be due to the presence of the thick sequence of formations overlying the Casper Formation, including the Satanka, Goose Egg, and Chugwater Formations.

Line 5 was also located near Lone Tree No. 1 to assess the geophysical character of the Casper Formation to assist in identifying areas of similar permeability and yield elsewhere on the Ranch. CSAMT lines 6 and 7 were added in the vicinity to geophysically assess how local resistivity features might extend to the south, parallel to outcrop. Near CSAMT station 350, Lone Tree No. 1 is associated with a seismic "bright spot" or fractured Casper Formation section, as well as a deep low resistivity feature. Similar features are located in the vicinity of several small faults (black lines) from approximately CSAMT station 525 to 925. While no seismic data were obtained along Lines 6 and 7, it was observed that conductivities on Line 7 correlate with the increasing or higher conductivities on the eastern portion of Line 5. The lower conductivities of Line 6 share a similar range of conductivity when projected into Line 5.

As shown on **Figure 2.1**, five prospective Casper Aquifer targets were delineated on Line 5. Lone Tree 5-1 (CSAMT station 225-375) is essentially an offset of Lone Tree No. 1. Lone Tree 5-2 (CSAMT station 550) and 5-3 (CSAMT station 725) target the Casper Formation where small faults appeared to have enhanced permeability and are associated with low resistivities. Lone Tree 5-4 (CSAMT station 975) and 5-5 (CSAMT station 1075-1125) target the Casper

Formation on the eastern margin of the hanging wall where the Casper has a very low resistivity signature. Kate stop here on Monday.

2.4 Potential Test Well Sites

Following presentation of the geologic and geophysical interpretation to the WWDC and the BOPU at the scoping meeting in November 2009, the project team selected eight potential test well sites from those that had been identified and ranked through the geologic and geophysical analysis. These sites, listed in **Table 2.2**, were selected to explore the yield potential of the Casper Aquifer on the Ranch. The project team had presented five potential sites during the scoping meeting, but added three others to include additional sites that warranted consideration, and to provide drill site flexibility during the permitting and environmental reporting phases. The locations of these eight sites are shown relative to the geophysical line locations on **Figure 2.1**, and include two sites on four of the five geophysical lines. Based upon geophysical data, perceived limited recharge, and budgetary constraints, no test well sites were originally proposed along the Spottlewood Anticline (Line 4) on the south end of the Ranch. The drilling sequence was intended to be an iterative process based on results of drilling each test well, progressive acquisition of hydrogeologic and geologic data, reinterpretation of geophysical data, and remaining drilling budget.

Given the mandate to explore the aquifer across the western part of the Ranch, the plan was to drill and complete three, 8 5/8-inch diameter test wells at the sites as they were prioritized in **Table 2.2**, and to focus exploration on the Duck Creek hydrostructural compartment, specifically along the Duck Creek (3-1 and 3-3) and Goose Creek (2-2 and 2-3) geophysical lines. Previous drilling in the area at Duck Creek No. 1 indicated the Casper Formation was saturated, but did not encounter significant permeability to yield water to the well. Proving out the permeability and yield potential of this area remained critical to the overall development of a Casper Aquifer well field in this area. The Duck Creek 3-1 site was to be drilled first to test what was thought to be the best seismic prospect on this line, and to calibrate the geophysical/hydrogeologic data for drilling at either Goose Creek 2-2 or 2-3.

After completing the Duck Creek 3-1 test well, it was the intention of the project team to move to a site on the Goose Creek structure regardless of the results of the initial test well. Geophysical interpretation of the data for the Goose Creek sites suggested the Casper Formation top might be shallower than originally interpreted from outcrop relationships. The selection of either Goose Creek 2-2 or 2-3 depended upon geophysical calibration and anticipated drilling depths. Either site along this structure would allow for yield testing on this line, but it was thought that 2-2 might present a shallower target.

After drilling both the Duck and Goose Creek structures, the project team had recommended drilling Lone Tree Fault 1-4 to evaluate the yield potential of the Casper Aquifer within the southern portion of the Lone Tree Creek hydrostructural compartment. The Lone Tree No. 1 well proved that this portion of the aquifer is highly permeable, but little was known about how far south this permeability extended. Drilling a test well at that location would allow for evaluation on the southern half and provide additional information on the potential extent and sustainability of a well field in this compartment.

The location and drilling of additional test wells beyond these first three would be dictated by the remaining drilling budget, and hydrogeologic data collected from the two hydrostructural compartments. If drilling on both the Goose and Duck Creek structures had yielded wells that produced little groundwater (i.e., less than 100 gpm), the project team would have recommended drilling another test well along either the Lone Tree Creek or Lone Tree Creek Fault structures. Lone Tree 5-2 and 5-4 were identified for such worst case drilling results. If drilling on either the Goose or Duck Creek structures identified areas of higher permeability, the project team was positioned to drill an additional test well along that respective structure.

3.0 Casper Aquifer Test Well Drilling

Relying upon the initial geologic, hydrogeologic, and geophysical interpretation of the site, the test wells were designed to be completed in a telescoped fashion, similar to the completions of Lone Tree No. 1 and Duck Creek No. 1 shown on **Figures 3.1** and **3.2**, respectively. The well casing would be placed to a sufficient depth through the overlying formations to accommodate a high capacity test pump, and cemented into the top of the Casper Formation. Water level data from Duck Creek No. 1 and Lone Tree No. 1 were used to estimate depths to groundwater in the aquifer, and to target locations such that groundwater levels in the casing remained above the pump with sufficient head for aquifer testing purposes. Below the casing, each well was to be completed as an open borehole through the Casper Formation to maximize exploration of the aquifer and minimize cost. In the event that the BOPU chose to utilize the well later for production, the open borehole was of sufficient diameter to accommodate a 4-inch diameter well screen. In this fashion, the well design balanced the objectives of exploration with the idea that the wells could be used later for production, or as monitoring wells.

Following the public bidding period, LA contracted Weston Engineering, Inc. (Weston) of Upton, Wyoming, to complete the test wells. Bids were received from seven drilling contractors and opened on March 31, 2010. Project bids ranged from approximately \$843,600 to \$1,800,700 to complete three test wells in the Casper Formation to depths anticipated to range from 1,635 to 3,135 feet. Weston was the low bidder, and was deemed to be both responsive and qualified to complete the wells.

Given the available drilling budget and their low bid, Weston was asked to complete four, rather than three test wells on the western portion of the Ranch. The wells were completed in the following order: Duck Creek 3-1, Lone Tree Fault 1-2, Goose Creek 2-2C, and Lone Tree Fault 1-5. Details on the completion of these four and the original two Casper Aquifer test wells are summarized in **Table 3.1**. Of these six test wells, only Lone Tree No. 1 was drilled through the Casper Formation and into the underlying Precambrian rocks.

The rationale for drilling each of the four test wells varied. Duck Creek 3-1 was drilled first for the reasons listed in Section 2.4. Based on an August 16, 2010, meeting between AMEC, WWDC, and LA, Lone Tree Fault 1-2 was selected as the second drill site. This site was drilled to assess the hydrogeologic role of the Lone Tree Creek Fault, which given its surface expression and geophysical signature was thought to be a potentially significant conveyor of recharge to the Duck Creek area. Following the completion of these two wells and revision of the geologic and geophysical interpretations for the geophysical lines, the project team sited and permitted two additional drilling locations, Goose Creek 2-1E and Lone Tree Fault 1-5. The location of Goose Creek 2-2 was revised westward to 2-2C near the Cloverly Formation outcrop in Section 30, T13N, R69W. These changes were made to take advantage of what were interpreted to be more permeable zones within the Casper Formation on the geophysical lines. Goose Creek 2-2C was drilled third to test out the yield potential of the Goose Creek line at a potentially shallower drilling depth. Finally, Lone Tree Fault 1-5 was drilled to further explore the yield potential of the southern portion of the Lone Tree hydrostructural compartment.

3.1 Drilling Conditions and Well Completion

Weston completed each test well in general accordance with the design presented in the drilling specifications. Well completion summaries, including lithologic data, geophysical logs, and well completion details, for each of the four new test wells are included on **Figures 3.3** through **3.6**. Following the installation of 13 3/8-inch diameter API H-40 surface casing, the annular space at each well was pressure cemented with neat cement. Once the cement had cured, Weston drilled each 12 1/4-inch production borehole utilizing direct circulation rotary techniques with bentonitic drilling fluids at least 19.5 feet into the top of the Casper Formation. Within these boreholes, Weston installed a sufficient length of 8 5/8-inch diameter, API J-55 casing with centralizers, and Basic Energy Services pressure cemented the annular space. Below the casing, Weston drilled 7 7/8-inch diameter production boreholes through the upper Casper Formation utilizing direct circulation air-based drilling techniques, and terminated the borehole below the contact with the lower Casper Formation. The use of air rotary drilling methods allowed for evaluation of Casper Aquifer productivity during drilling.

Weston encountered several difficulties in drilling and completing the wells, including borehole sloughing, slow penetration rates, and borehole deviation. At the first well, Duck Creek 3-1, Weston had difficulty advancing the 12 1/4-inch production borehole because fine gravel from the Ogallala Formation below the surface casing readily sloughed into the hole. After raising their viscosity, Weston was able to advance the hole. Weston also experienced difficulty with slow drilling conditions as well as borehole deviation. Drilling penetration rates slowed dramatically below a depth of 979 feet and were consistently 2 feet per hour or less from this point into the Casper Formation. In addition and concurrently, the borehole deviated up to 10 degrees from vertical before Weston was able to reduce the deviation to 4 1/2 degrees at a depth of 1,255 feet.

On the three subsequent test wells, Weston counteracted these difficulties in different ways, and also had to deal with lost circulation problems. First, Weston drilled a 7 7/8-inch diameter pilot hole in advance of setting and cementing the surface casings. Second, Weston either drilled and reamed 7 7/8-inch diameter pilot holes or used a 12 1/4-inch diameter PDC bit to counteract the slow drilling conditions. Neither of these techniques were successful in counteracting their borehole deviation issues, however, as the 12 1/4-inch diameter boreholes deviated in excess of 14 degrees for both Goose Creek 2-2C and Lone Tree Fault 1-5. Despite the borehole deviation issues, Weston had no difficulty either setting the 8 5/8-inch diameter casing to the appropriate depth or placing and retrieving their test pump in the wells. With regard to lost circulation conditions while drilling with bentonitic drilling fluids, Weston had issues on both the Goose Creek 2-2C well in the Cloverly Formation and on the Lone Tree Fault 1-5 well in the Satanka Formation, approximately 12 feet above the Casper Formation contact. In both instances, Weston was able to regain circulation using approved lost circulation materials and successfully completed the wells.

Weston also experienced lost circulation during the pressure cementing on the 8 5/8-inch diameter casing at Lone Tree Fault 1-5. After Basic Energy Services had displaced cement to the mud pit, they lost circulation in the annular space while using water to displace the cement from inside the casing. Consequently, Weston topped off the annular cement with an additional

55 sacks of neat cement and ran a cement bond log on the casing prior to drilling out the cement and float shoe inside the casing. The cement bond log revealed good cement bond to the casing such that Weston continued drilling.

3.2 Geologic and Hydrogeologic Logging

Based on the cuttings obtained from the four test wells along with the data from Lone Tree No. 1 and Duck Creek No. 1, the project team made several discoveries with regard to the Permian-Triassic redbed formations on the Ranch.

- ✓ Significantly, more redbed formations were present above the Casper Formation than were originally anticipated. During previous test well drilling in 2006, only 40 feet of redbeds were drilled in the Lone Tree No.1 well, and 685 feet were drilled in Kennedy No. 2. However, no definitive marker bed was encountered during the drilling of these test wells.
- ✓ The red siltstone and shale of the Chugwater, Goose Egg, and Satanka Formations have no distinguishing characteristics and therefore cannot be readily differentiated apart from the complete redbed sequence. Originally interpreted as the Goose Egg Formation (States West Water Resources Corporation, 2006), the redbed section in Lone Tree No. 1 has been reinterpreted as the Satanka Formation as noted on **Figure 3.1**.
- ✓ The Forelle member of the Goose Egg Formation is a marker bed for the redbed sequence, but varies in its lithology over short distances. The continuity and lithologic variability of this bed can be seen when comparing the Forelle section that was drilled in all four recent test wells, and is summarized on **Figures 3.3 through 3.6**.
- ✓ The redbed sequence effectively confines and isolates the Casper Aquifer from the High Plains Aquifer. The hydrogeologic role of these units is highlighted by the fact that the Casper Aquifer water level in the five wells that encountered redbeds stands above that contact (artesian).

The investigation demonstrated that concealed localized geologic structure has a profound influence on the subsurface location of the Casper Formation top. Drilling revealed that neither geologic surface dip projections into the subsurface, nor geophysical interpretations of the seismic reflection and electrical resistivity data were completely reliable. The depth to the Casper Formation top varied from what was geologically or geophysically anticipated across the site. The project team had anticipated that the Casper Formation top at Duck Creek 3-1 could be as shallow as 525 feet based on the geophysical interpretation, or as deep as 650 to 800 feet based on down dip projections from outcrop. When Weston hit the Casper top at 1,492 feet, as noted in **Table 3.1**, it became apparent that concealed subsurface structure had significantly repositioned the sedimentary rock sequence. Despite efforts to reinterpret the geophysical data and refine drilling depths prior to each subsequent test well, this difficulty in predicting Casper Formation tops persisted on the subsequent three test wells. **Table 3.1** highlights how the Casper Formation tops at the respective test wells varied from what was geologically and geophysically anticipated.

Based on the exploratory drilling, the project team discovered several things about the geology and hydrogeology of the Casper Formation.

- ✓ Not only does the thickness of the Casper Formation vary, but the thicknesses of the upper and lower sequences of the unit vary as well. As shown in **Table 3.1**, while the apparent thickness of the Casper Formation varies from approximately 826 to 1,686 feet, the apparent thickness of the upper portion of the formation varies from 721 to 1,188 feet. These apparent thicknesses are a function of dip as well as potentially changing depositional environments or underlying Precambrian formation topography across the property.
- ✓ The upper and lower portions of the Casper Formation vary both in lithology and water yield potential. The upper part of the Casper consists of interbedded dolomitic limestone and sandstone that may readily yield water from fractures or dissolution tubes. The lower part of the Casper consists primarily of siltstone, has low intergranular permeability, is of poor structural integrity, and did not readily yield water.
- ✓ While the lithology of the upper portion of the Casper Formation has some influence on specific well yield, the type of permeability is the most significant factor in completing a high capacity well. As noted in **Table 3.1**, the yields of the Casper Aquifer wells completed to date range from 24 to 600 gpm, and are highest where the permeability has been enhanced through fracturing of the interbedded sandstone or dissolution tube development within limestone as at Lone Tree No. 1.

3.3 Video and Geophysical Logging

Following drilling of the 12 ¼- and 7 7/8-inch diameter boreholes, Weston's geophysical logging subcontractors, Goodwell, Inc. and Colog, Inc., collected downhole geophysical logs on each test well to obtain additional stratigraphic and hydrogeologic information. These data were also used to calibrate and iteratively reinterpret the surface geophysical data. The geophysical logging suite on the 12 ¼-inch boreholes typically consisted of the following logs: caliper, natural gamma, 16-inch resistivity, 64-inch resistivity, point resistivity, spontaneous potential, and full wave form compensated sonic. For the 7 7/8-inch boreholes, density and neutron logs were also run to qualitatively assess water yielding characteristics of the Casper Formation. At Duck Creek 3-1, a full wave form compensated sonic log was obtained on the 7 7/8-inch borehole to quantify sonic velocities on the Casper Formation. With the exception of the sonic logs, data from these geophysical logging runs are included on the well completion record documents shown on **Figures 3.1** through **3.6**. To the extent that fluid levels would allow, sonic logs were also run through the 8 5/8-inch diameter casings on each test well to assess the cement bond to the casing. A sonic log was not run through the cased portion of Lone Tree Fault 1-2. A complete set of the geophysical logs for each test well is included in the Project Notebook.

With respect to the geophysical logs summarized for the test wells on **Figures 3.1** through **3.6**, several unique characteristics of the Casper Formation were observed.

- ✓ The upper portion of the Casper Formation is more resistive than the lower portion.

- ✓ The upper part of the Casper appears to consist of more limestone or higher resistivity beds than were logged from the drill cuttings, and the difference in resistivity of the sandstone and limestone interbeds gives the formation its sawtooth resistivity character observed in all six test wells.
- ✓ The sawtooth resistivity character of the upper Casper Formation is muted in Duck Creek 3-1, likely attributable to faulting in that portion of the section.
- ✓ The caliper log highlights the washouts and structural instability of the lower portion of the Casper Formation.
- ✓ The sandstones of the upper Casper typically have higher gamma signatures, but the general gamma signature of the lower Casper is consistently higher than the majority of the upper Casper.
- ✓ The neutron and density signatures highlight differences in porosity and rock bulk density, and can indicate the presence of water filled fractures or dissolution tubes. **Figure 3.3** is characterized by a neutron porosity spike around 1,886 feet, which corresponds to increased groundwater production at Duck Creek 3-1.

The video logs of the test wells reveal that the most significant permeability associated with the Casper Aquifer is due to cavities, dissolution tubes, large vertical fractures, horizontal fractures, and vugs. Video logs were completed on five of the six Casper Aquifer test wells. The video of Lone Tree No. 1 shows two, 5-foot tall cavities at depths of 464 and 574 feet, and indicates that the Casper Formation in this well is fractured both horizontally and vertically, particularly at depths of 780 to 811 feet. These features are also revealed by the caliper and density logs on **Figure 3.1**, and appear to be associated with limestone beds in the upper Casper section. With respect to Duck Creek 3-1, the video of this well revealed the presence of a 3 foot cavity in limestone at a depth of 1,888 feet. This cavity is also evident from the caliper and neutron logs as shown on **Figure 3.3**, and corresponds to increased water flow during drilling. The video log of Lone Tree Fault 1-2 revealed the Casper Formation has many horizontal fractures and vugs, and also identified a small cavity at a depth of 1,344 feet. In Goose Creek 2-2C, the video indicated that the Casper section in this well contains many vugs, small cavities, and both vertical and horizontal fractures. The well video for Lone Tree Fault 1-5 revealed similar features. The video logs also confirm that the lower portion of the Casper Formation has collapsed in the test wells.

3.4 Well Development

Weston developed each of the test wells utilizing airlifting and surging techniques. Their airlifting package typically consisted of open ended drill pipe and their air compressor and pressure booster equipment. Weston completed the development process by airlifting from several different depths in each well, including the bottom of the well and bottom of the casing. Because Weston drilled the Casper Formation section with air-based drilling fluids, the wells cleaned up quickly.

With regard to yields during development, LA and Weston found airlifting yields to be good initial estimates of what the wells might yield with downhole submersible pumping equipment. Airlifting

yields from the test wells varied, Duck Creek 3-1 yielded approximately 280 gpm; Lone Tree Fault 1-2 yielded 30-53 gpm; Goose Creek 2-2C yielded 40-170 gpm; and Lone Tree Fault 1-5 yielded 101-149 gpm. With the exception of Lone Tree Fault 1-2, aquifer tests were completed on the test wells to determine what the wells would yield under standard pumping conditions for longer durations.

4.0 Hydrogeologic Evaluation of the Casper Aquifer

In collaboration with Weston and AMEC, LA completed aquifer tests on three of the four new test wells, Duck Creek 3-1, Goose Creek 2-2C, and Lone Tree Fault 1-5. Aquifer tests on all the wells consisted of both stepped and seven day constant rate tests. Duck Creek 3-1 was tested between August 21-29, 2010, while Goose Creek 2-2C and Lone Tree Fault 1-5 were tested between March 11-19, 2011, and May 26-June 3, 2011, respectively. Because the yield during well development was less than 100 gpm, LA decided not to perform an aquifer test on Lone Tree Fault 1-2.

The remaining wells were test pumped to improve our understanding of the hydrogeology of the Casper Aquifer on the Ranch. Based on individual well yields observed during drilling, step tests were designed to assess drawdown conditions associated with a variety of discharge conditions. The constant rate tests were completed for seven days using both pumping and observation wells in order to see how the aquifer responded to long term pumping and to assess how the test wells were hydraulically connected. The results of the tests were used to assess the hydraulic conductivity, transmissivity, and storage coefficient of the aquifer, as well as any associated boundary conditions that would either help or hinder discharge. The tests were also used to estimate the sustainable yields of individual wells, and to provide a basis for well spacing and well field pumping considerations.

For test pumping purposes, Weston installed the pump and all necessary appurtenances, and assisted in data collection. Weston utilized a submersible electric Goulds 7CHC pump equipped with a variable frequency drive to complete the tests on all three wells. The pump intake position was not adjusted between the stepped and constant rate test. During the tests, groundwater was lifted from the pump through 4-inch diameter steel column pipe, and routed through a 2-inch discharge manifold at ground surface that typically consisted of a 2-inch totalizing Cameron flowmeter, pressure gage, sample port, Rossum sand tester, and a gate valve. Below the gate valve, a 4-inch flexible hose was used to discharge the water to ground surface. Discharge rates were monitored with both the in-line Cameron flowmeter and a Parshall flume. The flowmeter was used to record both total gallons pumped and instantaneous flow. An orifice plate was also used to gage discharge for the Goose Creek 2-2C test. During the stepped and constant rate tests, water level changes were monitored with pressurized airline, and In-Situ pressure transducers. Manually obtained water level tape data were used to calibrate the transducer data. Observation well water levels were collected either manually with a water level tape or with In-Situ pressure transducers that were calibrated via water level tape measurements.

Water quality samples were collected toward the middle and end of the constant rate aquifer tests on each well to evaluate water quality differences between wells, and each well's ability to meet U.S. Environmental Protection Agency (EPA) drinking water standards. Analytical results for the wells are summarized in Section 5.0.

4.1 Stepped Rate Testing

LA evaluated the range in yields obtained from each of the test wells through stepped rate testing. The wells were pumped at successively higher rates without interruption, and the highest discharge rate for each well corresponded to the maximum rate it would yield due to

either hydrogeologic conditions or pumping equipment limitations. Discharge rates during each step were held constant and tested for approximately 60 minutes. At the end of the final step, the pump was disengaged and the water level was allowed to recover prior to the start of the constant rate test.

Water level and discharge data were collected during the test to evaluate well yields for the constant rate tests. Water levels for each step were measured and recorded on a logarithmic time scale. Drawdown in the well was plotted versus time for each step, and specific capacities were calculated at the end of each step. Results of the stepped rate tests, including those from 2006 and 2007 for Lone Tree No. 1, are summarized in **Table 4.1**. Time drawdown data for each new well are presented graphically with respect to depths to water in **Figures 4.1** through **4.3**. **Figure 4.4** illustrates how the specific capacity curves of the three new test wells compare with Lone Tree No. 1. Original aquifer test data and analyses are included in the Project Notebook.

Stepped rate testing of the three test wells indicated that yields vary with location and in relation to geologic structure. As noted on **Figure 4.4**, the highest yielding wells are Lone Tree No. 1 located along Granite Springs Anticline, and Duck Creek 3-1 located along Duck Creek Anticline. In contrast, Goose Creek 2-2C and Lone Tree Fault 1-5 yielded less water from areas that appear to be less affected by structural deformation. Of all the wells tested, Lone Tree No. 1 yields water most efficiently, as its specific capacity is over 10 gallons per minute per foot (gpm/ft) of drawdown. The specific capacities of all three new tested wells as shown in **Table 4.1** were observed to be less than one gpm/ft, or significantly less efficient than Lone Tree No. 1. Hydrogeologic conditions affecting well production were further evaluated through analysis of the constant rate test data.

4.2 Constant Rate Testing

Seven day constant rate tests were completed on the three test wells to assess both the sustainability of prolonged pumping from each well, and the degree of hydraulic communication between wells through the aquifer. Each well was pumped separately and nearby wells were used as observation wells to record water level measurements. During the testing of Duck Creek 3-1, Duck Creek No. 1 was used as an observation well. During the testing of Goose Creek 2-2C, Duck Creek 3-1, Lone Tree Fault 1-2, and Duck Creek No. 1 were used as observation wells. During the testing of Lone Tree Fault 1-5, Lone Tree No. 1, Lone Tree Fault 1-2, and Goose Creek 2-2C were used as observation wells. Target discharge rates for each well were selected based on analysis of the respective stepped rate test data. Prior to starting the constant rate test, each test well was allowed to recover overnight. A summary of the constant rate tests, including those for Lone Tree No. 1 from 2006 and 2007, is presented in **Table 4.2**. Along with hydrographs of the observation well data that include distance from the pumping well, time drawdown and recovery data are shown graphically with respect to depth to water for all the tests on **Figures 4.5** through **4.13**. Original aquifer test data and analyses are included in the Project Notebook.

Analyses of the time drawdown, recovery, and observation well data from all the constant rate tests are summarized in **Table 4.2**. These data indicate that the transmissivity and hydraulic

conductivity of the Casper Aquifer at Duck Creek 3-1, Goose Creek 2-2C, and Lone Tree Fault 1-5 are typical of those associated with sandstone. In contrast, the hydrogeologic parameters obtained from Lone Tree No. 1 are more typical of those associated with karst limestone (Driscoll, 1986). Using Aquifer Test Pro 2010.1, LA estimated that the transmissivity and hydraulic conductivity of the Casper Aquifer ranges from 160 to 81,000 gallons per day per foot (gpd/ft) and 0.21 to 95.5 gallons per day per square foot (gpd/ft²), respectively. Because several of the pumping wells lowered water levels in their respective observation wells, LA calculated a storage coefficient of 0.0002 to 0.0003 for the Casper Aquifer, clearly indicating the aquifer is confined. Sand production from all the test wells was determined to be less than one part per million. The design pumping rates noted on the right side of **Table 4.2** are a direct reflection of these hydrogeologic conditions.

4.3 Hydrogeologic Evidence from Testing

Aquifer testing completed during the 2006 groundwater grant project and this Level II project revealed that the Casper Aquifer at the Ranch responds to pumping conditions differently in different areas. This is evident when comparing the Lone Tree hydrostructural area between Granite Springs and the Lone Tree Creek Fault, and the Duck Creek hydrostructural area between Lone Tree Creek Fault and Spottlewood Fault. In the north along Granite Springs Anticline, Lone Tree No. 1 yielded 600 gpm of groundwater with far less drawdown than was observed in the other test wells. Pumping of this well appeared to intercept an impermeable boundary condition (Lidstone and Associates, 2008). The source of this hydrologic boundary appears to be faulting of the aquifer east of the test well. At Lone Tree Fault 1-5 on the far southern flank of Granite Springs Anticline, the Casper Aquifer yielded only 74 gpm, but it responded as if it were leaky, being recharged, or had fracture and intergranular permeability based on constant rate test analysis. While pumping from this well did not draw water levels down in its observation wells, it also did not encounter any impermeable boundary conditions. While Lone Tree Fault 1-2 was not tested, the limited available yield of this well indicated either that Lone Tree Creek Fault is not a significant conduit for transmitting groundwater to the south, or that the test well missed significant water transmitting fractures or conduits.

Similar hydrogeologic conditions are present south of Lone Tree Creek Fault. The constant rate test of Goose Creek 2-2C appeared to intersect an impermeable hydrologic boundary as the discharge rate had to be cut from 200 to 100 gpm after 14 hours so that the water level would not be drawn down to the pump intake. Despite the flow rate reduction, the change in water levels appeared to mimic its trend before the flow rate was dropped. At the same time, this test drew down water levels in Duck Creek 3-1, which is located more than 0.5 miles south. The impermeable boundary could be a clay lined portion of Lone Tree Creek Fault or a backthrust fault to the west toward Goose Creek Sink. Without encountering a boundary condition, the constant rate test of Duck Creek 3-1 revealed through drawdown of the water level in Duck Creek No. 1 that it was in hydrologic communication. Given the drawdowns observed in the observation wells during these two tests, it is clear that the Casper Aquifer is in hydraulic communication across the Duck Creek Anticline area.

5.0 Casper Aquifer Water Quality

During development or aquifer testing of the four test wells, LA collected and submitted water samples to evaluate the quality of groundwater obtained from the Casper Aquifer. Field water quality measurements were collected in conjunction with the water quality sampling. Field measurements included pH, electrical conductivity, and temperature. Results for select constituents detected during these analyses are summarized in **Table 5.1** for comparison with water quality results for other Casper Aquifer wells, recharge sources (Lone Tree Creek, Duck Creek, and Goose Creek), and discharge points (Granite Springs). Complete analytical reports for the four test wells are included **Appendix D**.

Along the western portion of the Ranch, the quality of groundwater obtained from the Casper Aquifer is consistently good, and is free of TCE. Within the vicinity of Lone Tree Creek, groundwater is typically calcium bicarbonate type, and is undersaturated with respect to calcite, dolomite, and aragonite. Increases in the concentrations of calcium, magnesium, bicarbonate, and TDS between the Lone Tree Creek Sink, Lone Tree No.1, and Granite Springs indicate that these sites lie along the same flowpath and that Granite Springs is downgradient of the sink. Despite the presence of TCE in the High Plains Aquifer in the vicinity of the former Atlas missile site (U.S. Army Corps of Engineers, 2006), the Casper Aquifer has not been affected by this contaminant.

South of Lone Tree Creek, Casper Aquifer water is similar in quality to areas near Lone Tree Creek, and although slightly different, still meets drinking water standards. Groundwater from the four test wells has slightly higher concentrations of magnesium, and therefore tends to be calcium magnesium bicarbonate type water. This water is also undersaturated with respect to calcite, aragonite, and dolomite. The higher magnesium concentration in these wells could be due either to the quality of water recharged from Goose and Duck Creeks, or dissolution of dolomite in the Casper Formation. Although uranium concentrations in Duck Creek No. 1, shown in **Table 5.1**, were above EPA's respective maximum contaminant level, subsequent water quality testing of other wells in this area, particularly Duck Creek 3-1, found uranium levels below the threshold. Additional water quality testing of Duck Creek No. 1 is warranted.

In summary, and with the exception of Duck Creek No. 1, groundwater from the Casper Aquifer on the western portion of the Ranch meets both primary and secondary EPA drinking water standards.

6.0 Hydrogeologic Implications for Casper Aquifer Well Fields

The geologic and hydrogeologic data acquired to date on the western end of the Ranch have led to significant discoveries about the structural configuration and development potential of the Casper Aquifer. From the test well hydrogeologic parameter data collection and well videos, it is clear that enhanced zones of permeability, including fractures, dissolution tubes, and small caverns, convey larger volumes of water and are typically associated with the most structurally deformed areas. Intergranular and matrix permeability predominate away from structures, resulting in lower well yields.

6.1 Casper Aquifer Permeability Architecture

The interplay of the geologic structure and recharge of the Casper Formation directly bear on the permeability architecture of the aquifer. The Casper Formation has been folded and faulted in many ways that are observed in surface exposures of the formation, but are hidden across much of the Ranch by the Tertiary Ogallala Formation. The presence and variable orientation of such structures as Granite Springs Anticline, Duck Creek Anticline, and Spottlewood Anticline along with Lone Tree Creek Fault and Spottlewood Fault indicate that the tectonic deformation was intense and varied in its expression. Correlating outcrop and test well data, the structure contour map shown on **Figure 6.1** and the geologic cross sections presented on **Figures 6.2** through **6.4** were constructed to understand how these structural features are expressed through the Casper Formation east of the outcrop. The structural cross section shown on **Figure 6.5** presents a north-south regional interpretation of the Casper Formation structural changes. As a result of recharge through Lone Tree, Goose, and Duck Creeks, the Casper Formation is sufficiently saturated and permeable to yield significant volumes of water to production wells. A potentiometric surface map of the Casper Aquifer, shown on **Figure 6.6**, was prepared to illustrate groundwater flow patterns and to evaluate how those patterns relate to the Casper structure contour. A hydrograph of Casper Aquifer water levels, shown on **Figure 6.7**, was prepared to understand recent water level trends in the aquifer.

Between Granite Springs and Lone Tree Creek Fault, the Casper Formation is folded by the Granite Springs Anticline and thrust eastward, as shown on **Figure 6.1**. While Casper Formation outcrop dips southeast of the anticlinal axis range from 41 to 55 degrees, geologic data from Lone Tree Fault 1-5 indicate the formation dips less steeply between the well and the outcrop. In contrast, the Casper Formation west of Lone Tree No. 1 dips from 20-24 degrees, and appears to steepen eastwardly as evidenced by geologic data obtained from the Lone Tree No. 1 and Kennedy No. 2 test wells. This tightening of the Casper Formation structure contours is shown on **Figures 6.1** and **6.2**. This steepening is thought to be due to a range front thrust fault that dies out to the south. This pair of geologic structures has resulted in an enhanced zone of permeability due to fracturing and dissolution tube development that would produce sufficient water to warrant a well field. This area is near Lone Tree No. 1 in Sections 17 and 20 of T13N, R69W where the Casper Formation strike changes from northeast to north. Structural deformation has also reduced the drilling depths required to fully penetrate the producing zone of the Casper Formation, thereby allowing the economic construction of more wells.

Within this same area, Casper Aquifer potentiometric data suggest that Lone Tree Creek plays a more significant role in recharging the aquifer than at just Lone Tree Creek Sink, and also indicates that the Casper Aquifer is not locally compartmentalized. Water levels in this area have risen approximately 40 feet between 2006 and 2011, as shown on **Figure 6.7**. As shown on **Figure 6.6**, contoured water level data from Lone Tree No. 1, Lone Tree Fault 1-5, and Lone Tree Fault 1-2 indicate that there is a groundwater divide in the Casper Aquifer northeast of Lone Tree Fault 1-5. The potentiometric surface configuration suggests that Lone Tree Creek recharges the aquifer along the length of the Casper Formation outcrop adjacent to the creek, and that water from this area flows both north toward Granite Spring and south toward and beyond Lone Tree Creek Fault. This substantiates the conclusion that the Lone Tree Creek Fault is not a local impermeable boundary, and that Lone Tree and Duck Creek are not separate hydrostructural compartments as previously conjectured. While structural permeability enhancement appears best in Section 17, this configuration of the potentiometric surface suggests that enhanced permeability conduits (i.e., fractures and/or dissolution tubes) in the vicinity of Lone Tree Fault 1-2 and Lone Tree Fault 1-5 also convey groundwater southward.

Between Lone Tree Creek Fault and Duck Creek Anticline, the Casper Formation has been folded across Duck Creek Anticline, and faulted southeastward along Lone Tree Creek Fault (left lateral slip) with associated backthrust faulting, as shown on **Figure 6.1**. This structure resulted in the development of several potential zones of enhanced permeability. Backthrust faulting in Section 30, T13N, R69W is believed to be related to the eastward movement of the Casper along the Lone Tree Creek Fault and northward steepening dips of the Casper Formation outcrop to the west. The permeability of the Casper in the hanging wall of this fault may have been enhanced through fracturing. The offset along this backthrust fault diminishes to the south as shown on **Figure 6.3**. This cross section lies parallel to the Duck Creek synclinal axis and incorporates data from Goose Creek 2-2C, the Casper outcrop to the west, and the Vessels No. 1 oil test well to the east. In contrast to the gentle dip and relatively unbroken section shown on **Figure 6.3**, the Duck Creek section shown on **Figure 6.4** suggests that structural deformation intensifies going southward toward Duck Creek Anticline. Using outcrop attitudes and geologic data from Duck Creek No. 1 and Duck Creek 3-1, the dip of the Casper Formation steepens dramatically northeastward. This dip change is attributed to folding and faulting, which appears to be evident in the resistivity logs of the Duck Creek 3-1 well around a depth of 2,000-2,100 feet, as shown on **Figure 3.3**. The folding and faulting is represented on **Figure 6.1** by the tightening of the structure contour lines across Duck Creek Anticline and by a small offset in the Casper Formation surface. Though not fully realized in Duck Creek 3-1, the permeability of the Casper Formation in this area is likely enhanced through extensional fracturing and dissolution tube development. The permeability of the Casper Formation may also be enhanced on the south side of the Lone Tree Creek Fault near its termination near the end of geophysical Line 2.

Within this area, the water level contours for the Casper Aquifer shown on **Figure 6.6** indicate that Duck and Goose Creeks are recharge contributors, and that Lone Tree Creek plays a major role in recharging the aquifer in this area. Groundwater generally flows southward past Lone Tree Creek Fault toward Goose Creek 2-2C and Duck Creek 3-1. This water could be conveyed

through the hanging wall of the backthrust fault in Section 30 or just through hydraulically connected portions of the Casper on either side of Lone Tree Creek Fault. Water recharged from Goose and Duck Creeks flows east and southeastward toward Duck Creek 3-1, the lowest measured potentiometric surface point in the area. The configuration of the potentiometric surface indicates that Duck Creek Anticline in Section 31 of T13N, R69W, and Section 6 of T12N, R69W is the primary local means for transmitting groundwater eastward through the Casper Aquifer. As such the permeability of this anticline has been sufficiently enhanced in this area to warrant further exploration for a well field.

Between Duck Creek Anticline and the Spottlewood Fault, the Casper Formation has been folded across Spottlewood Anticline and Syncline, and faulted westward along Spottlewood Fault. Given the lack of potentiometric data on this structure, it is uncertain how groundwater is locally moving through the Casper in this area. As shown on **Figure 6.1**, the Casper Formation is thought to be unfaulted and continuous between the Duck Creek and Spottlewood structures. However, there is some evidence in the difference in the general outcrop strike that suggests the presence of a concealed left lateral strike slip fault below the Tertiary Ogallala Formation cover in Section 1, T12N, R70W. This interpretation is not reflected on **Figure 6.1**. The most likely location of permeability enhancement due to fracturing on this structure is along the crest of Spottlewood Anticline. It appears that groundwater from this structure either flows eastward or northeastward. If the orientation is northeastward, the Spottlewood structures may be contributing water that would be captured in a well field at Duck Creek. If the orientation is eastward, it may indicate that there is a strike slip fault present between the Duck Creek and Spottlewood Anticlines that is acting as a local hydrologic boundary to flow.

6.2 Post Test Well Drilling Hydrogeophysical Interpretation

While the geophysical interpretation was iteratively updated between test wells, the project team finished revising the geophysical interpretation upon completion of all test well drilling. The revision included geologic information obtained from lithologic logging and borehole geophysical data. This information was reviewed and infused into the processed seismic and CSAMT data. The final sections that contain the electrical resistivity and seismic reflection data, as well as the current interpretation on formation contacts and structural features, are included in **Appendix E**. The locations of the geophysical lines are shown on **Figure 2.1**. The following sections discuss the post drilling hydrogeophysical interpretation of each line.

6.2.1 Lone Tree Creek Fault (Line 1)

Geologic and downhole geophysical data from Lone Tree Fault 1-2 and 1-5 revealed the Casper Formation top was deeper than initially interpreted, but higher than would be expected from projection of Casper outcrop dips. The geophysical reinterpretation indicates there is significant structural deformation along this line. That deformation includes Lone Tree Creek Fault as well as faults southwest and northeast of this zone. Reinterpreted seismic reflection and electrical resistivity data for this line are presented in **Appendix E**.

Along the southwestern third of the line, there are very steep easterly dips related to both strike slip and thrust faulting. The dip is produced by a high angle reverse (thrust) fault. The apparent

dip of this fault is approximately 70 degrees based on known well velocity data in the area. The vertical offset on this fault is likely more than 300 feet. A very shallow back-thrust (black line) is present in this seismic section. This back-thrust has a vertical offset of about 100 feet. Lone Tree Creek Fault, a strike-slip fault zone, occurs at the base of the steep dip, and exhibits vertical offset downward on the northeast side across the zone.

At least three faults are observed on the northeastern part of the line. These faults dip at approximately 60 degrees to the northeast. An unusual roll-over, or drag feature is seen above the black normal fault, which may indicate lateral movement as well as normal fault deformation. The northeastern end of the line has moderately high conductivities suggesting that the Casper Aquifer is very fractured, and perhaps contains abundant groundwater.

Despite the relatively low yield of Lone Tree Fault 1-2 and 1-5, there are two areas on this line that warrant further exploration based on their seismic and electrical resistivity character; and potentiometric data. These sites include CSAMT stations 1275 (**Appendix E**) near the natural gas pipelines, and 1925 on the northeastern end of the line near Lone Tree Fault 1-5.

6.2.2 Goose Creek Structure (Line 2)

Similar to Line 1, geologic data obtained from Goose Creek 2-2C revealed the Casper Formation top was lower than originally interpreted, and confirmed the structural complexity of the line. A large reverse fault (black line) is interpreted beneath the western portion of Line 2. The apparent dip of this fault is about 65 degrees based on known well velocity data in the area. Most of the sediments dip strongly to the east along this line. This seismic section clearly reveals the offset and geometry of this fault. The vertical offset on this fault is more than 500 feet. A shallow back-thrust (black line) off this fault is also apparent in the section. This back-thrust has a vertical offset of about 200 feet. Reinterpreted seismic reflection and electrical resistivity data for this line are presented in **Appendix E**.

Two strike-slip fault zones are interpreted beneath the eastern portion of the line (violet and red lines). These fault zone features appear to be nearly vertical and may be related to the Lone Tree Creek Fault zone imaged beneath Line 1. However, the seismic coverage is not adequate to connect these faults from line to line with confidence, and therefore additional data would be needed.

Despite the fact that several of the targeted seismic “bright spots” were not actually within the Casper Formation, there remain several prospective drilling targets within the Casper Formation on this line. These include CSAMT station 675, which presents a shallow drilling opportunity to test the Casper in the hanging wall of the large reverse fault closer to the range front; CSAMT station 1800, which targets deep low resistivity and seismic “bright spots” adjacent to the interpreted purple strike slip fault; and CSAMT station 2125 that would answer questions about the hydrogeologic role and condition of the Casper Aquifer between the two faults on the east end of the line. The latter two prospects would require very deep test wells.

6.2.3 Duck Creek Structure (Line 3)

Drilling of the Duck Creek 3-1 well indicated the initially targeted seismic “bright spots” on Line 3 were actually above the Casper Formation top. Despite the misinterpretation, the well yielded a significant volume of water (200 gpm) from the Casper Aquifer along Duck Creek Anticline where previous drilling had yielded little at Duck Creek No. 1 (24 gpm). This yield appears to be related to structural deformation in the reinterpreted Casper Formation, and low resistivities in this area.

The Duck Creek line is oriented roughly parallel to structural strike based on surface geologic mapping. This line ties the western end of Line 2, and the data at the intersection show good correlation. The same reverse fault system and back-thrust that were seen on Line 2 are present beneath this line. Since the line crosses the faults obliquely, they are not as well imaged as if crossing them more perpendicularly as at Line 2. The apparent dip of the reverse fault is approximately 25 degrees. The vertical offset along the main fault appears to be small, but the back-thrust fault shows over 500 feet of vertical displacement. The seismic section also indicates three faults in this central part of the line; it is possible that this central part of Line 3 is broadly more fractured than other parts of the line. Reinterpreted seismic reflection and electrical resistivity data for this line are presented in **Appendix E**.

The reinterpretation of this line also highlights a shallowing of the Casper Formation top to the south. This interpretation differs from that presented on the Casper Formation structure contour map on **Figure 6.1**. This difference could be due to a northwest-southeast strike-slip fault, which lies between the Duck Creek and Spottlewood lines, but is concealed by Tertiary formation cover.

Given the success of the Duck Creek 3-1 well, the project team believes other opportunities to develop Casper Aquifer groundwater from this structure exist. These opportunities include prospects both on Line 3 and offset from the line across the anticline. Within the reinterpreted Casper Formation section on Line 3, the following CSAMT stations appear favorable for drilling potential production wells given their seismic “bright spots” or fractured character, low resistivity, and/or geologic structure: 1400, 1125, 775, and 325.

6.2.4 Spottlewood Structure (Line 4)

Lacking any on line test well data, Line 4 was reinterpreted on the basis of the geologic and downhole geophysical data acquired on the other lines, particularly Duck Creek 3-1 on Line 3. This line across Spottlewood Anticline and Syncline exhibits northward dipping thrust faulting, which has significantly deformed the rocks in this area. As a result, the target Casper Formation is only locally well depicted on this line. Three reverse faults (black) show between 100 and 300 feet of vertical displacement. These faults have apparent dips between 30 and 80 degrees. The two interpreted 70 degree dipping normal faults (violet) on the southern end of the line have 50 to 150 feet of vertical offset. Reinterpreted seismic reflection and electrical resistivity data for this line are presented in **Appendix E**.

While the initial interpretation was not generally favorable toward drilling, there does appear to be one potential exploration prospect on this line. That prospect lies at CSAMT station 1950 along the potential crest of Spottlewood Anticline. This location is associated with a moderate resistivity signature and a significant “bright spot” in the interpreted Casper section.

6.2.5 Lone Tree Creek (Line 5)

Despite the presence of Kennedy No. 2 and Lone Tree No. 1 along this section, neither well had data that could be used to test the current structural interpretation of this line. The Chugwater and Goose Egg Formations were absent in Lone Tree No. 1, and the Kennedy No. 2 well was not deep enough to tie the Casper and verify the thrust faulting. Line 5 is primarily a dip line that exhibits both east and west dipping thrust faults (black lines). The largest interpreted fault is the eastward dipping shallower thrust fault, which dips about 40 degrees. The sediments above this fault are also dipping steeply (>40 degrees). Above the westward dipping thrust fault, there are also several small normal faults (violet) on the western half of this line that dip about 80 degrees to the west. These faults show less than 100 feet of vertical displacement. The eastern end of the line has a complex feature interpreted as a vertical strike-slip fault zone (red line), similar to that seen beneath Line 1. Reinterpreted seismic reflection and electrical resistivity data for this line are presented in **Appendix E**.

While the Casper Formation is well imaged on the western half of this line, it has not been identified beneath the eastern half. This trouble in observing the Casper could be due to displacement along the west dipping thrust fault. However, there is a weak suggestion that the Casper may continue to plunge downward further to the east below the east-dipping thrust fault and the reflectivity of that area has been diminished for some unknown reason.

Because of the success of the Lone Tree No. 1 well and given the structural configuration of the area, the project team believes there are opportunities here both on the line and off the line to develop additional Casper Aquifer groundwater. In addition to a production size offset of Lone Tree No. 1, these options include CSAMT stations 550 and 975. At both of these locations, the permeability and yield potential of the Casper Aquifer appears to have been enhanced and is reflected in low resistivities and seismic “bright spots.”

6.3 Potential Well Sites for Well Field Development and Future Exploration

Based on the geologic and hydrogeologic interpretation of the data obtained and reinterpretation of the seismic and CSAMT resistivity survey data, two well fields and a number of locations for exploratory wells have been identified. This proposed development includes 13 production wells and six exploratory wells. The conceptual Lone Tree Creek Well Field consists of seven wells, and the conceptual Duck Creek Well Field consists of six wells. The locations of the proposed wells are shown on **Figure 6.8**, and conceptual details about individual wells are included in **Table 6.1**. The key to successful development of the well fields is locating wells where permeability enhancement of the upper Casper Formation will lend itself to increased well yields. In some instances, especially at the Duck Creek well field, predictions based on geologic interpretations vary from predictions based on revised geophysical interpretations. The costs presented in **Table 6.1** reflect the geologic interpretation. It should be noted that drilling depths

and costs associated with the proposed wells may vary depending on actual subsurface conditions encountered.

The geologic and geophysical interpretations for the top of the Casper Formation differ for several reasons. The geologic interpretation was developed from outcrop bedding attitudes, observed geologic structure, test well drilling data, and aquifer test results. In contrast, the geophysical interpretation is based on the seismic reflection, CSAMT resistivity, test well drilling data, and formation velocities. Lines 1, 2, and 3 have been calibrated with test well data, but Lines 4 and 5 have not. Line 5 was calibrated to a limited degree with test well data from the 2006 groundwater grant project. Differences in the interpretation of depths to the Casper Formation top arise from the uncertainties associated with the different approaches. These uncertainties include, but are not limited to, changing formation velocities, variable formation thickness and lithology, concealed or unrecognized geologic structure, and changing formation dip away from outcrop. Any or all of these could account for the differences in potential drilling depths at any given location.

With two potential well fields and additional exploration areas identified, the Casper Aquifer represents a significant groundwater development opportunity for the BOPU on the west end of the Belvoir Ranch. Significant questions still remain, however, regarding details of the complex geologic structure and its impact upon Casper Aquifer hydrogeology. These questions include the following:

1. How much water is recharged to the Casper Aquifer annually from Lone Tree, Goose, and Duck Creeks via their respective stream sinks?
2. Where are the permeable conduits in the Casper Aquifer below the groundwater divide near the former Atlas missile site, and how much additional water might they yield?
3. Why is the Casper Formation along the Lone Tree Creek Fault line so shallow based on test well drilling, and how does any geologic structure present in this area affect recharge heading south toward Duck Creek Anticline?
4. What structure underlies the Duck Creek Anticline area that creates such dramatic dip changes, and what impact will that have on future groundwater development in the vicinity of this well field?
5. What permeability features exist across Duck Creek Anticline that result in lower Casper Aquifer water levels across this area, and will they yield water more efficiently than Duck Creek 3-1?
6. What type of structure, if any, lies between Duck Creek Anticline and Spottlewood Anticline and what is its hydrogeologic impact?
7. What yield potential does Spottlewood Anticline have given its apparent low recharge, but complex geologic structure?
8. What other geologic structures are present that affect the Casper Formation subsurface configuration and potential aquifer yield?

To address these questions, the project team recommends a phased approach that combines further geophysical exploration with test well drilling prior to completing the proposed wells as municipal water supply wells. Production size test wells would be initially completed with open boreholes through the upper part of the Casper Formation. If subsequent aquifer testing results in adequate yield, then the wells would be fully completed with screen and gravel pack in the Casper Aquifer. Details of the proposed phased approach, and associated costs are presented in Section 7.1.

6.3.1 Potential Well Field Aquifer Yield Assessment

To evaluate the amount of groundwater potentially available to the BOPU on an annual basis, LA combined a surface water hydrologic with a hydrogeologic assessment of the Casper Aquifer on the western part of the Ranch. The evaluation process included two analyses. The first analysis involved estimating the amount of groundwater stored within and recharged to the aquifer. This process included reviewing available precipitation and snow water equivalent records in the Crow Creek drainage area (the next major drainage to the north), and stream gaging data on Lone Tree and Crow Creeks in order to calculate the amount of water potentially recharged to the system through stream losses on Lone Tree Creek. This recharge volume was compared to spring gaging data on Granite Springs. The second analysis utilized the Theis equation to analytically model drawdown on the aquifer over a 20 year period.

Recognizing the Casper Aquifer consists of sandstone and dolomitic limestone interbeds, the amount of groundwater in storage was estimated on the basis of specific yield, aquifer thickness, and areal aquifer extent. Calculations were made with respect to the areas near the Lone Tree Creek and Duck Creek Well Fields. For the analysis, a specific yield of 5% was assumed, which is low for sandstone and high for limestone (Driscoll, 1986). The assumed aquifer thickness was based on the drilled or average drilled thickness of the upper Casper Formation at the test wells (**Table 3.1**). The assumed aquifer area was developed on the basis of geologic outcrop (**Figure 1.1**), potentiometric mapping (**Figure 6.6**), and assumed boundary conditions (faults, groundwater divides, etc.). Given these assumptions, LA estimated the amount of groundwater in storage in the Casper Aquifer to be approximately 18 billion and 48 billion gallons in the Lone Tree Creek and Duck Creek Well Field areas, respectively.

Along with stream gage records on both Lone Tree and Crow Creeks, precipitation and snow water equivalent records in the Crow Creek drainage area were reviewed to identify water year conditions relative to stream flows specifically on Lone Tree Creek. Stream flow on Lone Tree Creek has only been gaged during a couple periods historically. The U.S. Geological Survey (2012) gaged the flow of this stream between 1933 and 1938, and States West Water Resources Corporation (2006; Lidstone and Associates, 2008) gaged its flow between 2005 and 2007. The most complete annual streamflow records for Lone Tree Creek are from the following years: 1934, 1935, 2005, and 2007. Based on Western Regional Climate Center (2012) records from 1915 through 2012 for the gage at the Cheyenne airport, the average precipitation for the city is 15.22 inches per year, but has ranged from approximately 6 to almost 24 inches per year over this timeframe. The Natural Resources Conservation Service (2012) maintains a SNOTEL site in the North Crow Creek drainage. Based on records from 2003 through 2012, the average

maximum snow water equivalent has been approximately 7.2 inches, but has ranged from 5.6 to 11.5 inches. Given these precipitation data, 1934 was a below average water year, 1935 and 2005 were above average water years, and 2007 was an average water year.

Given this hydrologic context, the amount of water recharged to the Casper Aquifer through stream losses along Lone Tree Creek were estimated and compared to the estimated discharge of Granite Springs. The recharge volumes were calculated for the four most complete annual stream gaging record years: 1934, 1935, 2005, and 2007. Assuming that any gaged flows less than 1.7 cfs directly recharged the aquifer, and any flows greater than this bypassed the aquifer, the annual volume of recharge to the Casper Aquifer was estimated. The recharge volume was calculated to be approximately 160 million gallons in 1934, 280 million gallons in 1935, 225 million gallons in 2005, and 200 million gallons in 2007. By comparison, Granite Springs is estimated to have discharged between 330 million gallons in 2006 and 354 million gallons in 2007 based on limited gaging data (States West Water Resources Corporation, 2006; Lidstone and Associates, 2008) and assuming static discharge year round.

Based on the volume of water potentially stored in the Casper Aquifer, the amounts of water recharged through Lone Tree Creek and discharged from Granite Springs, the Casper Aquifer may be able to support development of 2,000 gpm from the Lone Tree Creek Well Field (1,060 acre feet per year) and 600 gpm from the Duck Creek Well Field (318 acre feet per year) on a seasonal basis, or 120 day annual summer pumping season.

To assess the overall impact of these pumping rates and periods on the Casper Aquifer, LA analytically modeled this scenario using Aquifer Test Pro 2010.1 and the Theis equation. This approach is conservative because this equation assumes that groundwater is derived from storage and there is no recharge. Although the aquifer is not infinite in areal extent, this simplistic approach yields a reasonable estimation of how groundwater levels in the area could be impacted through well field pumping. The Lone Tree Well Field was modeled with four production wells (**Figure 6.8**) each pumping 500 gpm for 120 days (approximately 345 million gallons) during the summer months annually for 20 years. Similarly but separately, the Duck Creek Well Field was modeled with three production wells each pumping 200 gpm for 120 days (approximately 104 million gallons) during the summer months annually for 20 years. These scenarios were modeled using the transmissivity and storage coefficients (**Table 4.2**) that were calculated from the aquifer tests completed in these areas.

With this analysis, the water level declines in the vicinity of the Lone Tree Creek and Duck Creek Well Fields were predicted. It was estimated that static water levels in the Lone Tree Creek Well Field would be lowered approximately 9 feet after 20 years of production. At the Duck Creek Well Field, static water levels could be lowered as much as 100 feet after 20 years of production. Figures illustrating the predicted drawdown during both pumping and non-pumping periods in the vicinity of the well fields over this 20 year timeframe are included in **Appendix F**.

6.3.2 Potential Casper Aquifer Well Fields

As shown on **Figure 6.8**, the proposed Lone Tree Creek Well Field consists of seven production wells, LTC 1 – LTC 7, that are located along Lone Tree Creek in the northwestern corner of the Ranch. This field may be capable of yielding approximately 2,000 gpm with only four of these wells pumping at any given time. Assuming this production occurred over a 120 day summertime operational period, the well field would deliver approximately 1,060 acre feet annually. The 2007 test of the Lone Tree No. 1 well revealed no quantifiable impacts on Granite Springs over the 30 day test period (Lidstone and Associates, 2008). This field owes its productivity to the recharge of Lone Tree Creek, and permeability enhancement associated with the intense southeastward folding along Granite Springs Anticline, cavity formation, and eastward faulting. Individual wells in this field may be capable of yielding 400 to 500 gpm, and well depths may range from 1,280 to 2,760 feet. Within the vicinity of this well field, LA's geologic and Zonge's geophysical interpretations of the Casper Formation top differ by up to 600 feet of each other.

The proposed Duck Creek Well Field consists of six production wells, DC 1 – DC 6, that are located along Duck Creek in the west central portion of the study area, as shown on **Figure 6.8**. Based on the hydrogeologic parameters derived from the Duck Creek 3-1 aquifer tests, this field may be capable of yielding 600 gpm from three wells that would be pumping simultaneously. Assuming this production occurred over a 120 day summertime operational period, the well field would deliver approximately 318 acre feet annually. The production of this field is due to recharge from Duck and Goose Creeks, and permeability enhancement of the Casper Formation associated with structural deformation along the Duck Creek Anticline. Individual wells in this field may be capable of yielding 200 gpm, and the permeability and yield potential may increase with wells drilled along the anticlinal axis south of Duck Creek 3-1. Differences in the geologic and geophysical interpretations of the Casper Formation top are significant in this area. While the difference is only 100 feet at DC 1, that difference is estimated to be approximately 2,200 feet at DC 4, as shown in **Table 6.1**. While LA anticipates drilling depths range from 1,925 to 3,870 feet, those depths could be shallower and drilling costs could be less if the geophysical interpretation proves to be more representative of actual conditions.

6.3.3 Potential Exploration Areas

Additional exploratory well locations are proposed along several of the geophysical lines, including Lines 1, 2, and 4, as shown on **Figure 6.8**. The two locations along Line 1, PE 1 and PE 2, were selected to look for conduits carrying recharged groundwater from Lone Tree Creek southward through the Casper Aquifer. Both of these locations have deep seated low resistivity signatures and associated bright spots in the interpreted Casper Formation section of the geophysical line. Considering the relatively high water elevations but less than 100 gpm yields of Lone Tree Fault 1-2 and Lone Tree Fault 1-5, these locations may be carrying larger volumes of groundwater than were encountered in previous drilling efforts on this line.

Three exploratory well locations are proposed along Line 2 around the location of Goose Creek 2-2C. These locations are associated with lower resistivity signatures and seismic bright spots in the reinterpreted Casper Formation section as well as geophysical indications of faulting. PE

3 targets recharged groundwater that may be moving southward from Lone Tree Creek through a zone of enhanced permeability along the crest of the backthrust fault, shown on **Figure 6.1**. PE 4 and PE 5 target deep permeability enhancement potentially associated with strike slip movement and associated faulting along the Lone Tree Creek Fault. Collectively, these sites are referred to as Goose Creek.

Located in the vicinity of Spottlewood Anticline, PE 6 targets enhanced permeability associated with the development of this anticline, and represents the best opportunity identified in the Spottlewood Creek area based on the geophysical data. This site is considered a wildcat given the lack of exploration completed in this area to date, and potentially limited recharge. Again differences between the geologic and geophysical interpretations on the top of Casper, which are noted in **Table 6.1**, will play a significant role in costs and actual drilling depths at this location.

6.4 Conceptual Well Design

The proposed production wells are designed to maintain well integrity for a long serviceable life, and the costs presented in **Table 6.1** reflect that. Set inside a 14 3/4-inch minimum borehole, the production wells would be completed with 10 3/4-inch diameter casing that would be cemented approximately 20 feet into the top of the Casper Formation. This casing provides adequate room for 6 or 8-inch pumping equipment to yield the discharge anticipated for each well. The borehole for this section could be drilled using direct rotary with either water or air-based drilling fluids. To maintain the integrity of the well within a 9 7/8-inch borehole through the upper Casper Formation, a 6-inch diameter, wire wrapped rod or pipe based well screen with 0.030-inch slots would be placed across this section and gravel packed with 12X20 silica sand. Costs could be reduced by selectively screening sections of the Casper Aquifer exhibiting enhanced permeability. The borehole would be drilled with air-based drilling fluids to minimize the potential for lost circulation, and to minimize development time requirements. Deeper production wells could be further telescoped to potentially reduce drilling and completion costs. For these wells, 10 3/4-inch diameter casing could be set to a depth of approximately 1,200 feet, with 7-inch diameter casing set 20 feet into the Casper Formation top, and 4-inch pipe based well screen and gravel pack set through the Casper Formation. In order to complete these wells in this manner, it will be important to control drillhole deviation.

With regard to maintaining the integrity of the Casper Formation, there are alternatives to the proposed design. These alternatives include mill slotted screen and Johnson Screen's Muni-Pak™. Mill slotted screen represents a capable less expensive alternative, but in either an open annular or gravel pack completion, the open area of the screen may adversely impact well yield and will reduce hydraulic efficiency. Muni-Pak™ includes both the screen and gravel pack and is installed together in one installation step. It also offers a high efficiency system that will not adversely impact well yield or hydraulic efficiency. The cost of this option and the impracticality of setting it to some of the depths listed in **Table 6.1** are the two primary deterrents to using this Muni-Pak™ screen.

7.0 Well Field and Transmission Line Development

Based upon the positive results of the exploration effort to date, but also deep drilling depths, outstanding questions, and costs to complete the well fields, the development of this resource in a phased approach is warranted. The following sections provide details on this approach to completing the exploration and development of the Casper Aquifer on the Ranch.

7.1 Phased Well Field Development

The project team recommends that each phase of Casper Aquifer well field development consist of further exploration in advance of full build out. To detail the costs of this proposed well field development, two phases are presented that are each subdivided into a geophysical exploration and test well drilling phase, and a well completion and transmission line phase.

7.1.1 Phase 1 - Lone Tree Creek Well Field

Exploration and development of the Lone Tree Creek Well Field is proposed as the first phase development of the Casper Aquifer. Subphase (1A) involves additional surface geophysical exploration, and completing test production wells at the Lone Tree Creek Well Field. This phase also includes further exploration of the potential expansion areas identified northeast of Lone Tree Creek Fault and beneath the former missile site. The geophysical data acquisition would consist of 2D seismic reflection and CSAMT resistivity. Subphase (1B) involves completing the wells with screen and gravel pack, and constructing the associated infrastructure to deliver this water to the BOPU water system.

Additional surface geophysical data acquisition and interpretation is recommended in Subphase (1A) to integrate previous geophysical and test well drilling data in advance of drilling production sized test wells. **Figure 7.1** illustrates the approximate locations of where these lines would be placed in the Lone Tree Creek Well Field area. Zonge has indicated the additional dip lines (oriented roughly perpendicular to Casper Formation strike) are intended to finalize the understanding of the structural configuration of the unit east and southeast of the outcrop. The additional strike lines are intended to tie the Casper Formation depth and structural configuration together across the Lone Tree Creek Well Field area. Because these lines tie into previous test well information, they should provide a high degree of confidence in test well placement.

The rationale for completing the additional lines in the Lone Tree Creek area is as follows:

- ✓ Tie into the geologic and geophysical information obtained during the 2005 and 2009 Zonge geophysical surveys and subsequent test well drilling;
- ✓ Define geologic structure and permeable pathways along Granite Springs Anticline;
- ✓ Identify permeability pathways for recharge from Lone Tree Creek to Casper Aquifer northeast of Lone Tree Creek Fault; and
- ✓ Refine drilling locations and depths for production sized test wells to be drilled for Lone Tree Creek Well Field and in potential exploration areas beneath and south of the former Atlas missile site.

Following the geophysical acquisition and reinterpretation, the locations of the test production well sites would be refined. The test wells would be completed with 10 ¾-inch diameter casing and an open borehole in the Casper Aquifer without screen and gravel pack. Initially completing the wells in this fashion allows for further exploration of the aquifer, and provides a suitable well diameter for screen installation and appropriate pumping equipment placement after the field has been proven successful. If suitable production is obtained, the number of wells in the field could be adjusted along with the associated infrastructure and costs.

Assuming the test production well completions are successful, subphase 1B is to complete the test wells at the Lone Tree Creek Well Field as production wells along with the associated infrastructure and transmission pipelines. This subphase would include a 24-inch diameter transmission main that would provide the necessary capacity for additional well fields as they are developed to the south. For this phase of construction, the transmission pipeline to the south would extend to the vicinity of PE 1.

7.1.2 Phase 2 – Duck Creek Well Field

The second phase involves exploration and development of the Duck Creek Well Field and associated exploration areas. Subphase (2A) involves additional surface geophysical exploration, and completing test production wells at the Duck Creek Well Field. It also includes further exploration of the potential expansion area along Goose Creek. The geophysical data acquisition would consist of 2D seismic reflection and CSAMT resistivity. Subphase (2B) involves completing the wells with screen and gravel pack, and constructing the associated infrastructure to tie these wells into the transmission line extending south from the Lone Tree Creek Well Field.

As with the Lone Tree Creek Well Field, additional surface geophysical data acquisition and interpretation is recommended in phase 2A to integrate previous geophysical and test well drilling data in advance of drilling production sized test wells. **Figure 7.2** illustrates the approximate locations of where these lines would be placed in the Duck Creek Well Field area. Zonge has indicated the additional dip lines are intended to finalize the understanding of the structural configuration of the unit east of the outcrop across the Duck Creek Anticline. The additional strike lines are intended to tie the Casper Formation depth and structural configuration together across the Duck Creek Well Field area. These lines will also tie in the data obtained from the development of the Lone Tree Creek Well Field and will overlap with the geophysical exploration previously conducted on Spottletwood. Because these lines will use previous test well information, they should provide a high degree of confidence in test well placement.

The rationale for completing the additional lines in the Duck Creek area is as follows:

- ✓ Tie into the geophysical and geologic information obtained from previous and future Lone Tree Creek exploration work;
- ✓ Define the structural configuration of the Casper Formation along the crest of Duck Creek Anticline;

- ✓ Determine the hydrogeologic impact, if any, of a possible strike slip fault between Duck Creek Anticline and Spottlewood Anticline; and
- ✓ Refine drilling locations and depths for production sized test wells to be drilled for the Duck Creek Well Field and potential expansion areas along Goose Creek.

Following the geophysical acquisition and reinterpretation, the locations of the test production well sites would be refined. As at the Lone Tree Creek Well Field, the test wells would be completed with 10 ¾-inch diameter casing and an open borehole in the Casper Aquifer without screen and gravel pack. If suitable production is obtained, the number of wells in the field could be also be adjusted along with the associated infrastructure and costs.

Assuming the test production well completions are successful, the final Subphase (2B) is to complete the test wells at the Duck Creek Well Field as production wells along with the associated infrastructure and transmission pipelines. This subphase would include extending transmission south from the Lone Tree Creek Well Field. For this phase of construction and for cost estimation purposes, the transmission pipeline to the south would extend to the vicinity of DC 4, or the southernmost production well. Future geophysical exploration may tie in the Spottlewood Anticline area, although it is currently considered a wildcat prospect based upon the information gathered to date. For that reason, it has not been included in the cost estimates for this project at this time.

7.2 Conceptual Transmission Pipeline Design

As part of the Tertiary Belvoir Ranch Level II study, JR Engineering (2007) provided preliminary designs and cost estimates for construction of transmission pipelines to convey water from well sites located on both the eastern and western portions of the Ranch to the existing Sherard water treatment plant. At the time of that study, some groundwater exploration work had been completed on the eastern portion of the Ranch, but the quantity of future water production from the western portion of the Ranch was largely unknown, especially from the Casper Aquifer. For preliminary design purposes at that time, it was assumed that the largest flow available from the Ranch would be 6,000 gpm (8.6 million gallons per day (MGD)), with 3,000 gpm coming from the eastern portion of the Ranch and 3,000 gpm coming from the western portion. Some excess capacity options were also included with the new pipeline to accept flows from the BOPU's Borie Well Field.

This study includes a more detailed evaluation for the development of the proposed Lone Tree Creek and Duck Creek Well Fields on the western portion of the Ranch. Conceptual designs are presented for a transmission pipeline to deliver the water from the two well fields. Potential well locations and pipeline alignments are shown on **Figure 7.3**.

As part of this conceptual design, LA evaluated the pipeline capacity for each proposed well field and potential expansion area to provide a conservative transmission pipeline concept. The project team has identified several potential water supply areas, including the Lone Tree Creek Well Field and expansion area, and the Duck Creek Well Field. LA is also recommending the Goose Creek expansion area be further explored. Spottlewood Creek remains a potential expansion area, but not in the near term. With allowances for additional capacity in these areas

the total volume of water that may be developed from the well fields and potential expansion areas is detailed in **Table 7.1**. For well fields of this size, the wells should not be operated continuously or all at the same time. The Lone Tree Creek Well Field may produce 2,000 gpm and the Duck Creek Well Field may produce 600 gpm, pending results of drilling and testing future production wells. Yields for the Spottlewood and Goose Creek areas are more speculative given the production to date in those areas, and will need to be determined through further drilling and testing.

To estimate the total flow that could be delivered from the maximum build out scenario for the western Ranch, it was assumed that the transmission pipeline will need to convey at least 75% of the well field flow. Including additional well field capacity for potential expansion as warranted, the conceptual design flows are presented in **Table 7.1**. Most of the pipelines will be able to accommodate 100% of the estimated well field yield. This results in a conservative conceptual design and cost estimate that provides some flexibility for planning purposes.

Shown on **Figure 7.3**, the pipeline route was developed to minimize the pipeline length to the north end of the Lone Tree Creek Well Field. The conceptual well field transmission line begins at the Lone Tree Creek area and then heads south where it ties in with the wells located at the Duck Creek Field and southern expansion area. The maximum ground surface elevation is 7,330 feet, and is located between Goose Creek and the Lone Tree Creek Well Field. After this point the elevation decreases to 7,060 feet at Lone Tree Creek. At the north end of the Lone Tree Creek Well Field, the well field transmission line ties into the transmission main that will parallel Lone Tree Creek and head east to eventually convey the groundwater to the Sherard water treatment plant. The alignment of this transmission main was not modified from JR Engineering's (2007) design. A copy of the map illustrating the alignment of the proposed JR Engineering transmission main is included in **Appendix G**.

Conceptual design analyses were completed to determine the pipeline sizes that are required to deliver the flows listed in **Table 7.1** from the various potential well fields or expansion areas. Pipe sizes were selected to efficiently carry an estimated quantity of water that could be developed from the areas. This analysis results in a conceptual pipeline with a 10-inch diameter pipe at the Spottlewood Creek area should future development occur there. Pipeline sizes increase in diameter northward to a 12-inch line to accommodate yields from the Duck Creek Well Field and potentially Goose Creek. A 16-inch diameter line is proposed between areas along the Lone Tree Creek Fault geophysical line and the Lone Tree Creek Well Field where the diameter increases to 24 inches for conveyance to the Sherard water treatment plant. This proposed pipeline could deliver 70% of the well field flow for the maximum buildout scenario. This sizing plan for the transmission main will also limit the headloss through the pipeline. The anticipated headloss for the pipeline from the Duck Creek Well Field to the south end of the Lone Tree Creek Well Field will not exceed 50 feet. At Lone Tree Creek, the main transmission line heads east to connect with the pipeline from the eastern portion of the Ranch. The junction where the pipelines would connect is in Section 15 of T13N and R68W, as shown on the map in **Appendix G**. The transmission main pipeline is just over 8-miles long, and 24-inches in diameter yielding a capacity of 3,750 gpm (5.4 MGD).

7.3 Phased Well Field and Transmission Line Costs

Based on 2012 dollars, cost estimates were developed for the geophysical exploration, well construction, infrastructure and transmission system to convey the water from the Casper Aquifer well fields located at the western portion of the Ranch to the Sherard water treatment plant. In addition to the costs of drilling and constructing the wells, other components that were considered for developing the cost estimates are the pumps, electrical equipment, well building, piping and SCADA system. Shown on **Figure 7.3**, most of the proposed supply wells lie at similar elevations, typically around 7,200 to 7,250 feet. Since the wells are at similar elevations and have similar pumping rates for each well field, the pumping units will be approximately the same size at each well field. This will result in much of the piping systems and components installed in the well buildings also being similar in size. For planning purposes, cost estimates are presented for each of the potential well field areas and correspond to the phases presented in Section 7.1. In addition to the costs of drilling and completing the wells, one of the primary cost components will be the installation of the PVC transmission pipeline. **Table 7.2** details the total installed pipe costs per foot that were utilized for the cost estimates. Costs presented in **Table 7.2** include materials, trench excavation, backfill, bedding material and an allowance for additional fittings for the pipeline.

Another major component of the cost estimate is the installation of three-phase power for the well sites, and upgrading the access roads for the site area. High West Energy was contacted to determine where the closest existing three-phase power line is located. There is three-phase power on the north side of I-80 along the western portion of the Ranch. At this time the line is not adequately sized to handle the large capacity power draw that would occur from 15 or more deep water supply wells. High West Energy did indicate that they are planning to upgrade this power line within the next four to five years so that it could then provide the needed electrical power to the proposed wells. Power line costs are presented with the assumption that the upgraded power line will be available at the time the well fields are constructed. The Spottletwood Creek area, however, is serviced by Cheyenne, Light, Fuel & Power. The availability of three phase power could affect costs for developing water there in the future.

There are some existing access roads located in close proximity to the proposed well fields and most of these roads will be adequate to service the proposed well fields. Cost estimates were developed to construct secondary access roads to each individual well. Where no roads are in close proximity to the proposed well field, an estimate was developed for constructing a primary road, specifically for the Spottletwood and Duck Creek areas. It was assumed that the access road to the Lone Tree Creek would require some upgrading and a cost estimate was included for upgrading this road as it will be the primary access to most of the wells in the Lone Tree Creek Well Field.

7.3.1 Lone Tree Creek Well Field Costs

Costs associated with the exploration, development, and completion of the Lone Tree Creek Well Field have been broken into phases 1A and 1B, and include those for proposed test well sites identified in this report. Seven potential well sites in this field are identified, along with two exploration well sites. Given the additional geophysical exploration recommended prior to drilling, it is entirely possible that some of these drill sites will be relocated, or drilled to different

depths than anticipated. Costs associated with the exploration of the proposed Lone Tree Creek Well Field are presented in **Table 7.3**. These costs include the Phase 1A geophysical data acquisition, processing, and interpretation, along with the costs for drilling production sized test wells that would be completed without screen and gravel pack. The estimated costs are presented in 2012 dollars.

Phase 1B costs associated with the completion of the well field are presented in **Table 7.4**. These costs include those associated with completing the wells with screen and gravel pack, placing pumping equipment, constructing transmission lines, and installing power lines and roads. The additional costs to install the screen and gravel pack and complete each well as a municipal production well would be approximately \$180,000 per well. This phase also includes the construction of the approximately 8-mile long, 24 inch diameter transmission pipeline from the Lone Tree Creek Well Field to the eastern Ranch junction.

7.3.2 Duck Creek Well Field Costs

The Duck Creek Well Field would be completed under the second phase. This phase was also broken into phases, 2A and 2B, that mimic the approach taken to develop the Lone Tree Creek Well Field. In this area, six potential well sites are identified, along with three potential exploration drill sites along Goose Creek. Costs are presented to drill and complete all of these wells. The ultimate location of those wells will be determined through the next round of geophysical exploration. Provided they can yield sufficient groundwater, shallower drill sites would be preferred to minimize development and operations costs.

Table 7.5 includes the exploration and test well drilling costs associated with phase 2A. As with the Lone Tree Creek Well Field, these costs include the additional geophysical data acquisition, processing and interpretation, along with the costs for drilling production sized test wells that would be completed without screen and gravel pack.

Costs associated with the completion of the well field are presented in **Table 7.6**. These costs include those associated with completing the wells with screen and gravel pack, placing pumping equipment, constructing transmission lines, and installing power lines and roads. This phase also includes the construction of the additional transmission line needed to connect to the Lone Tree Creek Well Field transmission line to the north.

7.4 Well Field Financing, Operation and Maintenance Costs

A financial evaluation was conducted for developing the proposed Lone Tree Creek and Duck Creek Well Fields. This included estimating the financial obligations for costs that would be incurred by the BOPU for developing the new well fields and the costs associated with operating and maintaining the well fields. For planning purposes, the analysis is divided into developing the Lone Tree Creek Well Field, and the Duck Creek Well Field as separate projects.

Information was obtained from the BOPU for their number of billing customers and the current residential water rate billing schedule. Cost estimates were developed for operating the well fields and then determining the cost to water users for operating the well field for the summer season. The operation costs for each of the well fields are detailed in **Table 7.7**. The costs are based on the average size well for each of the fields that are identified in **Table 6.1**. This

information was utilized to determine the average monthly power cost for the wells. Electrical rate information was obtained from High West Energy. Based on discussion with the BOPU, it was determined that the annual operating cost should be based on a 120-day pumping season (i.e., providing additional water during the higher use summer time period). In addition it was assumed that during a monthly time period, each well would operate 75% of the time.

The exploration and construction costs detailed in Section 7.3 were evaluated to determine the pay back costs for the well fields. For this analysis it is assumed that the well field development project would be eligible for a 67% grant from the WWDC, and it is anticipated that the loan portion of the project would be obtained from the State Land and Investment Board (SLIB). For the financing evaluation, it was estimated that the loan funds would be obtained at an interest rate of 2.5%. Using the anticipated water yield from the well fields for the anticipated 120-day operation period, the user cost and operation costs were determined for the two well fields. This information is detailed in **Table 7.8**. It is estimated that the Lone Tree Creek wells will have a higher yield and the pumping levels are shallower than the Duck Creek wells. This analysis results in the Lone Tree Creek well field providing lower operational costs and user costs per 1,000 gallons of water provided.

Based on discussions with BOPU personnel, LA understands the BOPU maintains a self sustaining water enterprise fund. **Table 7.9** summarizes information from the BOPU FY2013 Budget Book and includes projections through 2018 for major water construction projects, water expenditures including debt service, water revenue, and operating capital. The projections include provisions for extending transmission lines to the eastern portion of the Belvoir Ranch in FY 2015, and the western end of the ranch in FY 2016. The Debt Service Expenditures in FY 2016 and beyond shown in **Table 7.9** include anticipated service of SRF loans for those water construction projects. The five year financial projection of revenue and expenditures presented in **Table 7.9** indicates the BOPU obtains sufficient revenue from water sales and fees to adequately cover projected debts, capital improvements, and major construction projects.

8.0 Permitting and Environmental Issues

For this project to proceed with construction, the BOPU will be required to obtain certain permits, rights-of-way, and easements. State, county, and federal agencies must be contacted as part of the Level III process. In most instances, these initial contacts have been made and copies of that correspondence related to wells drilled under this project is included in the Project Notebook. The following issues must be addressed during the final design.

State Land Easements. While generally on BOPU property, the transmission main alignment crosses state land in several sections. The BOPU will need to obtain an access agreement with the Office of State Lands and Investments. All other well and associated infrastructure is located on BOPU-owned land.

SEO Permits. All wells, either production or exploration, will require permits from the SEO.

DEQ/WQD Permit to Construct. DEQ will need to be contacted with regard to construction of the wells and transmission pipelines. All system improvements will require a Permit to Construct from the DEQ. They will also require a discharge permit for all aquifer testing completed on either exploration or production wells.

USACE §404 Permit. The transmission main along Lone Tree Creek may be subject to 404 permitting depending upon whether or to what extent the line crosses the creek or lies within wetlands identified within the National Wetland Inventory. Activities in an area classified as a Jurisdictional Wetland will require a Nationwide or possibly, a §404 Permit from the USACE and §401 authorization from the State of Wyoming.

9.0 Recommendations

Based on the results of the Belvoir Ranch Groundwater Level II Study, the project team offers these recommendations for the WWDC and the BOPU related to the development of the Casper Aquifer on the west end of the Ranch.

- ✓ Obtain additional hydrologic and hydrogeologic data as follows to understand how the Casper Aquifer can be sustainably developed:
 - Install data logging pressure transducers in all six Casper Aquifer test wells to record water level and temperature data six times daily year round;
 - Install stream gaging stations equipped with data logging pressure transducers up and downstream of the sinks on Lone Tree, Goose, and Duck Creeks to record streamflow six times daily year round;
 - Construct a gaging station on Granite Springs to record spring discharge six times daily year round; and
 - Based on well, stream, and spring discharge data, assess the volume of water that recharges the aquifer on an annual basis, and evaluate how recharge conditions affect water levels in the aquifer and potential changes in aquifer storage.

With regard to this recommendation, there are certain associated costs that must be taken into account. Based on quotes from In-Situ, Inc., the six wells could be equipped with Level Troll 300 pressure transducers for approximately \$20,000, which includes installation. Approximately \$15,000 would be required to equip Granite Springs, not including access costs, and \$25,000 would be required to equip each stream. States West Water Resources Corporation previously identified and rated sections of these creeks above their respective sinks, but long term data collection was not initiated. Those points were observed during LA's geologic reconnaissance. An overall cost savings in future exploration work would likely be realized as a result of updating and building upon this previously completed work. The BOPU will also need to obtain consent from Union Pacific to gage the flow of Granite Springs. All streamflow measuring devices will need to be protected from livestock. This monitoring will require semiannual maintenance and monitoring of the gaging stations, and/or annual data review and analysis to refine the overall hydrogeologic picture.

- ✓ Conduct further exploration and test well drilling of the Casper Aquifer in the various well fields in advance of production well completion and full scale development.
 - Obtain additional local seismic reflection and CSAMT geophysical data to better tie together the geologic and hydrogeologic framework of the aquifer in this area and refine well site locations and drilling depths; and
 - Conduct further test production well drilling at sites identified from the geophysical and geologic exploration.

Given differences between geologic and geophysical interpretations, uncertainty remains regarding potential drilling depths, costs, and the identification of the best

areas of permeability enhancement in the Casper Aquifer. The understanding of the structural configuration of the Casper Formation could be enhanced through additional, seismic reflection and CSAMT data acquisition. The project team has provided a conceptual layout of potential future geophysical data acquisition lines. Within the missile site area specifically near the Lone Tree Creek Well Field, the strategy would involve combining the existing data with strategically placed strike and dip lines taking into account that the survey design could include previous results from TDEM and ZETA performed by Zonge in 2005 at the former Atlas Site "D" Missile facility. The resultant survey would refine the understanding of the area, thereby increasing the reliability of well site selections and reducing drilling uncertainty in the Lone Tree Creek Well Field vicinity.

- ✓ Complete production wells prior to constructing pipeline or associated infrastructure at either identified well field.
 - Complete production wells without screen and gravel pack at the Lone Tree Creek Well Field first;
 - Finish successful production wells at Lone Tree Creek with screen and gravel pack;
 - Complete production wells without screen and gravel pack at the Duck Creek Well Field; and
 - Finish successful production wells at Duck Creek with screen and gravel pack.

While the project team has completed two high yielding Casper Aquifer test wells to date, the full yield of the Casper Aquifer well fields is yet to be determined. The wells could be screened and packed as needed once a sufficient number of high capacity wells have been completed at each well field. A high capacity transmission line would only be extended following development of the Lone Tree Creek Well Field. The main transmission line must be sized appropriately to accommodate whatever additional production will be obtained from areas to the south.

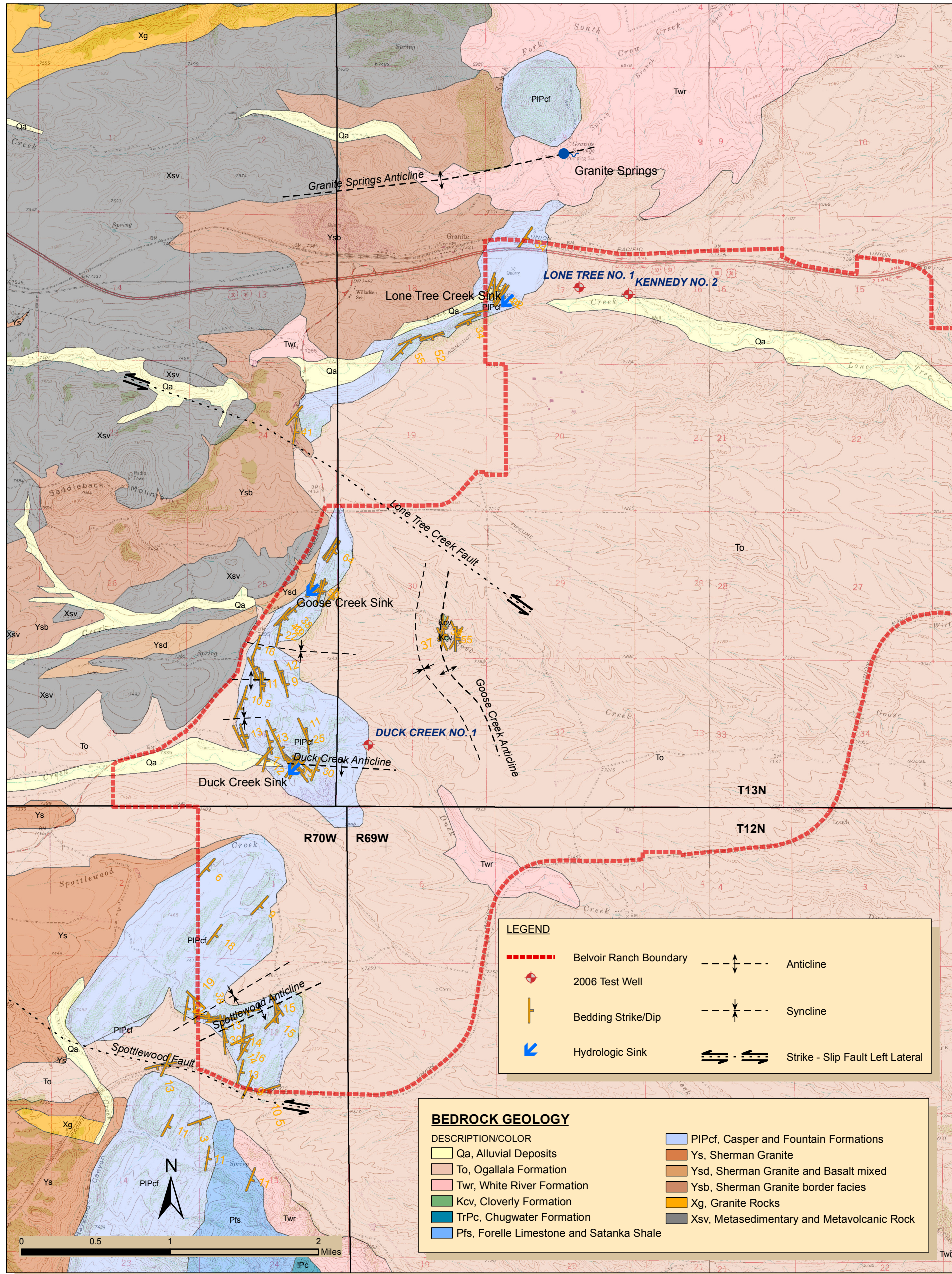
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NOTES:

MODIFIED FROM:
LARAMIE 100K QUADRANGLE
GEOLOGIC MAP, VER PLOEG AND BOYD, 2007

Lidstone and Associates, Inc.
Engineering Geology & Water Resources Consulting
4025 Automation Way, Bldg. E
Fort Collins, CO 80525

CHEYENNE BELVOIR RANCH

Groundwater Level II Study

Wyoming Water Development Commission

FIGURE 1.1

BEDROCK GEOLOGY MAP

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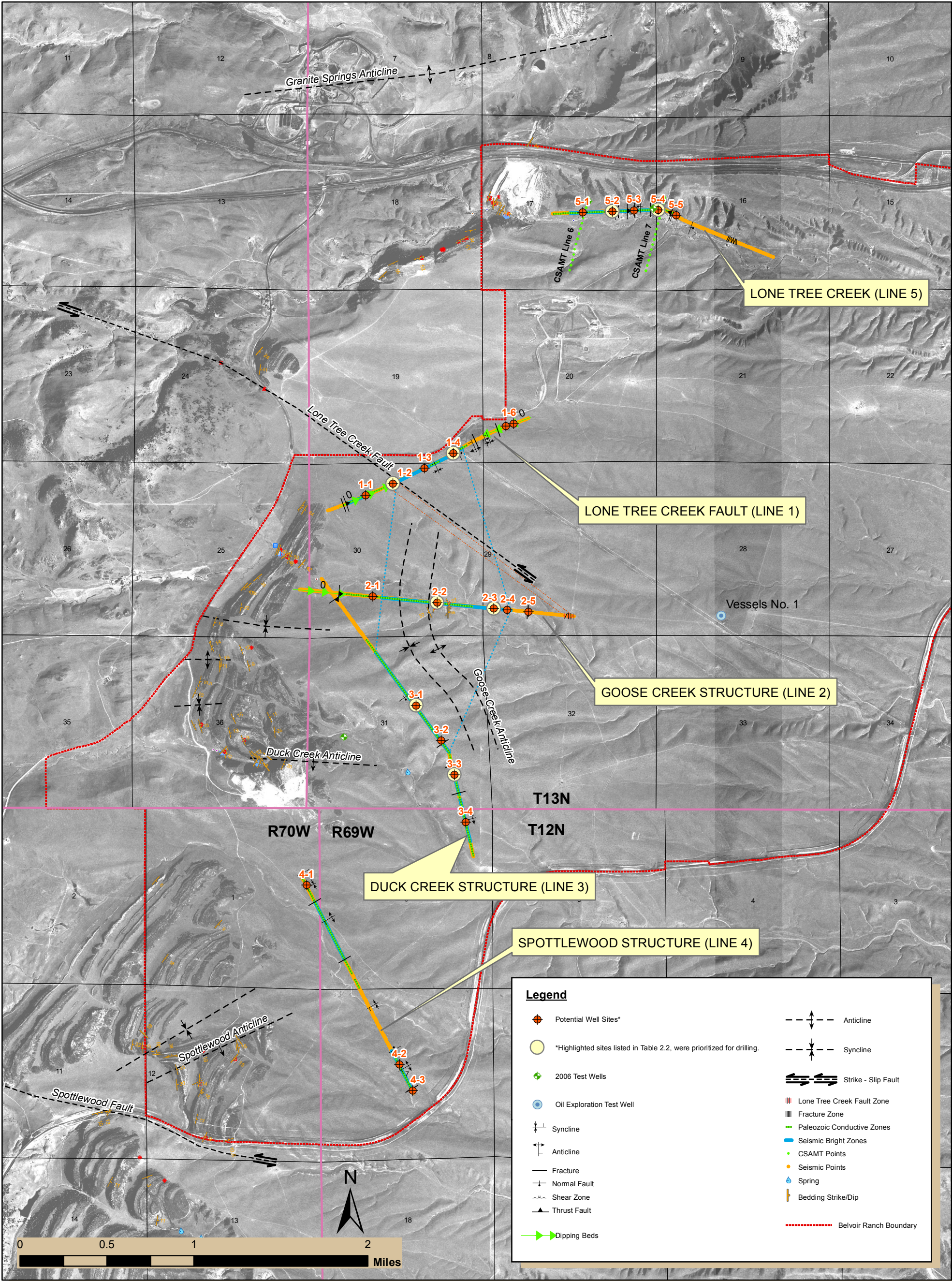
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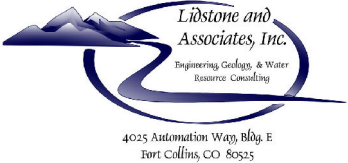
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CHECKED/APPR: MES

REVISED:



NOTES:
DESCRIPTIONS ON GEOPHYSICAL LINES REFLECT
INITIAL GEOPHYSICAL INTERPRETATION.



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Groundwater Level II Study Wyoming Water Development Commission


FIGURE 2.1
TEST WELL LOCATION MAP
WITH GEOPHYSICAL LINES



DESIGN: MES
DRAWN: JHF/AMEC
CHECKED/APPR: MES
REVISED:

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DATE: 4/30/12





Project: Belvoir Ranch Casper Aquifer Test Wells

Location: T13N, R69W, Sec. 17SWNE

Drilled by: Layne Western

Date started: 1/21/2006

Date completed: 2/4/2006

Well Name: Lone Tree No. 1

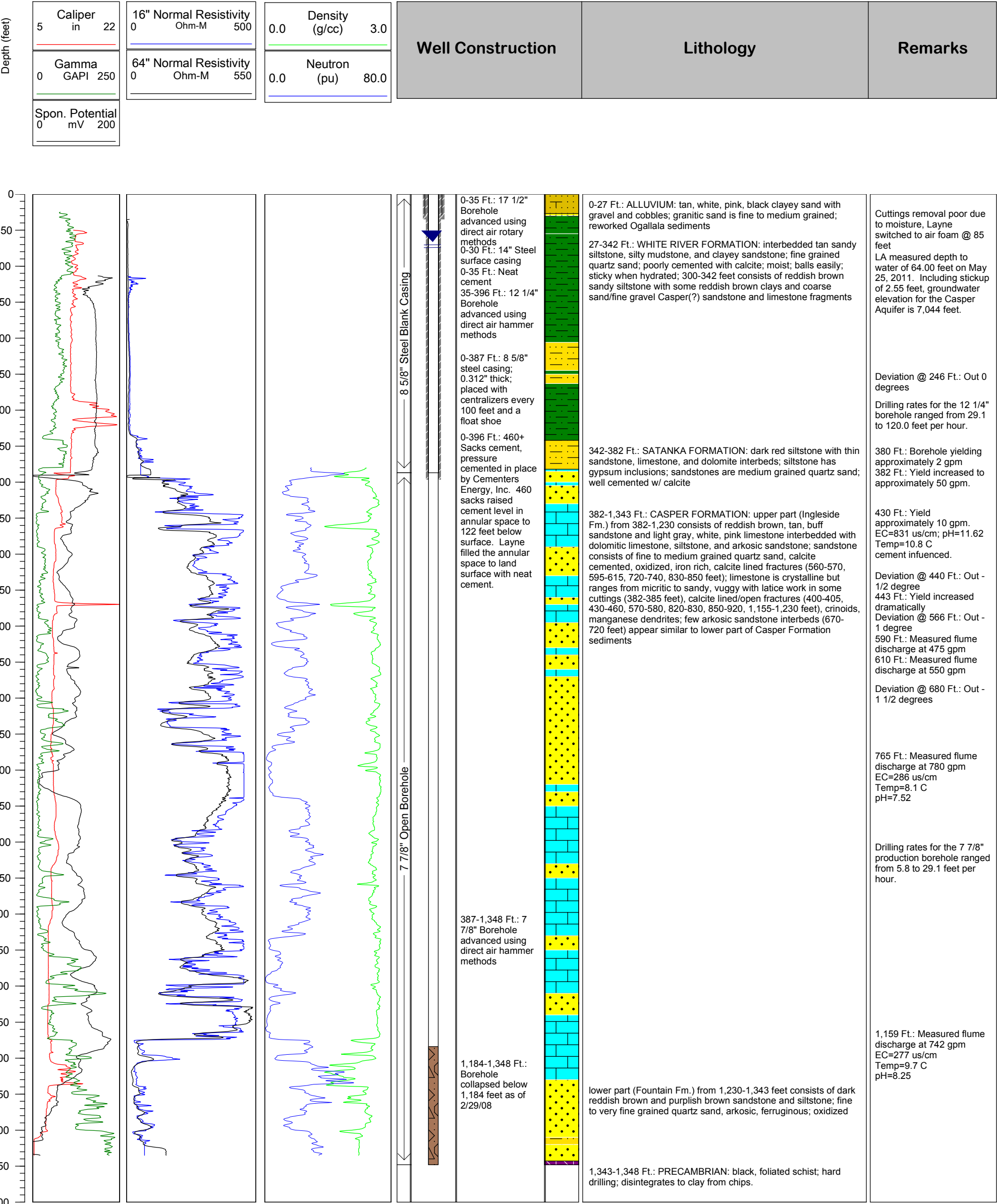
Drilling Method: Direct Air Hammer

Logged by: M. Stacy

Total depth: 1,348 Ft.


Ground Elev.: 7,105 Ft.

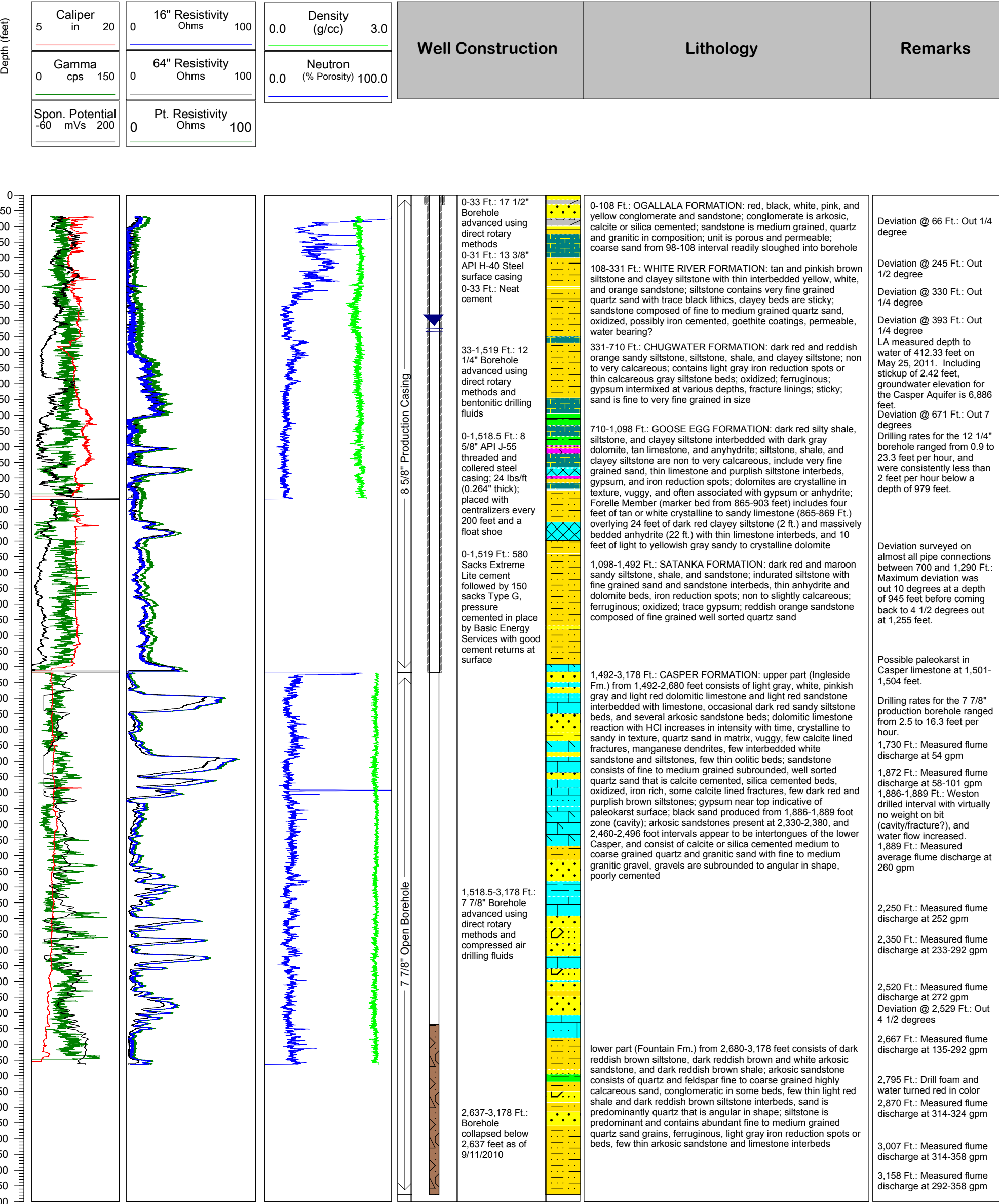
Lidstone and Associates, Inc.




Notes: The test well was drilled under Wyoming State Engineer's Office Permit No. U.W. 168921 near CSAMT Station 325 on the Lone Tree Creek geophysical line. This figure presents the well completion details for Lone Tree No. 1, an 8 5/8 inch diameter test well that was drilled on the Belvoir Ranch along Granite Springs Anticline. Layne Western drilled this well with direct air hammer techniques through the overlying formations and the Casper Formation to evaluate well yield and water quality conditions. The well was developed via airlifting techniques for approximately 8 hours following well completion. Final water quality parameters upon completion of development included the following: pH = 7.99; temperature = 9.0C; electrical conductivity = 267 uS. Subsequent stepped and constant rate testing of the well in 2006 and 2007 indicated it would yield up to 702 gpm. The first constant rate test was conducted for 2 days in 2006 at a discharge rate of 600 gpm, and a second constant rate test was conducted for 30 days in 2007 at a discharge rate of 600 gpm.

FIGURE 3.1 LONE TREE NO. 1 WELL COMPLETION

| | | |
|--|--|--|
| <div></div> <div>Lidstone and Associates, Inc.</div> | Project: Belvoir Ranch Casper Aquifer Test Wells | Well Name: Duck Creek 3-1 |
| | Location: T13N, R69W, Sec. 31SWNE | Drilling Method: Direct Air/Mud Rotary |
| | Drilled by: Weston Engineering, Inc. | Logged by: M. Stacy |
| | Date started: 5/21/2010 | Total depth: 3,178 Ft. |
| | Date completed: 8/6/2010 | Ground Elev.: 7,296 Ft. |





Lidstone and Associates, Inc.
Engineering, Geology, & Water
Resource Consulting

Project: Belvoir Ranch Casper Aquifer Test Wells

Location: T13N, R69W, Sec. 30NENW

Drilled by: Weston Engineering, Inc.

Date started: 8/19/2010

Date completed: 9/27/2010

Well Name: Lone Tree Fault 1-2

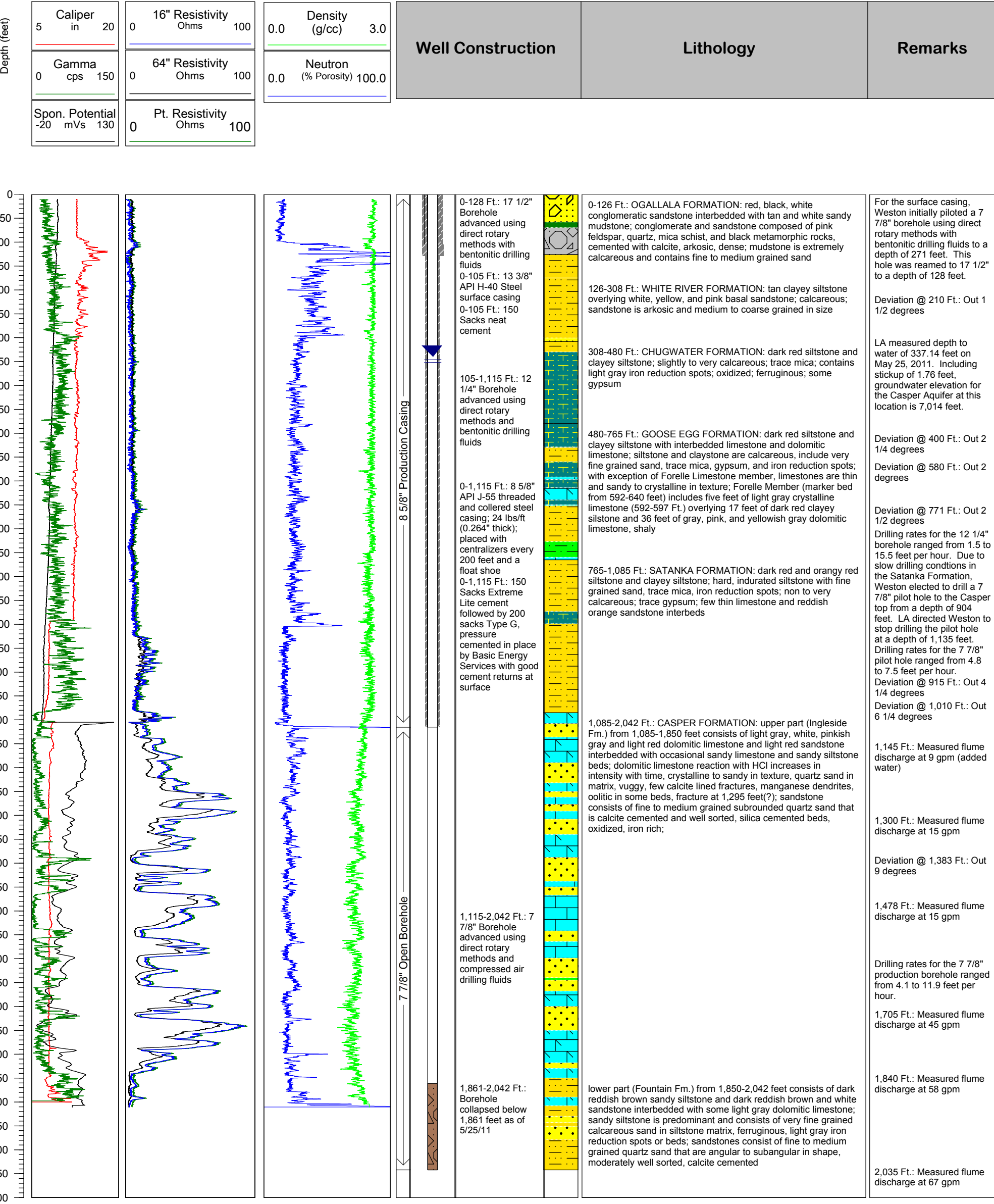
Drilling Method: Direct Air/Mud Rotary

Logged by: M. Stacy

Total depth: 2,042 Ft.


Ground Elev.: 7,349 Ft.

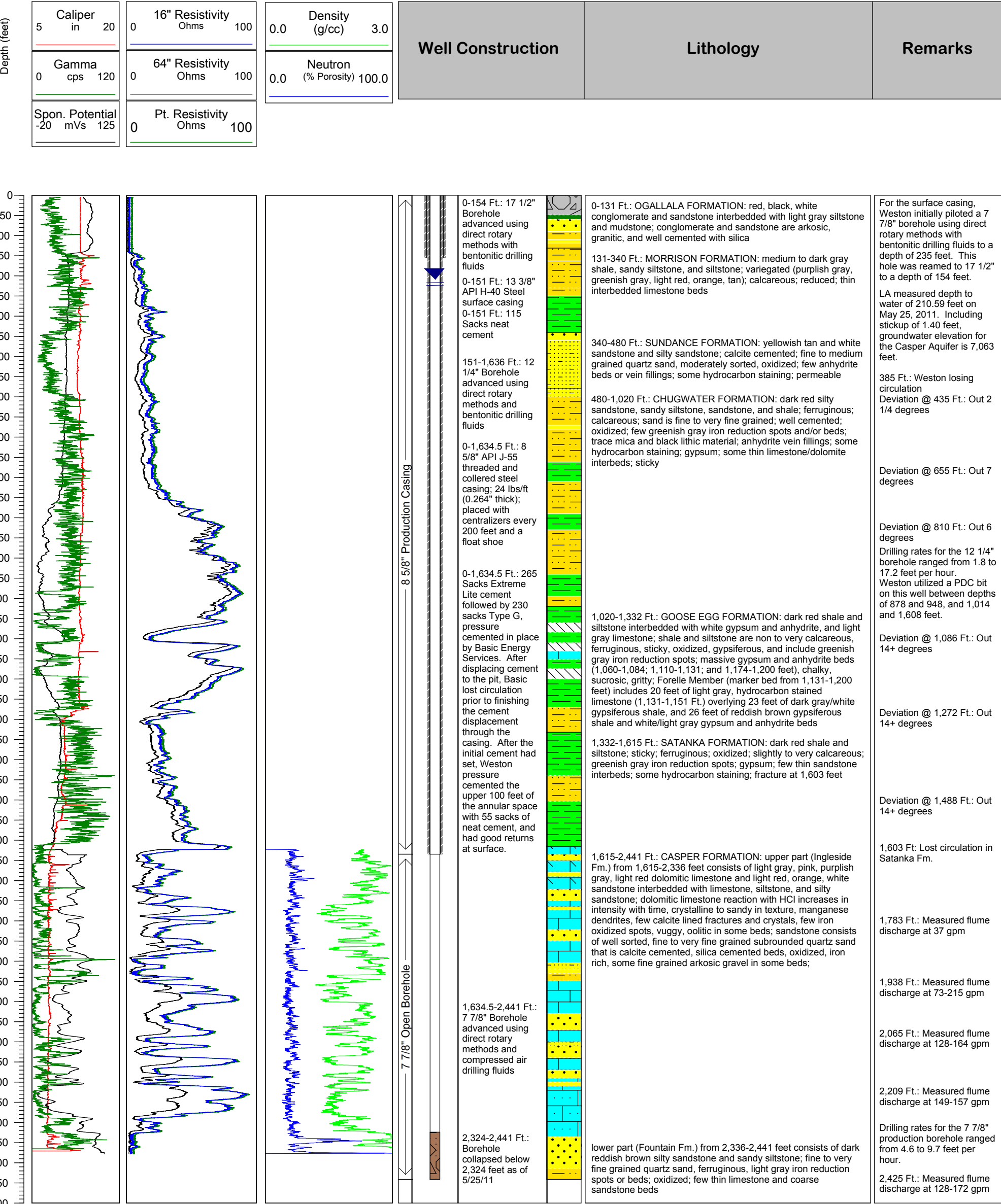
Lidstone and Associates, Inc.



Notes: The test well was drilled under Wyoming State Engineer's Office Permit No. U.W. 191987 at CSAMT Station 650 on the Lone Tree Creek Fault geophysical line. This figure presents the well completion details for Lone Tree Fault 1-2, an 8 5/8 inch diameter test well that was drilled on the Belvoir Ranch along the Lone Tree Creek Fault trace. The well was drilled with direct mud rotary techniques through the overlying formations and into the Casper Formation. Following geophysical logging and 8 5/8 inch casing installation, Weston drilled through the Casper Formation with direct air rotary techniques to evaluate well yield and water quality conditions. The well was developed via airlifting techniques for 12 hours following well completion. LA collected a formation water sample near the end of development, and submitted it for analysis. Final water quality parameters upon completion of development included the following: pH = 8.54; temperature = 13.5C; electrical conductivity = 224 uS. As the test well yielded between 30 and 53 gpm from depths of 1,104 and 2,040 feet, respectively, during development, LA chose not to conduct aquifer testing on this well.

FIGURE 3.4 LONE TREE FAULT 1-2 WELL COMPLETION

| | | |
|--|--|--|
|  | Project: Belvoir Ranch Casper Aquifer Test Wells | Well Name: Lone Tree Fault 1-5 |
| | Location: T13N, R69W, Sec. 20SWSW | Drilling Method: Direct Air/Mud Rotary |
| | Drilled by: Weston Engineering, Inc. | Logged by: M. Stacy |
| | Date started: 3/6/2011 | Total depth: 2,441 Ft. |
| Lidstone and Associates, Inc. | Date completed: 4/19/2011 | Ground Elev.: 7,272 Ft. |



Notes: The test well was drilled under Wyoming State Engineer's Office Permit No. U.W. 193944 at CSAMT Station 1875 on the Lone Tree Creek Fault geophysical line. This figure presents the well completion details for Lone Tree Fault 1-5, an 8 5/8 inch diameter test well that was drilled on the Belvoir Ranch northeast of the Lone Tree Creek Fault. The well was drilled with direct mud rotary techniques through the overlying formations and into the Casper Formation. Following geophysical logging and 8 5/8 inch casing installation, Weston drilled through the Casper Formation with direct air rotary techniques to evaluate well yield and water quality conditions. The well was developed via airlifting techniques for 8 hours following well completion. Final water quality parameters upon completion of development included the following: pH = 8.23; temperature = 15.3C; electrical conductivity = 234 uS. Subsequent stepped and constant rate testing of the well indicated it would yield up to 125 gpm. The constant rate test was conducted for 7 days at a discharge rate of 75 gpm.

FIGURE 3.6 LONE TREE FAULT 1-5 WELL COMPLETION

Figure 4.1
Wyoming Water Development Commission
Duck Creek 3-1 Stepped Rate Test, 8/21/10

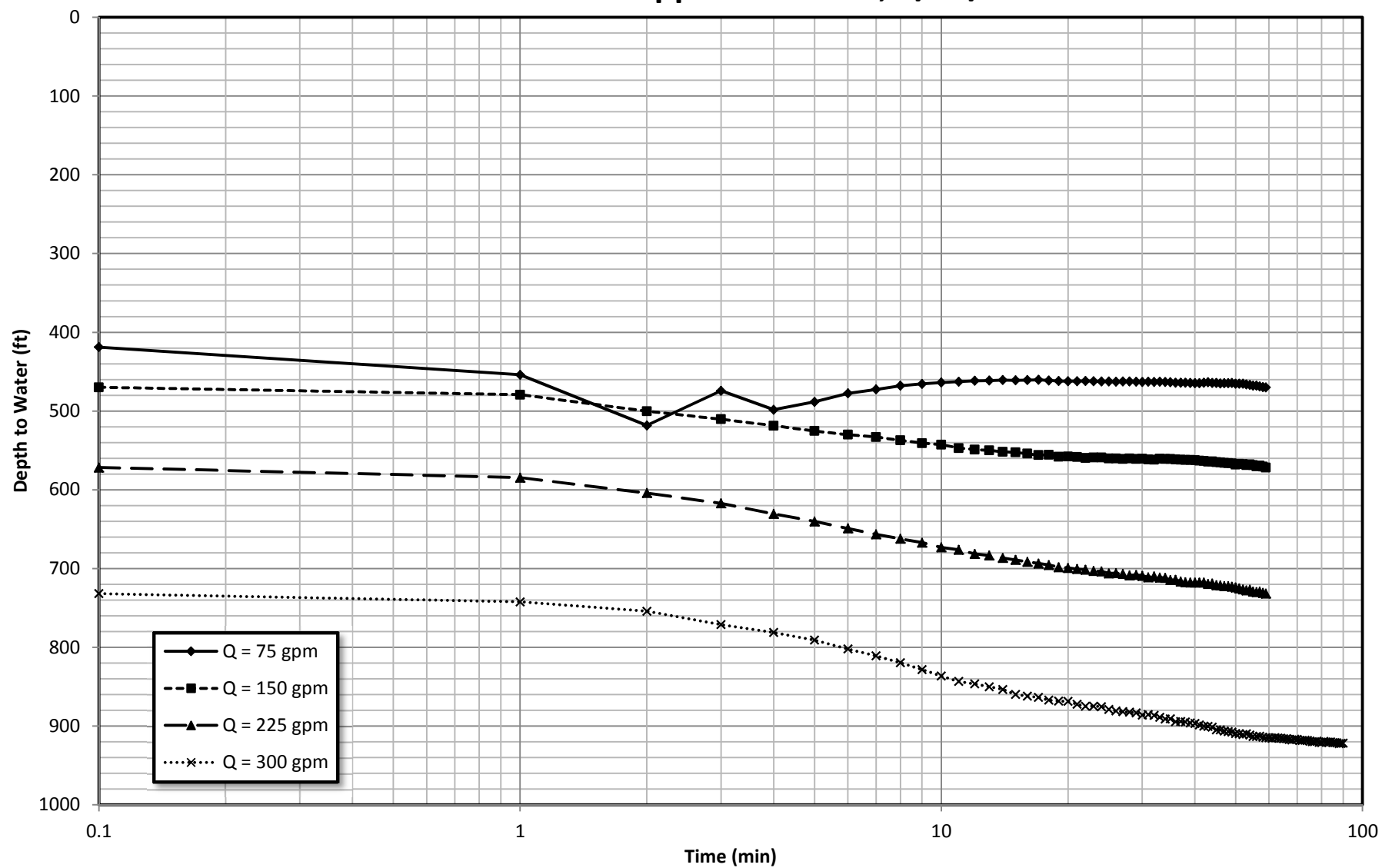


Figure 4.2
Wyoming Water Development Commission
Goose Creek 2-2C Stepped Rate Test, 3/11/2011

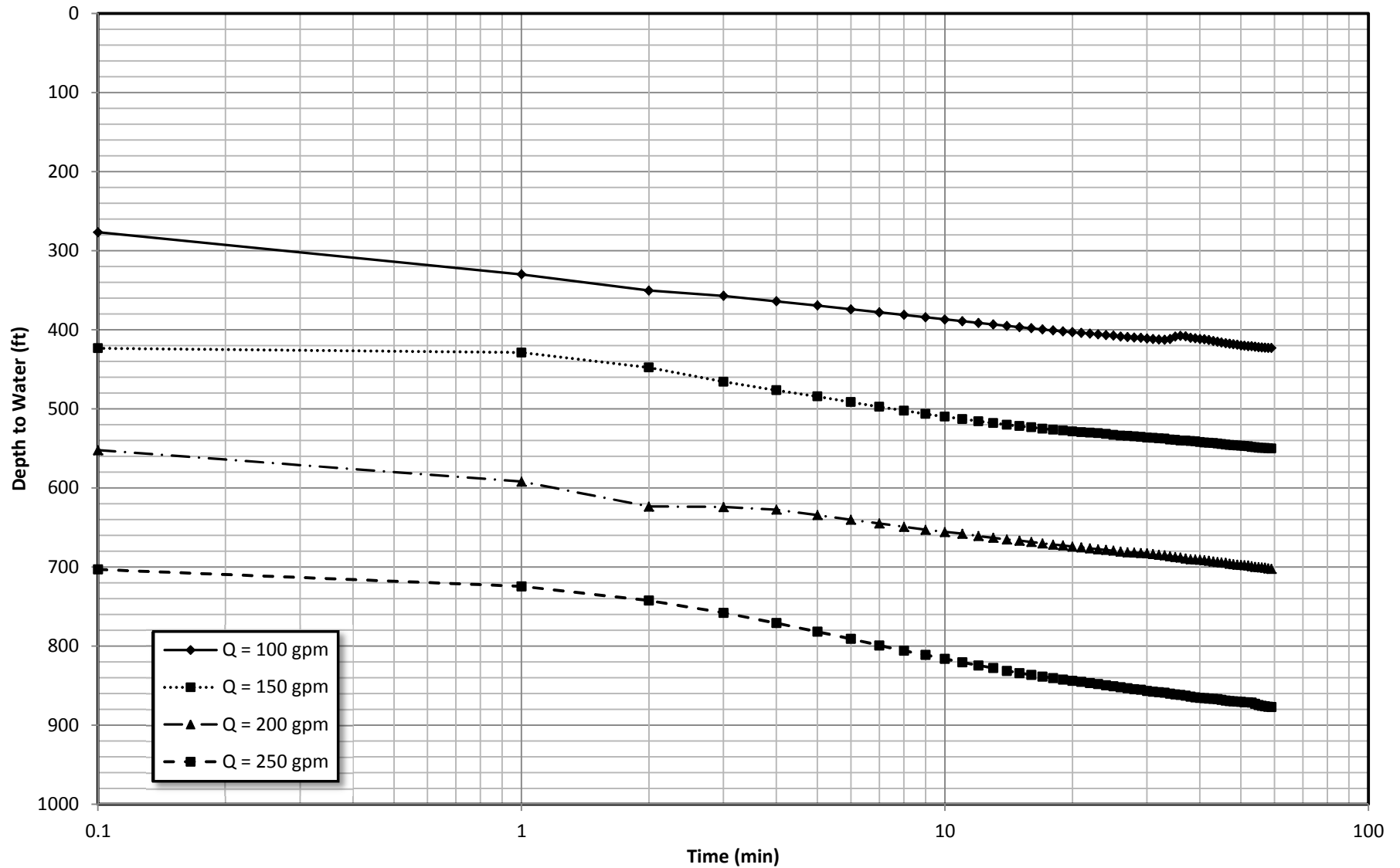


Figure 4.3
Wyoming Water Development Commission
Lone Tree Fault 1-5 Stepped Rate Test, 5/26/11

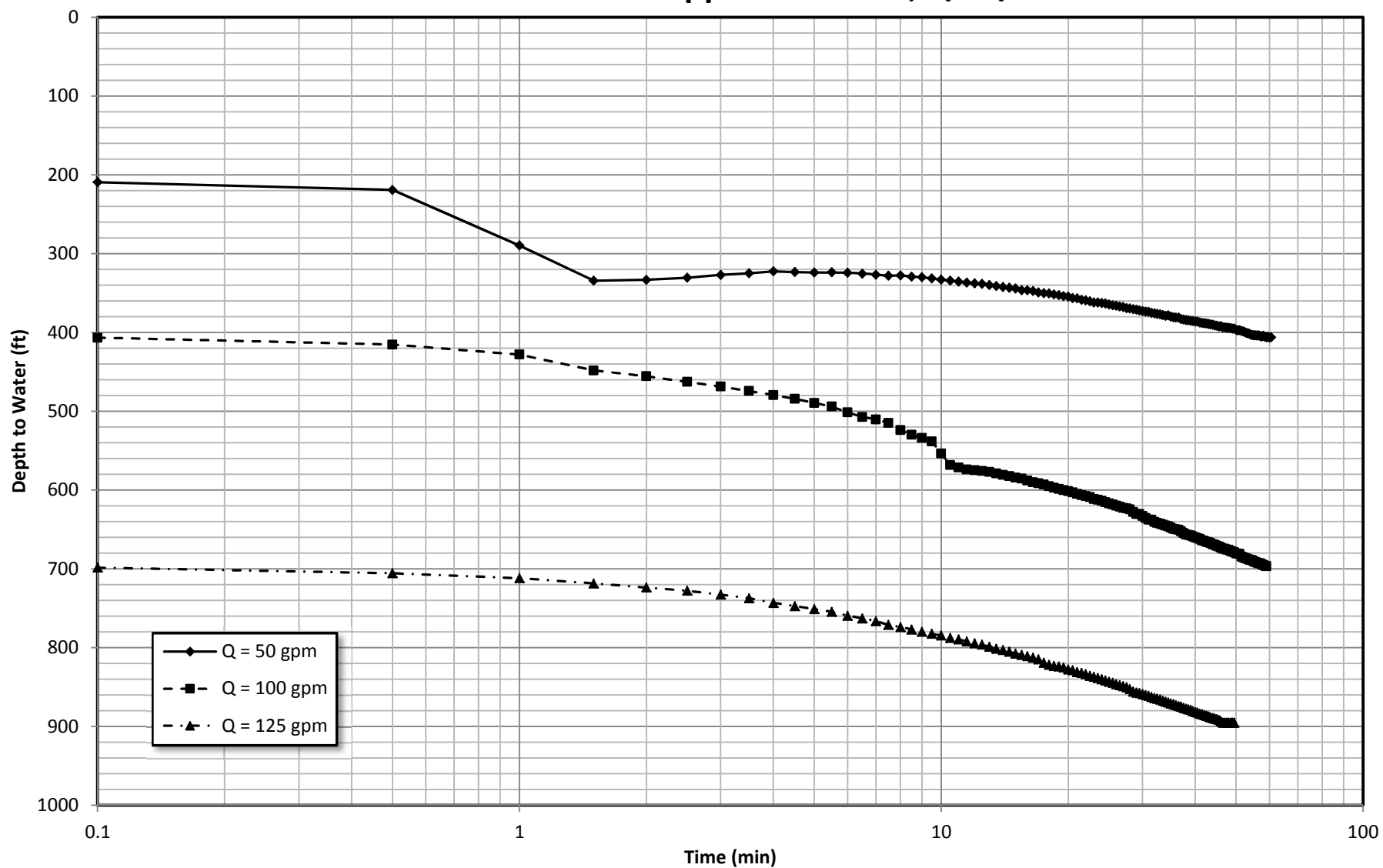


Figure 4.4
Wyoming Water Development Commission
Belvoir Ranch Casper Aquifer Wells
Specific Capacity Curve Comparison

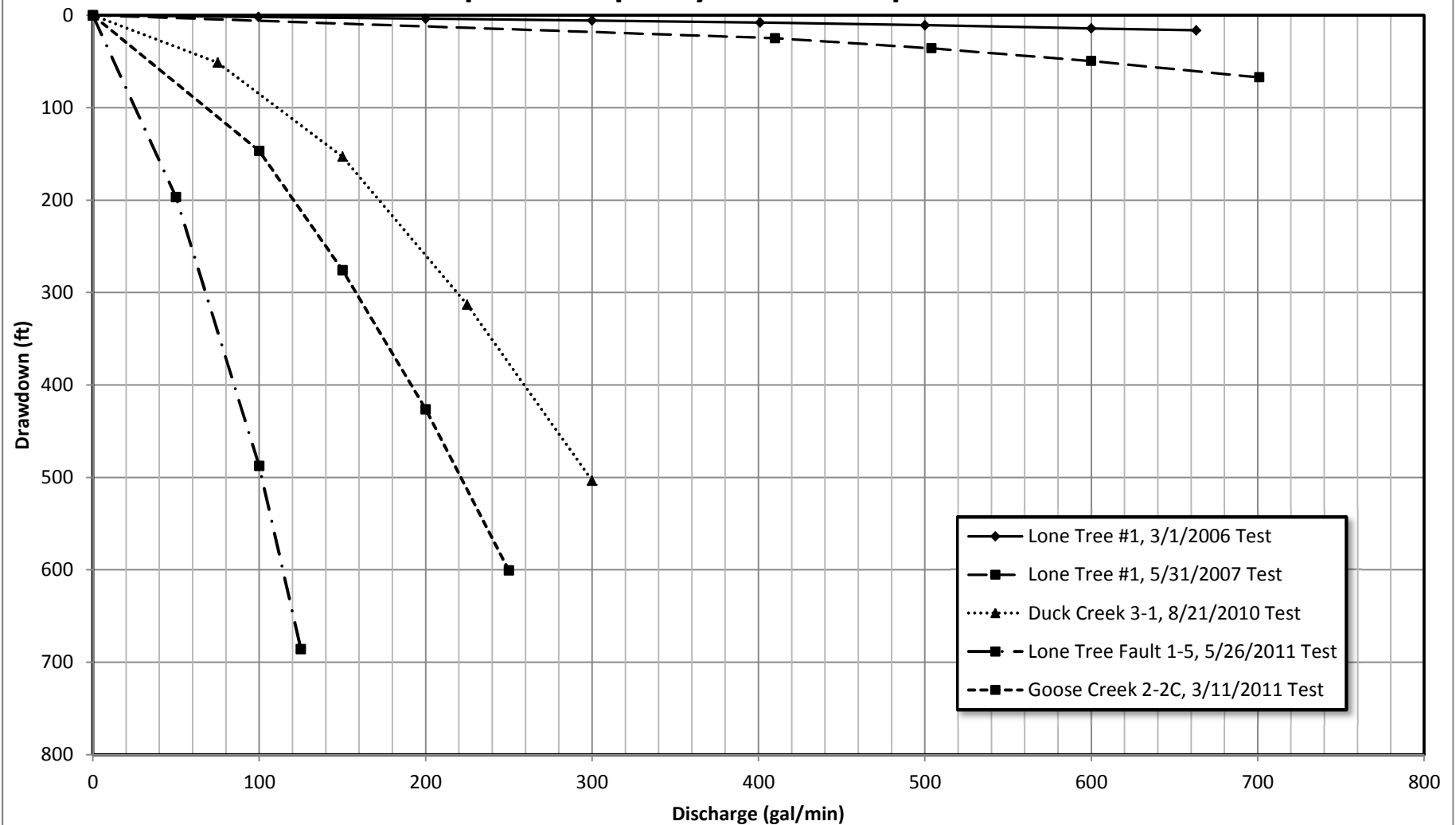


Figure 4.5
Wyoming Water Development Commission
Duck Creek 3-1 Constant Rate Test, 8/22-29/2010

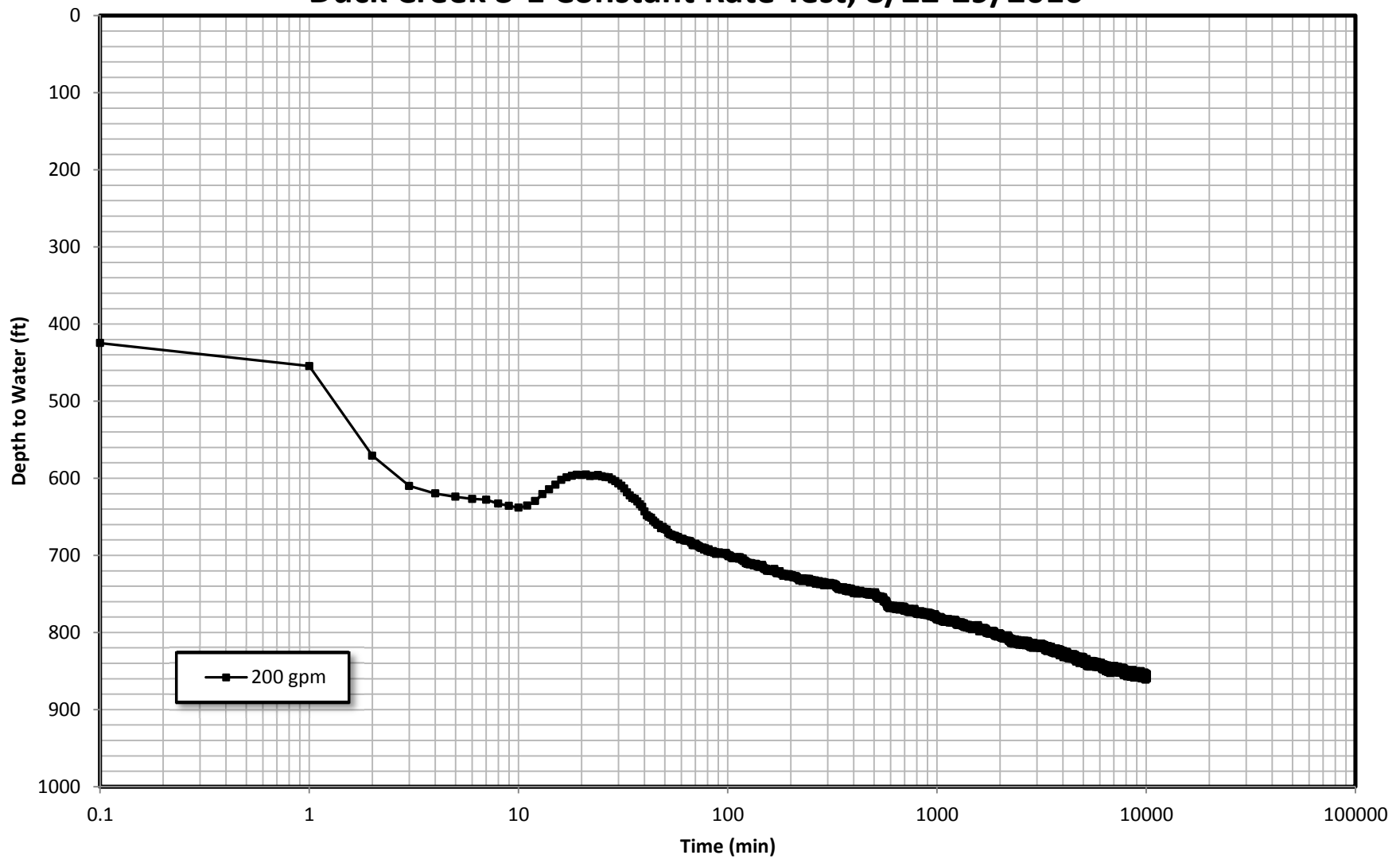


Figure 4.6
Wyoming Water Development Commission
Duck Creek 3-1 Constant Rate Test Recovery, 8/29-9/8/2010

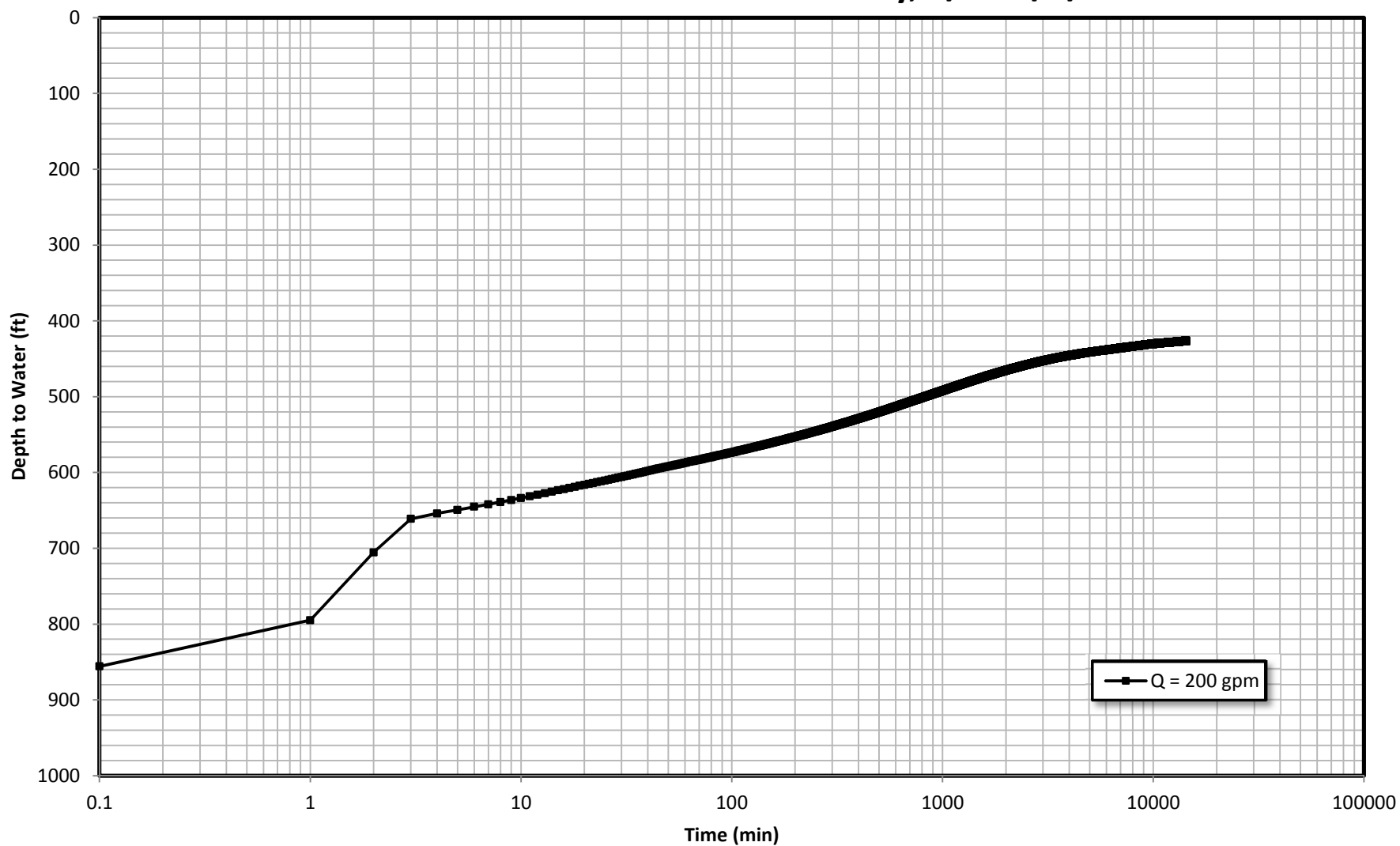


Figure 4.7
Wyoming Water Development Commission
Duck Creek 3-1 Testing, Observation Well
Water Level Elevation 8/21-29/10

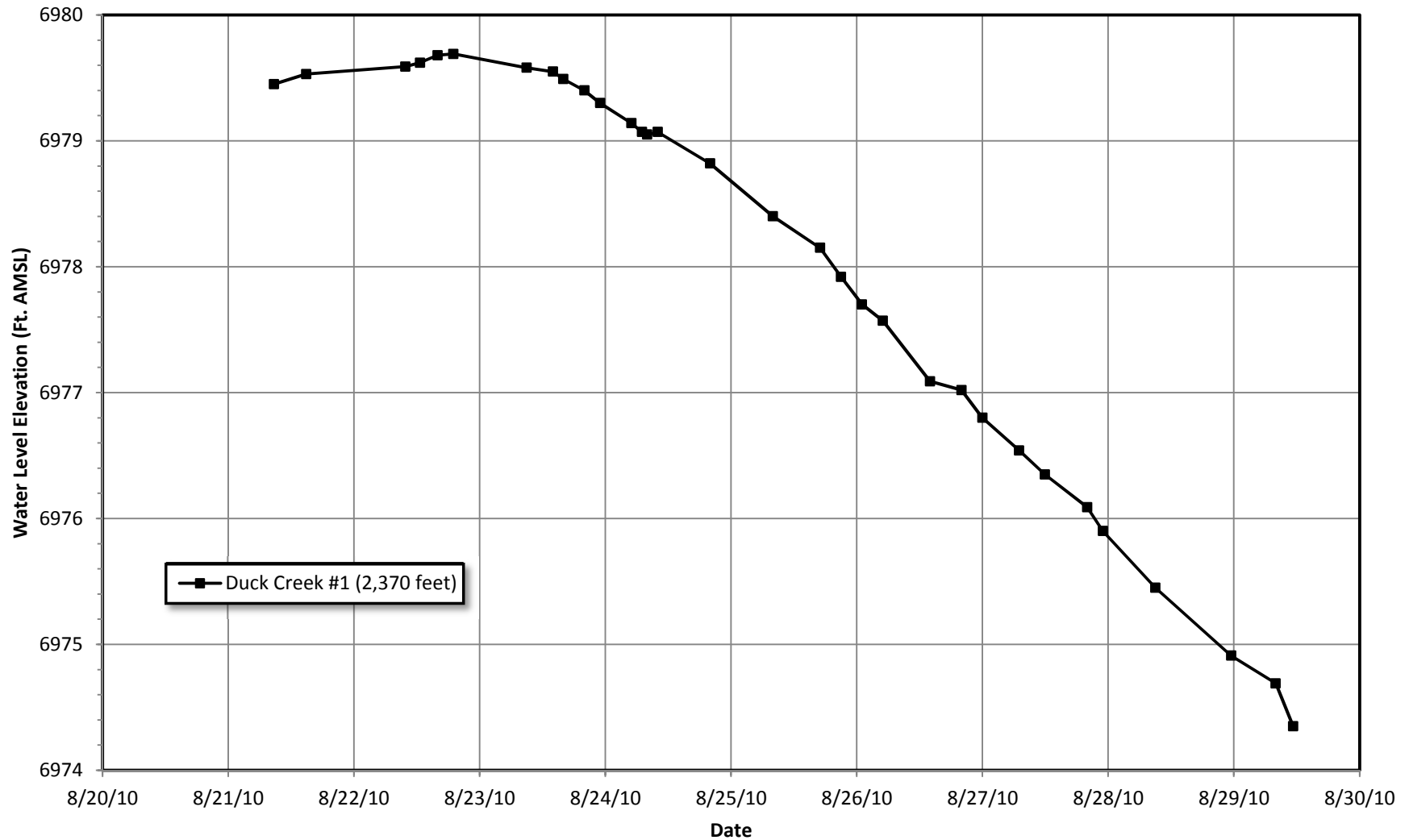


Figure 4.8
Wyoming Water Development Commission
Goose Creek 2-2C Constant Rate Test, 3/12-19/2011

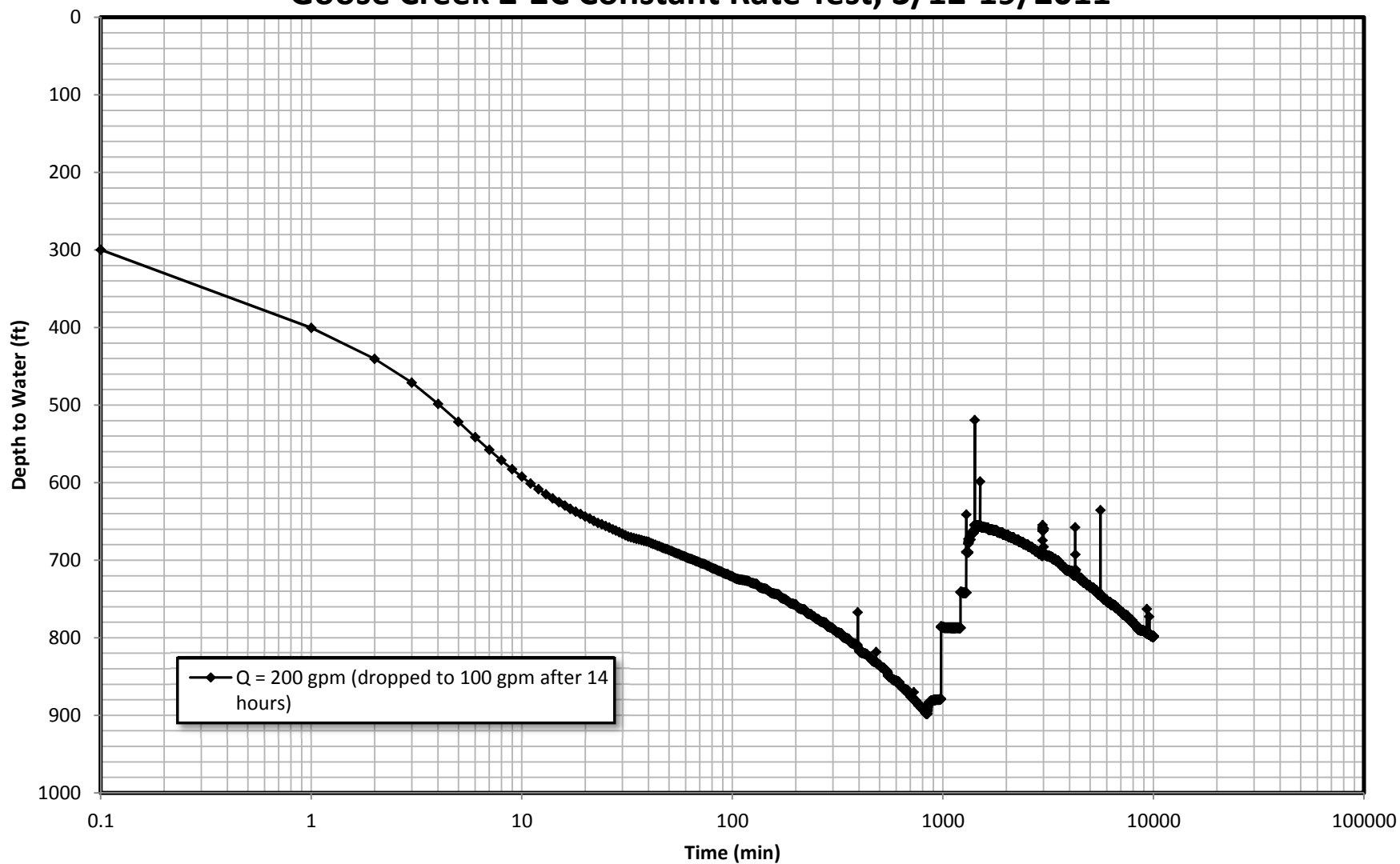


Figure 4.9
Wyoming Water Development Commission
Goose Creek 2-2C Constant Rate Test Recovery, 3/19-25/2011

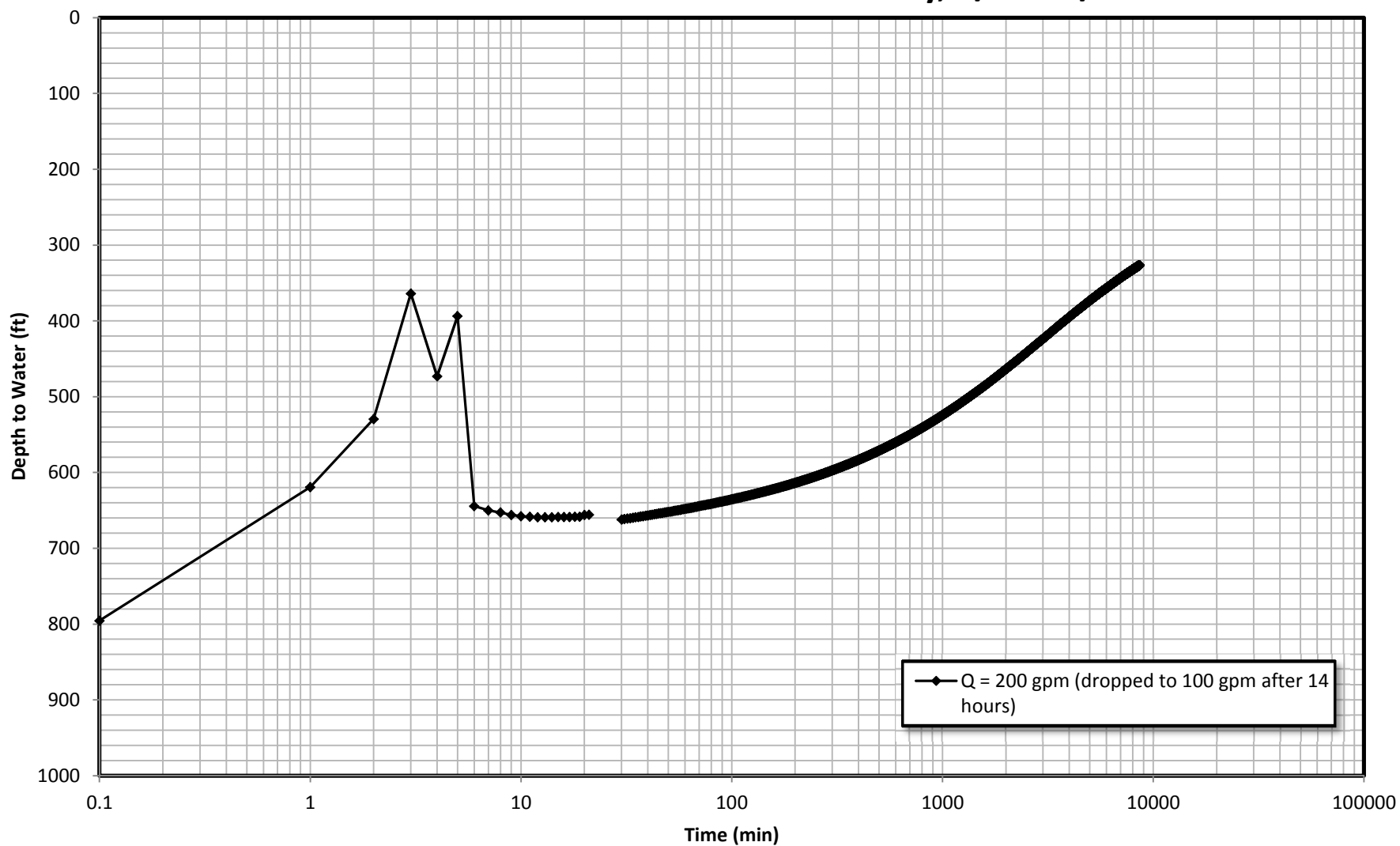


Figure 4.10
Wyoming Water Development Commission
Goose Creek 2-2C Testing, Observation Wells
Water Level Elevations 3/3-25/2011

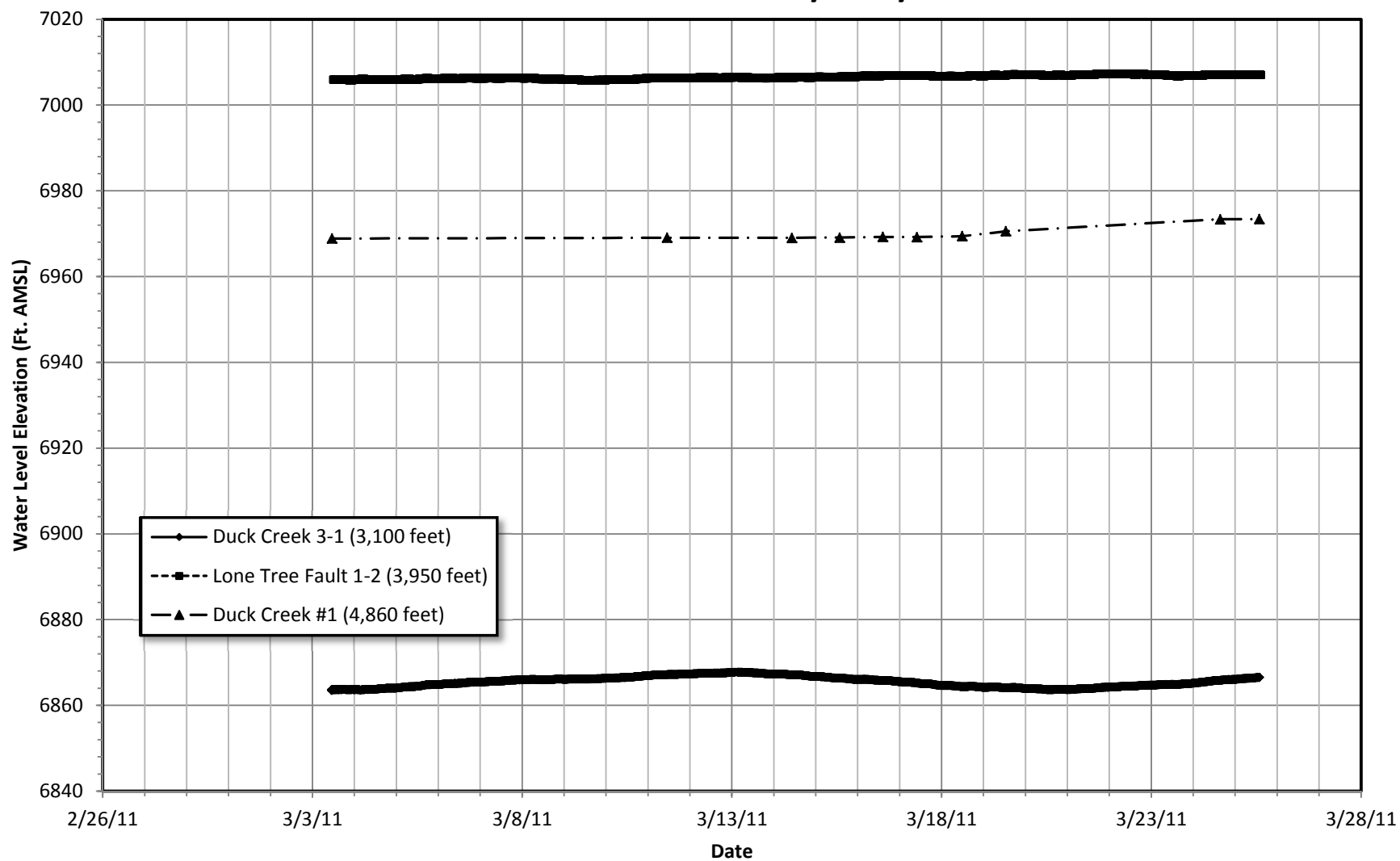


Figure 4.11
Wyoming Water Development Commission
Lone Tree Fault 1-5 Constant Rate Test, 5/27-6/3/11

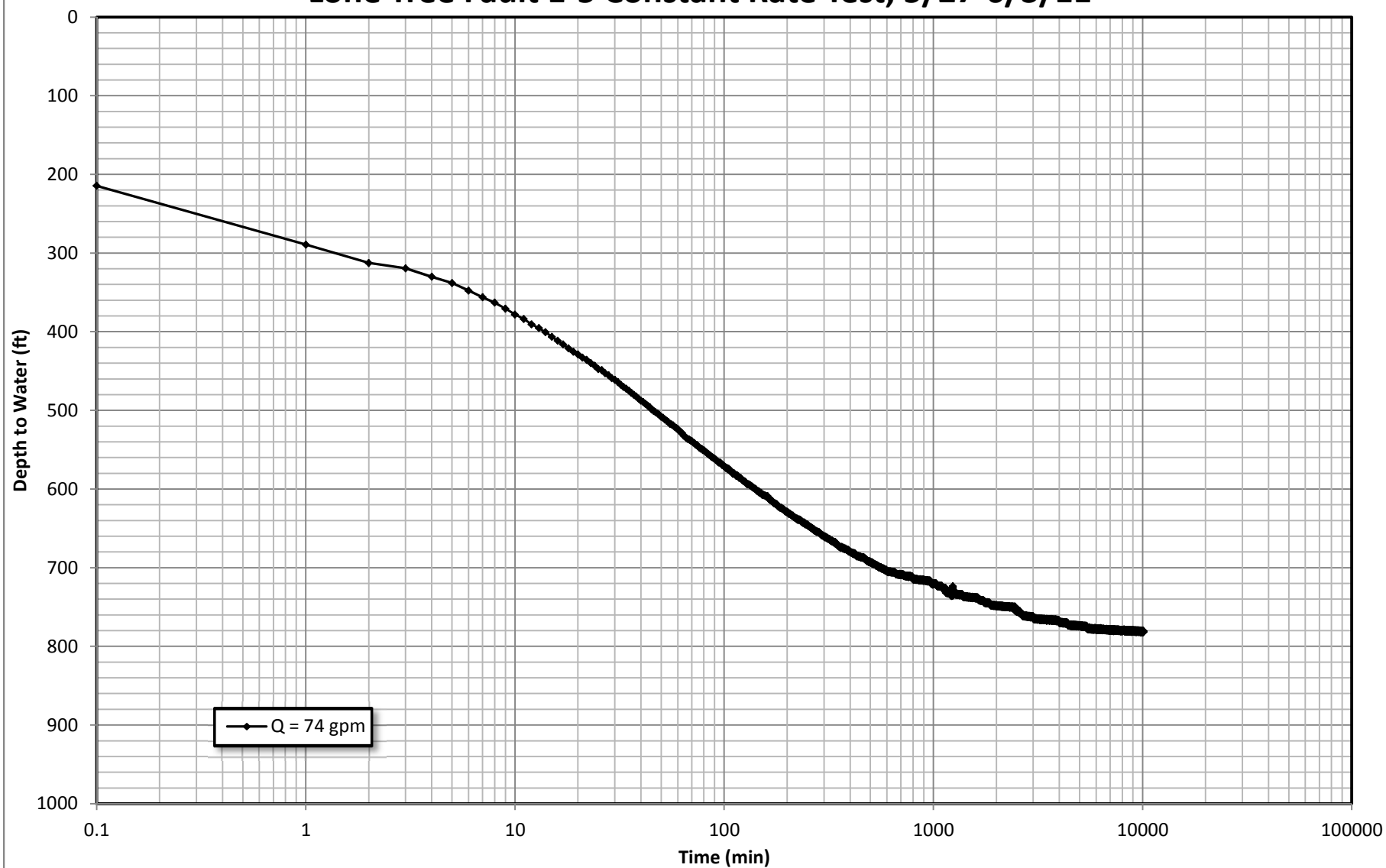


Figure 4.12
Wyoming Water Development Commission
Lone Tree Fault 1-5 Constant Rate Test Recovery, 6/3-6/10/11

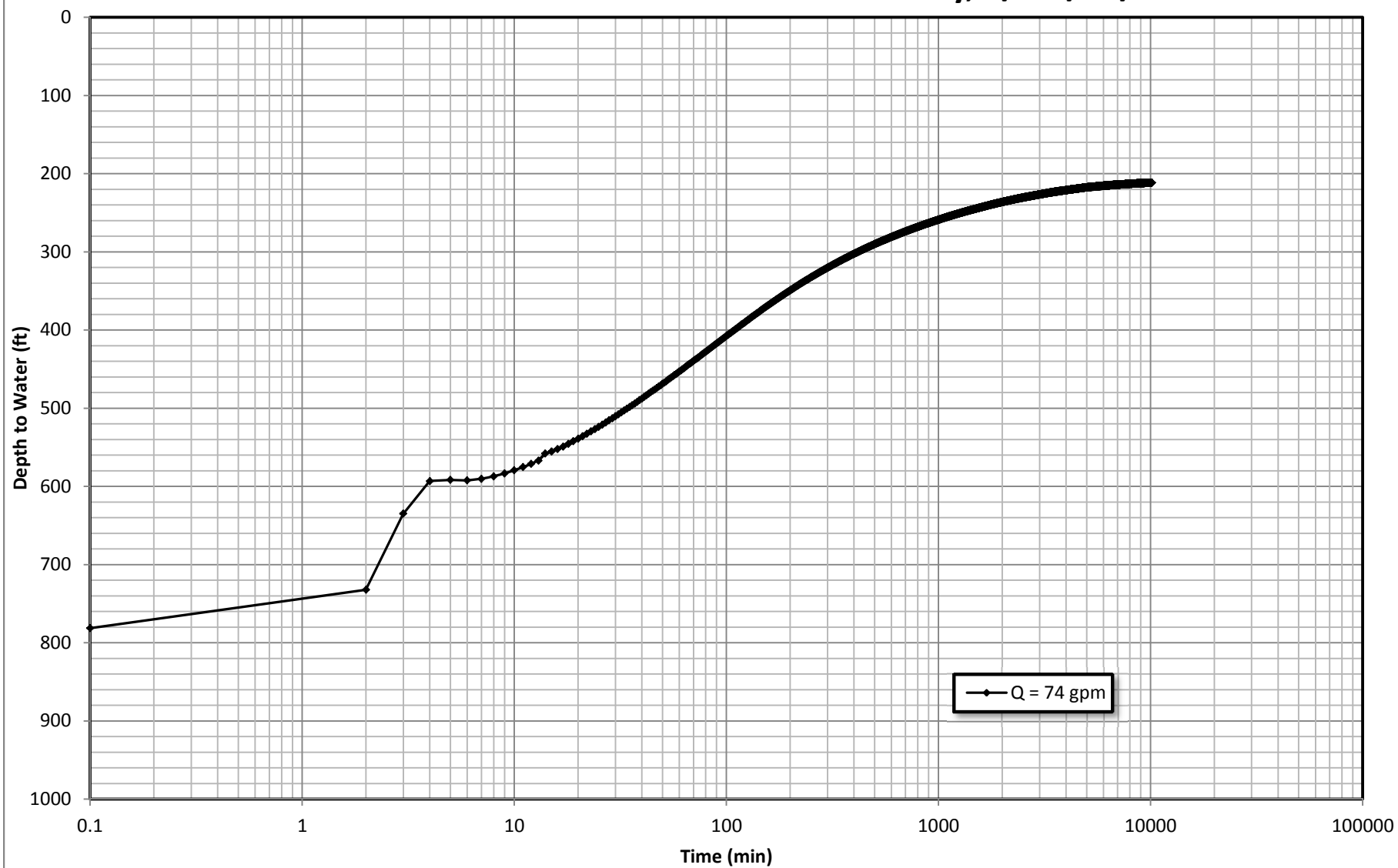
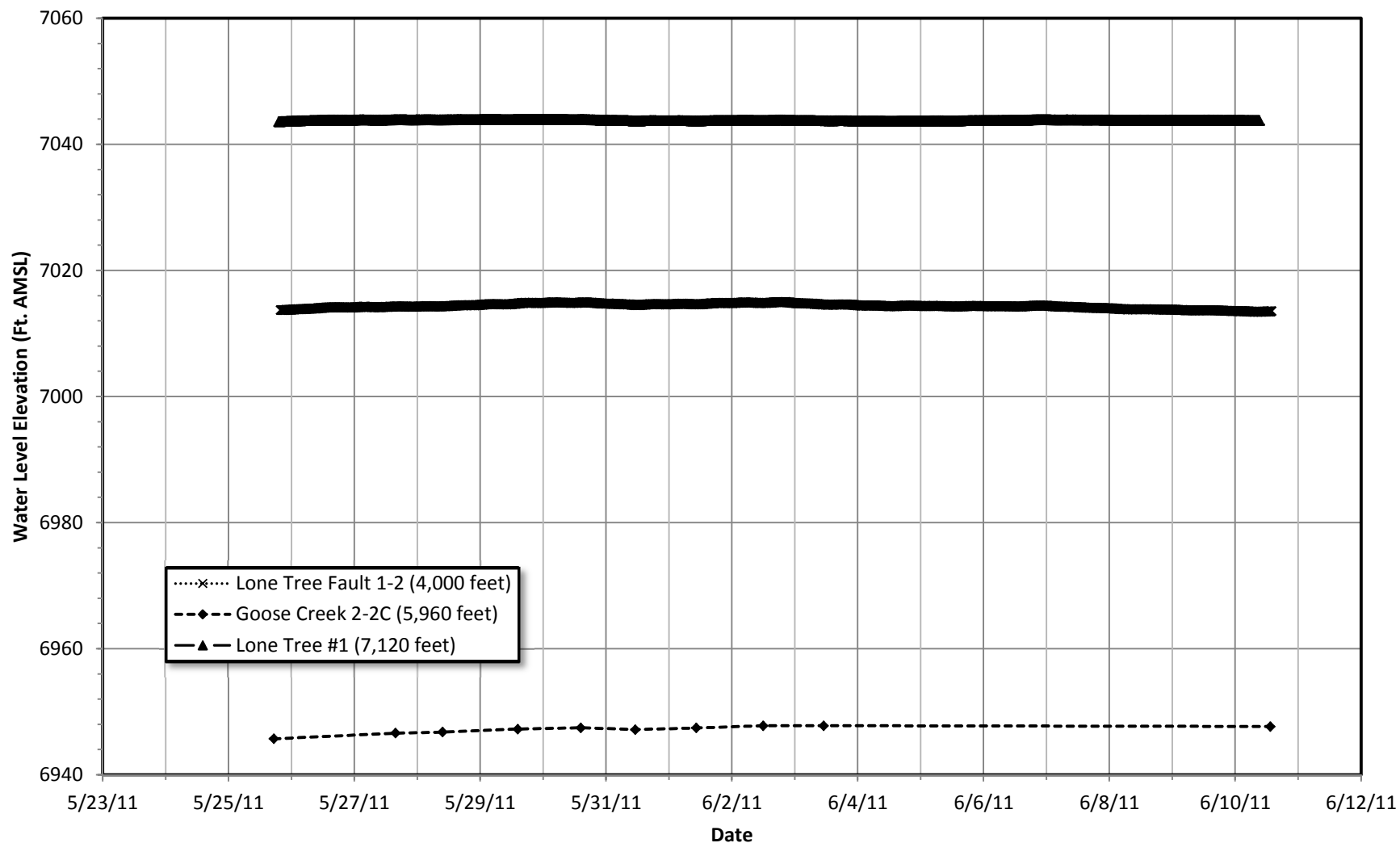
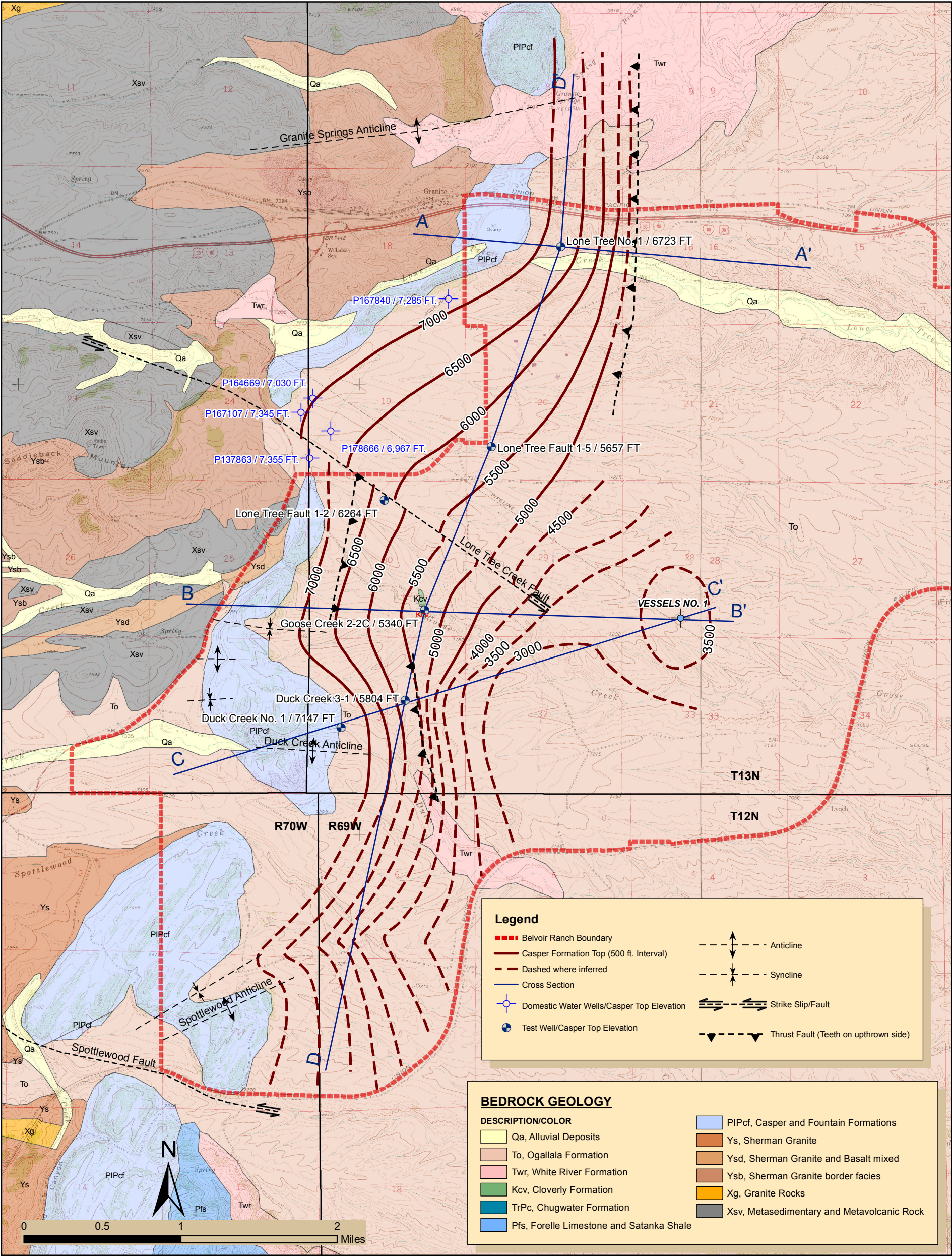


Figure 4.13
Wyoming Water Development Commission
Lone Tree Fault 1-5 Testing, Observation Wells
Water Level Elevations 5/25-6/10/11





NOTES:

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LARAMIE 100K QUADRANGLE
GEOLOGIC MAP, VER PLOEG AND BOYD, 2007

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Engineering Geology & Water Resource Consulting
4025 Automation Way, Bldg. E
Fort Collins, CO 80525

CHEYENNE BELVOIR RANCH

Groundwater Level II Study

Wyoming Water Development Commission

DESIGN: MES

DRAWN: JHF/AMEC

CHECKED/APPR: MES

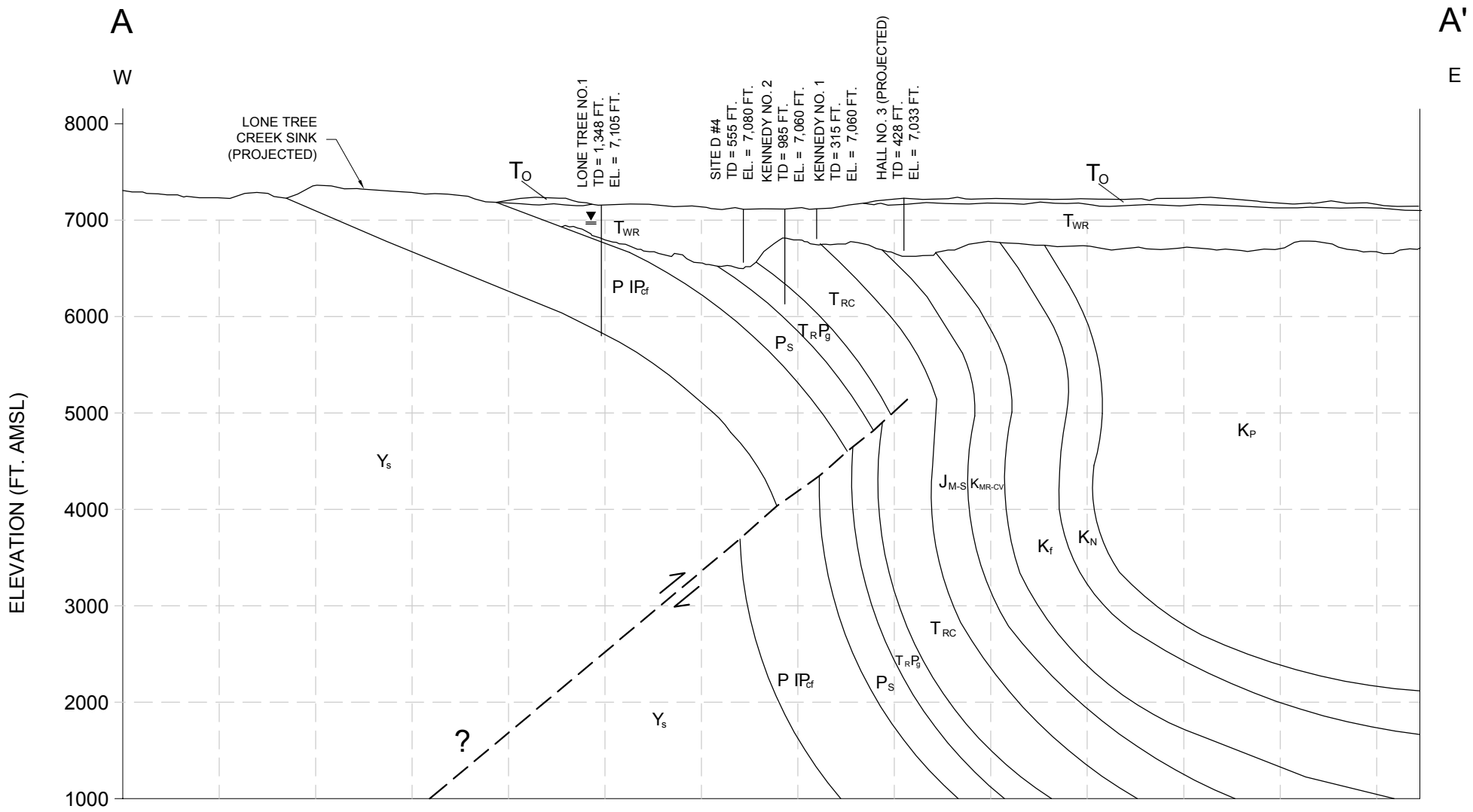
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FIGURE 6.1

CASPER FORMATION STRUCTURE CONTOUR MAP

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DATE: 5/1/2012



LEGEND

GEOLOGIC UNIT (WITH THICKNESS)

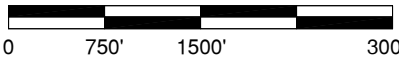
| | | | |
|-------------|---|-------------|--|
| T_O | OGALLALA FORMATION (0-131 FT.) | J_{M-S} | MORRISON FORMATION, SUNDANCE FORMATION (410 FT.) |
| T_{WR} | WHITE RIVER FORMATION (0-620 FT.) | T_{RC} | CHUGWATER FORMATION (540 FT.) |
| K_P | PIERRE SHALE (4,430+ FT.) | $T_R P_g$ | GOOSE EGG FORMATION (270 FT.) |
| K_N | NIOBRARA FORMATION (340 FT.) | P_S | SATANKA FORMATION (340 FT.) |
| K_f | FRONTIER FORMATION (575 FT.) | $P IP_{cf}$ | CASPER FORMATION (895 FT.) |
| K_{MR-CV} | MOWRY SHALE, NEWCASTLE SANDSTONE, SKULL CREEK SHALE, CLOVERLY FORMATION (370 FT.) | Y_s | SHERMAN GRANITE |

▼ CASPER AQUIFER WATER WELL WITH DEPTH AND ELEVATION WATER ELEVATION (5/25/11)

GEOLOGIC CONTACT

THRUST FAULT WITH SENSE OF MOVEMENT, QUERIED AT DEPTH (?)

HORIZONTAL/VERTICAL SCALE IN FEET



NOTES:

- SEE FIGURE 6.1 FOR LOCATION OF CROSS SECTION.



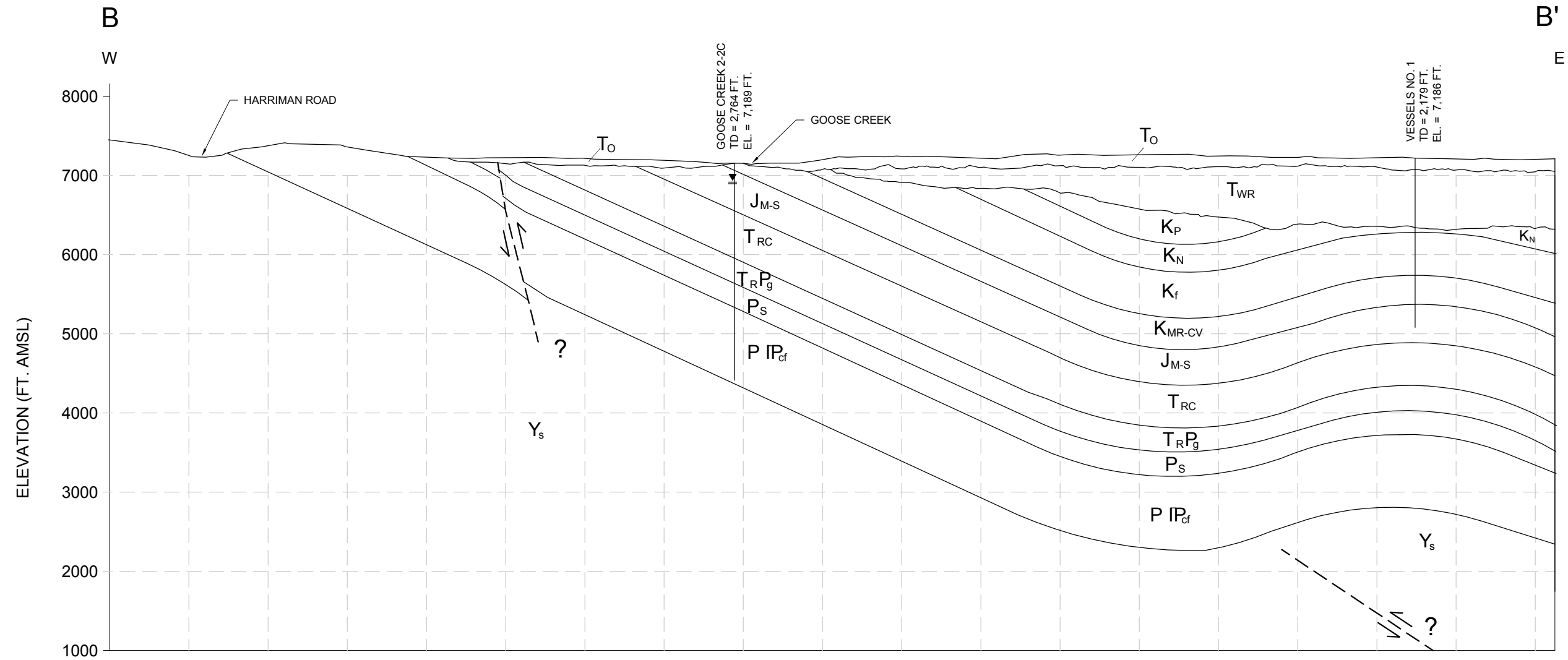
CHEYENNE BELVOIR RANCH
GROUNDWATER LEVEL II

| | | | |
|-----------------|-----------------------------------|---------------|--------|
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| DRAWN DATE: | 12/26/11 | CHECKED: | MES |
| ACAD FILE: | WYWDC109_CROSS SECTION PROFILE.DW | APPROVED: | K.J.L. |

LONE TREE CREEK GEOLOGIC
CROSS SECTION
A - A'

REVISIONS:

FIGURE
6.2



LEGEND

GEOLOGIC UNIT (WITH THICKNESS)

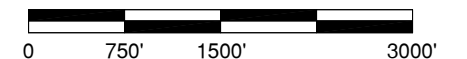
| | | | |
|-------------|---|-------------|--|
| T_O | OGALLALA FORMATION (0-170 FT.) | J_{M-S} | MORRISON FORMATION, SUNDANCE FORMATION (460 FT.) |
| T_{WR} | WHITE RIVER FORMATION (0-750 FT.) | T_{RC} | CHUGWATER FORMATION (540 FT.) |
| K_P | PIERRE SHALE (4,430+ FT.) | $T_R P_g$ | GOOSE EGG FORMATION (300 FT.) |
| K_N | NIOBRAA FORMATION (340 FT.) | P_s | SATANKA FORMATION (290 FT.) |
| K_f | FRONTIER FORMATION (575 FT.) | $P IP_{cf}$ | CASPER FORMATION (895 FT.) |
| K_{MR-CV} | MOWRY SHALE, NEWCASTLE SANDSTONE, SKULL CREEK SHALE, CLOVERLY FORMATION (370 FT.) | Y_s | SHERMAN GRANITE |

▼ CASPER AQUIFER WATER WELL WITH DEPTH AND ELEVATION WATER ELEVATION (5/25/11)

— — — — — GEOLOGIC CONTACT

— — — — — THRUST FAULT WITH SENSE OF MOVEMENT, QUERIED AT DEPTH

HORIZONTAL/VERTICAL SCALE IN FEET



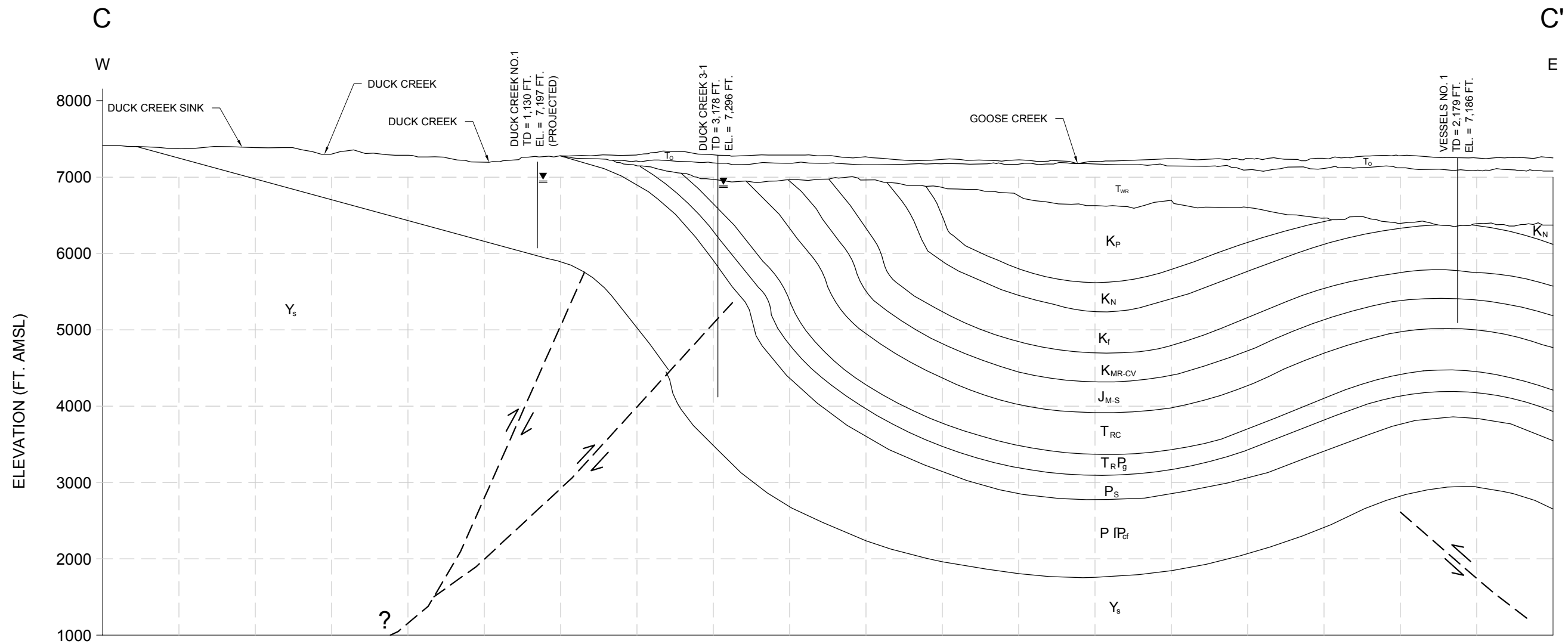
NOTES:

- VESSELS NO. 1 WAS AN OIL EXPLORATION TEST WELL
- SEE FIGURE 6.1 MAP FOR LOCATION OF CROSS SECTION.



CHEYENNE BELVOIR RANCH
GROUNDWATER LEVEL II

| | |
|--|-------------------|
| PROJECT NUMBER: WYWD109 | DESIGN/DRAWN: MES |
| DRAWN DATE: 12/26/11 | CHECKED: MES |
| ACAD FILE: WYWD109_CROSS SECTION PROFILE.DW | APPROVED: K.J.L. |
| GOOSE CREEK GEOLOGIC CROSS SECTION B - B' | |
| REVISIONS: | FIGURE 6.3 |



LEGEND

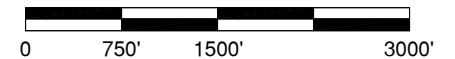
GEOLOGIC UNIT (WITH THICKNESS)

| | | | |
|-------------|---|-------------|---|
| T_o | OGALLALA FORMATION(0-160 FT.) | J_{M-S} | MORRISON FORMATION, SUNDANCE FORMATION (410 FT.) |
| T_{WR} | WHITE RIVER FORMATION (0-740 FT.) | T_{RC} | CHUGWATER FORMATION (540 FT.) |
| K_P | PIERRE SHALE (4,430+ FT.) | $T_R P_g$ | GOOSE EGG FORMATION (270 FT.) |
| K_N | NIOBARRA FORMATION (340 FT.) | P_S | SATANKA FORMATION (270 FT.) |
| K_F | FRONTIER FORMATION (575 FT.) | $P IP_{cf}$ | CASPER FORMATION (895-1,340 FT.) |
| K_{MR-CV} | MOWRY SHALE, NEWCASTLE SANDSTONE, SKULL CREEK SHALE, CLOVERLY FORMATION (370 FT.) | Y_s | SHERMAN GRANITE |

▼ CASPER AQUIFER
WATER WELL WITH
DEPTH AND ELEVATION
WATER ELEVATION (5/25/11)

— — — — —
GEOLOGIC CONTACT
— — — — —
THRUST FAULT WITH
SENSE OF MOVEMENT,
QUERIED AT DEPTH

HORIZONTAL/VERTICAL SCALE IN FEET



NOTES:

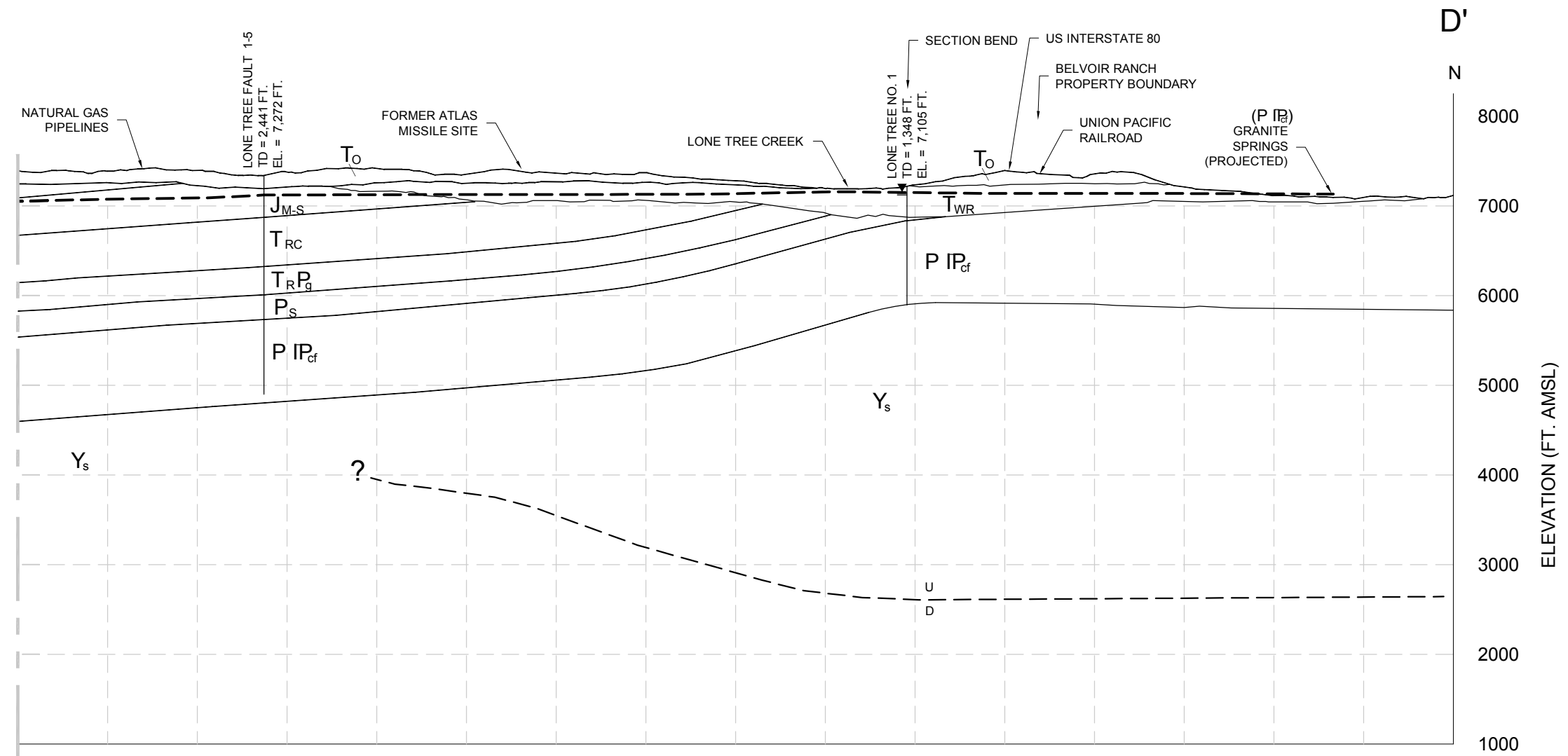
- SEE FIGURE 6.1 FOR MAP FOR LOCATION OF CROSS SECTION.
- VESSELS NO. 1 WAS AN OIL EXPLORATION TEST WELL.



CHEYENNE BELVOIR RANCH
GROUNDWATER LEVEL II

| | |
|--|----------------------|
| PROJECT NUMBER: WYWDC109 | DESIGN/DRAWN: MES |
| DRAWN DATE: 12/26/11 | CHECKED: MES |
| APPROVED: K.J.L. | |
| ACAD FILE: WYWDC109_CROSS SECTION PROFILE.DWG | |
| DUCK CREEK GEOLOGIC CROSS SECTION C - C' | |
| REVISIONS: | FIGURE 6.4 |

MATCHLINE SECTION D-D'



LEGEND

GEOLOGIC UNIT (WITH THICKNESS)

| | | | |
|-------------|---|-------------|--|
| T_O | OGALLALA FORMATION (0-140 FT.) | J_{M-S} | MORRISON FORMATION, SUNDANCE FORMATION (410 - 525 FT.) |
| T_{WR} | WHITE RIVER FORMATION (0-340 FT.) | T_{RC} | CHUGWATER FORMATION (540 - 590 FT.) |
| K_{MR-CV} | MOWRY SHALE, NEWCASTLE SANDSTONE, SKULL CREEK SHALE, CLOVERLY FORMATION (370 FT.) | $T_R P_g$ | GOOSE EGG FORMATION (270 - 320 FT.) |
| | | P_S | SATANKA FORMATION (270 - 375 FT.) |
| | | $P IP_{cf}$ | CASPER FORMATION (895-1,340 FT.) |
| | | Y_s | SHERMAN GRANITE |

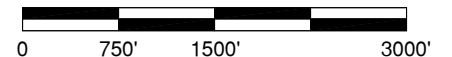
▼ CASPER AQUIFER WATER WELL WITH DEPTH AND ELEVATION WATER ELEVATION (5/25/11)

----- CASPER AQUIFER POTENTIOMETRIC SURFACE (5/25/11)

===== GEOLOGIC CONTACT

--->--->--- U/D --- THRUST FAULT WITH SENSE OF MOVEMENT, QUERIED AT DEPTH OR TERMINATION

HORIZONTAL/VERTICAL SCALE IN FEET



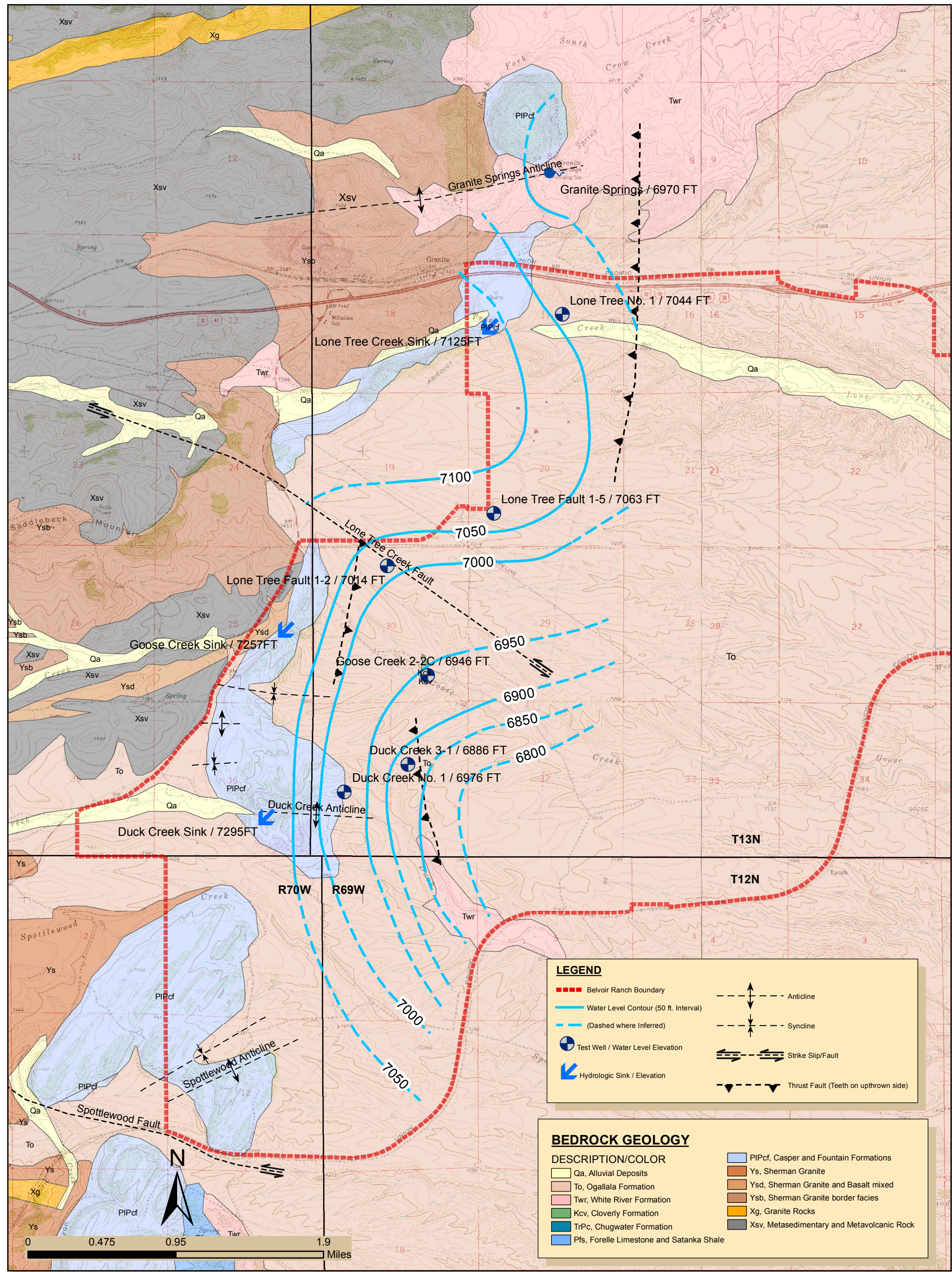
NOTES:

- SEE FIGURE 6.1 FOR LOCATION OF CROSS SECTION.



CHEYENNE BELVOIR RANCH
GROUNDWATER LEVEL II

| | |
|--|-------------------|
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| DRAWN DATE: 12/26/11 | CHECKED: MES |
| ACAD FILE: WYWD0109_CROSS SECTION PROFILE.DWG | APPROVED: K.J.L. |
| WESTERN BELVOIR GEOLOGIC CROSS SECTION D - D' (2 OF 2) | |
| REVISIONS: | FIGURE |
| | 6.5 |







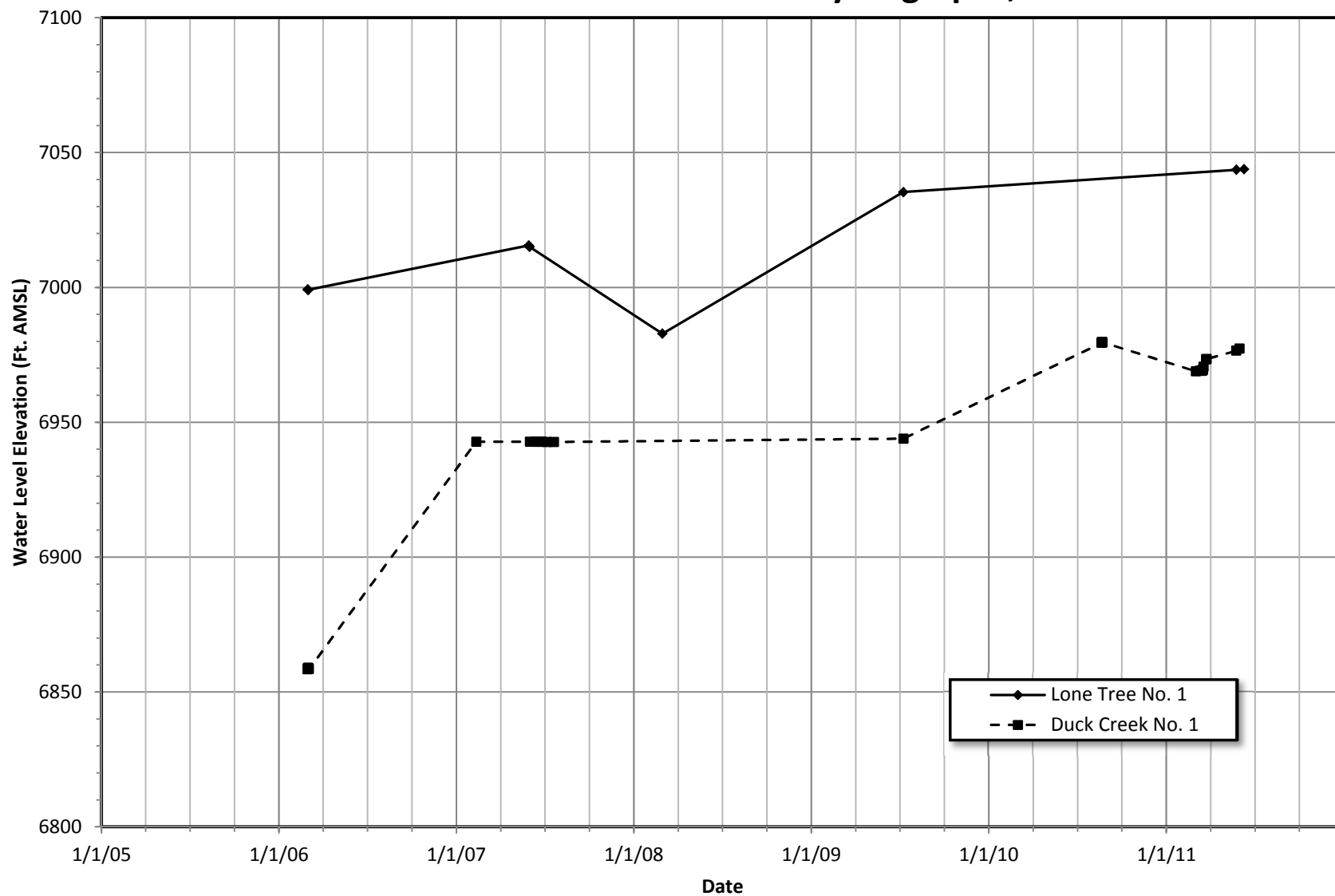
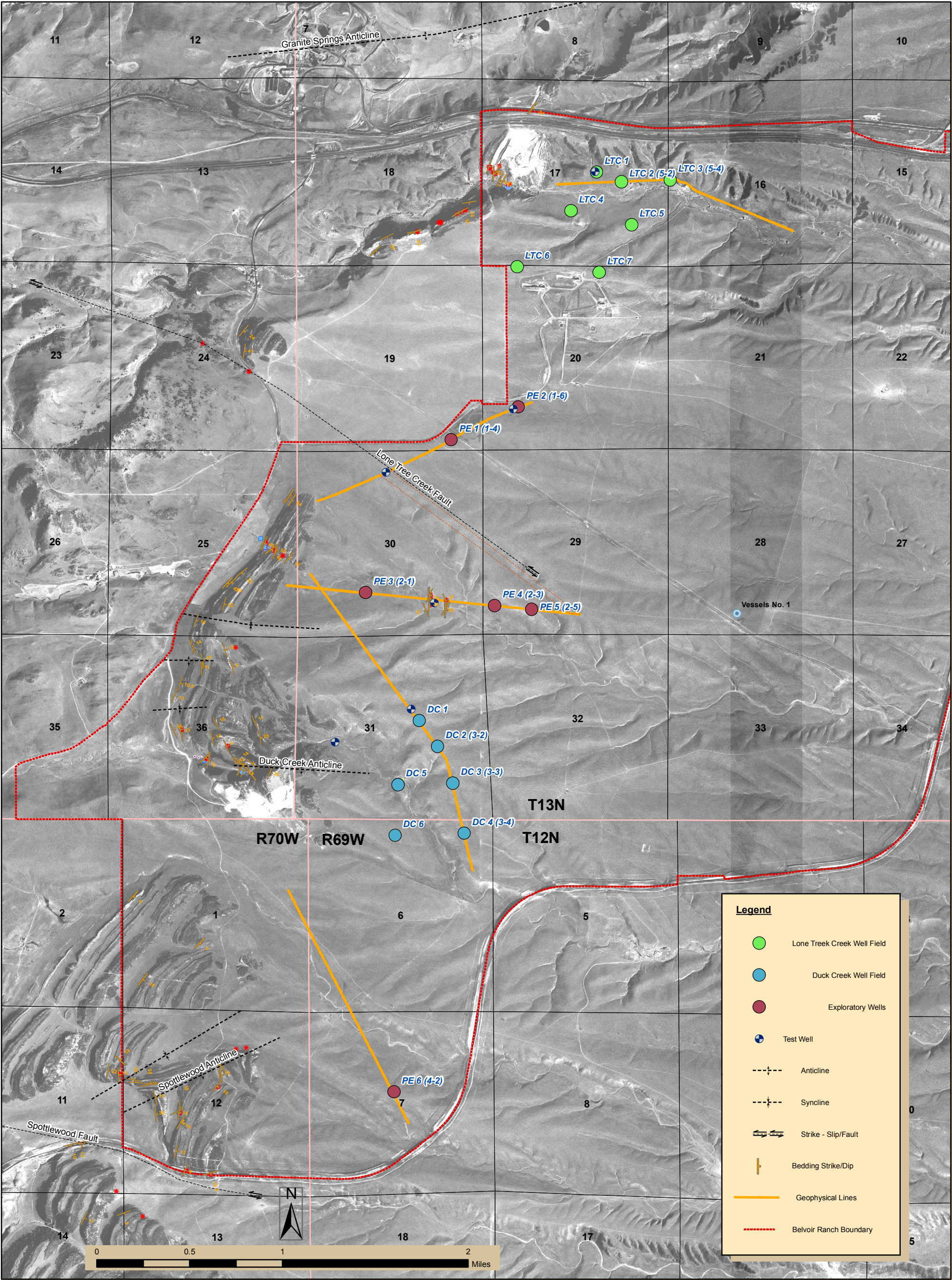
| | | |
|---|---|---|
| <div>NOTES:</div> <div>MODIFIED FROM: LARAMIE 100K QUADRANGLE GEOLOGIC MAP, VER PLOEG AND BOYD, 2007 (Water Level Data taken 5/25/11)</div> | <div><div>Liostone and Associates, Inc. Engineering Geology & Water Resource Consulting 4025 Automation Way, Bldg. E Fort Collins, CO 80525</div></div> | <div>CHEYENNE BELVOIR RANCH</div> <div>Groundwater Level II Study</div> <div>Wyoming Water Development Commission</div> |
| | DESIGN: MES | FIGURE 6.6 CASPER AQUIFER POTENTIOMETRIC SURFACE MAP |
| | DRAWN: JHF/AMEC | |
| | CHECKED/APPR: MES | FILE: L:\WYWDC109 - Belvoir\GIS\WYWDC109_BELVOIR_RANCH_POTENTIOMETRIC_SURFACE_MAP.mxd |
| <div></div> <div><div>Wyoming Water Development Commission</div></div> | REVISED: | DATE: 5/2/12 |

Figure 6.7
Wyoming Water Development Commission
Lone Tree No. 1 and Duck Creek No. 1 Hydrographs, 2006-2011





NOTES:



CHEYENNE BELVOIR RANCH

Groundwater Level II Study

Wyoming Water Development Commission



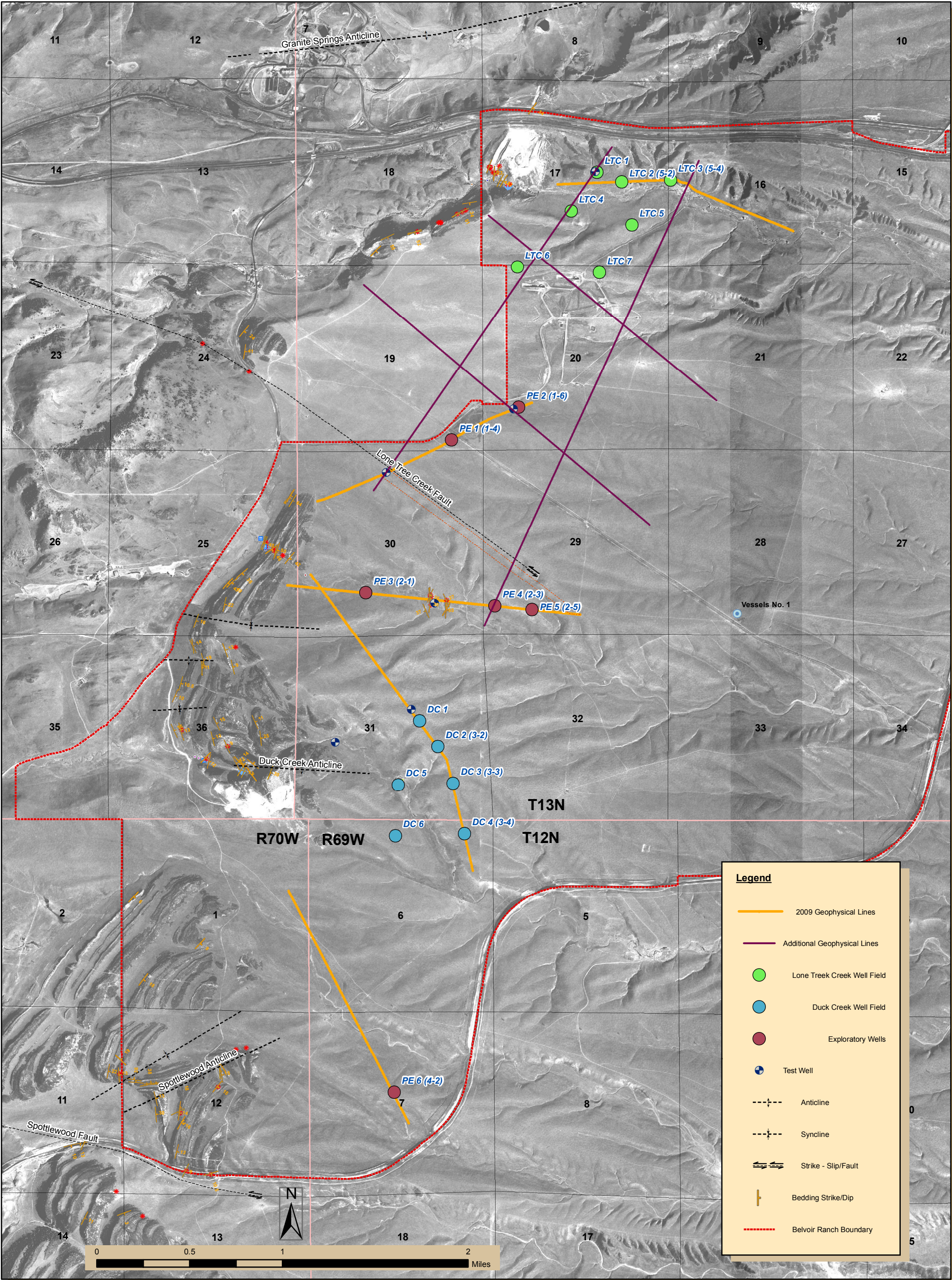
DESIGN: MES
DRAWN: JHF/AMEC
CHECKED/APPR: MES
REVISED:

FIGURE 6.8
POTENTIAL PRODUCTION AND
EXPLORATORY WELL LOCATIONS

FILE: WYWDC_BELVOIR_POTENTIAL_PRODUCTION_EXPLORATORY_SITES

DATE: 5/2/12





NOTES:
ILLUSTRATES POTENTIAL LOCATIONS
OF FUTURE SEISMIC REFLECTION AND
CSAMT RESISTIVITY LINES.



CHEYENNE BELVOIR RANCH
Groundwater Level II Study
Wyoming Water Development Commission



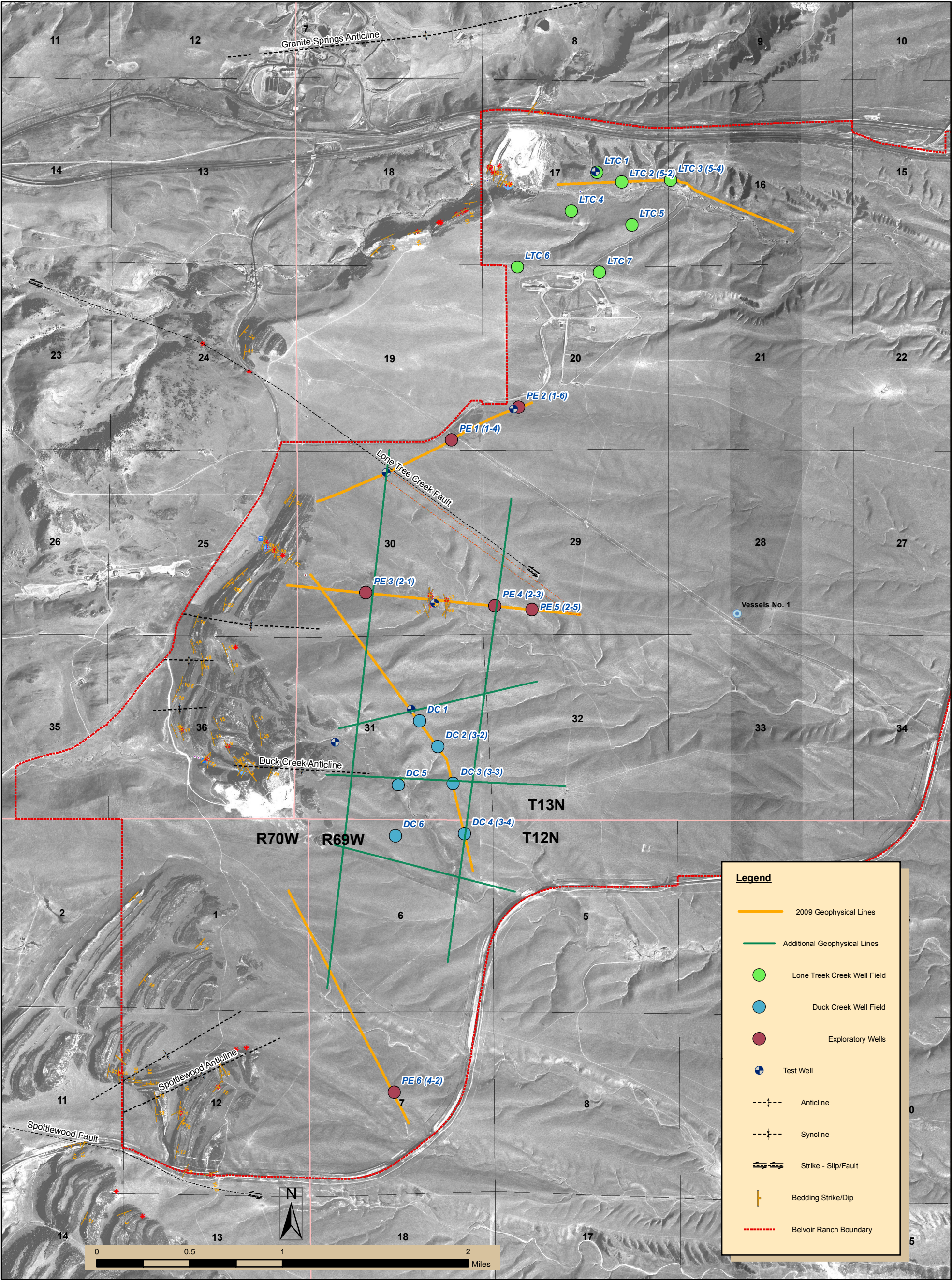
DESIGN: MES
DRAWN: JHF/AMEC
CHECKED/APPR: MES
REVISED:

FIGURE 7.1
LONE TREE CREEK
ADDITIONAL GEOPHYSICAL LINES

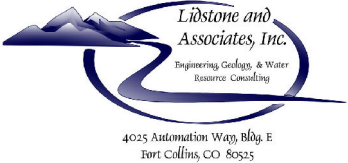
FILE: WYWDC109_LONE TREE CREEK ADD GEO LINES

DATE: 5/2/12





NOTES:
ILLUSTRATES POTENTIAL LOCATIONS
OF FUTURE SEISMIC REFLECTION AND
CSAMT RESISTIVITY LINES.



CHEYENNE BELVOIR RANCH
Groundwater Level II Study
Wyoming Water Development Commission



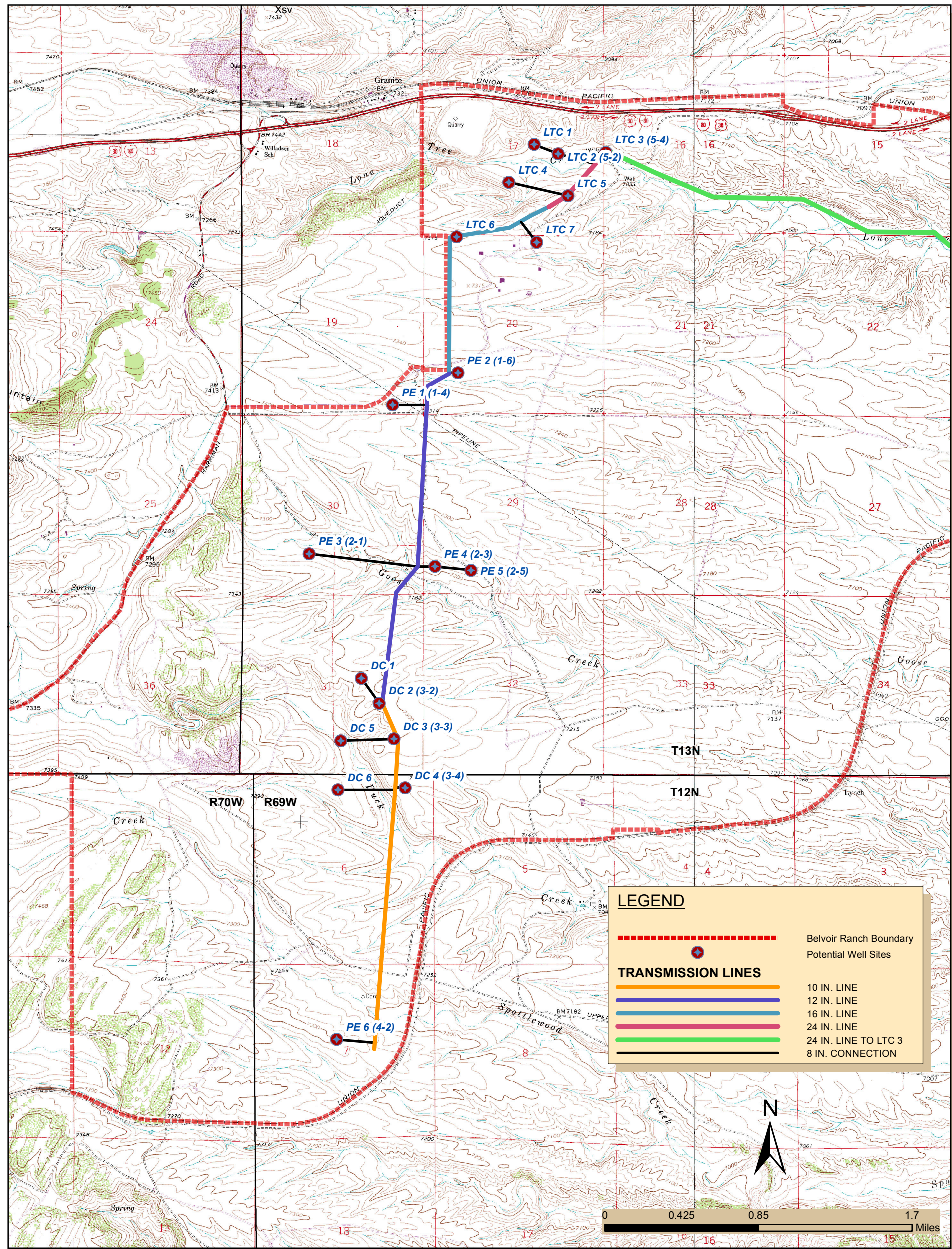
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DRAWN: JHF/AMEC
CHECKED/APPR: MES
REVISED:

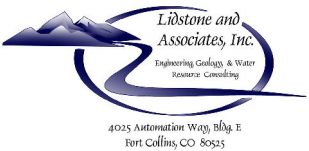



FIGURE 7.2
DUCK CREEK
ADDITIONAL GEOPHYSICAL LINES

FILE: WYWDC109_DUCK_CREEK ADD GEO LINES

DATE: 5/2/12





| | | |
|---|---|---|
| <p>NOTES:</p> <p>Alignment for 24 in. line east of LTC 3 is included on the map in Appendix G and partially represented here.</p> |  <p>LiDstone and Associates, Inc. Engineering Geology & Water Resource Consulting 4025 Automation Way, Bldg. E Fort Collins, CO 80515</p> | <p>CHEYENNE BELVOIR RANCH</p> <p>Groundwater Level II Study</p> <p>Wyoming Water Development Commission</p> |
|    | <p>DESIGN: CMJ/MES</p> <p>DRAWN: JHF</p> <p>CHECKED/APPR: MES</p> <p>REVISED:</p> | <p>FIGURE 7.3</p> <p>TRANSMISSION LINE TO</p> <p>DUCK CREEK AND LONE TREE CREEK WELL FIELDS</p> <p>FILE: L:\WYWDC109 - Belvoir\GIS\WYWDC109_BELVOIR_RANCH_TRANSMISSION_LINE_MAP.mxd</p> <p>DATE: 5/2/12</p> |

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| Table 7.8 | Construction Cost Summary and Financial Analysis |
| Table 7.9 | Cheyenne BOPU Water Enterprise Fund |

Table 1.1 Existing Casper Aquifer Test Wells at Belvoir Ranch

| Permit No. ¹ | Well Name | Well Location (T, R, Sect.) | Surface Elevation (ft. AMSL) ² | Well Depth (ft) | Depth to Casper Formation Top (ft) | Casper Formation Thickness (ft) ³ | Depth to Water (ft) ⁴ | Well Yield (gpm) ⁵ |
|--|------------------|-----------------------------|---|-----------------|------------------------------------|--|----------------------------------|-------------------------------|
| P168921W | Lone Tree No. 1 | T13N, R69W, Sect. 17 SWNE | 7105 | 1348 | 382 | 961 | 64.00 | 600 |
| P168918W | Duck Creek No. 1 | T13N, R69W, Sect. 31 NWSW | 7197 | 1130 | 50 | 1080+ | 222.76 | 24 |
| P168920W | Kennedy No. 2 | T13N, R69W, Sect. 17 NESW | 7065 | 985 | -- | -- | -- | -- |
| Notes: 1. Permit number on file with the Wyoming State Engineer's Office. 2. Surface elevation estimated from Cheyenne Board of Public Utilities 5-foot contour interval data for Belvoir Ranch. 3. + indicates Casper Formation was not fully penetrated, and is therefore thicker than this number shown. 4. Depth based on 5/25/11 water level measurements. 5. Well yield based on aquifer testing of Lone Tree No. 1 and airlift development of Duck Creek No. 1 -- Indicates Casper Formation was not encountered, nor was well completed into the Casper Formation. Table compiled from data contained in Lidstone and Associates, Inc. 2008, and States West Water Resources Corporation 2006. | | | | | | | | |

Table 1.2 Casper Aquifer Exploration Timeline

| Timeframe | Exploration Activities |
|----------------|--|
| 6/2009 | Received Notice to Proceed and initiated work on the project. |
| 7/2009 | Completed reconnaissance level geologic and hydrogeologic fieldwork, and delivered compiled 2005 and 2009 field data to AMEC and Zonge for inclusion, overlay, and planning on geophysical data acquisition. |
| 8/2009 | Identified and finalized the geophysical line locations, and Zonge completed the seismic reflection survey of the lines. |
| 9/2009 | Zonge completed the CSAMT resistivity survey of the lines, and LA distributed environmental reporting letters to appropriate state and federal agencies. |
| 11/2009 | Presented results of geologic and geophysical work to WWDC and the BOPU, along with potential test well site options. |
| 12/2009-2/2010 | Finalized test well site options and delivered test program development letter to WWDC and the BOPU. Submitted U.W. 5 applications for the test well sites to the Wyoming SEO, Permit to Construct applications to DEQ, and WYPDES applications to DEQ for aquifer test discharge. Obtained and submitted wildlife and archaeological reports for test well sites to appropriate agencies. |
| 3/2010-4/2010 | Finalized well bidding documents, advertised for bids, and opened bids. Contracted Weston Engineering to complete the test wells. |
| 5/2010-8/2010 | Drilled, completed, geophysically logged, developed, and test pumped Duck Creek 3-1. LA and Zonge revised drilling depth projections and geophysical interpretation on other seven potential test well sites and geophysical lines. Met with WWDC to finalize location of second test well site. |
| 8/2010-10/2010 | Drilled, completed, geophysically logged, and developed Lone Tree Fault 1-2. Obtained archaeological clearance and filed U.W. 5 applications on two additional drill sites. Revised geophysical interpretations and met to finalize location of third test well site. Added completion of one additional well to Weston's contract. |
| 10/2010-3/2011 | Drilled, completed, geophysically logged, developed, and test pumped Goose Creek 2-2C. Revised geophysical interpretations and met to finalize location of the fourth test well site. |
| 3/2011-6/2011 | Drilled, completed, geophysically logged, developed, and test pumped Lone Tree Fault 1-5. Developed and presented list of options and costs to WWDC and the BOPU for further exploration work given remaining budget. Obtained downhole video surveys of test wells. Obtained water levels on all Casper Aquifer wells on the ranch on May 25, 2011. |
| 10/2011 | Weston completed restoration of the test well sites. |

Table 2.1 Stratigraphic Column

| System | Geologic Unit | Symbol ¹ | Thickness (ft) ² | Lithologic Description ³ | Hydrogeologic Character ³ | Remarks |
|------------|-----------------------|---------------------|-----------------------------|---|--|--|
| Quaternary | Alluvium | Qa | 0-27 | lenticular beds in drainages that consist of dark brown, black silty sand and black, red, white sandy gravel; sand is loose; coarse gravel | Minor Aquifer | Areal extent limited to major drainages. |
| Tertiary | Ogallala Formation | To | 0-131 | red, black, white, pink, and yellow conglomerate and sandstone; conglomerate is arkosic, calcite or silica cemented; sandstone is medium grained, quartz and granitic in composition | Major Aquifer | Predominant geologic cover of post-Casper Formation bedrock at Belvoir Ranch. |
| | White River Formation | Twr | 0-315 | tan and pinkish brown siltstone and clayey siltstone with thin interbedded yellow, white, and orange sandstone; siltstone contains very fine grained quartz sand, clayey beds are sticky; sandstone composed of fine to medium grained quartz sand, possibly iron cemented, goethite coatings | Aquitard with discontinuous major Aquifers | Outcrops at Belvoir Ranch, but subcrop is discontinuous. |
| Cretaceous | Pierre Shale | Kp | 4,430+ | dark gray shale with thin to moderately thick, sometimes persistent sandstone beds | Major Aquitard | No outcrop on Belvoir Ranch. |
| | Niobrara Formation | Kn | 340 | black or gray calcareous shale, and light colored limestone and chalk | Aquitard | No outcrop on Belvoir Ranch. |
| | Frontier Formation | Kf | 575 | dark gray to black shale with interbedded thin, lenticular, tan to gray sandstone and thin bentonite beds | Aquitard with minor discontinuous Aquifers | No outcrop on Belvoir Ranch. |
| | Mowry Shale | Kmr | 80 | dark gray to black siliceous shale, weathers silver gray, contains bentonite beds and fish scales | Aquitard | No outcrop on Belvoir Ranch. |
| | Newcastle Sandstone | Knc | 40 | tan to gray sandstone, crossbedded, fine to coarse grained | Minor Aquifer | Limited outcrop in Section 30 of T13N, R69W. With Skull Creek and Cloverly, correlates to Dakota Group in northern Colorado. |
| | Skull Creek Shale | Ksc | 140 | dark gray to black fissile shale with thin bentonite and sandstone, ironstone concretions | Aquitard | Poor outcrop at Belvoir Ranch. |
| | Cloverly Formation | Kcv | 110 | light gray sandstone and dark red, yellow, light gray shale; sandstone is fine to medium grained, well sorted, quartz, well cemented with silica, fractured, trace hydrocarbon staining; shale is variegated, dry, soft, with fine grained sand intermixed | Minor Aquifer | Limited outcrop in Section 30 of T13N, R69W. |

Table 2.1 Stratigraphic Column

| System | Geologic Unit | Symbol ¹ | Thickness (ft) ² | Lithologic Description ³ | Hydrogeologic Character ³ | Remarks |
|------------------|---------------------|---------------------|-----------------------------|---|--|--|
| Jurassic | Morrison Formation | Jm | 270 | dark gray shale and greenish gray sandy shale with minor light gray silty sandstone; shale is variegated (red, yellow, greenish gray, light green, purple), well consolidated, waxy, with a few thin limestone and red sandstone interbeds | Aquitard | No outcrop on Belvoir Ranch. |
| | Sundance Formation | Js | 140 | tan sandstone and silty sandstone; calcite cemented, well sorted, fine to very fine grained, 98% quartz, subrounded, iron stained; silty in some beds and slightly carbonaceous with gray sandstone or sandy shale near base | Minor Aquifer | No outcrop on Belvoir Ranch. |
| Triassic | Chugwater Formation | Trc | 540 | dark red and reddish orange sandy siltstone, siltstone, shale, and clayey siltstone; non to very calcareous; contains light gray iron reduction spots or thin gray siltstone beds; ferruginous; gypsum intermixed or lining fractures; sticky; sand is fine to very fine grained | Aquitard with discontinuous minor Aquifers | No outcrop on Belvoir Ranch. With Goose Egg Formation, correlative with Lykins Formation in northern Colorado. |
| Triassic Permian | Goose Egg Formation | TrPg | 270 | dark red silty shale, siltstone, and clayey siltstone interbedded with dark gray dolomite, tan limestone, and anhydrite; non to very calcareous, very fine grained sand intermixed, gypsum, and iron reduction spots; dolomites are crystalline in texture, vuggy, and often associated with gypsum or anhydrite; Forelle Member is a marker bed and consists of interbedded limestone, dolomite, siltstone, gypsum, and/or anhydrite beds. | Aquitard | No outcrop on Belvoir Ranch. |
| Permian | Satanka Formation | Ps | 340 | dark red and maroon sandy siltstone, shale, and sandstone; indurated siltstone with fine grained sand and sandstone interbeds, thin anhydrite and dolomite beds, iron reduction spots; non to slightly calcareous; ferruginous; gypsum; thin reddish orange well sorted quartz sandstone interbeds | Aquiclude | Limited outcrop in Sec. 30, T13N, R69W. Correlative with Owl Canyon Formation of northern Colorado. |

Table 2.1 Stratigraphic Column

| System | Geologic Unit | Symbol ¹ | Thickness (ft) ² | Lithologic Description ³ | Hydrogeologic Character ³ | Remarks |
|--|------------------|---------------------|-----------------------------|--|--|--|
| Permian Pennsylvanian | Casper Formation | PIPcf | 895 | <p>Upper part consists of light gray, white, and pinkish gray dolomitic limestone, and light red sandstone interbedded with limestone, sandy limestone, and minor siltstone beds; dolomitic limestone is crystalline, vuggy, manganese dendrites, calcite lined fracture surfaces; sandstone consists of fine to very fine grained subrounded to subangular quartz sand that is calcite cemented and well sorted, silica cemented beds, iron rich, fractured. Thickness of upper unit varies from 198 to 895 feet.</p> <p>Lower part consists of dark reddish brown siltstone and sandstone with sandy limestone; siltstone contains fine to very fine grained sand, ferruginous, light gray iron reduction spots or beds; sandstone consists of fine to medium grained quartz sand that is angular to subangular, moderately sorted, calcite cemented; interfingers with upper portion and pinches out to the north. Thickness of lower unit varies from 100 to 725 feet.</p> | Major Aquifer. Yields up to 700 gpm to wells completed on Belvoir Ranch, and up to 875 gpm to Granite Springs. | Upper and lower portions correlative with Ingleside and Fountain Formations, respectively, in northern Colorado. |
| Precambrian | Sherman Granite | Ys, Xsv | Unknown | Pink to orange, medium to coarse grained, biotite hornblende granite, syenogranite, quartz monzonite, and granodiorite with metasedimentary and metavolcanic rocks including schist, felsic gneiss, granite gneiss, and layered amphibolites. | Minor Aquifer | Only encountered in one borehole drilled to date at Belvoir Ranch. |
| <p>Notes: ¹ – Symbols used either on geologic maps or cross sections included with this report.</p> <p>² – Thickness shown is considered to be the average of measurements mapped in the local area. Along with test well data, these were used to prepare geologic cross sections at Belvoir Ranch. Thicknesses observed in the test wells reflect nonhorizontal bedding conditions, as well as varying unit thicknesses across the site.</p> <p>³ – In addition to data obtained during this study, this table was compiled from the following references: Brady, 1949; Chronic, 1955; Courtright and Braddock, 1989; Houston and Marlatt, 1997; Libra and others, 1981; Lidstone and Associates, 2008; Lowry and Crist, 1967; McGookey, 1952; States West Water Resources Corporation, 2006; Swenson, 1980; Ver Ploeg and Boyd, 2007; and Wyoming Oil and Gas Conservation Commission, 2010.</p> | | | | | | |

Table 2.2
Prospective Casper Aquifer Test Well Drilling Sites, December 2009

| | | | | | | | | | | | | | | | | | |
|---|------------------------------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|
| Prospect Name | | Lone Tree 5-4 | | Lone Tree 5-2 | | Lone Tree Fault 1-2 | | Lone Tree Fault 1-4 | | Goose Creek 2-2 | | Goose Creek 2-3 | | Duck Creek 3-1 | | Duck Creek 3-3 | |
| Location (T, R, & Section) | | T13N, R69W, Sec. 16NWSW | | T13N, R69W, Sec. 17NESE | | T13N, R69W, Sec. 30NENW | | T13N, R69W, Sec. 19SESE | | T13N, R69W, Sec. 30SESE | | T13N, R69W, Sec. 29SWSW | | T13N, R69W, Sec. 31SWNE | | T13N, R69W, Sec. 31SESE | |
| Location (Latitude, Longitude) | | 41.095398; -105.134891 | | 41.095266; -105.139951 | | 41.072592; -105.164142 | | 41.075106; -105.157503 | | 41.062557; -105.158069 | | 41.062162; -105.153037 | | 41.054088; -105.161585 | | 41.048293; -105.157356 | |
| Resistivity Station | | 975 | | 550 | | 650 | | 1275 | | 1375 | | 1800 | | 1525 | | 775 | |
| Surface Elevation (Ft. AMSL) | | 7060 | | 7075 | | 7350 | | 7335 | | 7195 | | 7200 | | 7295 | | 7285 | |
| Structural Compartment | | Lone Tree | | Lone Tree | | Lone Tree/Duck Creek | | Lone Tree | | Duck Creek | | Duck Creek | | Duck Creek | | Duck Creek | |
| GEOLOGIC RANKING CRITERIA | Rating (R)Relative Importance (RI) | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI |
| Structural Permeability Enhancement | 1, 3, 51 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| Geophysical Seismic Signature (bright spot) | 1, 3, 51 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 |
| Geophysical Resistivity Signature (low) | 1, 3, 51 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 1 |
| Depth to Water | 1-32 | 1 | 2 | 1 | 2 | 3 | 6 | 2 | 4 | 2 | 4 | 2 | 4 | 3 | 6 | 3 | 6 |
| Depth to Top of Casper | 1-32 | 2 | 4 | 1 | 2 | 2 | 4 | 2 | 4 | 1 | 2 | 3 | 6 | 1 | 2 | 1 | 2 |
| Anticipated Drilling Depth through Casper Formation | 1-33 | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 3 | 9 | 1 | 3 | 1 | 3 |
| Hydrologic Sustainability, recharge | 1-31 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cumulative Rating | | 8 | | 9 | | 14 | | 11 | | 13 | | 13 | | 14 | | 14 | |
| Hydrogeologic/Geophysical Rating | | 3 | | 5 | | 7 | | 5 | | 7 | | 3 | | 7 | | 7 | |
| DRILLING PRIORITIZATION | | | | | | 4A | | 3 | | 2A | | 2B | | 1 | | 4B | |
| Weighted ranking system = sum(R*RI) | | | | | | | | | | | | | | | | | |
| QUALITATIVE SCORE | | Score = 13 | | Score = 13 | | Score = 21 | | Score = 17 | | Score = 18 | | Score = 24 | | Score = 20 | | Score = 20 | |
| | | | | | | | | | | | | | | | | | |
| COST RANKING CRITERIA | Units | Units | Amount | Units | Amount | Units | Amount | Units | | Units | Amount | Units | Amount | Units | Amount | Units | Amount |
| Capital costs for test well drilling ¹ | \$ | \$ | \$342,400 | \$ | \$270,400 | \$ | \$299,200 | \$ | \$326,400 | \$ | \$262,400 | \$ | \$500,000 | \$ | \$260,000 | \$ | \$220,000 |
| Capital costs for production well drilling ² | \$ | \$ | \$535,000 | \$ | \$422,500 | \$ | \$467,500 | \$ | \$510,000 | \$ | \$410,000 | \$ | \$781,250 | \$ | \$406,250 | \$ | \$343,750 |
| Estimated test well/production well completion depth | Ft | Ft | 2,140 | Ft | 1,690 | Ft | 1,870 | Ft | 2,040 | Ft | 1,640 | Ft | 3,125 | Ft | 1,625 | Ft | 1,375 |
| Estimated per well production rate | GPM | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 |

Lower rating for better alternative: 1=Best, 5=Worst

Relative Importance: 1=Most, 5=Least

Maximum Score= 55
Minimum Score = 11

Notes: ¹Estimated test well drilling costs (\$160/ft) include 6 3/4" diameter hole through Casper Formation, geophysics, well development, and aquifer testing. Based on recent 2,800' Wamsutter No. 9 bid (8.625" Casing, May 2009).

²Estimated production well drilling costs (\$250/ft) include 9 7/8" diameter hole through Casper Formation, geophysics, well development, and aquifer testing. Based on recent 2,400' Bighorn Regional bid (10.75" casing; October 2009).

Estimated costs are for drilling contractor only and do not include any associated engineering expenses.

Table 3.1
Summary of Casper Aquifer Test Wells on Belvoir Ranch

| Permit No. ¹ | Well Name | Well Location (T, R, Sect.) ² | Line/CSAMT Station ³ | Surface Elevation (ft) ⁴ | Well Casing Stickup (ft) ⁵ | Well Depth (ft) | Anticipated Depth to Casper Fm. Top - Geologic (ft) | Anticipated Depth to Casper Fm. Top - Geophysical (ft) | Actual Depth to Casper Formation Top (ft) ⁶ | Top of Casper Formation Elevation (ft) ⁷ | Casper Formation Thickness (ft) ⁸ | Upper Casper Formation Thickness (ft) | Lower Casper Formation Thickness (ft) ⁹ | Depth to Water (ft) ¹⁰ | Date/Time DTW Measured ¹⁰ | Casper Aquifer Water Level Elevation (ft) ¹⁰ | Well Yield (gpm) ¹¹ |
|-------------------------|---------------------|--|---------------------------------|-------------------------------------|---------------------------------------|-----------------|---|--|--|---|--|---------------------------------------|--|-----------------------------------|--------------------------------------|---|--------------------------------|
| P168921W | Lone Tree No. 1 | T13N, R69W, Sect. 17 SWNE | -- | 7105 | 2.55 | 1348 | -- | -- | 382 | 6723 | 961 | 848 | 113 | 64.00 | 5/25/11; 18:30 | 7044 | 600 |
| P168918W | Duck Creek No. 1 | T13N, R69W, Sect. 31 NWSW | -- | 7197 | 2.25 | 1130 | -- | -- | 50 | 7147 | 1080+ | 890 | 190+ | 222.76 | 5/25/11; 17:43 | 6976 | 24 |
| P191981W | Duck Creek 3-1 | T13N, R69W, Sect. 31 SWNE | 3/1525 | 7296 | 2.42 | 3178 | 650-800 | 525 | 1492 | 5804 | 1686+ | 1188 | 498+ | 412.33 | 5/25/11; 17:29 | 6886 | 200 |
| P191987W | Lone Tree Fault 1-2 | T13N, R69W, Sect. 30 NENW | 1/650 | 7349 | 1.76 | 2042 | 2456 | 1546 | 1085 | 6264 | 957+ | 765 | 192+ | 337.14 | 5/25/11; 16:01 | 7014 | 30 |
| P191983W | Goose Creek 2-2C | T13N, R69W, Sect. 30 SESE | 2/1275 | 7189 | 1.70 | 2764 | 2053 | 1030 | 1849 | 5340 | 915+ | 784 | 131+ | 245.00 | 5/25/11; 17:16 | 6946 | 100 |
| P193944W | Lone Tree Fault 1-5 | T13N, R69W, Sect. 20 SWSW | 1/1875 | 7272 | 1.40 | 2441 | 1020 | 570 | 1615 | 5657 | 826+ | 721 | 105+ | 210.59 | 5/25/11; 15:47 | 7063 | 75 |

Notes:
1 - Permit number on file with the Wyoming State Engineer's Office.
2 - Well locations shown on Figure 2.1, relative to geophysical line locations.
3 - Line and CSAMT station number from original Zonge 2009 geophysical data collection. Line and station locations shown on Figure 2.1 and in Appendix C. -- Symbol indicates site located off geophysical line.
4 - Surface elevation estimated from Cheyenne Board of Public Utilities five foot contour interval data for Belvoir Ranch. Elevation above mean sea level.
5 - Height of casing sticking above ground level.
6 - Depth to top of the upper part of the Casper Formation.
7 - Elevation calculated from unsurveyed surface elevation at respective wellhead and depth to Casper Formation top. Used to prepare Casper Formation structure contour map shown on Figure 6.1.
8 - + indicates Casper Formation was not fully penetrated, and is therefore thicker than this number shown due to changing formation thicknesses, bedding attitudes, or both.
9 - + indicates lower portion of the Casper Formation was not fully penetrated, and is therefore thicker than this number shown.
10 - These data were used along with stream sinks and Granite Springs to prepare the Casper Aquifer potentiometric surface map shown on Figure 6.6.
11 - Well yield based either on aquifer testing or airlift development of well.
In addition to data obtained during this investigation, this table was compiled from data contained in Lidstone and Associates, 2008, and States West Water Resources Corporation, 2006.

Table 4.1 Casper Aquifer Test Well Stepped Rate Test Summaries, Belvoir Ranch

| Date | Discharge (gpm) | Depth to Water (ft) ¹ | Drawdown (ft) ² | Sc (gpm/ft) ³ | pH | Electrical Conductivity (μS/cm) | Temperature (°C) |
|--|-----------------|----------------------------------|----------------------------|--------------------------|------|---------------------------------|------------------|
| Lone Tree No. 1 | | | | | | | |
| 3/1/2006 | 99 | 110.02 | 1.72 | 58.1 | 8.22 | 270 | 10.3 |
| 3/1/2006 | 200 | 111.95 | 3.65 | 54.7 | 7.86 | 271 | 10.2 |
| 3/1/2006 | 300 | 113.80 | 5.50 | 54.5 | 7.95 | 264 | 10.2 |
| 3/1/2006 | 400 | 116.12 | 7.82 | 51.1 | 7.95 | 266 | 9.3 |
| 3/1/2006 | 500 | 119.03 | 10.73 | 46.6 | 7.95 | 270 | 9.3 |
| 3/1/2006 | 600 | 122.43 | 14.13 | 42.5 | 7.96 | 267 | 9.1 |
| 3/1/2006 | 663 | 124.56 | 16.26 | 40.8 | 7.92 | 268 | 8.9 |
| 5/31/2007 | 411 | 116.90 | 24.85 | 16.5 | -- | -- | -- |
| 5/31/2007 | 504 | 127.70 | 35.65 | 14.1 | -- | -- | -- |
| 5/31/2007 | 600 | 141.50 | 49.45 | 12.1 | -- | -- | -- |
| 5/31/2007 | 702 | 159.23 | 67.18 | 10.4 | -- | -- | -- |
| Duck Creek 3-1 | | | | | | | |
| 8/21/2010 | 75 | 469.86 | 51.06 | 1.47 | 7.3 | -- | 20 |
| 8/21/2010 | 150 | 571.69 | 152.89 | 0.98 | 7.8 | -- | 20.0 |
| 8/21/2010 | 225 | 731.84 | 313.04 | 0.72 | 7.8 | -- | 20.1 |
| 8/21/2010 | 300 | 914.78 | 495.98 | 0.60 | 7.8 | -- | 20.3 |
| Goose Creek 2-2C | | | | | | | |
| 3/11/2011 | 100 | 423.33 | 146.67 | 0.68 | 7.78 | 286 | 17 |
| 3/11/2011 | 150 | 552.31 | 275.65 | 0.54 | 7.85 | 261 | 19.8 |
| 3/11/2011 | 200 | 702.95 | 426.29 | 0.47 | 7.85 | 264 | 19.9 |
| 3/11/2011 | 250 | 877.29 | 600.63 | 0.42 | 7.93 | 262 | 20.2 |
| Lone Tree Fault 1-5 | | | | | | | |
| 5/26/2011 | 50 | 406.01 | 196.72 | 0.25 | 8.35 | 223 | 14.8 |
| 5/26/2011 | 100 | 696.83 | 487.54 | 0.21 | 7.80 | 235 | 16.5 |
| 5/26/2011 | 125 | 895.19 | 685.91 | 0.18 | 7.85 | 235 | 16.6 |
| Notes: <ol style="list-style-type: none"> 1. Depth to water represents dynamic water level conditions at the end of each step during the test. 2. Drawdown at the end of each step, generally 60 minutes. 3. Specific capacity for the well at the end of each step. Equal to discharge divided by drawdown. -- Symbol indicates data either not available or not estimated. Both Duck Creek No. 1 and Lone Tree Fault 1-2 were not aquifer tested due to their relatively low yield during well development. In addition to data collected during this study, this table includes data from the following references: States West Water Resources Corporation, 2006; and Lidstone and Associates, Inc., 2008. | | | | | | | |

Table 4.2 Casper Aquifer Test Well Constant Rate Test Summaries, Belvoir Ranch

| Well No. | Date | Discharge ¹ (gpm) | Depth to Water (ft) ² | Cased Depth (ft) ³ | Pump Depth Setting (ft) _A | Drawdown (ft) ⁴ | Sc ⁵ (gpm/ ft) | Transmissivity ⁶ (gpd/ft) | Hydraulic Conductivity ⁶ (gpd/ft ²) | Storage Coefficient ⁶ | Sand Production (ppm) | Design Pumping Rate (gpm) |
|--|---------------|---------------------------------|---|-------------------------------------|--|-------------------------------|---------------------------------|---|--|-------------------------------------|-----------------------------|------------------------------------|
| Lone Tree No. 1 | 3/2-4/2006 | 600 | 108.45 | 387 | 378 | 17.15 | 35.0 | 81,000 | 95.5 | -- | 0.37 | 600 |
| Lone Tree No. 1 | 6/1-7/1/2007 | 600 | 92.05 | 387 | 378 | 71.28 | 8.4 | 43,900 | 51.8 | -- | 0.07 | 600 |
| Duck Creek 3-1 | 8/22-29/2010 | 200 | 418.83 | 1,518.5 | 967 | 437.05 | 0.45 | 860 | 0.72 | 0.00035 | 0.56 | 200 |
| Goose Creek 2-2C | 3/12-19/2011 | 200/100 | 276.66 | 1,873 | 967 | 521.73 | 0.19 | 1,190 | 1.1 | 0.00021 | 0.01 | 100 |
| Lone Tree Fault 1-5 | 5/27-6/3/2011 | 74 | 209.59 | 1,634.5 | 907 | 572.15 | 0.13 | 160 | 0.21 | -- | Trace | -- |
| Notes: <ol style="list-style-type: none"> Discharge for Goose Creek 2-2C test had to reduced from 200 to 100 gpm after 14 hours to avoid drawing the water level down to the pump intake prior to test completion. Depth to water represents static water level conditions at the time of testing. Amount of 8 5/8 inch diameter test well casing, shown relative to depth to water, drawdown, and pump setting depth. Drawdown at the end of each test period (approximately 48 hours, 7 days, or 30 days after the start). Specific capacity for the well at the end of the test period. Equal to discharge divided by drawdown. Hydrogeologic parameters derived from pumping or recovery data for pumping well, or observation well. Hydraulic conductivities based on thickness of upper portion of Casper Formation. Storage coefficients calculated from observation well data. <p>A. Pump settings were the same for both the stepped and constant rate tests.</p> <p>-- Symbol indicates data either not available or not estimated.</p> <p>Both Duck Creek No. 1 and Lone Tree Fault 1-2 were not aquifer tested due to their relatively low yield during well development.</p> <p>In addition to data collected during this study, this table includes data from the following references: States West Water Resources Corporation, 2006; and Lidstone and Associates, Inc., 2008.</p> | | | | | | | | | | | | |

Table 5.1
Casper Aquifer Water Quality Summary

| Analyte | EPA Primary and Secondary Standards ^A | Granite Springs | Lone Tree Creek (At Sink) | Lone Tree No. 1 | Lone Tree Fault 1-2 | Lone Tree Fault 1-5 (Midway) | Lone Tree Fault 1-5 (Final) | Goose Creek (Before Sink) | Goose Creek 2-2C (Midway) | Goose Creek 2-2C (Final) | L-F #1 Well (W. of Quarry) | Duck Creek (Before Sink) | Duck Creek No. 1* | Duck Creek 3-1 (Midway) | Duck Creek 3-1 (Final) |
|------------------------------------|--|-----------------------------------|-----------------------------------|-----------------------------------|--------------------------|------------------------------|-----------------------------|-----------------------------------|---------------------------|--------------------------|-----------------------------|-----------------------------------|-----------------------------------|--------------------------|--------------------------|
| Water Source | -- | Casper Aquifer | Surface Water | Casper Aquifer | Casper Aquifer | Casper Aquifer | Casper Aquifer | Surface Water | Casper Aquifer | Casper Aquifer | Casper Aquifer | Surface Water | Casper Aquifer | Casper Aquifer | Casper Aquifer |
| Location | -- | T13N, R69W, Sec. 8 NWSE | T13N, R69W, Sec. 17 NWSW | T13N, R69W, Sec. 17 SWNE | T13N, R69W, Sec. 30 NENW | T13N, R69W, Sec. 20 SWSW | T13N, R69W, Sec. 20 SWSW | T13N, R70W, Sec. 25 NESE | T13N, R69W, Sec. 30 SESE | T13N, R69W, Sec. 30 SESE | T13N, R70W, Sec. 36 NWSW | T13N, R70W, Sec. 36 NWSW | T13N, R69W Sec. 31 NWSW | T13N, R69W, Sec. 31 SWNE | T13N, R69W, Sec. 31 SWNE |
| Sample Date | -- | 2/4/2006 | 2/4/2006 | 3/3/2006 | 9/28/2010 | 5/31/2011 | 6/2/2011 | 2/17-24/05 | 3/15/2011 | 3/17/2011 | 1938 | 2/17-24/05 | 2/23/2006 | 8/23/2010 | 8/26/2010 |
| Water Temp ¹ | -- | -- | -- | 9.7 | 13.5 | 18.3 | 18.3 | 1.5 | 20.0 | 17.9 | -- | 2 | 10.3 | 20.1 | 20.1 |
| pH ² | 6.5-8.5 | 8.25 | 8.17 | 8.43 | 8.29 | 7.90 | 8.02 | 7.85 | 7.98 | 8.08 | -- | 8.35 | 8.61 | 7.93 | 7.95 |
| Conductivity ³ | -- | 268 | 190 | 247 | 238 | 224 | 223 | 80 | 265 | 267 | -- | 145 | 405 | 299 | 308 |
| Calcium | -- | 39.4 | 26.5 | 37 | 29 | 28 | 28 | 37.95 | 32 | 30 | -- | 49.52 | 55.4 | 35 | 37 |
| Magnesium | -- | 6.5 | 4.1 | 6 | 9 | 10 | 10 | 6.17 | 15 | 13 | -- | 9.95 | 15.8 | 14 | 14 |
| Sodium | -- | 5.7 | 4.8 | 6 | 5 | 5 | 5 | 8.66 | 5 | 5 | 20 | 14.15 | 50.4 | 5.1 | 5.1 |
| Potassium | -- | 1.8 | 1.7 | 2 | 2 | 2 | 2 | 1.37 | 1 | 1 | -- | 3.1 | 2.2 | 1.4 | 1.5 |
| Chloride | 250 | 7 | 5 | 7 | 2 | 2 | 2 | 4.32 | -- | 2 | -- | 4.26 | 8 | 3 | 2 |
| Nitrate | 10 | -- | -- | 0.5 | 0.4 | -- | 0.4 | 0.41 | -- | 0.5 | 1.3 | -- | 0.9 | -- | 0.9 |
| Sulfate | 250 | 18 | 17 | 18 | 7 | 8 | 8 | 19.81 | -- | 7 | 24 | 19.27 | 41 | 6 | 7 |
| Fluoride | 4 | -- | -- | 0.9 | 0.9 | -- | 0.9 | 0.87 | -- | 0.6 | -- | 0.78 | 0.9 | -- | 0.6 |
| Carbonate | -- | <1 | <1 | 2 | <1 | <1 | <1 | -- | <5 | <1 | -- | -- | 5 | <1 | <1 |
| Bicarbonate | -- | 128 | 88 | 117 | 150 | 134 | 135 | -- | 167 | 169 | -- | -- | 200 | 197 | 199 |
| TDS | 500 | 150 | 110 | 144 | 197 | 111 | 143 | -- | 145 | 147 | 280 | -- | 252 | 160 | 173 |
| Alkalinity | -- | -- | -- | 98 | 123 | -- | 111 | -- | -- | 138 | -- | -- | 170 | 161 | 163 |
| Iron Related Bacteria ⁴ | -- | -- | -- | 2300 | -- | 630 | 3200 | -- | 4300 | 8600 | -- | -- | -- | 170 | 10000 |
| Hardness | -- | 125 | 83.1 | 119 | 112 | 111 | 110 | 120 | 142 | 129 | -- | -- | 203 | 145 | 149 |
| Silica | -- | -- | -- | 15 | 15.8 | -- | 15.6 | -- | -- | 14.0 | -- | -- | 15.1 | -- | 15.1 |
| Aluminum, Total | 0.2 | -- | -- | <0.1 | <0.1 | -- | <0.1 | -- | -- | <0.1 | -- | -- | 0.6* | <0.1 | <0.1 |
| Arsenic, Total | 0.01 | -- | -- | <0.005 | 0.002 | -- | 0.002 | -- | -- | 0.003 | -- | -- | 0.003* | 0.002 | 0.002 |
| Barium, Total | 2 | -- | -- | <0.1 | <0.1 | -- | <0.1 | -- | -- | <0.1 | -- | -- | 0.1* | <0.1 | <0.1 |
| Boron, Total | -- | -- | -- | <0.1 | <0.1 | -- | <0.1 | -- | -- | <0.1 | -- | -- | 0.1* | <0.1 | <0.1 |
| Copper, Total | 1.0 | -- | -- | <0.01 | <0.01 | -- | <0.01 | -- | -- | <0.01 | -- | -- | 0.02* | <0.01 | <0.01 |
| Iron, Total | 0.3 | -- | -- | 0.07 | 0.1 | 0.19 | 0.18 | -- | 0.17 | <0.03 | -- | -- | 0.45* | 0.12 | <0.03 |
| Lead, Total | 0.015 | -- | -- | <0.001 | <0.001 | -- | <0.001 | -- | -- | <0.001 | -- | -- | <0.05 | 0.003 | <0.001 |
| Manganese, Total | 0.05 | -- | -- | <0.01 | <0.01 | -- | 0.01 | -- | -- | 0.02 | -- | -- | 0.12* | <0.01 | <0.01 |
| Selenium, Total | 0.05 | -- | -- | <0.005 | <0.001 | -- | <0.001 | -- | -- | 0.001 | -- | -- | 0.002* | <0.001 | <0.001 |
| Thallium, Total | 0.002 | -- | -- | 0.00004 | <0.0004 | -- | <0.0004 | -- | -- | 0.001 | -- | -- | -- | <0.0004 | <0.0004 |
| Uranium, Total | 0.03 | -- | -- | <0.001 | 0.0018 | 0.0013 | 0.0013 | -- | 0.0024 | 0.0026 | -- | -- | 0.0428* | 0.0023 | 0.0021 |
| Zinc, Total | 5 | -- | -- | <0.01 | <0.01 | -- | <0.01 | -- | -- | <0.01 | -- | -- | 0.08* | 0.01 | 0.03 |
| Trichloroethene | 0.005 | -- | -- | <0.0005 | -- | -- | <0.0005 | -- | -- | <0.0005 | -- | -- | -- | -- | <0.0005 |
| Gross Alpha ⁵ | 15 | -- | -- | <3.0 | 3.2 | 0.3 | 2.7 | -- | 1.9 | 1.1 | -- | -- | -- | <1 | <1 |
| Gross Beta ⁵ | 50 | -- | -- | 7.5 | 3.4 | <1 | 1.6 | -- | 1.7 | 1.8 | -- | -- | -- | 0.9 | 0.6 |
| Radium 226 ⁵ | -- | -- | -- | <0.2 | 0.2 | 0.09 | 0.08 | -- | 0.36 | 0.5 | -- | -- | 0.5 | 0.2 | 0.09 |
| Radium 226+228 ⁵ | 5 | -- | -- | <1.0 | 2.3 | 0.6 | 2.0 | -- | -- | 0.3 | -- | -- | -- | 0.1 | 0.3 |
| Source | -- | States West Water Resources, 2006 | States West Water Resources, 2006 | States West Water Resources, 2006 | This Study | This Study | This Study | States West Water Resources, 2006 | This Study | This Study | Richter and Hunttoon (1982) | States West Water Resources, 2006 | States West Water Resources, 2006 | This Study | This Study |

Notes:
^A Primary standards shown in bold
Bold and italicized results indicate results exceeds EPA primary standard.
Results listed in mg/l unless noted otherwise.
-- Indicates not applicable or no analytical data available.
< Symbol indicates analyte concentration was below laboratory method detection limit shown.
1 - Temperature in degrees centigrade.
2 - pH reported in standard units.
3 - Conductivity reported in uS/cm.
4 - Reported in terms of CFU/ml.
5 - Reported in terms of pCi/L.
*Sample collected during initial development, metals concentrations reflect acidification of formation material.

Table 6.1
Potential Casper Aquifer Well Sites, December 2011

| Well Name ¹ | Well Location (T, R, Sect.) | Line/CSAMT Station ² | Surface Elevation (Ft. AMSL) ³ | Zonge Casper Formation Top Elevation (ft) ⁴ | LA Casper Formation Top Elevation (ft) ⁵ | Depth to LA Casper Formation Top (ft) ⁵ | Cased Well Depth (ft) ⁶ | Estimated Well Completion Depth (ft) ⁷ | Casper Aquifer Water Elevation (Ft. AMSL) ⁸ | Depth to Water (ft) ⁸ | Anticipated Yield (gpm) ⁹ | Estimated Cost ¹⁰ | Remarks |
|------------------------|-----------------------------|---------------------------------|---|--|---|--|------------------------------------|---|--|----------------------------------|--------------------------------------|------------------------------|----------------------------------|
| Production Wells | | | | | | | | | | | | | |
| LTC 1 | T13N, R69W, Sect. 17 SWNE | -- | 7100 | -- | 6720 | 380 | 400 | 1280 | 7044 | 56 | 500 | \$532,000 | Offset from Lone Tree No. 1 well |
| LTC 2 (5-2) | T13N, R69W, Sect. 17 NESE | 5/550 | 7075 | 6600 | 6490 | 585 | 605 | 1485 | 7040 | 35 | 500 | \$588,375 | |
| LTC 3 (5-4) | T13N, R69W, Sect. 16 NWSW | 5/975 | 7060 | 5800 | 5200 | 1860 | 1880 | 2760 | 7000 | 60 | 500 | \$939,000 | |
| LTC 4 | T13N, R69W, Sect. 17 NESW | -- | 7140 | -- | 6720 | 420 | 440 | 1320 | 7075 | 65 | 500 | \$543,000 | |
| LTC 5 | T13N, R69W, Sect. 17 SESE | -- | 7185 | -- | 6000 | 1185 | 1205 | 2085 | 7040 | 145 | 500 | \$753,375 | |
| LTC 6 | T13N, R69W, Sect. 20 NWNW | -- | 7300 | -- | 6600 | 700 | 720 | 1600 | 7110 | 190 | 400 | \$620,000 | Production may diminish to south |
| LTC 7 | T13N, R69W, Sect. 20 NWNE | -- | 7255 | -- | 5900 | 1355 | 1375 | 2255 | 7060 | 195 | 400 | \$800,125 | Production may diminish to south |
| DC 1 | T13N, R69W, Sect. 31 SWNE | 3/1400 | 7310 | 5900 | 5800 | 1510 | 1530 | 2410 | 6870 | 440 | 200 | \$842,750 | Offset from Duck Creek 3-1 well |
| DC 2 (3-2) | T13N, R69W, Sect. 31 NESE | 3/1125 | 7300 | 6000 | 5000 | 2300 | 2320 | 3200 | 6850 | 450 | 200 | \$1,060,000 | |
| DC 3 (3-3) | T13N, R69W, Sect. 31 SESE | 3/775 | 7285 | 6100 | 4500 | 2785 | 2805 | 3685 | 6815 | 470 | 200 | \$1,193,375 | |
| DC 4 (3-4) | T12N, R69W, Sect. 6 NENE | 3/325 | 7220 | 6400 | 4250 | 2970 | 2990 | 3870 | 6800 | 420 | 200 | \$1,244,250 | |
| DC 5 | T13N, R69W, Sect. 31 SWSE | -- | 7170 | -- | 6500 | 670 | 690 | 1570 | 6880 | 290 | 200 | \$611,750 | |
| DC 6 | T12N, R69W, Sect. 6 NENW | -- | 7225 | -- | 6200 | 1025 | 1045 | 1925 | 6900 | 325 | 200 | \$709,375 | |
| Exploratory Wells | | | | | | | | | | | | | |
| PE 1 (1-4) | T13N, R69W, Sect. 19 SESE | 1/1275 | 7335 | 5500 | 5800 | 1535 | 1555 | 2435 | 7050 | 285 | 100+ | \$438,300 | |
| PE 2 (1-6) | T13N, R69W, Sect. 20 SWSW | 1/1925 | 7275 | 6250 | 5650 | 1625 | 1645 | 2525 | 7060 | 215 | 100+ | \$454,500 | Offset from Lone Tree Fault 1-5 |
| PE 3 (2-1) | T13N, R69W, Sect. 30 SESW | 2/675 | 7230 | 6600 | 6100 | 1130 | 1150 | 2030 | 6975 | 255 | 100+ | \$365,400 | |
| PE 4 (2-3) | T13N, R69W, Sect. 29 SWSW | 2/1800 | 7200 | 3400 | 4550 | 2650 | 2670 | 3550 | 6925 | 275 | 100+ | \$639,000 | |
| PE 5 (2-5) | T13N, R69W, Sect. 29 SWSW | 2/2125 | 7235 | 3100 | 4000 | 3235 | 3255 | 4135 | 6900 | 335 | 100+ | \$744,300 | |
| PE 6 (4-2) | T12N, R69W, Sect. 7 SENW | 4/1950 | 7285 | 6050 | 5000 | 2285 | 2305 | 3185 | 7050 | 235 | 50? | \$573,300 | |

- Notes:
- 1 - Well name corresponds to that shown on Figure 6.8.
- 2 - Line and CSAMT station number from original Zonge 2009 geophysical data collection. Line and station locations shown on Figure 2.1 and Appendix B, respectively. -- Symbol indicates site located off geophysical line.
- 3 - Surface elevation estimated from Cheyenne Board of Public Utilities five foot contour interval data for Belvoir Ranch.
- 4 - Casper Formation top estimated from post Lone Tree Fault 1-5 geophysical cross sections from Appendix B.
- 5 - Depth estimate based on LA's cross sectional analysis and structure contour mapping. Drilling depths could be shallower or deeper if Zonge interpretation is more accurate.
- 6 - Depth to be cased to seal off overlying formations from the Casper Aquifer, assumed to be 20 feet below the Casper Formation top.
- 7 - Depth reflects completion through the upper part of the Casper Formation, which is approximately 900 feet thick on average based on test wells drilled to date. Wells may be terminated either in lower portion of the Casper Formation or underlying Precambrian rocks.
- 8 - Depths to water based on 5/25/11 water level data measurements and potentiometric surface mapping shown on Figure 6.6.
- 9 - Individual well yields based on historic aquifer yields in the area, queried where uncertain.
- 10 - Costs, in 2012 dollars, based on the following for either production or exploratory wells:
- Production wells completed with 10 3/4 inch diameter production casing, and six inch pipe or rod based well screen through the Casper Formation with gravel pack. Cost per foot = \$275/ft + \$180,000 for screen and gravel pack.
- Costs include well drilling, well completion, downhole geophysical logging, well development, and aquifer testing. Completions could be telescoped on deeper wells to potentially reduce costs. Does not include construction observation or design/permitting fees.
- Exploratory wells completed with 8 5/8 inch diameter casing, 7 7/8 inch open borehole through the Casper Formation. Cost per foot = \$180/ft, based on March 2010 bid tab for this project.
- Costs include well drilling, well completion, downhole geophysical logging, well development, and aquifer testing. Does not include construction observation or design/permitting fees.

Table 7.1 Well Field Composite Yields for Pipeline Capacity

| Well Field or Potential Expansion Area | Individual Well Field Composite Yield -Total (gpm) ¹ | Estimated Total Flow From Well Fields (gpm) ² | Pipeline Capacity (gpm) ³ |
|---|---|--|--------------------------------------|
| Spottlewood Creek | 200 | 200 | 500 |
| Duck Creek | 900 | 1,100 | 1,000 |
| Goose Creek | 400 | 1,500 | 1,500 |
| Lone Tree Creek | 3,100 | 4,600 | 3,750 |
| Notes: <ol style="list-style-type: none"> 1. Anticipated discharge rate of developed groundwater by potential well field. 2. Anticipated aggregate well field yield coming north along the pipeline route. 3. Discharge rate the conceptual pipeline can accommodate. | | | |

Table 7.2 Pipeline Costs Used for Estimates

| PVC Pipeline Size | Cost per Linear Foot Installed |
|-------------------|--------------------------------|
| 8 inch | \$66 |
| 10 inch | \$72 |
| 12 inch | \$83 |
| 16 inch | \$100 |
| 24 inch | \$140 |

Table 7.3 Phase 1A – Lone Tree Creek Well Field Exploration Costs

| Item | Unit | Estimated Quantity | Unit Price | Cost |
|---|----------|--------------------|------------|--------------------|
| Surface Geophysics¹ | | | | |
| Data Compilation | Lump Sum | 1 | \$25,000 | \$25,000 |
| Mob/Demob | Lump Sum | 1 | \$25,000 | \$25,000 |
| Seismic Reflection | Mile | 8.6 | \$11,500 | \$98,900 |
| CSAMT Survey | Mile | 8.6 | \$6,000 | \$51,600 |
| Reporting | Lump Sum | 1 | \$10,000 | \$10,000 |
| Wells² | | | | |
| LTC 1 | Feet | 1,280 | \$275 | \$352,000 |
| LTC 2 (5-2) | Feet | 1,485 | \$275 | \$408,375 |
| LTC 3 (5-4) | Feet | 2,760 | \$275 | \$759,000 |
| LTC 4 | Feet | 1,320 | \$275 | \$363,000 |
| LTC 5 | Feet | 2,085 | \$275 | \$573,375 |
| LTC 6 | Feet | 1,600 | \$275 | \$440,000 |
| LTC 7 | Feet | 2,255 | \$275 | \$620,125 |
| PE 1 (1-4) | Feet | 2,435 | \$275 | \$669,625 |
| PE 2 (1-6) | Feet | 2,525 | \$275 | \$694,375 |
| Subtotal 1 | | | | \$5,090,375 |
| Engineering @ 10% of Subtotal 1 | | | | \$509,038 |
| Subtotal 2 | | | | \$5,599,413 |
| Contingency @ 15% of Subtotal 2 | | | | \$839,912 |
| Total Construction Costs | | | | \$6,439,324 |
| Hydrogeology/Well Design | | | | \$10,000 |
| Permitting | | | | \$9,000 |
| Final Plans and Specifications | | | | \$20,000 |
| Reporting | | | | \$25,000 |
| Total Costs | | | | \$6,503,324 |
| Note: Costs are based on 2012 dollars. <ol style="list-style-type: none"> 1. Includes 2D seismic reflection and CSAMT resistivity surveying. 2. Cost does not include screen and gravel pack. Open hole completions. | | | | |

Table 7.4 Phase 1B – Lone Tree Creek Well Field Exploration Costs

| Item | Unit | Estimated Quantity | Unit Price | Cost |
|---|----------|--------------------|------------|---------------------|
| Wells¹ | | | | |
| LTC 1 | Well | 1 | \$180,000 | \$180,000 |
| LTC 2 (5-2) | Well | 1 | \$180,000 | \$180,000 |
| LTC 3 (5-4) | Well | 1 | \$180,000 | \$180,000 |
| LTC 4 | Well | 1 | \$180,000 | \$180,000 |
| LTC 5 | Well | 1 | \$180,000 | \$180,000 |
| LTC 6 | Well | 1 | \$180,000 | \$180,000 |
| LTC 7 | Well | 1 | \$180,000 | \$180,000 |
| PE 1 (1-4) | Well | 1 | \$180,000 | \$180,000 |
| PE 2 (1-6) | Well | 1 | \$180,000 | \$180,000 |
| Pumping Equipment | | | | |
| Mobilization | EA | 9 | \$10,000 | \$90,000 |
| Pump and Motor, 500 gpm Pump w/Column Pipe and Pitless Unit | EA | 7 | \$95,000 | \$665,000 |
| Pump and Motor, 200 gpm Pump w/Column Pipe and Pitless Unit | EA | 2 | \$100,000 | \$200,000 |
| Well Building and Piping | EA | 9 | \$37,500 | \$337,500 |
| Electrical Components, VFD and Telemetry, and SCADA | EA | 9 | \$110,000 | \$990,000 |
| Miscellaneous Costs/Testing | EA | 9 | \$10,000 | \$90,000 |
| Well Field Transmission Pipeline System | | | | |
| Transmission Main; 24 inch | LF | 2,000 | \$140 | \$280,000 |
| Transmission Main; 16 inch | LF | 12,500 | \$100 | \$1,250,000 |
| Well Field Pipe; 8 inch | LF | 5,000 | \$66 | \$330,000 |
| Powerline | | | | |
| Primary Line | Miles | 2.1 | \$75,000 | \$157,500 |
| Secondary Line | Miles | 1 | \$50,000 | \$50,000 |
| Access Roads | | | | |
| Main Access Route to the Well Field | Lump Sum | 2.1 | \$210,000 | \$210,000 |
| Primary Road | Miles | 2.25 | \$75,000 | \$168,750 |
| Secondary Road | Miles | 1.25 | \$40,000 | \$50,000 |
| Transmission Main Pipeline | | | | |
| Transmission Main from Lone Tree Creek to Eastern Belvoir Ranch Junction; 24 inch | LF | 43,000 | \$140 | \$6,020,000 |
| Subtotal 1 | | | | \$12,508,750 |
| Engineering @ 10% of Subtotal 1 | | | | \$1,250,875 |
| Subtotal 2 | | | | \$13,759,625 |
| Contingency @ 15% of Subtotal 2 | | | | \$2,063,945 |
| Total Construction Costs | | | | \$15,823,570 |
| Surveying | | | | \$60,000 |
| Geotechnical | | | | \$40,000 |
| Legal Costs | | | | \$15,000 |
| Easements | | | | \$20,000 |
| Permitting | | | | \$50,000 |
| Final Plans and Specifications | | | | \$250,000 |
| Total Costs | | | | \$16,258,570 |
| Note: Costs are based on 2012 dollars. | | | | |
| 1. Includes costs to complete production wells with screen and gravel pack. | | | | |

Table 7.5 Phase 2A – Duck Creek Well Field Exploration Costs

| Item | Unit | Estimated Quantity | Unit Price | Cost |
|---|----------|--------------------|------------|--------------------|
| Surface Geophysics¹ | | | | |
| Data Compilation | Lump Sum | 1 | \$25,000 | \$25,000 |
| Mob/Demob | Lump Sum | 1 | \$25,000 | \$25,000 |
| Seismic Reflection | Mile | 9.1 | \$11,500 | \$104,650 |
| CSAMT Survey | Mile | 9.1 | \$6,000 | \$54,600 |
| Reporting | Lump Sum | 1 | \$10,000 | \$10,000 |
| Wells² | | | | |
| DC 1 | Feet | 2,410 | \$275 | \$662,750 |
| DC 2 (3-2) | Feet | 3,200 | \$275 | \$880,000 |
| DC 3 (3-3) | Feet | 3,685 | \$275 | \$1,013,375 |
| DC 4 (3-4) | Feet | 3,870 | \$275 | \$1,064,250 |
| DC 5 | Feet | 1,570 | \$275 | \$431,750 |
| DC 6 | Feet | 1,925 | \$275 | \$529,375 |
| PE 3 (2-1) | Feet | 2,030 | \$275 | \$558,250 |
| PE 4 (2-3) | Feet | 3,550 | \$275 | \$976,250 |
| PE 5 (2-5) | Feet | 4,135 | \$275 | \$1,137,125 |
| Subtotal 1 | | | | \$7,472,375 |
| Engineering @ 10% of Subtotal 1 | | | | \$747,238 |
| Subtotal 2 | | | | \$8,219,613 |
| Contingency @ 15% of Subtotal 2 | | | | \$1,232,942 |
| Total Construction Costs | | | | \$9,452,554 |
| Hydrogeology/Well Design | | | | \$10,000 |
| Permitting | | | | \$9,000 |
| Final Plans and Specifications | | | | \$20,000 |
| Reporting | | | | \$25,000 |
| Total Costs | | | | \$9,516,554 |
| Note: Costs are based on 2012 dollars. | | | | |
| 1. Includes 2D seismic reflection and CSAMT resistivity surveying. | | | | |
| 2. Cost does not include screen and gravel pack. Open hole completions. | | | | |

Table 7.6 Phase 2B – Duck Creek Well Field Exploration Costs

| Item | Unit | Estimated Quantity | Unit Price | Cost |
|---|-------|--------------------|------------|--------------------|
| Wells¹ | | | | |
| DC 1 | Well | 1 | \$180,000 | \$180,000 |
| DC 2 (3-2) | Well | 1 | \$180,000 | \$180,000 |
| DC 3 (3-3) | Well | 1 | \$180,000 | \$180,000 |
| DC 4 (3-4) | Well | 1 | \$180,000 | \$180,000 |
| DC 5 | Well | 1 | \$180,000 | \$180,000 |
| DC 6 | Well | 1 | \$180,000 | \$180,000 |
| PE 3 (2-1) | Well | 1 | \$180,000 | \$180,000 |
| PE 4 (2-3) | Well | 1 | \$180,000 | \$180,000 |
| PE 5 (2-5) | Well | 1 | \$180,000 | \$180,000 |
| Pumping Equipment | | | | |
| Mobilization | EA | 9 | \$10,000 | \$90,000 |
| Pump and Motor, 200 gpm Pump w/Column Pipe and Pitless Unit | EA | 9 | \$100,000 | \$900,000 |
| Well Building and Piping | EA | 9 | \$30,000 | \$270,000 |
| Electrical Components, VFD and Telemetry, and SCADA | EA | 9 | \$92,000 | \$828,000 |
| Miscellaneous Costs/Testing | EA | 9 | \$10,000 | \$90,000 |
| Well Field Transmission Pipeline System | | | | |
| Transmission Main; 12 inch | LF | 9,500 | \$83 | \$788,500 |
| Transmission Main; 10 inch | LF | 2,750 | \$72 | \$198,000 |
| Well Field Pipe; 8 inch | LF | 6,000 | \$66 | \$396,000 |
| Powerline | | | | |
| Primary Line | Miles | 2.3 | \$75,000 | \$172,500 |
| Secondary Line | Miles | 2.2 | \$50,000 | \$110,000 |
| Access Roads | | | | |
| Primary Road | Miles | 2.5 | \$80,000 | \$200,000 |
| Secondary Road | Miles | 2 | \$40,000 | \$80,000 |
| | | | | |
| Subtotal 1 | | | | \$5,743,000 |
| Engineering @ 10% of Subtotal 1 | | | | \$574,300 |
| Subtotal 2 | | | | \$6,317,300 |
| Contingency @ 15% of Subtotal 2 | | | | \$947,595 |
| Total Construction Costs | | | | \$7,264,895 |
| Surveying | | | | \$35,000 |
| Geotechnical | | | | \$25,000 |
| Legal Costs | | | | \$15,000 |
| Easements | | | | \$20,000 |
| Permitting | | | | \$50,000 |
| Final Plans and Specifications | | | | \$100,000 |
| Total Costs | | | | \$7,509,895 |
| Note: Costs are based on 2012 dollars. | | | | |
| 1. Includes costs to complete production wells with screen and gravel pack. | | | | |

Table 7.7 Belvoir Ranch Well Field Monthly Operation Costs

| | Lone Tree Creek | Duck Creek |
|--|--|--|
| Number of Wells and Capacity | 7 wells = 500 GPM 2 wells = 150 GPM | 6 wells = 250 GPM 3 wells = 150 GPM |
| Monthly Operation Information | | |
| Monthly Water Volume | 164.3 M Gal | 84.3 M Gal |
| Monthly Power Use | 985,000 KW | 591,850 KW |
| Power Cost | | |
| Base Rate | \$18.85 | \$18.85 |
| First 500 KW Hr | \$61.50 | \$61.50 |
| Over 500 KW Hr | \$90,160.00 | \$53,990.20 |
| Total | \$90,240.35 | \$54,070.55 |
| Maintenance | \$5,400.00 | \$5,400.00 |
| Total | \$95,640.35 | \$59,470.55 |
| Wells to be Operated 75% of the Time for 120-day Period | | |
| Monthly Cost | \$71,730.26 | \$44,602.91 |
| Number of Wells | 9 | 9 |
| Seasonal Total | \$286,921 | \$178,412 |
| Total All Wells | | \$465,333 |

Table 7.8 Construction Cost Summary and Financial Analysis

| Item | Well Field | |
|--|----------------------------|------------------------|
| | Lone Tree Creek Well Field | Duck Creek Well Fields |
| Construction Cost | \$21,138,445 | \$14,763,020 |
| 67% WWDC Grant | \$14,099,343 | \$9,846,934 |
| Loan Source | SLIB | SLIB |
| 33% Loan | \$7,039,102 | \$4,916,086 |
| Interest Rate | 2.50% | 2.50% |
| Annual Payment | \$451,538 | \$315,353 |
| Annual O&M Cost | \$286,921 | \$178,412 |
| Total Cost | \$738,459 | \$493,764 |
| Project Cost: Per Tap/Month ¹ | \$.267 | \$1.78 |
| Volume of Water Produced ² (M Gal) | 493 | 253 |
| Project Cost: Per 1,000 Gallons | \$1.49 | \$1.95 |
| Notes: | | |
| 1. Number of users/taps is 23,000. | | |
| 2. For 120-day operation season. Well rotation operation will have each well operating 75% of the time | | |

Table 7.9 Cheyenne BOPU Water Enterprise Fund

| Item # | Explanation | Projection FY 2015 | Projection FY 2016 | Projection FY 2017 | Projection FY 2018 |
|-------------------------------|--------------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Water Expenditures | | | | | |
| a | Debt Service – New | \$715,483 | \$715,483 | \$1,164,583 | \$1,677,783 |
| b | Debt Service – Existing | \$3,532,659 | \$3,321,674 | \$3,210,459 | \$2,962,484 |
| c | Early Retirement of Debt | | | 891,838 | \$737,067 |
| d | Distribution Main Projects | \$1,400,000 | \$1,400,000 | \$2,000,000 | \$2,000,000 |
| e | Well Field Improvements | \$400,000 | \$400,000 | \$400,000 | \$400,000 |
| f | Special Water Projects | \$400,000 | \$400,000 | \$400,000 | \$400,000 |
| g | Other Construction Projects | -- | -- | -- | -- |
| h | Capital Additions/Replacements | \$950,000 | \$950,000 | \$950,000 | \$950,000 |
| i | Operation and Maintenance Expenses | \$10,566,346 | \$10,830,504 | \$11,101,267 | \$11,378,799 |
| Estimated Expenditures | | \$17,964,488 | \$18,017,661 | \$20,118,147 | \$20,506,133 |
| Water Revenue | | | | | |
| j | Water Sales Revenue | \$18,673,856 | \$19,234,071 | \$19,811,094 | \$20,405,426 |
| k | Other Revenue | \$424,890 | \$437,637 | \$450,766 | \$464,289 |
| l | System Development/Pump Station Fees | \$1,337,795 | \$1,377,929 | \$1,419,267 | \$1,461,845 |
| m | Grants/City Transfers | -- | -- | -- | -- |
| Total Water Revenue | | \$20,436,541 | \$21,049,637 | \$21,681,126 | \$22,331,560 |

Appendices

- Appendix A State of Wyoming Approved Permits
- Appendix B Environmental Reporting
- Appendix C Pre-Drilling Geophysical Interpreted Sections, November 2009
- Appendix D Test Well Water Quality Analytical Reports
- Appendix E Post Lone Tree Fault 1-5 Geophysical Reinterpreted Sections, August 2011
- Appendix F Analytically Modeled Theis Drawdowns for Proposed Well Fields
- Appendix G Western Belvoir Ranch Transmission Main

Appendix A

State of Wyoming Approved Permits



Appendix A

Contents

Wyoming State Engineer's Office Test Well Permits

Wyoming Department of Environmental Quality Permit to Construct

Figure 1

Figure 2

Table 1

Attachment

Specs

Wyoming Department of Environmental Quality NYPDES Permit



State Engineer's Office

HERSCHLER BUILDING, 4-E CHEYENNE, WYOMING 82002
(307) 777-7354 FAX (307) 777-5451
<http://seo.state.wy.us>

DAVE FREUDENTHAL
GOVERNOR

PATRICK T. TYRRELL
STATE ENGINEER

JAN 26 2010

January 25, 2010

Wyoming Water Development Commission/City of Cheyenne, Board of Public Utilities
6920 Yellowtail Road
Cheyenne, Wyoming 82002

Dear Applicant or Agent:

You are advised that the State Engineer approved the following application(s) to appropriate ground water for **MONITOR/TEST** on **January 21, 2010**. A copy of each permit is enclosed. Also enclosed are forms and instructions for submitting data to the State Engineer relating to the completion of the well, as required by law.

PERMIT FILE NUMBER

U.W. 191981-191988

WELL LOCATION -SW1/4NE1/4 31-013N-069W

By Statute the well must be completed by -DECEMBER 31, 2011. ***IF THE REQUIRED NOTICES ARE NOT RETURNED TO THIS OFFICE WITHIN THE STATUTORY TIME LIMITS SET FORTH, THE PERMIT(S) WILL BE SUBJECT TO CANCELLATION, WHICH ACTS AS A FORFEITURE OF THE WATER RIGHT GRANTED BY THIS PERMIT.***

An extension of time may be requested for completion of work when good reason is provided. A request for such extension must be received in the State Engineer's Office prior to the expiration date shown on the permit. Requests for extension of time must indicate due diligence on the part of the applicant to comply with the time limits imposed by this permit.

Sincerely,

A handwritten signature in black ink, appearing to read "Lisa Lindemann", is written over a faint, larger signature.

Lisa Lindemann
Ground Water Division

xc: DIV 1 (1)

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

PERMIT NO. U.W. 191981
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Ground Water District

Temporary Filing No. U.W. 41-5-589

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Duck Creek 3-1

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7628/307-637-8460

2. Address of applicant(s) 6920 Yellowtail Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidsone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, Improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SW 1/4 NE 1/4 of Sec. 31, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the Subdivision (or Add'n) of Resurvey Location: Tract, (or Lot)

6. Estimated depth of the well or spring is 1625 ft. Estimated production interval is 525 ft. to 1625 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: If for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

Permit No. U.W. 191981 SEE REVERSE SIDE 1385 Page No. 81

- This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2014 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191981
T.F. No. U.W. 41-5-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

PERMIT NO. U.W. 191982
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

Temporary Filing No. U.W. 41-6-589

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Duck Creek 3-3

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-637-6460

2. Address of applicant(s) 8920 Yellowtail Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Slacy, C/O Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SE 1/4 SE 1/4 of Sec. 31, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the Subdivision (or Add'n) of . Resurvey Location: Tract (or Lot) .

6. Estimated depth of the well or spring is 1375 ft. Estimated production interval is 375 ft. to 1375 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0.
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATION AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191982
T.F. No. U.W. 41-6-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

PATRICK T. TYRRELL
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 417-589

PERMIT NO. U.W. 191983
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Goose Creek 2-2

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-837-6460

2. Address of applicant(s) 6920 Yellowtail Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SE 1/4 SE 1/4 of Sec. 30, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract _____ Block _____ of the _____ Subdivision (or Add'n) of _____. Resurvey Location: Tract _____ (or Lot) _____.

6. Estimated depth of the well or spring is 1640 ft. Estimated production interval is 500 ft. to 1640 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0.
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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Permit No. U.W. 191983 SEE REVERSE SIDE Book No. 1385 Page No. 83

9. If for Irrigation use:
- Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
 - ☐ Land will be irrigated from this well only.
 - ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.
10. If for Irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.: _____
11. The well or spring is to be constructed on lands owned by City of Cheyenne, Wyoming
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)
12. The water is to be used on lands owned by City of Cheyenne, Wyoming
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

Mark Henry
Signature of Applicant or Authorized Agent

12/9 , 20 09
Date

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

| | |
|--|---------|
| DOMESTIC AND/OR STOCK WATERING USES (Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.) | \$50.00 |
| COAL BED METHANE USE | \$50.00 |
| IRRIGATION, MUNICIPAL, INDUSTRIAL, AND MISCELLANEOUS USES | \$75.00 |
| MONITOR (For water level measurements or chemical quality sampling) or TEST WELL USES | No Fee |

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 14th day of December, A.D. 20 09, at 9:33 o'clock A M.

Permit No. U.W. 191983

Berzin R
for State Engineer

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.
FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion must be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 20 11.

~~The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.~~

Witness my hand this 21ST day of January, A.D. 20 10.

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191983
T.F. No. U.W. 41-7-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

PERMIT NO. U.W. 191984
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

Temporary Filing No. U.W. 41-8-589

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Goose Creek 2-3

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-837-6460
2. Address of applicant(s) 6920 Yellowtail Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)
3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SW 1/4 SW 1/4 of Sec. 29, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the Subdivision (or Add'n) of Resurvey Location: Tract, (or Lot) Subdivision

6. Estimated depth of the well or spring is 3125 ft. Estimated production interval is 1940 ft. to 3125 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.
- (b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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9. If for Irrigation use:
a. Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
b. ☐ Land will be irrigated from this well only.
c. ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.

10. If for Irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.: _____

11. The well or spring is to be constructed on lands owned by City of Cheyenne, Wyoming
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)

12. The water is to be used on lands owned by City of Cheyenne, Wyoming
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's
Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be
used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

_____ 12/19, 20 09
Signature of Applicant or Authorized Agent Date

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

| | |
|--|---------|
| DOMESTIC AND/OR STOCK WATERING USES (Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.) | \$50.00 |
| COAL BED METHANE USE | \$50.00 |
| IRRIGATION, MUNICIPAL, INDUSTRIAL, AND MISCELLANEOUS USES | \$75.00 |
| MONITOR (For water level measurements or chemical quality sampling) or TEST WELL USES | No Fee |

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 14th day of December, A.D. 20 09, at 9:33 o'clock A M.

Permit No. U.W. 191984 Blair R. R.
for State Engineer

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.
FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion must be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 20 11.

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 21ST day of January, A.D. 20 10.

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on Decemb 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191984
T.F. No. U.W. 41-8-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 41-9-589

PERMIT NO. U.W. 191985
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Lone Tree 5-2

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-637-6460

2. Address of applicant(s) 6920 Yellowtail Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidsone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, NE 1/4 SE 1/4 of Sec. 17, T. 13 N., R. 89 W. of the 6th P.M. (W.R.M.).
Wyoming. If located in a platted subdivision, also provide Lot/Tract _____ Block _____ of the _____
Subdivision (or Add'n) of _____ Resurvey Location: Tract _____ (or Lot) _____

6. Estimated depth of the well or spring is 1690 ft. Estimated production interval is 560 ft. to 1690 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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Permit No. U.W. 191985 SEE REVERSE SIDE 1385 Page No. 85

9. If for Irrigation use:
a. Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
b. ☐ Land will be irrigated from this well only.
c. ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.
10. If for Irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.: _____
11. The well or spring is to be constructed on lands owned by City of Cheyenne, Wyoming
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)
12. The water is to be used on lands owned by City of Cheyenne, Wyoming
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

[Signature]
Signature of Applicant or Authorized Agent

12/9, 20 09
Date

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

| | |
|--|---------|
| DOMESTIC AND/OR STOCK WATERING USES (Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.) | \$50.00 |
| COAL BED METHANE USE | \$50.00 |
| IRRIGATION, MUNICIPAL, INDUSTRIAL, AND MISCELLANEOUS USES | \$75.00 |
| MONITOR (For water level measurements or chemical quality sampling) or TEST WELL USES | No Fee |

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 14th day of December, A.D. 20 09, at 9:33 o'clock A M.

Permit No. U.W. 191985

[Signature]
for State Engineer

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.

This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion must be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 20 11.

~~The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.~~

Witness my hand this 21st day of January, A.D. 20 10.

[Signature]
PATRICK T. TYRRELL, State Engineer

PERMIT NO. U.W. 191985
T.F. No. U.W. 41-9-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

PERMIT NO. U.W. 191986
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

Temporary Filing No. U.W. 41-10-589

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Lone Tree 5-4

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-637-6460

2. Address of applicant(s) 6920 Yellowwall Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidsone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, NW 1/4 SW 1/4 of Sec. 16, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the Subdivision (or Add'n) of . Resurvey Location: Tract , (or Lot) .

6. Estimated depth of the well or spring is 2140 ft. Estimated production interval is 1200 ft. to 2140 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0.
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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9. If for Irrigation use:
a. Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
b. ☐ Land will be irrigated from this well only.
c. ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.

10. If for Irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.:

11. The well or spring is to be constructed on lands owned by City of Cheyenne, Wyoming
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)

12. The water is to be used on lands owned by City of Cheyenne, Wyoming
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

Shah Henry 12/9, 20 09
Signature of Applicant or Authorized Agent Date

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

| | |
|--|---------|
| DOMESTIC AND/OR STOCK WATERING USES (Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.) | \$50.00 |
| COAL BED METHANE USE | \$50.00 |
| IRRIGATION, MUNICIPAL, INDUSTRIAL, AND MISCELLANEOUS USES | \$75.00 |
| MONITOR (For water level measurements or chemical quality sampling) or TEST WELL USES | No Fee |

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 14th day of December, A.D. 20 09, at 9:33 o'clock A M.

Permit No. U.W. 191986 Bryan R. [Signature]
for State Engineer

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.
FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion must be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 20 11.

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 21st day of January, A.D. 20 10.

[Signature]
PATRICK T. TYRRELL, State Engineer

This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on Decemr 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191986
T.F. No. U.W. 41-10-589

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

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APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 41-1-590

PERMIT NO. U.W. 191987
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Groundwater District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Lone Tree Fault 1-2

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-637-6460

2. Address of applicant(s) 6920 Yellowstone Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidsone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, NE 1/4 NW 1/4 of Sec. 30, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.).
Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the
Subdivision (or Add'n) of Resurvey Location: Tract (or Lot)

6. Estimated depth of the well or spring is 1870 ft. Estimated production interval is 670 ft. to 1870 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.
- (b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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- This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191987
T.F. No. U.W. 41-1-590

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is Domestic and/or Stock Watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 41-2-590

PERMIT NO. U.W. 191988
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Ground Water District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

NAME AND NUMBER OF WELL or SPRING Lone Tree Fault 1-4

1. Name of applicant(s) Wyoming Water Development Commission/ City of Cheyenne, Board of Public Utilities Phone 307-777-7626/307-637-6460

2. Address of applicant(s) 6920 Yellowstone Road, Cheyenne, WY 82002/ 2100 Pioneer Avenue, Cheyenne, WY 82003-1469
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

3. Name & address of agent to receive correspondence and notices Mark Stacy, C/O Lidsone and Associates, Inc.
4025 Automation Way, Bldg. E Fort Collins CO Phone 970-223-4705
(MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied

- ☐ Domestic Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____
- ☐ Stock Watering Normal livestock use at four tanks or less within one mile of well or spring. Stock-watering pipelines and commercial feedlots are a Miscellaneous use. Number of stock tanks? _____
- ☐ Irrigation Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., are Miscellaneous uses).
- ☐ Municipal Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. are Miscellaneous uses. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous Any use of water not defined under previous definitions such as stock-watering pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in REMARKS). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required. ☒ Test Well (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SE 1/4 SE 1/4 of Sec. 19, T. 13 N., R. 69 W. of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract _____ Block _____ of the _____ Subdivision (or Add'n) of _____. Resurvey Location: Tract _____, (or Lot) _____.

6. Estimated depth of the well or spring is 2040 ft. Estimated production interval is 1040 ft. to 2040 ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for Domestic and/or Stock-watering use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0.
Circle appropriate units: (Gallons) (Acre Feet) NOTE: A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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9. If for Irrigation use:
- Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
 - ☐ Land will be irrigated from this well only.
 - ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.

10. If for Irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.:

11. The well or spring is to be constructed on lands owned by City of Cheyenne, Wyoming
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)

12. The water is to be used on lands owned by City of Cheyenne, Wyoming
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

Red Hany Signature of Applicant or Authorized Agent Date 12/9, 20 09

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

| | |
|--|---------|
| DOMESTIC AND/OR STOCK WATERING USES (Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.) | \$50.00 |
| COAL BED METHANE USE | \$50.00 |
| IRRIGATION, MUNICIPAL, INDUSTRIAL, AND MISCELLANEOUS USES | \$75.00 |
| MONITOR (For water level measurements or chemical quality sampling) or TEST WELL USES | No Fee |

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.
STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 14th day of December, A.D. 2009, at 9:33 o'clock A. M.

Permit No. U.W. 191988

Berlin R.
for State Engineer

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.
FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion must be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by December 31, 2011.

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 21st day of January, A.D. 20 10.

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer

This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATE AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT.

PERMIT NO. U.W. 191988
T.F. No. U.W. 41-2-590

Priority Date December 14, 2009 Approval Date JAN 21 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

January 21, 2010
Date of Approval

Patrick T. Tyrrell
PATRICK T. TYRRELL, State Engineer



State Engineer's Office

HERSCHLER BUILDING, 4-E CHEYENNE, WYOMING 82002
(307) 777-7354 FAX (307) 777-5451
<http://seo.state.wy.us>

DAVE FREUDENTHAL
GOVERNOR

PATRICK T. TYRRELL
STATE ENGINEER

October 27, 2010

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, Wyoming 82002

Dear Applicant or Agent:

You are advised that the State Engineer approved the following application(s) to appropriate ground water for **MONITOR/TEST** on **October 26, 2010**. A copy of each permit is enclosed. Also enclosed are forms and instructions for submitting data to the State Engineer relating to the completion of the well, as required by law.

PERMIT NUMBER
U.W. 193944-193945

By Statute the well must be completed by -DECEMBER 31, 2011. ***IF THE REQUIRED NOTICES ARE NOT RETURNED TO THIS OFFICE WITHIN THE STATUTORY TIME LIMITS SET FORTH, THE PERMIT(S) WILL BE SUBJECT TO CANCELLATION, WHICH ACTS AS A FORFEITURE OF THE WATER RIGHT GRANTED BY THIS PERMIT.***

An extension of time may be requested for completion of work when good reason is provided. A request for such extension must be received in the State Engineer's Office prior to the expiration date shown on the permit. Requests for extension of time must indicate due diligence on the part of the applicant to comply with the time limits imposed by this permit.

Sincerely,

Lisa Lindemann
Ground Water Division

xc: DIV 1 (1)

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

e-Permit App
10-4-2010 RCLVD 2:26 PM.
No Fee

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is domestic and/or stock watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 42-2-216

PERMIT NO. U.W. 193944
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne GW District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

LONE TREE FAULT 1-5

NAME AND NUMBER OF WELL or SPRING

1. Name of applicant(s) WYOMING WATER DEVELOPMENT COMMISSION Phone: 307-777-7626
2. Address of applicant(s) 6920 YELLOWTAIL ROAD CHEYENNE Wyoming 82002
(MAILING ADDRESS) (CITY) (STATE) (ZIP)
3. Name & address of agent to receive correspondence and notices MARK STACY, LIDSTONE AND ASSOCIATES, INC.
4025 AUTOMATION WAY, FORT COLLINS Colorado 80525 Phone: 970-223-4705
BLDG. E (MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied:

- ☐ Domestic: Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? _____.
- ☐ Stock Watering: Normal livestock use at four tanks or less within one mile of well or spring. Stockwatering pipelines and commercial feedlots are a miscellaneous use. Number of stock tanks? _____.
- ☐ Irrigation: Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., is miscellaneous use).
- ☐ Municipal: Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. is classified as miscellaneous use. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial: Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous: Any use of water not defined under previous definitions such as stock water pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in Remarks). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane: Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation: Note: a WDEQ permit may be required ☒ Test Well: (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SW 1/4 SW 1/4 of Sec. 20, T. 013N, R. 069W of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract Block of the Subdivision (or Add'n) of Laramie. Resurvey Location: Tract Block, (or Lot) Block.

6. Estimated depth of the well or spring is 3000 feet. Estimated production interval is _____ ft. to _____ ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute.
NOTE: if for domestic and/or stock use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0 gallons.
Circle appropriate units: (Gallons) (Acre Feet) A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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SEE REVERSE SIDE

Permit No. U.W.

193944

Book No.

1398

Page No.

94

If for irrigation use:

- a. Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
b. ☐ Land will be irrigated from this well only.
c. ☒ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.

10. If for irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.: _____

11. The well or spring is to be constructed on lands owned by _____ See Additional Applicants continued in Remarks.
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)

12. The water is to be used on lands owned by _____ N/A
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: This test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

MARK STACY

Signature of Applicant or Authorized Agent

October 4

Date

, 20 10

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

DOMESTIC AND/OR STOCK WATERING USES \$25.00
(Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.)

IRRIGATION, MUNICIPAL, INDUSTRIAL, MISCELLANEOUS, COAL BED METHANE \$50.00

MONITOR (For water level measurements or chemical quality sampling) or TEST WELL No Fee

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.


THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.

STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 4th day of October, A.D. 20 10, at 2:26 o'clock P M.

Permit No. U.W. 193944



THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

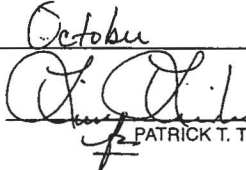
~~Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet.~~
This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATION AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT. FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET.

Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion will be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by

~~The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.~~

Witness my hand this 26TH day of October, A.D. 20 10.



PATRICK T. TYRRELL, State Engineer


PERMIT NO. U.W. 193945
T.F. No. U.W. 42-3-216

Priority Date October 4, 2010 Approval Date OCT 26 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

October 26, 2010
Date of Approval


PATRICK T. TYRRELL, State Engineer

REMARKS CONTINUATION

T.F. No. 42-3-216

(APPLICANT INFORMATION CONTINUED)

CHEYENNE BOARD OF PUBLIC UTILITIES, 2100 PIONEER AVENUE, CHEYENNE,
Wyoming 82003.

Item 11 continuation

CHEYENNE BOARD OF PUBLIC UTILITIES, WYOMING WATER DEVELOPMENT COMMISSION

PERMIT NO. 193945

PAGE NO. 95

If for irrigation use:

- a. Describe MAXIMUM acreage to be irrigated in each 40 acre subdivision in the tabulation box above.
- b. ☐ Land will be irrigated from this well only.
- c. ☐ Land is irrigated from existing water right(s) with water from this well to be additional supply. Describe existing water right(s) under REMARKS.

10. If for irrigation use, describe method of irrigation, i.e. center pivot sprinkler, flood, etc.: _____

11. The well or spring is to be constructed on lands owned by _____ See Additional Applicants continued in Remarks.
(The granting of a permit does not constitute the granting of a right-of-way. If any easement or right-of-way is necessary in connection with this application, it should be understood that the responsibility is the applicant's. A copy of the agreement should accompany this application, if the land is privately owned and the owner is not the co-applicant.)

12. The water is to be used on lands owned by _____ N/A
(If the landowner is not the applicant, a copy of the agreement relating to the usage of the appropriated water on the land should be submitted to this office. If the landowner is included as co-applicant on the application, this procedure need not be followed.) NOTE: Water rights attach to the area(s) and/or point(s) of use.

REMARKS: The test well will be drilled to evaluate the yield potential of the Casper Aquifer on Cheyenne's Belvoir Ranch. The well will be drilled, geophysically logged, and aquifer tested. The well may be used for municipal supply in the future, depending upon results of all testing.

Under penalties of perjury, I declare that I have examined this application and to the best of my knowledge and belief it is true, correct and complete.

MARK STACY

Signature of Applicant or Authorized Agent

October 4

, 20 10

Date

THE LEGALLY REQUIRED FILING FEE MUST ACCOMPANY THIS APPLICATION

DOMESTIC AND/OR STOCK WATERING USES \$25.00

(Domestic use is defined as use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totalling one acre or less.)

IRRIGATION, MUNICIPAL, INDUSTRIAL, MISCELLANEOUS, COAL BED METHANE \$50.00

MONITOR (For water level measurements or chemical quality sampling) or TEST WELL No Fee

IF WELL WILL SERVE MULTIPLE USES, SUBMIT ONLY ONE (THE HIGHER) FILING FEE.

THIS SECTION IS NOT TO BE FILLED IN BY APPLICANT

THE STATE OF WYOMING)
) ss.

STATE ENGINEER'S OFFICE)

This instrument was received and filed for record on the 4th day of October, A.D. 2010, at 2:41 o'clock P.M.

Permit No. U.W. 193945 

THIS IS TO CERTIFY that I have examined the foregoing application and do hereby grant the same subject to the following limitations and conditions:

This application is approved subject to the condition that the proposed use shall not interfere with any existing rights to ground water from the same source of supply and is subject to regulation and correlation with surface water rights, if the ground and surface waters are interconnected. The use of water hereunder is subject to the further provisions of Chapter 169, Session Laws of Wyoming, 1957, and any subsequent amendments thereto.

Granting of a permit does not guarantee the right to have the water level or artesian pressure in the well maintained at any specific level. The well should be constructed to a depth adequate to allow for the maximum development and beneficial use of ground water in the source of supply.

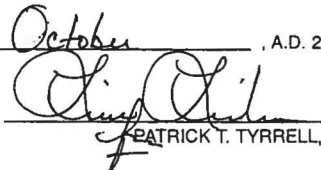
If the well is a flowing artesian well, it shall be so constructed and equipped that the flow may be shut off when not in use without loss of water into sub-surface formations or at the land surface.

Coal Bed Methane wells have Additional Conditions and Limitations on attachment sheet. FOR ADDITIONAL CONDITIONS AND LIMITATIONS SEE ATTACHED STATUS SHEET. This application is for test purposes only; no water will be beneficially used. The approval of this test well permit does NOT OBLIGATE the State Engineer to approve the permanent production well permit. This permit will be automatically cancelled on December 31, 2011 or upon receipt of an acceptable Statement of Completion. PROOF OF APPROPRIATION AND BENEFICIAL USE OF GROUND WATER (FORM U.W. 8) IS WAIVED UNDER THIS PERMIT. Approval of this application may be considered as authorization to proceed with construction of the proposed well or spring. A Statement of Completion will be filed within thirty (30) days of completion of construction, including pump installation.

Completion of construction and completion of the beneficial use of water for the purposes specified in Item 4 of this application will be made by

The amount of appropriation shall be limited to the quantity to which permittee is entitled as determined at time of proof of application of water to beneficial use.

Witness my hand this 26th day of October, A.D. 2010.


PATRICK T. TYRRELL, State Engineer

STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E CHEYENNE, WYOMING 82002
(307) 777-6163

e-Permit App
10-4-2010 RLVD 2:41 PM
No fee

APPLICATION FOR PERMIT TO APPROPRIATE GROUND WATER

APPLICATION FOR WELLS AND SPRINGS

Note: Only springs flowing 25 gallons per minute or less, where the proposed use is domestic and /or stock watering, will be considered as ground water appropriations.

FOR OFFICE USE ONLY

Temporary Filing No. U.W. 42-3-216

PERMIT NO. U.W. 193945
WATER DIVISION NO. 1 DISTRICT 1
U.W. DISTRICT Cheyenne Gw District

NOTE: Do not fold this form. Use typewriter or print neatly with black ink.
ALL ITEMS MUST BE COMPLETED BEFORE APPLICATION IS ACCEPTABLE

GOOSE CREEK 2-1

NAME AND NUMBER OF WELL or SPRING

1. Name of applicant(s) WYOMING WATER DEVELOPMENT COMMISSION Phone: 307-777-7626
6920 YELLOWTAIL ROAD CHEYENNE Wyoming 82002
(MAILING ADDRESS) (CITY) (STATE) (ZIP)
2. Address of applicant(s)
3. Name & address of agent to receive correspondence and notices MARK STACY, LIDSTONE AND ASSOCIATES, INC.
4025 AUTOMATION WAY, FORT COLLINS Colorado 80525 Phone: 970-223-4705
BLDG. E (MAILING ADDRESS) (CITY) (STATE) (ZIP)

4. Use to which the water will be applied:

- ☐ Domestic: Use of water in 3 single family dwellings or less, noncommercial watering of lawns and gardens totaling one acre or less. Number of houses served? ____.
- ☐ Stock Watering: Normal livestock use at four tanks or less within one mile of well or spring. Stockwatering pipelines and commercial feedlots are a miscellaneous use. Number of stock tanks? ____.
- ☐ Irrigation: Watering of any lands for agricultural purposes not covered by the definition of domestic use (large-scale lawn watering of golf courses, cemeteries, recreation areas, etc., is miscellaneous use).
- ☐ Municipal: Use of water in incorporated Towns and Cities. Note 1: use of water in unincorporated towns, subdivisions, improvement districts, mobile home parks, etc. is classified as miscellaneous use. Note 2: a permit may be required by the Wyoming Department of Environmental Quality (WDEQ) if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Industrial: Long term use of water for the manufacture of a product or production of oil/gas or other minerals (oil field water flood operations, power plant water supply, etc.). (Describe in REMARKS)
- ☐ Miscellaneous: Any use of water not defined under previous definitions such as stock water pipelines, subdivisions, mine dewatering, mineral/oil exploration drilling, potable supplies in office, etc. (Describe in Remarks). Note: a permit may be required by the WDEQ if the well will be classified as a public water supply under the WDEQ's rules and regulations.
- ☐ Coalbed Methane Water produced in the production of coal bed methane gas. Note: wells used in the production of coal bed methane gas will require a permit from the Wyoming Oil and Gas Conservation Commission.
- ☐ Monitor, Observation Note: a WDEQ permit may be required ☒ Test Well: (Describe in REMARKS)

5. Location of the well or spring: (NOTE: Quarter-quarter (40 acre subdivision) MUST be shown. EXAMPLE: SE 1/4 NW 1/4 of Sec. 12, Township 14 North, Range 68 West.)
Laramie County, SW 1/4 SE 1/4 of Sec. 30, T. 013N, R. 069W of the 6th P.M. (W.R.M.), Wyoming. If located in a platted subdivision, also provide Lot/Tract ____ Block ____ of the ____ Subdivision (or Add'n) of Laramie. Resurvey Location: Tract ____ (or Lot) ____.

6. Estimated depth of the well or spring is 2500 feet. Estimated production interval is ____ ft. to ____ ft.

7. (a) MAXIMUM instantaneous flow of water to be developed and beneficially used: 0 gallons per minute. NOTE: if for domestic and / or stock use, this application will be processed for a maximum of 25 gallons per minute. For a spring, after approval of this application, some type of artificial diversion or improvement must be constructed to qualify for a water right.

(b) MAXIMUM volumetric quantity of water to be developed and beneficially used per calendar year: 0 gallons. Circle appropriate units: (Gallons) (Acre Feet) A four person family utilizes approximately one (1) acre-foot of water per year or 325,000 gallons.

8. Mark the point(s) or area(s) of use in the tabulation box below. Note: Upper row refers to the quarter of the section. Next row refers to the quarter of the quarter section.

TABULATION BOX

| TWP | RNG | SEC | NE 1/4 | | | | NW 1/4 | | | | SW 1/4 | | | | SE 1/4 | | | | TOTAL |
|-----|-----|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| | | | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | NE 1/4 | NW 1/4 | SW 1/4 | SE 1/4 | |
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193945

SEE REVERSE SIDE

1398

PERMIT NO. U.W. 193944
T.F. No. U.W. 42-2-216

Priority Date October 4, 2010 Approval Date OCT 26 2010

ADDITIONAL CONDITIONS AND LIMITATIONS:

1. In the event that this well will be completed as a production well, the well shall be completed in the Casper Formation. Multiple formation completion or multiple formation water production from a production well at this location is strictly prohibited.
2. In the event that this well will be completed as a production well, this well will be cemented from the top of the Casper Formation to the land surface, to eliminate the commingling of ground water from different aquifers.

October 26, 2010
Date of Approval


PATRICK T. TYRRELL, State Engineer

REMARKS CONTINUATION

T.F. No. 42-2-216

(APPLICANT INFORMATION CONTINUED)

CHEYENNE BOARD OF PUBLIC UTILITIES, 2100 PIONEER AVENUE, CHEYENNE,
Wyoming 82003.

Item 11 continuation

CHEYENNE BOARD OF PUBLIC UTILITIES, WYOMING WATER DEVELOPMENT COMMISSION

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION
PERMIT TO CONSTRUCT

PERMIT NO. 10-046

BELVOIR RANCH EXPLORATION TEST WELLS
PWS WY5600011

This permit hereby authorizes the applicant:

CHEYENNE BOARD OF PUBLIC UTILITIES
2100 PIONEER AVENUE
CHEYENNE, WY 82001

to construct, install or modify four Municipal Test Wells for Conversion to four Municipal Water Supply Wells according to the procedures and conditions of the application number 10-046. The facility is located in Sections 16, 17, 19, 29, 30 and 31, T13N R69W; Laramie County, in the State of Wyoming. All construction, installation, or modification allowed by this permit shall be completed February 24, 2012. The issuance of this permit confirms that the Wyoming Department of Environmental Quality (DEQ) has evaluated the application submitted by the permittee and determined that it meets minimum applicable construction and design standards. The compliance with construction standards and the operation and maintenance of the facility to meet the engineer's design are the responsibility of the permittee, owner, and operator.

Granting this permit does not imply that DEQ guarantees or ensures that the permitted facility, when constructed, will meet applicable discharge permit conditions or other effluent or operational requirements. Compliance with discharge standards remains the responsibility of the permittee.

Nothing in this permit constitutes an endorsement by DEQ of the construction or the design of the facility described herein. This permit verifies only that the submitted application meets the design and construction standards imposed by Wyoming statutes, rules and regulations. The DEQ assumes no liability for, and does not in any way guarantee or warrant the performance or operation of the permitted facility. The permittee, owner and operator are solely responsible for any liability arising from the construction or operation of the permitted facility. By issuing this permit, the State of Wyoming does not waive its sovereign immunity.

The permittee shall allow authorized representatives from DEQ to enter and inspect any property, premise or place on or at which the facility is located or is being constructed or installed for the purpose of investigating actual or potential sources of water pollution, and for determining compliance or non-compliance with any rules, regulations, standards, permits or orders.

Nothing in this permit shall be construed to preclude the institution of any legal action or other proceeding to enforce any applicable provision of law or rules and regulations. It is the duty of the permittee, owner and operator to comply with all applicable federal, state and local laws or regulations in the exercise of its activities authorized by this permit.

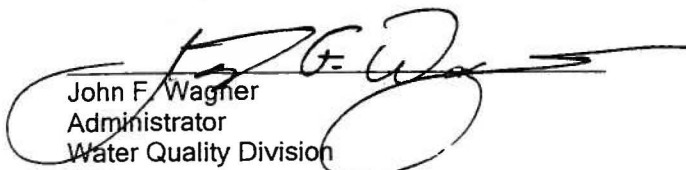
The issuance of this permit does not convey any property rights in either real or personal property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

The permittee shall construct and operate the permitted facility in accordance with the statements, representations, procedures, terms and conditions of the permit application, supporting documents and permit. This permit does not relieve the permittee from any duty to obtain any other permit or authorization that may be required by any provision of federal, state or local laws.

In carrying out its activities authorized by this permit, the permittee, owner and operator shall comply with all of the following permit conditions:

- 1 The applicant will provide immediate oral or written notice to the Southeast District, Water Quality Division, Herschler Building 4 West, Cheyenne, WY, 82002, Phone 307-777-7075, FAX 307-777-7610, in accordance with the provisions of Section 11, Chapter 3, Wyoming Water Quality Rules and Regulations of any changes or modifications which are not consistent with the terms and conditions of this permit.
2. Separate permits to construct will be required for the improvements necessary to the wells to supply water to a public water system.
3. The casing must extend at least 18 inches above the ground surface.
4. Within sixty days of completion of construction of the authorized facility, the applicant will submit to the Southeast District, Water Quality Division, Herschler Building 4 West, Cheyenne, WY, 82002 a certification of completion signed by the Engineer of Record or the owner. A form titled "Certificate of Completion" has been provided.
 - a. Date that construction of the facility was completed; and
 - b. Date that the facility was placed in operation; and
 - c. Certification the facility was constructed in accordance with the terms and conditions of the permit; or
 - d. Certification the facility was completed with changes or modifications. Submittal of as-constructed plans and specifications for the system as it was constructed, certified by an engineer if appropriate is required. All modifications or deviations from the authorized plans must be highlighted.
 - e. As a part of the certificate of completion, the Engineer must certify that all Test Wells have been plugged and abandoned as required by Chapter 11, WQD Rules and Regulations.
5. The review and approval of this permit is based upon the items identified in the attached "Statement of Basis".

AUTHORIZED BY:


John F. Wagner
Administrator
Water Quality Division


John W. Corra
Director
Department of Environmental Quality

Date of Issuance

2/25/10

RRC/rm/10-0151

STATEMENT OF BASIS

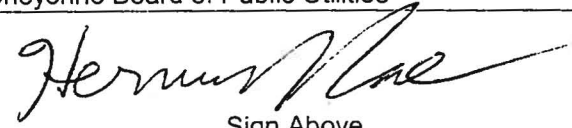
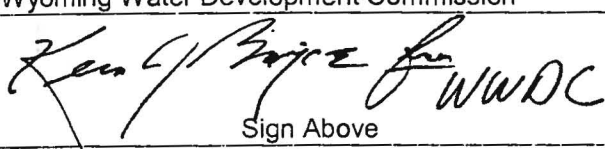
1. Permit Number: 10-046
2. This application was reviewed for compliance with the applicable regulations ;
Chapters 3, 12
3. Does the permit comply with all applicable regulations identified above?
No
4. The permit approval is based upon a deviation from applicable regulations in accordance with Section 5. of Chapter 12.
 - a. Identify specific sections of the regulations for which a deviation is approved and briefly summarize the regulation.
Chapter 12, Section 9(b)(iii) requires a 2" annular space between the casing and the borehole.
 - b. Briefly state the basis for the deviation.
Because technology advances and the use of pressure grouting, a variance allowing a 1 3/4" annular space between the production casing, the surface casing, and the sealed borehole is granted.
5. A review to determine groundwater impacts in accordance with Section 17, Chapter 3 was not required.
Public water supplies are exempted from review by Chapter 3, Section 17.
6. Documentation of Statement of Basis: The archive file for this permit includes adequate documentation of all sections of this Statement of Basis.

CERTIFICATION

The issuance of this permit is based upon a review of the application package submitted in accordance with the requirements of Chapter 3, Section 6, Wyoming Water Quality Rules and Regulations. This review was performed by Richard Cripe, Southeast District Engineer, Water and Wastewater Section, Wyoming Department of Environmental Quality /Water Quality Division, and completed on February 24, 2010. Permit issuance is recommended based upon statements, representations, and procedures presented in the permit application and supporting documents, permit conditions, and the items identified in this "Statement of Basis."

10-046

RECEIVED

| WYOMING WATER QUALITY APPLICATION FORM | | WQD USE ONLY | |
|--|-----------------|---|-------------------|
| Use for Construction, Groundwater Monitoring, Groundwater Remediation, Subdivisions and Land Application of Wastewater | | APP. NO. | |
| | | DATE | JAN 25 2009 |
| | | PROG. | |
| A complete application package must include three copies of each of the following: Application Form; at least one copy must have original signatures. Investigations, design reports, plans, specifications, and any other information as appropriate. | | | |
| Submit to appropriate office | | http://deq.state.wy.us/wqd/www/district_Map.jpg | |
| DEQ/Water Quality Division, 122 West 25th Street, Cheyenne, WY 82002 | | (307) 777-7781 | |
| DEQ/Water Quality Division, 510 Meadowview Drive, Lander, WY 82520 | | (307) 332-3144 | |
| DEQ/Water Quality Division, 1866 South Sheridan, Sheridan, WY 82801 | | (307) 673-9337 | |
| DEQ/Water Quality Division, 152 North Durbin Street, Ste 100, Casper, WY 82601 | | (307) 473-3465 | |
| NAME OF PROPOSAL | | | |
| Belvoir Ranch Exploration Test Wells | | | |
| DESCRIPTION OF PROJECT | | | |
| Project will consist of the drilling, construction, development, and aquifer testing of up to four 8.625 inch diameter test wells on Cheyenne's Belvoir Ranch. | | | |
| LOCATION: | County: Laramie | Latitude: 41.054088 | Long.: 105.161585 |
| Legal Description (1/4 Section, Section, Township and Range or Lot No. and Subdivision) | | | |
| T13N, R69W, Sections 16, 17, 19, 29, 30 and 31 on western portion of Belvoir Ranch - see map. | | | |
| SIGNATURES: All undersigned agree to comply with applicable Wyoming Statutes and Regulations and to allow the activities described in this application. | | | |
| Real Estate Owner | | The real estate owner or the grantee of the applicable easement must sign this form | |
| Cheyenne Board of Public Utilities | | | |
|  | | Address: 2100 Pioneer Avenue | |
| Sign Above | | City: Cheyenne | |
| | | State: WY ZIP Code: 82001 | |
| | | Phone Number: 307-637-6416 | |
| Printed Name: Herman Noel | | Title: Engineering and Water Resources Manager | |
| If the owner or easement grantee is a public entity, partnership, or corporation, a legally binding authority must sign | | | |
| Operator or Developer | | (If same as real estate owner this space may be left blank) | |
| Wyoming Water Development Commission | | | |
|  | | Address: 6920 Yellowtail Road | |
| Sign Above | | City: Cheyenne | |
| | | State: WY ZIP Code: 82002 | |
| | | Phone Number: 307-777-7626 | |
| Printed Name: Kevin Boyce | | Title: Project Manager | |
| If the operator or developer is a public entity, partnership, or corporation, a legally binding authority must sign | | | |
| Engineer or Geologist | | | |
| Printed Name: Mark Stacy | | WY P.E.# | WY PG# 3440 |
| Firm Name: Lidstone and Associates, Inc. | | | |
| Address: 4025 Automation Way, Bldg. E | | | |
| City: Fort Collins | | | |
| State CO | | Zip Code: 80525 | |
| Phone Number: 970-223-4705 | | | |

Please complete information on the second page or the back of this form

WYOMING DEQ/WQD <http://deq.state.wy.us/wqd/index.asp> Phone 307-777-7781

The Wyoming Environmental Quality Act, W.S. 35-11-101 and Wyoming Environmental Quality Act, Article 3, W.S. 35-11-301 mandates that permits are required for construction or modification of public water supplies, wastewater facilities, land application systems, and confined swine feeding operations. W.S. 18-5-306 requires the review of the safety and adequacy of proposed sewage systems and water systems in new subdivisions by the Department of Environmental Quality.

All Wyoming Water Quality Regulations are available at <http://deq.state.wy.us/wqd/WQDrules/index.asp>

Chapter 3 of the Wyoming Water Quality Division Rules and Regulations defines the permitting process.

Specific chapters of the Wyoming Water Quality Rules and Regulations have been developed for each of the areas that require a permit. The regulatory chapters for types of projects that this application is to be used for are listed below. Please check all that apply to your project.

| | | |
|---|-------|--|
| X | 11 | Design and Construction Standards for Sewerage Systems, Treatment Works, Disposal System of other Facilities Capable of Causing or Contributing to Pollution, includes septic tanks/leach fields, monitoring wells, and road application of wastewater |
| X | 12 | Design and Construction Standards for Public Water Supplies, includes subdivision water supplies and water line extensions |
| | 21 | Standards for the Reuse of Treated Wastewater |
| | 23 | Minimum Standards for Subdivision Applications |
| | Other | Describe briefly |

| Previous or Associated State of Wyoming Permits | |
|--|---|
| WQD Permit to Construct | 00-182 (WWDC former general welis permit) |
| WQD Subdivision Recommendation to County | |
| Air Quality | |
| Land Quality | |
| Oil and Gas Commission | |
| Solid and Hazardous Waste | |
| State Engineers Surface Water Right or Well Permit | In process |
| WQD Underground Injection Control | |
| WYPDES (discharge permit) | In process |
| US EPA Public Water Supply (PWS) Number | |

10-046

| | | | |
|--|------------------------|---|--------------------------|
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| | | DATE | |
| | | PROG. | |
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| Real Estate Owner | | The real estate owner or the grantee of the applicable easement must sign this form | |
| Cheyenne Board of Public Utilities | | | |
| Sign Above Printed Name: Herman Noe | | Address: 2100 Pioneer Avenue | |
| | | City: Cheyenne | |
| | | State: WY | ZIP Code: 82001 |
| | | Phone Number: 307-637-6416 | |
| | | Title: Engineering and Water Resources Manager | |
| If the owner or easement grantee is a public entity, partnership, or corporation, a legally binding authority must sign | | | |
| Operator or Developer | | (If same as real estate owner this space may be left blank) | |
| Wyoming Water Development Commission | | | |
| Sign Above Printed Name: Kevin Boyce | | Address: 6920 Yellowtail Road | |
| | | City: Cheyenne | |
| | | State: WY | ZIP Code: 82002 |
| | | Phone Number: 307-777-7626 | |
| | | Title: Project Manager | |
| If the operator or developer is a public entity, partnership, or corporation, a legally binding authority must sign | | | |
| Engineer or Geologist | | | |
| Printed Name: Mark Stacy | | WY P.E.# | WY PG# 3440 |
| Firm Name: Lidstone and Associates, Inc. | | | |
| Address: 4025 Automation Way, Bldg. E | | | |
| City: Fort Collins | | | |
| State CO | | Zip Code: 80525 | |
| Phone Number: 970-223-4705 | | | |
| Please complete information on the second page or the back of this form | | | |

WYOMING DEQ/WQD <http://deq.state.wy.us/wqd/index.asp> Phone 307-777-7781

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| Solid and Hazardous Waste | |
| State Engineers Surface Water Right or Well Permit | In process |
| WQD Underground Injection Control | |
| WYPDES (discharge permit) | In process |
| US EPA Public Water Supply (PWS) Number | |



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

January 20, 2010

Mr. Rich Cripe
Southeast District Engineer
Wyoming Department of Environmental Quality
122 West 25th Street, 4W
Cheyenne, WY 82002

RE: **Exploration Well Program Design
Permit to Construct Application
Belvoir Ranch Exploration Test Wells**

AUTHORIZED BY AUTHORITY OF
Water Quality Rules and
Regulations, Chapter III
Director

Department of Environmental Quality

PERMIT NO. 10-046

DATE 2/24/10

BY Rich Cripe

Dear Mr. Cripe,

Introduction

Lidstone and Associates, Inc. (LA), is currently exploring the feasibility of developing ground water from the Casper Aquifer on the western portion of Belvoir Ranch for the Cheyenne Board of Public Utilities (BOPU). With this letter, the enclosed figures, and the attached Water Quality Division permit application form, LA is applying to obtain a Permit to Construct for the test wells that will be drilled under the Level II Wyoming Water Development Commission (WWDC) project. LA anticipates drilling up to four wells depending upon drilling depths at each site and costs. For your reference and review, LA has also included draft technical drilling specifications for the test wells.

Exploratory Drill Site Options/Drilling Sequence

Eight potential test well sites are listed in **Table 1**. The drill sites target areas of potentially enhanced aquifer permeability associated with major structural deformation. Surface geophysical exploration was employed to identify these areas in the Casper Aquifer. The locations of these eight sites are shown on **Figure 1**, and include two sites on four of the five geophysical lines. At this time, no test well sites have been proposed along the Spottewood Structure on the south end of the ranch. The drilling sequence will be an iterative process based on results of drilling each test well, progressive acquisition of hydrogeologic and geologic data, and remaining drilling budget.

LA intends to drill the sites as they are prioritized numerically in **Table 1**, and to focus exploration on the Duck Creek hydrostructural compartment, specifically along the Duck Creek (3-1 and 3-3) and Goose Creek (2-2 and 2-3) geophysical lines. Previous drilling in the area (Duck Creek No. 1) indicated the Casper Formation was saturated, but did not encounter significant permeability. Proving out the permeability and yield potential of this compartment is critical to the overall development of a Casper Aquifer well field in this area. The Duck Creek 3-1 site will be drilled first to test the best seismic prospect on this line, and to calibrate the geophysical/hydrogeologic data for drilling at the Goose Creek sites (either 2-2 or 2-3).

Geophysical data for the Goose Creek sites suggest the Casper Formation top may be shallower than previously thought, but only drilling will confirm whether this is the case.

After completing the Duck Creek test well, LA plans to move to a site on the Goose Creek structure. If drilling Duck Creek 3-1 proves successful, LA will move to Goose Creek 2-2 or 2-3 depending on geophysical calibration and drilling depths. Either site along this structure will allow for yield testing on this geophysical line, but 2-2 may present a shallower target. If drilling at Duck Creek 3-1 results in a low yielding well, it would still be worth drilling a test well on the Goose Creek structure to evaluate whether poor yield is problematic throughout the compartment, or just localized on the Duck Creek structure.

After drilling both the Duck and Goose Creek structures, LA plans to drill on the Lone Tree Creek Fault structure (1-4) to evaluate the yield potential of the Casper Aquifer within the southern portion of the Lone Tree Creek hydrostructural compartment. The Lone Tree No. 1 well proved that this portion of the aquifer is highly permeable, but little is known about how far south this permeability extends. Drilling a test well at this location will allow for evaluation on the southern half and provide additional information on the potential extent and sustainability of a well field in this compartment.

The location and drilling of additional test wells beyond these first three will be dictated by the remaining drilling budget, and hydrogeologic data collected within the two hydrostructural compartments. If drilling on both the Goose and Duck Creek structures yields wells that produce little ground water (i.e. less than 100 gpm), it may behoove the BOPU to drill another test well along either the Lone Tree Creek or Lone Tree Creek Fault structures. Lone Tree 5-2 and 5-4 were identified for such worst case drilling results. If drilling on either the Goose or Duck Creek structures, but not both, identified areas of higher permeability, LA may recommend drilling an additional test well along that respective structure. In all cases, LA and its project team will work with the WWDC and BOPU to devise an appropriate course of action given the hydrogeologic knowledge obtained and available funds.

Exploratory Well Designs and Drilling Methods

Each test well will be completed in a telescoped fashion. Well casing will be placed to a sufficient depth to accommodate a high capacity pump, and will be cemented into the top of the Casper Formation. Limited available data on the potentiometric surface of the Casper Aquifer have been used to estimate depths to ground water and to identify appropriate casing points such that ground water levels in the casing remain above the pump for aquifer testing purposes. Below the casing, the remainder of the well will be completed as open borehole through the Casper Formation to maximize exploration of the aquifer and minimize cost. The borehole will be left as an open hole in the event that it could be completed later with a wire wrapped or pre-packed well screen if the well proves successful. In this fashion, the well design balances the objectives of exploration with the reality that these wells may ultimately be used for production, or as monitoring wells.

The test wells will be completed in general accordance with the design presented on **Figure 2**. Following the installation of 30 feet of 13 3/8 inch diameter surface casing, the annular space will be pressure cemented via tremie pipe with neat cement. Once the cement has cured, each 12 1/4 inch production borehole will be drilled utilizing either air percussion rotary or water-based direct circulation rotary techniques at least 10 feet, if possible, into the top of the Casper Formation. Depths to the top of the Casper Formation vary between the eight potential drill sites listed in **Table 1**. Deviation surveys will be conducted once every 200 feet. The drilling

contractor will install a sufficient length of 8 5/8 inch OD casing with centralizers placed every 200 feet into each production borehole, and will pressure cement the annular space with neat cement grout. A 7 7/8 inch production borehole will then be drilled through the Casper Formation and terminated below the contact with the underlying Precambrian granitic rocks. Following well completion, the well will be developed via airlifting techniques utilizing the rig's air compressor.

To balance drilling costs and exploration objectives, LA is requesting a waiver of WDEQ Chapter 12, Section 9 guidelines requiring a minimum two inch thick annular seal, including couplings. The annular seal within the cased portion of the borehole will be nominally 1.8 inches thick. This waiver request is based on the following:

1. Previous successful test well completions with this proposed approach at the site (Lone Tree No. 1 (Wyoming SEO Permit No. 168921) and Duck Creek No. 1 (Wyoming SEO Permit No. 168918).
2. Adequate surface seal depth is achieved with both the production and surface casings (30 feet minimum).
3. Centralizers will be placed on the well casing to ensure proper borehole placement.
4. Pressure grouting techniques will be used to complete each well.
5. Bond logs will be completed on each well to indicate full bond is produced.

To the extent practical, the test wells, particularly within the Casper Formation, will be completed using direct air rotary drilling techniques with downhole hammers. The use of air rotary drilling methods allows for evaluation of Casper Aquifer productivity during drilling, limits the potential for lost circulation conditions, and may provide cost savings on development and aquifer testing of low yielding wells, if encountered. Drilling contractors will have the option of using water-based drilling fluids in formations encountered above the Casper Aquifer, but will be required to use air-based fluids through the Casper Aquifer. Alternate water-based drilling fluids may be allowed when drilling the Casper Aquifer depending upon drilling depths and costs, and if conditions warrant their use.

Geophysical Logging Program

Each test well will be geophysically logged to obtain stratigraphic and hydrogeologic information. These data will also be used to calibrate and iteratively reinterpret the surface geophysical data the LA project team collected. This process will help refine drilling depths and structural geologic interpretations. The geophysical logging suite will consist of the following logs: caliper, natural gamma, 16 inch normal resistivity, 64 inch normal resistivity, spontaneous potential, density, neutron, and sonic (full wave form). The sonic log will also be used to assess the cement bond to the 8 5/8 inch casing.

With the exception of the sonic log, LA anticipates that geophysical logs will primarily be collected from the open borehole portion of each test well. Geophysical log information may be collected across the 12 1/4 inch production borehole in locations where the thicknesses of both the overlying Tertiary sedimentary cover and post-Casper Formation rocks are sufficient to provide surface geophysical data calibration (i.e. Goose Creek 2-3). In particular, a sonic log through the post-Casper Formation rocks would provide information that could be used to better understand the structures and stratigraphy observed on the east end of several surface geophysical lines.

Aquifer Testing Program

As warranted, LA will complete aquifer tests on each completed test well. The aquifer tests will consist of both stepped and constant rate tests. The stepped rate test on each well will be completed over a six to eight hour period, and constant rate tests will be conducted for at least 48 hours and may be conducted over a seven day period. The constant rate tests will be completed following water level recovery from the step test, which will likely occur the following day after step test termination. Water level data on all tests will be collected both manually and electronically. LA will supervise all testing and will work with the drilling contractor to complete the tests.

Based on the yield observed during air-based fluid drilling, LA will design the step test to assess drawdown conditions associated with a variety of discharge conditions. Individual yields from each well may be as much as 500 gpm. If the yield of any test well during drilling with air-based drilling fluids is less than 100 gpm, LA may not complete an aquifer test on the well. If water-based fluid drilling masks yield from any test well, aquifer testing will be completed to assess aquifer permeability at the site.

Closing

If you have any questions regarding this proposed approach, please do not hesitate to call me at 970-223-4705. I would be happy to meet with you to clarify any questions you have, or to facilitate your review of this permit application.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.

Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures

cc w/Enclosures:

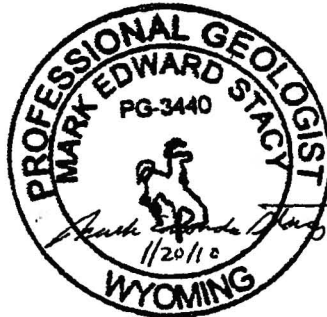
Kevin Boyce, WWDC

Tim Wilson, BOPU

Herman Noe, BOPU

Paul Ivancie, AMEC

Sent via: E-mail and First Class Mail



Figures

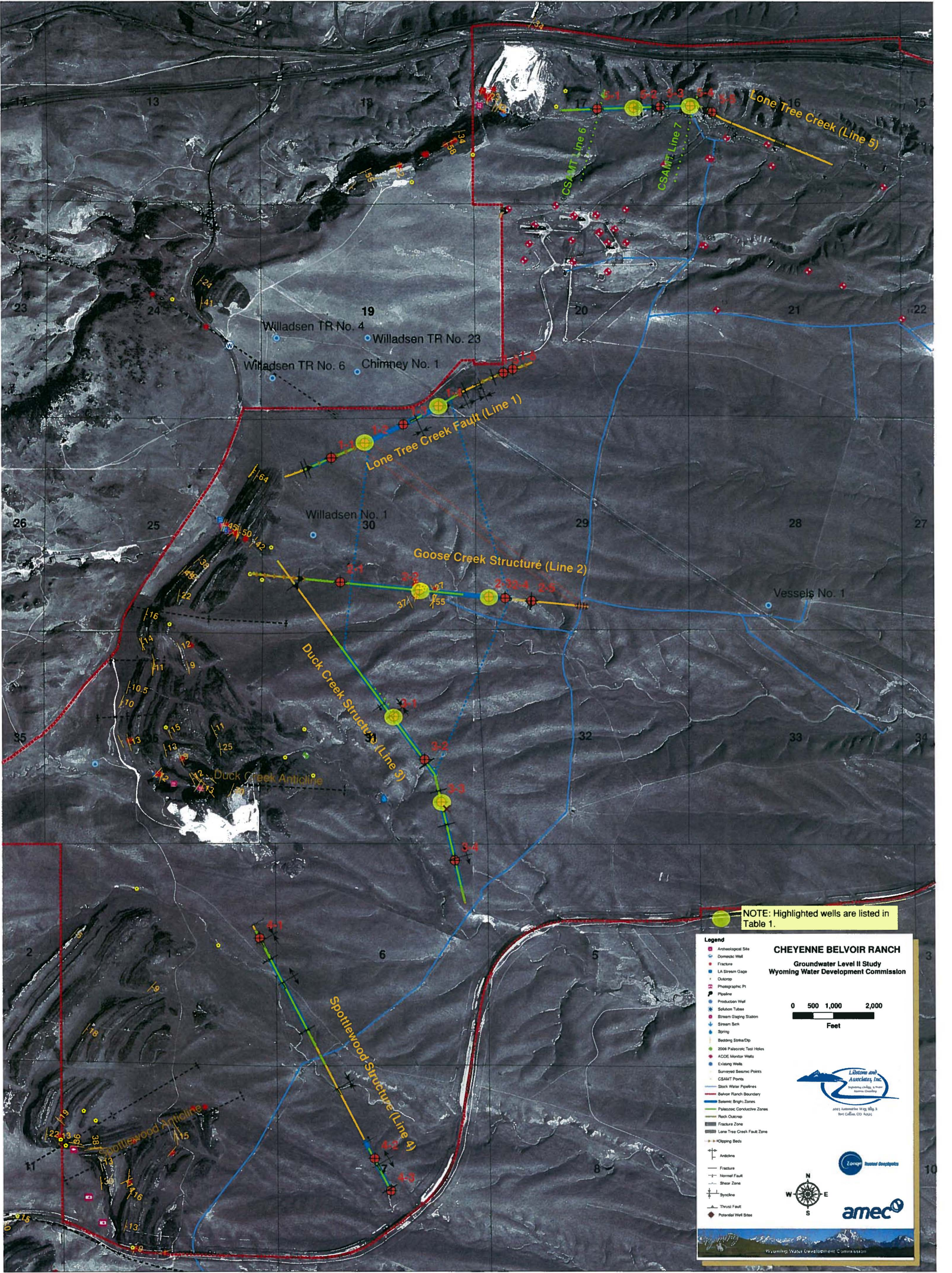


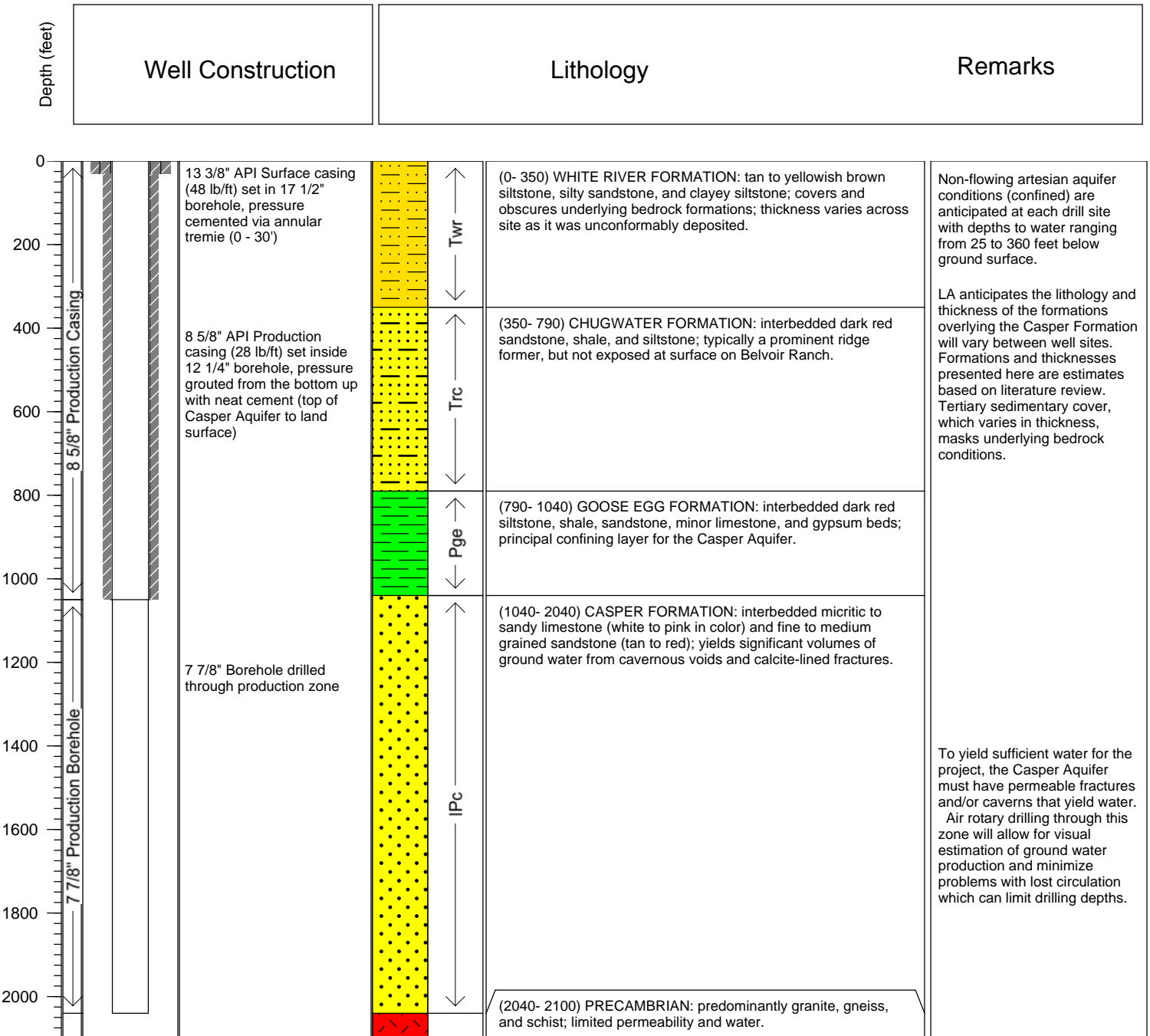
FIGURE 1



Lidstone and Associates, Inc.

Project: BELVOIR RANCH
 Location: T13N, R69W, Section 19
 Drilled by: TBD
 Date started: TBD
 Date completed: TBD

Well Name: Conceptual Casper Aquifer Well
 Drilling Method: Direct Air Percussion Rotary
 Logged by: MES
 Total depth: 2,040 Ft.
 Elev.: 7,335 Ft.



Notes: This figure presents a conceptual well design to complete a test well into the Casper Aquifer. Actual well completion depths at each respective drill site will vary depending upon Casper Formation attitudes, distance from outcrop, and topographic elevations at land surface. Proposed well locations are shown on Figure 1. Our concept includes a telescoped well that consists of an open borehole through the Casper Aquifer with 8 5/8 inch diameter API production casing set through the overlying formations.

FIGURE 2

Tables

Table 1
Belvoir Ranch Prospective Casper Aquifer Drilling Sites

| Prospect Name | | Lone Tree 5-4 | | Lone Tree 5-2 | | Lone Tree Fault 1-2 | | Lone Tree Fault 1-4 | | Goose Creek 2-2 | | Goose Creek 2-3 | | Duck Creek 3-1 | | Duck Creek 3-3 | |
|--|--|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|-------------------------|---------------|
| Location (T, R, & Section) | | T13N, R69W, Sec. 16NWSW | | T13N, R69W, Sec. 17NESE | | T13N, R69W, Sec. 30NENW | | T13N, R69W, Sec. 19SESE | | T13N, R69W, Sec. 30SESE | | T13N, R69W, Sec. 29SWSW | | T13N, R69W, Sec. 31SWNE | | T13N, R69W, Sec. 31SESE | |
| Location (Latitude, Longitude) | | 41.095398; -105.134891 | | 41.095266; -105.139951 | | 41.072592; -105.164142 | | 41.075106; -105.157503 | | 41.062557; -105.158069 | | 41.062162; -105.153037 | | 41.054088; -105.161585 | | 41.048293; -105.157356 | |
| Resistivity Station | | 975 | | 550 | | 650 | | 1275 | | 1375 | | 1800 | | 1525 | | 775 | |
| Surface Elevation (Ft. AMSL) | | 7060 | | 7075 | | 7350 | | 7335 | | 7195 | | 7200 | | 7295 | | 7285 | |
| Structural Compartment | | Lone Tree | | Lone Tree | | Lone Tree/Duck Creek | | Lone Tree | | Duck Creek | | Duck Creek | | Duck Creek | | Duck Creek | |
| GEOLOGIC RANKING CRITERIA | Rating (R) Relative Importance (RI) | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI | Rating (R) | Product =R*RI |
| Structural Permeability Enhancement | 1, 3, 5 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 3 |
| Geophysical Seismic Signature (bright spot) | 1, 3, 5 1 | 1 | 1 | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 |
| Geophysical Resistivity Signature (low) | 1, 3, 5 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 1 | 3 | 3 | 1 | 1 |
| Depth to Water | 1-3 2 | 1 | 2 | 1 | 2 | 3 | 6 | 2 | 4 | 2 | 4 | 2 | 4 | 3 | 6 | 3 | 6 |
| Depth to Top of Casper | 1-3 2 | 2 | 4 | 1 | 2 | 2 | 4 | 2 | 4 | 1 | 2 | 3 | 6 | 1 | 2 | 1 | 2 |
| Anticipated Drilling Depth through Casper Formation | 1-3 3 | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 1 | 3 | 3 | 9 | 1 | 3 | 1 | 3 |
| Hydrologic Sustainability, recharge | 1-3 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cumulative Rating | | 8 | | 9 | | 14 | | 11 | | 13 | | 13 | | 14 | | 14 | |
| Hydrogeologic/Geophysical Rating | | 3 | | 5 | | 7 | | 5 | | 7 | | 3 | | 7 | | 7 | |
| DRILLING PRIORITIZATION | | | | | | 4A | | 3 | | 2A | | 2B | | 1 | | 4B | |
| Weighted ranking system = sum(R*RI) QUALITATIVE SCORE | | Score = 13 | | Score = 13 | | Score = 21 | | Score = 17 | | Score = 18 | | Score = 24 | | Score = 20 | | Score = 20 | |
| | | | | | | | | | | | | | | | | | |
| COST RANKING CRITERIA | Units | Units | Amount | Units | Amount | Units | Amount | Units | | Units | Amount | Units | Amount | Units | Amount | Units | Amount |
| Capital costs for test well drilling ¹ | \$ | \$ | \$342,400 | \$ | \$270,400 | \$ | \$299,200 | \$ | \$326,400 | \$ | \$262,400 | \$ | \$500,000 | \$ | \$260,000 | \$ | \$220,000 |
| Capital costs for production well drilling ² | \$ | \$ | \$535,000 | \$ | \$422,500 | \$ | \$467,500 | \$ | \$510,000 | \$ | \$410,000 | \$ | \$781,250 | \$ | \$406,250 | \$ | \$343,750 |
| Estimated test well/production well completion depth | Ft | Ft | 2,140 | Ft | 1,690 | Ft | 1,870 | Ft | 2,040 | Ft | 1,640 | Ft | 3,125 | Ft | 1,625 | Ft | 1,375 |
| Estimated per well production rate | GPM | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 | GPM | 500 |

Notes: ¹Estimated test well drilling costs (\$160/ft) include 6 3/4" diameter hole through Casper Formation, geophysics, well development, and aquifer testing. Based on recent 2,800' Wamsutter No. 9 bid (8.625" Casing, May 2009).

Lower rating for better alternative: 1=Best, 5=Worst

²Estimated production well drilling costs (\$250/ft) include 9 7/8" diameter hole through Casper Formation, geophysics, well development, and aquifer testing. Based on recent 2,400' Bighorn Regional bid (10.75" casing; October 2009).

Relative Importance: 1=Most, 5=Least

Estimated costs are for drilling contractor only and do not include any associated engineering expenses.

Maximum Score= 55

Minimum Score = 11

Attachments

SECTION 02800

TEST WELL DRILLING AND CONSTRUCTION

PART 1 GENERAL

1.01 TEST WELLS

- A. This section outlines the requirements for the drilling, installation, and testing of up to four (4) test wells to be constructed at the selected drill sites. The total number of test wells drilled under this contract will depend upon actual drilling depths through the Casper Formation, hydrogeologic conditions encountered, and costs expended during the course of drilling. Test well depths are anticipated to range from 1,375 to 3,125 feet to fully penetrate the Casper Formation.
- B. The CONTRACTOR is to furnish all materials, supplies, equipment, and personnel necessary to successfully complete the test wells and any appurtenant structures in a timely and professional manner. The wells shall be constructed in general accordance with the American Water Works Association Standard for Deep Wells (AWWA A100-06), EPA Manual of Water Well Construction Practice (EPA 570/9-75-001), and the State of Wyoming DEQ and State Engineer's Office Regulations and Instructions for the Construction of Water Wells.
- C. The work shall be carried out in accordance with the following specifications and any amendments or additions that may be attached by the OWNER or ENGINEER. Work to be performed in the presence of the ENGINEER is so indicated within these specifications.

1.02 RELATED SECTIONS

Section 02810 - Geophysical Logging
Section 02820 - Well Development
Section 02830 - Aquifer Testing

1.03 REFERENCES

- 1. "Manual of Water Well Construction Practice," EPA-570/9-75-001.
- 2. American Water Works Association Standard for Water Wells, AWWA A100-06.
- 3. Wyoming State Engineer's Office Regulations and Instructions for Water Well Minimum Construction Standards.
- 4. Wyoming Department of Environmental Quality (DEQ) Well and Borehole Abandonment Standards, Chapter 11.
- 5. Wyoming Department of Environmental Quality (DEQ) Design and Construction Standards for Public Water Supplies, Chapter 12.

1.04 SUBMITTALS

The CONTRACTOR shall keep records providing the following information. The following records will be presented to the ENGINEER during the course of the project or following the completion of all operations at the drill site.

- A. Driller's Log. The driller's log shall include all information pertinent to the test well construction and the progress of work. The driller's log shall be a running account which includes: (1) drilling fluids and additives, including quantity of materials used; (2) drilling fluid properties, including weight, fluid loss, and viscosity; (3) type and diameter of bits used for drilling and total footage for each bit; (4) penetration rate log using a single-pin Geograph of ENGINEER-approved equivalent; and (5) any remarks or comments concerning the drilling characteristics of the borehole, including circulation loss, special or peculiar events, etc. The forms shall be kept onsite during drilling for inspection by the OWNER or ENGINEER.
- B. Materials Log. The CONTRACTOR shall keep a record of the assembled order, number, type, size, lengths and couplings of any applicable individual pieces of casing, column pipe, blank, centralizers, and other items placed in the well.
- C. Material Certificates. Manufacturers' and suppliers' certificates or invoices for all materials delivered or services rendered to the job site shall be maintained. The certificates or invoices shall describe the material delivered including weight, class or grade, quantity and unit cost, etc. Copies of these certificates shall be provided to the ENGINEER upon delivery of materials to the site.

PART 2 MATERIALS & PRODUCTS

2.01 DRILLING FLUIDS

- A. Material. The selection of drilling fluids shall be at the discretion of the CONTRACTOR, with the approval of the ENGINEER. Water from a source approved by the ENGINEER, or air shall be used as the base for the drilling fluid, whether used alone or in combination with ENGINEER-approved drilling fluid additives. The drilling fluid may consist of water mixed with high-grade bentonite and polymers, air mixed with appropriate fluid additives, or other ENGINEER-approved materials. If there should be a conflict between the drilling fluid requirements for ease of drilling and drilling fluid requirements for aquifer protection, then the ruling requirements shall be those for aquifer protection. The drilling fluid shall possess characteristics required to: (1) prevent caving as drilling progresses; (2) permit recovery of representative drill cutting samples; (3) maintain the structural integrity of the borehole during casing installation; and (4) allow for visual assessment of water yield and quality from the Casper Formation.

If requested by the ENGINEER, the CONTRACTOR will employ a qualified drilling fluids engineer onsite with more than two years experience to ensure the viability of the drilling fluid. The CONTRACTOR shall bear the costs of the drilling fluids engineer.

- B. Lost Circulation. In the event of lost circulation conditions, the CONTRACTOR shall notify the ENGINEER and OWNER for approval of using lost circulation materials, and shall use micaceous flakes or other ENGINEER approved inert materials to regain drilling fluid circulation. Upon completion of borehole drilling, the CONTRACTOR must use appropriate procedures to remove most drilling fluid additives and/or lost circulation materials to the maximum extent possible during development.

2.02 CASING AND CEMENTING MATERIALS

- A. Surface Casings. The CONTRACTOR shall install at least thirty (30) linear feet of a minimum thirteen and three-eighths (13 3/8) inch diameter surface casing at each test well site. Casing shall be of steel construction, and at least one-quarter (1/4) inch minimum wall thickness. The type and weight of API surface casing to be used is at the option of the CONTRACTOR.
- B. Test Well Casings. Between three hundred and eighty-five (385) and one-thousand nine hundred and fifty (1,950) feet of eight and five-eighths (8 5/8) inch, 28 pound per foot blank steel well casing will be required to complete the construction of the test well at each site. The well casing shall conform to the physical and chemical properties of AWWA A100-06, API J-55 or K-55, or equivalent approved by the ENGINEER. The casing shall be new. Rusted casing will not be accepted. The casing shall be supplied with threads and couplings, or beveled ends for welded joints. The well casing will extend to a final height of two feet above ground surface at each site.
- C. Centralizers. Centralizers manufactured to fit the casing will be used in the installation of the 8 5/8 inch diameter casing in the borehole. To maintain the casing in the center of the borehole, three (3) centralizers circumferentially spaced 60° apart will be installed at no less than 200-foot intervals as directed by the ENGINEER. Three (3) centralizers shall also be spaced circumferentially within the bottom five feet on each surface casing.
- D. Cement Seals. (1) The selection of grout to cement the surface casings for the test wells in place shall be at the option of the CONTRACTOR. (2) The 8 5/8-inch well casings for the test wells shall be cemented in place with neat cement grout conforming to ASTM C150, API Type G or H, or ENGINEER-approved equivalent. The CONTRACTOR shall allow for at least 40 percent overrun on cement to compensate for washout zones in the borehole. In the event more than 40 percent excess is required to completely cement the casings in place, then the CONTRACTOR shall be paid for the excess at CONTRACTOR's additional

invoice cost plus 10 percent for handling. The CONTRACTOR shall provide the ENGINEER an estimate of the volume of cement required for each cementing operation, inclusive of any required overage, prior to placing his order for cement.

2.03 WELLHEAD CONSTRUCTION

The CONTRACTOR shall extend the well casing two (2) feet above the ground surface and install a weather tight locking security cover after all WORK associated with well construction, development, and testing is completed. All above ground metal shall be primed and painted with a brightly colored rust-resistant paint. If flowing well conditions are encountered, the CONTRACTOR shall install a flange and an appropriately sized gate valve atop the casing to control the water flow. The CONTRACTOR shall also attach a two foot length of flanged casing equipped with one, four inch diameter port and gate valve; two, two inch diameter ports with valves; and one, one inch diameter port equipped with a valve and liquid filled pressure gage. A blind flange shall be also be installed. All valving shall be insulated and/or protected from freezing conditions.

PART 3 EXECUTION

3.01 BOREHOLE DRILLING

- A. The CONTRACTOR shall provide all necessary equipment that assures proper and timely execution and completion of the project in accordance with these CONTRACT DOCUMENTS. The CONTRACTOR is encouraged to suggest modifications if such modifications will meet the project objectives, expedite drilling and well construction, and save project costs. For each test well, the ENGINEER anticipates the CONTRACTOR will drill the borehole utilizing direct or reverse rotary water-based drilling fluid techniques to set casing into the top of the Casper Formation. Once casing is set, the CONTRACTOR will advance the borehole through the Casper Formation using a downhole hammer with air and appropriate additives to the extent practical, or ENGINEER-approved alternative as warranted, to allow for hydrogeologic assessment of the Casper Formation during drilling. The CONTRACTOR shall indicate on the Bid Form and in his submittals which circulation and drilling techniques he intends to use in the respective intervals to drill these test wells.
- B. The surface casings for the test wells shall be installed in a minimum 17 1/2-inch diameter borehole to a depth of at least 30 feet. The CONTRACTOR shall take all measures necessary to protect the top portions of the borehole from caving or raveling. The test wells will be completed in two stages. First, a minimum 12 1/4 inch diameter borehole shall be drilled through the surface casing to an anticipated depth of approximately 385 to 1,950 feet, depending upon drilling location. The exact depth of the borehole to be cased will be determined by the ENGINEER during borehole drilling. Following installation and grouting of each 8 5/8-inch diameter test well casing, the CONTRACTOR shall advance a minimum 7 5/8-

inch diameter borehole through the Casper Formation. The final depth of each borehole will be specified by the ENGINEER, and is anticipated to range from 1,375 to 3,125 feet. Overall drilling depths will depend upon geologic conditions encountered in the borehole at each location.

- C. The drilling fluid properties shall be maintained in such a manner as to ensure the structural integrity of the borehole, and to circulate drill cuttings representative of the strata penetrated to the ground surface. While not anticipated at this location, the CONTRACTOR shall be aware of the potential difficulties associated with drilling a water well capable of discharging several hundred gallons per minute under artesian pressure. Blow-out preventers and heavy muds containing mineral additives may be required. All chemical or mineralogical additives must be suitable for introduction into a potable water supply. The CONTRACTOR may be required to retain or employ an experienced, qualified, and ENGINEER approved drilling fluids engineer on the job during all drilling and completion operations to supervise and maintain the drilling fluid characteristics. The use of above-ground tanks or excavated mud pits is at the discretion of the CONTRACTOR.
- D. The CONTRACTOR shall make a recommendation to the ENGINEER when in their opinion lost circulation conditions have been encountered. The CONTRACTOR shall also propose remedies for the situation. Thickening of the drilling fluid and use of standard fluid additives are not considered remedial lost circulation measures. The ENGINEER shall review lost circulation conditions and CONTRACTOR methodologies to regain circulation, and approve, reject, or propose a substitute. Lost circulation shall be at the approval of the ENGINEER. Upon approval, the CONTRACTOR shall immediately implement remedial measures to regain circulation using lost circulation materials listed in this Contract. If after working four (4) hours to re-establish circulation, the loss of circulation is not overcome, the CONTRACTOR shall submit a written remedial methodology to regain circulation. Upon ENGINEER approval of this written plan, all additional CONTRACTOR work to regain circulation, including any footage gained, shall be at the hourly rig time rate. All lost circulation materials and mud used in attempting to restore circulation shall be paid at invoice cost plus 10 percent to cover transportation and handling.
- E. The CONTRACTOR shall be aware that obtaining good quality and representative soil, cuttings, rock flour, and formation water samples from the borehole is an essential aspect of this drilling project. The CONTRACTOR shall sample the drill cuttings as directed by the ENGINEER, at a minimum of 10-foot intervals. Each sample shall be stored in insect- and mildew-proof oil well sand sample bags. Each sample bag shall be labeled with depth interval, date, time, well name, and location. Sample bags containing the drill cuttings shall be stored in wooden crates or cardboard equivalent in a warm (above freezing), clean, dry area near the well. All samples are to be submitted to the ENGINEER.

- F. All drilling fluids shall be disposed of in accordance with State and Federal regulations. Method and place of disposal shall be approved by the ENGINEER. Costs incurred in connection with the disposal of drilling fluids and developed water will be borne by the CONTRACTOR.

3.03 PLUMBNESS AND ALIGNMENT

- A. The CONTRACTOR shall construct the test wells sufficiently straight and plumb to permit free installation and removal, without binding, of a test pump in each well. The test wells shall be drilled to a depth designated by the ENGINEER with a total deviation not to exceed one (1) degree per 200 feet from vertical with the total deviation throughout the entire depth of the borehole not to exceed five (5) degrees from vertical. It shall be the responsibility of the CONTRACTOR to see that the well is being constructed straight and plumb within these limits at all times, and the CONTRACTOR will be required by the ENGINEER to routinely test for hole deviation at least every 200 feet. The tests will be completed during the course of drilling using the plumbness and alignment requirements of AWWA A100-06, or a wireline mechanical drift indicator device manufactured by TOTCO, or equivalent. Any indications of inadequate plumbness or alignment during drilling, casing, or pump setting operations shall be cause to require measurement of plumbness and alignment by a method acceptable to the ENGINEER. No payment shall be made for tests of alignment; any such tests shall be included in the costs bid for other items in this contract.
- B. If the well is of unacceptable plumbness and alignment, the CONTRACTOR shall undertake remedial measures. Any alignment work required by the CONTRACTOR in redrilling or straightening the well shall be at his sole expense. If a well is deemed unacceptable following remedial measures, then as much casing as can be removed from the well shall be salvaged by the CONTRACTOR. The well shall be abandoned in accordance with Wyoming state regulations at the CONTRACTOR's expense. All repeated work, additional materials, labor, and equipment required to drill and construct the replacement well, satisfying the Plumbness and Alignment specifications outlined in Section 3.03A above, shall be furnished at the expense of the CONTRACTOR, and no claim for additional compensation shall be made or be allowed except as specifically provided within these CONTRACT DOCUMENTS.

3.04 INSTALLATION OF WELL CASINGS AND CEMENT SEALS

- A. Well Casings and Centralizers. The CONTRACTOR shall install the 13 3/8 and 8 5/8-inch diameter casings in accordance with the final designs furnished by the ENGINEER for each test well. The CONTRACTOR shall assure that the capacity of his equipment is adequate to hang the designed casing weight. Individual lengths of casing shall be joined by either threads and couplings, or welding. Any couplings used shall be made up power-tight in accordance with the manufacturer's recommendations. Any welding of the well casing shall be

performed by properly qualified operators and welders following the manufacturer's recommendations. The casing shall not be supported from the bottom of the borehole at any time during installation. Centralizers shall be installed on the 13 3/8 and 8 5/8 inch diameter casings at 200 foot intervals, as directed by the ENGINEER.

- B. Cement Seals. The test well casings shall be cemented in place. The 13 3/8-inch diameter casings shall be suspended in the borehole and pressured cemented in place via tremie by the CONTRACTOR. The 8 5/8-inch diameter casings shall be suspended in the borehole and cemented in place by pressure circulation of cement grout from bottom to top. Cementing shall be performed by an ENGINEER-approved cementing service company or the CONTRACTOR, if the CONTRACTOR supplies sufficient evidence to the ENGINEER, in the Information Required of Bidders, which will demonstrate his capability to properly execute this task. The cement used shall conform to the specifications of Article 2.02D above. The cement shall be allowed to cure a minimum of 18 hours, or more if directed by the cementing subcontractor, before further drilling proceeds. Two samples of the cement installed in the annular space will be collected by the CONTRACTOR in appropriate containers and presented to the ENGINEER for inspection to ensure that the cement sets in a reasonable time frame. The samples shall be collected at the beginning and at the end of each pour, and labeled accordingly.
- C. If the casing string cannot be positioned according to the final well design furnished by the ENGINEER, then the CONTRACTOR shall remove all casing from the borehole and undertake remedial measures. Failed casing due to collapse or breakage associated with installation, removal, or other construction activity prior to well completion shall be withdrawn and replaced at the CONTRACTOR's expense. If remedial measures are insufficient to permit well construction in accordance with the final well design, the CONTRACTOR shall construct another well immediately adjacent to the original location in accordance with these CONTRACT DOCUMENTS. The abandoned borehole shall be abandoned and sealed in accordance with state regulations at the sole expense of the CONTRACTOR. All repeated work, additional materials, labor, and equipment required to rehabilitate or reconstruct the well prior to well completion shall be furnished at the expense of the CONTRACTOR, and no claim for additional compensation shall be made or be allowed except as specifically provided within these CONTRACT DOCUMENTS.

3.05 WELLHEAD CONSTRUCTION

The CONTRACTOR shall extend the 8 5/8-inch diameter well casing two (2) feet above the ground surface and install a weather tight locking security cover after all WORK associated with well construction, development, and testing is completed. If a flowing well is completed, valving to relieve pressure and evacuate water will be required. The wellhead shall be insulated and protected from freezing conditions. All above ground

metal shall be primed and painted with a brightly colored rust-resistant paint. No payment shall be made for this item; it shall be included in the unit price bid to furnish and install the 8 5/8-inch diameter casing.

3.06 PLUGGING AND ABANDONMENT

- A. Any well or borehole plugging and abandonment shall meet the Wyoming DEQ/Water Quality Division's Rules and Regulations for water wells in addition to those available from the Wyoming State Engineer's Office.
- B. In the event that the CONTRACTOR fails to complete a well to the designed depth, or should he abandon the well because of loss of his tools or equipment downhole, or for any other cause related to deficiencies in his equipment or performance, the CONTRACTOR shall plug and abandon the well in accordance with Wyoming state regulations after removing as much casing as can be salvaged. All plugging and abandonment work shall be done at the sole expense of the CONTRACTOR. All salvaged materials furnished by the CONTRACTOR shall remain his property.
- C. Materials. Casings shall be cemented in place with neat cement, sand cement grout or concrete, or ENGINEER-approved equivalent. If these formations extend to considerable depth, alternate layers of coarse stone and cement grout or concrete may be used to fill the well between total depth and 30 feet below grade. Cement grout will be circulated up from the bottom up for the uppermost 30-foot interval. The services of a cementing service company shall not be required for this procedure if the CONTRACTOR can demonstrate competence in producing the desired result.
- D. Marker. For plugged wells, the top of the well casing shall be sealed with a threaded or welded steel cap. The cap shall be water tight and primed and painted. The CONTRACTOR shall label in capital (Upper Case) letters with the legal location, the State Engineer's Office permit number, well identification number, "RELOCATED," and the date of plugging. The label shall be legible.

PART 4 MEASUREMENT AND PAYMENT

4.01 PAY ITEM MEASUREMENT

- A. Bid quantities are estimated only; the ENGINEER does not expressly or by implication agree that the actual amount of work or material will correspond therewith, and reserves the right after award to increase or decrease the quantity of any unit price item of the work, without a change in the unit price, and shall include the right to delete any bid item in its entirety. Payment for construction of the wells shall be in accordance with unit price quantities, and will be made on actual quantities of the work performed under construction.

- B. Unit prices shall include all labor, equipment, tools, materials and all other items necessary and incidental to the completion of work. Measurements of all linear footage items shall be in agreement with the ENGINEER's records, prior to compensation. Payment shall constitute full compensation for all labor, equipment, tools, materials, and all other items necessary and incidental to completion of the work. There will be no payment for lost tools or materials which are improperly installed or materials which are rejected by the ENGINEER as faulty, broken or fail to meet specifications.
- C. The ENGINEER and OWNER may terminate work on the project at any point if, in the ENGINEER's judgment, the OWNER's best interests are not served by continuation. Conditions which may lead to project termination include, but are not limited to, inability to regain lost circulation and insurmountable drilling problems, indications of low groundwater development potential as determined during drilling, geophysical logging, and aquifer testing. In such event, the CONTRACTOR shall be paid for the value of work completed at that time on the basis of the Total Bid Price, modified in accordance with the unit price and lump sum items listed on the Bid Schedule. If well construction is terminated by decision of the ENGINEER, the CONTRACTOR may be required to properly abandon the well. Materials used in abandonment shall be paid at invoice cost plus 10 percent to cover transportation and handling. Payment for rig time shall be at the bid unit price.
- 01 Drill, Furnish, Install, and Cement Surface Casings. Measurement and payment for the casings shall be based on the linear footage emplaced in the test wells. Payment for the casings shall include drilling the borehole to allow emplacement of the surface casing, installing the cement seal, and security cap. Payment shall be full compensation for the casing, transportation, labor, materials, rig, fuel, air compressors, and other incidentals required to install it into the wells at the work sites.
- 02 Drill 12 1/4-Inch Minimum Diameter Boreholes. Measurement and payment for drilling the borehole in accordance with these CONTRACT DOCUMENTS shall be based upon the linear footage actually drilled. All drilling will be measured on an in-place completed linear foot basis as called on the Bid Schedule. Payment for drilling shall be full compensation for rig, fuel, air compressors, mud pumps, bits, labor, drilling fluids, and incidentals necessary to complete the hole in accordance with these CONTRACT DOCUMENTS. The respective unit price will compensate the CONTRACTOR for all bits used and wear and tear on equipment.
- 03 Furnish and Install 8 5/8-inch Casings. Measurement and payment for the casings shall be based on the linear footage emplaced in each test well. Payment for the casings shall serve as full compensation for the casing,

centralizers, transportation, installation costs and labor, and other incidentals required to deliver it to the work site and install it in place. Drilling, reaming, mud, bits and related costs associated with drilling shall be incidental to production casing.

- 04 Furnish and Install Grout (8 5/8-inch Casings). Measurement and payment for furnishing and installing the cement grout will be based on the volume (cubic feet) emplaced in the annular space, all in accordance with these CONTRACT DOCUMENTS. Payment for the grout at the unit price listed on the bid schedule shall constitute full compensation for furnishing all tools, rigs, equipment, tremie pipes, labor, materials, cement and incidentals necessary to cement the well at the specified site in accordance with these CONTRACT DOCUMENTS. The CONTRACTOR shall allow for 40 percent overrun in materials to compensate for any washouts in the borehole.
- 05 Drill 7 5/8-Inch Minimum Diameter Boreholes. Measurement and payment for drilling the boreholes in accordance with these CONTRACT DOCUMENTS shall be based upon the linear footage actually drilled. All drilling will be measured on an in-place completed linear foot basis as called on the Bid Schedule. Payment for drilling shall be full compensation for rig, fuel, air compressors, mud pumps, bits, labor, drilling fluids, and incidentals necessary to complete the hole in accordance with these CONTRACT DOCUMENTS. The respective unit price will compensate the CONTRACTOR for all bits used and wear and tear on equipment.
- 06 Rig Time. Measurement for rig time will be measured and compensated by the hour. Payment shall be full compensation for rig, fuel, air compressors, labor, drill bits, and incidentals necessary to perform the work. Rig time shall be paid only when authorized in writing by the ENGINEER.
- 07 Standby Time. Standby time shall be the time when the drill rig is shut down, although in readiness to begin or resume operations, while the CONTRACTOR is waiting on orders of the ENGINEER or on materials or services or other items to be furnished by the ENGINEER. The CONTRACTOR shall be reimbursed for standby time at the unit price per hour bid. Standby time shall not include such items as geophysical logging, waiting for cement to cure, flow testing, or delivery of materials to site, among other items. Standby shall be paid only when authorized in writing by the ENGINEER.
- 08 OPTION: Plug and Abandon the Well. Measurement and payment for furnishing and installing the cement grout shall be based on the linear footage of hole plugged, all in accordance with these CONTRACT

DOCUMENTS. Payment will be made at the unit price listed on the bid schedule, which price shall constitute full compensation for furnishing all tools, rigs, equipment, tremie pipes, labor, materials, cement and incidentals necessary to cement the well at the specified site in accordance with these CONTRACT DOCUMENTS. The CONTRACTOR shall allow for 40 percent overrun in materials to compensate for any washouts in the borehole.

4.02 PAY ITEMS

| | | |
|----|--|-------------|
| 01 | Drill, Furnish, Install, and Cement Surface Casing | linear foot |
| 02 | Drill 12 1/4-Inch Minimum Diameter Borehole | linear foot |
| 03 | Furnish and Install 8 5/8-inch Casing | linear foot |
| 04 | Furnish and Install Grout (8 5/8 Inch Casing) | cubic feet |
| 05 | Drill 7 5/8 Inch Minimum Diameter Borehole | linear foot |
| 06 | Rig Time | hour |
| 07 | Standby Time | hour |
| 08 | OPTION: Plug and Abandon the Well | linear foot |

END OF SECTION 02800



Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.



Dave Freudenthal, Governor

John Corra, Director

Authorization to Discharge Wastewater Associated with Pump Testing of Water Wells and Disinfection of Potable Water Lines Under the Wyoming Pollutant Discharge Elimination System

Authorization # WYG720218

Lidstone and Associates have requested that this general permit authorization being extended for one year. The general permit for temporary discharges allows up to one year of discharges only. The facility has discharged approximately 10 days with the authorization. It is therefore eligible to be extended for up to 355 days. To allow for a margin of error, this renewed authorization will expire October 31, 2011. The authorization currently held by Lidstone and Associates, must be replaced immediately with this edition.

In compliance with the provisions of the Federal Water Pollution Control Act and the Wyoming Environmental Quality Act,

Lidstone and Associates, Inc., Attn: Ms. Katherine Laudon, 4025 Automation Way, Building E, Fort Collins, CO. 80525

is authorized to discharge wastewater associated with pump testing of water wells and for disinfection of the water wells from

Belvoir Ranch Ground Water Development Level II

Outfall 001: SWNE Section 31, Township 13N, Range 69W, Latitude 41.054088, Longitude -105.161585

Outfall 002: SESE Section 30, Township 13N, Range 69W, Latitude 41.062557, Longitude -105.158069

Outfall 003: SESE Section 19, Township 13N, Range 69W, Latitude 41.075106, Longitude -105.157503

Outfall 004: NWSW Section 16, Township 13N, Range 69W, Latitude 41.09539, Longitude -105.13489

Outfall 005: NESE Section 17, Township 13N, Range 69W, Latitude 41.095266, Longitude -105.139951

Outfall 006: NENW Section 30, Township 13N, Range 69W, Latitude 41.07259, Longitude -105.16414

Outfall 007: SWSW Section 29, Township 13N, Range 69W, Latitude 41.06216, Longitude -105.15806

Outfall 008: SESE Section 31, Township 13N, Range 69W, Latitude 41.048293, Longitude -105.157356

to surface waters of the State of Wyoming in accordance with the requirements of the enclosed general permit for temporary discharges. Receiving waters:

Outfall 001: Goose Creek (class 2AB) via an unnamed ephemeral tributary (class 3B)

Outfalls 002 and 007: Goose Creek (class 2AB)

Outfalls 003 and 006: Goose Creek, via Willow Creek (class 2AB waters) via an unnamed ephemeral tributary (class 3B)

Outfall 008: Duck Creek (class 2AB) via an unnamed ephemeral tributary (class 3B)

Outfalls 004 and 005: Lone Tree Creek (class 2AB).

Herschler Building • 122 West 25th Street • Cheyenne, WY 82002 • <http://deq.state.wy.us>

ADMIN/OUTREACH
(307) 777-7937
FAX 777-3610

ABANDONED MINES
(307) 777-6145
FAX 777-6462

AIR QUALITY
(307) 777-7391
FAX 777-5616

INDUSTRIAL SITING
(307) 777-7369
FAX 777-5973

LAND QUALITY
(307) 777-7756
FAX 777-5864

SOLID & HAZ. WASTE
(307) 777-7752
FAX 777-5973

WATER QUALITY
(307) 777-7781
FAX 777-5973



All receiving streams and tributaries are in HUC 10190008 which is the same drainage and so all outfalls are listed on the same authorization, South Platte River basin.

Permit limits and monitoring requirements for the Well Pump Test for all outfalls is as follows:

Effluent Limitation

| Parameter | Monthly Average | Weekly Average | Daily Maximum |
|------------------------------|------------------------|-----------------------|----------------------|
| Total Dissolved Solids, mg/L | N/A | N/A | 5,000 |
| Total Suspended Solids, mg/L | 30 | 45 | 90 |
| pH, su (standard units) | N/A | N/A | 6.5-9.0 |

Monitoring Requirements

| Parameter | Measurement Frequency | Sample Type |
|------------------------------|------------------------------|-----------------------------|
| Flow, gpm | Daily | Instantaneous or Continuous |
| Total Dissolved Solids, mg/L | Weekly | Grab |
| Total Suspended Solids, mg/L | Weekly | Grab |
| pH su (standard units) | Daily | Grab |

Permit limits and monitoring requirements for Chlorine Disinfection of the Wells for all outfalls is as follows:

Effluent Limitation

| Parameter | Monthly Average | Weekly Average | Daily Maximum |
|--|------------------------|-----------------------|----------------------|
| Total Suspended Solids, mg/l | 30 | 45 | 90 |
| pH, su (standard units) | N/A | N/A | 6.5-9.0 |
| Total Residual Chlorine, mg/l ⁽¹⁾ | N/A | N/A | 0.02 ⁽¹⁾ |

⁽¹⁾Chlorinated water must be detained until the chlorine residual reaches less than 0.02 mg/l (non-detectable).

Monitoring Requirements, Disinfection

| Parameter | Measurement Frequency | Sample Type |
|---|------------------------------|-----------------------------|
| Flow, gpm | Daily | Instantaneous or Continuous |
| Total Suspended Solids, mg/l | Weekly | Grab |
| pH, s.u. (standard units) | Daily | Grab |
| Total Residual Chlorine ⁽¹⁾ , mg/l | Daily | Grab |

⁽¹⁾Chlorinated water must be detained until the chlorine residual reaches less than 0.02 mg/l (non-detectable).

For outfalls 001 through 008:

If the duration of the discharge is shorter than the required sample frequency, a minimum of one sample shall be taken for all parameters

If the discharge point is more than 0.5 miles from a perennial stream and the discharge flow is less than 0.5 cfs, permittee may use a series of hay bales instead of a temporary sedimentation basin.

If the discharge point is more than 0.5 miles from a perennial stream but the discharge flow is greater than 0.5 cfs, permittee must use a temporary sedimentation basin.

If the discharge point is less than 0.5 miles from a perennial stream and discharge potentially reaches the perennial stream, permittee must use a temporary sedimentation basin.

For Outfalls 002, 004, 005, and 007: Any combination of hay bales, silt fence, waddles, sandbags, temporary sedimentation basin with sheet flow overflow; followed by upland overflow is required.

For All Outfalls: The above mentioned measures shall be modified or augmented if ineffective in preventing sedimentation or erosion.

Reporting is required quarterly, using the enclosed, DEQ-provided, "Discharge Monitoring Logs", to be submitted by the 28th day following the calendar quarter of discharge activity (e.g., January 28, April 28, July 28, or October 28), to WYPDES Permits Section, DEQ/WQD, Herschler Building - 4 W, 122 West 25th Street, Cheyenne, WY 82002.

The discharge monitoring logs shall include this temporary authorization number (**WYG720218**); outfall number, date and time of sampling, dates and times of analyses, and the person or persons performing sampling and analyses.


For termination of this authorization, the enclosed Termination Notice (also available at http://deq.state.wy.us/wqd/WYPDES_Permitting/downloads/TD_NOT_2_07.doc) must be completed and submitted at the completion of the discharge, along with monitoring analytical results. Authorizations cannot be terminated until the monitoring data and all completed "Discharge Monitoring Logs" have been submitted to the WQD for review.

Once this permit has been issued, the permittee will be assessed a \$100.00 per-year permit fee by the Water Quality Division. The fee year runs from January 1st through December 31st. This permit fee will continue to be assessed for as long as the permit is active, regardless of whether discharge actually occurs. This fee is not pro-rated. If the permit is active during any portion of the fee year, the full fee will be billed to the permittee for that fee year.

This facility has been assigned permit number **WYG720218**.

Coverage under this general permit for temporary discharges shall begin upon date of signature below, and is authorized to continue no longer than **October 31, 2011**.

If you have any questions concerning the conditions of this general permit authorization, contact Marcia Porter at 307-777-6081, or email mporte@wyo.gov.



Leah Krafft
Department of Environmental Quality
Water Quality Division



Date of Signature

TERMINATION NOTICE

INSTRUCTIONS: Submit this form with *water quality monitoring results* and any completed "Discharge Monitoring Logs" not already submitted upon completion of discharge activity.

1. Name, address, and telephone number of the company, individual, or organization which received authorization for a temporary discharge under the attached general permit.

Name:

Address:

Telephone:

2. Identification number assigned to this temporary discharge:
WYG _____

3. Project Name:

4. Certification:

I certify under penalty of law that the temporary discharge identified above has been completed and that the discharge locations have been returned to approximate pretest conditions. I understand that by submitting this notice I am terminating coverage under Wyoming's general NPDES permit for temporary discharges. I also understand that if, at a later date, it is determined that the site was inadequately reclaimed and pollutant discharge results, I may be liable for discharging pollutants without a permit.

Printed Name of Person Signing

Title

Signature

Date

Telephone

Section 35-11-901 of Wyoming Statutes provides that:

"Any person who knowingly makes any false statement, representation, or certification in any application ... shall, upon conviction, be fined not more than \$10,000 per day for each violation or imprisoned for not more than one (1) year or both."

Upon completion, remove this notice from the permit and mail to:

WYPDES Permits Section
DEQ/WQD
Herschler Building - 4 W
122 West 25th Street
Cheyenne, WY 82002

**BE SURE TO INCLUDE WATER QUALITY MONITORING RESULTS WITH THIS FORM
EVEN IF YOU HAVE PREVIOUSLY SUBMITTED THEM!**

Appendix B

Environmental Reporting



Appendix B

Contents

Letter dated September 30, 2009 from Lidstone and Associates, Inc. (LA) to Brian Kelly, USFWS
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter dated October 20, 2009 from USFWS to Mark Stacy, LA

Wildlife and Threatened and Endangered Species Report for the Belvoir Ranch Paleozoic Ground Water Supply
Wells – Prepared by Real West Natural Resource Consulting, January 2010

Letter dated March 9, 2010 from USFWS to Mark Stacy, LA

Letter dated September 30, 2009 from LA to Mary Hopkins, Wyoming SHPO
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

The 2010 Class III Cultural Resource Inventory of Eight Proposed Well Locations at the Belvoir Ranch, Laramie
County, Wyoming – Submitted by Office of the Wyoming State Archaeologist, February 2010

Letter dated February 18, 2010 from Wyoming State Historic Preservation Office to Mark Stacy, LA
Re: Belvoir Ranch Paleozoic Ground Water Supply Wells (SHPO File # 0605RLC008)

The 2010 Class III Cultural Resource Inventory of the Goose Creek 2-1E and 2-2C and Lone Tree Creek Fault 1-5
Proposed Well Locations at the Belvoir Ranch, Laramie County, Wyoming – Submitted by Office of the Wyoming
State Archaeologist, October 2010

Letter dated September 30, 2009 from LA to Matthew Bilodeau, Wyoming Regulatory Office-USACOE
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter Dated October 14, 2009 from Army Corps of Engineers to Tim Wilson, Cheyenne Board of Public Utilities

Letter dated September 30, 2009 from LA to Paige Smith, Wyoming DEQ, Air Quality Division
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter dated October 6, 2009 from Wyoming DEQ, Air Quality Division to Mark Stacy, LA
Re: Air Quality Division Environmental Review of the Board of Public Utilities Belvoir Ranch Paleozoic
Ground water Exploration Project

Letter dated September 30, 2009 from LA to J. Xavier Montoya, Wyoming State Conservationist-NRCS
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter dated September 30, 2009 from LA to Matthew Hoobler, Wyoming State Engineer's Office
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter dated October 14, 2009 from Wyoming State Engineer's Office to Mark Stacy, LA
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Letter dated September 30, 2009 from LA to Don Beard, Laramie County Public Works
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Email dated January 7, 2010 from Mark Stacy, LA to Cathy Heatherington, Laramie County
Re: Belvoir Ranch Floodplain Question

Letter dated September 30, 2009 from Mark Stacy, LA to Jane Francis, Wyoming DEQ, Water Quality Division
Re: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service
Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Mr. Brian T. Kelly
Field Supervisor
Ecological Services
U.S. Fish and Wildlife Service
5353 Yellowstone Road, Suite 308A
Cheyenne, WY 82009

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Kelly:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Previous correspondence for this project area can be found under WY9566. Please note that the test well locations included herein are different from those previously identified. For your reference, I have attached a copy of your letter dated June 23, 2005, in response to States West 2005 request for site review. The issues raised in your June 2005 letter will be addressed in our Environmental Report.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on your previous response under WY9566 and identified species within the area, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well development and aquifer testing activities. Disturbed areas will also be reseeded upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
USFWS Letter dated June 23, 2005
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

JUN 23 2005

In Reply Refer To:
ES-61411/W.39/WY9566

Mr. Jack Meena
States West Water Resources Corporation
1904 East 15th Street
Cheyenne, Wyoming 82001

Dear Mr. Jack Meena:

Thank-you for your letter and environmental assessment (EA) of May 31, 2005 received in our office on June 3 regarding the Belvoir Ranch Paleozoic Groundwater Exploration Project in southern Laramie County, Wyoming. According to your letter and the EA four test wells will be drilled at the Belvoir Ranch, which is located approximately 15 miles west of the City of Cheyenne, and in Townships 12 and 13 North, Ranges 69 and 70 West. Approximately 0.5 acres will be disturbed at each site, and drilling will take approximately three days to complete. Drilling is expected to occur in late summer to early fall 2005. You have requested that the U.S. Fish and Wildlife Service (Service) review this project.

The Service provided comments on this project to Lidstone and Associates, Incorporated in correspondence dated November 24, 2004 (WY8828). Further, Jessica Homyack of my staff accompanied Bruce Brinkman of the Wyoming Water Development Commission and Kate Laudon from Lidstone and Associates on a site visit to the Belvoir ranch on November 23, 2004. Based on the EA and maps you provided, it appears that the locations for test wells have changed since the Service's November 2004 review of the project. Thus the Service is providing States West Water Resources Corporation with updated comments on the Belvoir Ranch Paleozoic Groundwater Exploration Project.

Federal Agency Responsibilities

The Service has responsibility, under a number of Federal laws, treaties, Executive Orders, and memoranda of agreement, for the conservation and management of fish and wildlife resources. Some of these same authorities also require other Federal agencies to consider, avoid, or prevent adverse impacts to fish, wildlife, and wetland resources. To ensure resources are afforded adequate consideration and protection, Federal agencies are often required to consult with the Service regarding potential impacts their actions may have on fish and wildlife resources.

If it is determined that any Federal agency program or project "is likely to adversely affect" any listed species, formal consultation should be initiated with this office. Alternatively, informal consultation can be continued so the Service can assist you to determine how the project could be

modified to reduce impacts to listed species to the "not likely to adversely affect" threshold. If it is concluded that the project "is not likely to adversely affect" listed species, you should request the Service to review the assessment and concur with the determination of not likely to adversely affect.

In response to your request to review the proposed action, we are providing you with comments on (1) threatened, endangered and candidate species, (2) migratory birds, and (3) wetlands and riparian areas. The U.S. Fish and Wildlife Service (Service) provides recommendations for protective measures for threatened and endangered species in accordance with the Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*). Protective measures for migratory birds are provided in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act.

In accordance with section 7 of the Act, we have determined that threatened or endangered species may potentially occur within the permit area. We would appreciate receiving information as to the status of each of these species within the permit area as well as your determination of effects from this project.

| SPECIES | STATUS | HABITAT |
|---|------------|---|
| Preble's meadow jumping mouse (<i>Zapus hudsonius preblei</i>) | Threatened | Riparian habitats east of Laramie Mts. and south of the N. Platte River |
| Colorado butterfly plant (<i>Gaura neomexicana</i> ssp. <i>coloradensis</i>) | Threatened | Wet meadows in floodplains |

If the proposed action may lead to consumptive use of water in the Platte River System, impacts to threatened and endangered species inhabiting the downstream reaches of these systems should be included in the evaluation.

| | | |
|----------------------|------------|---|
| Platte River species | Endangered | Downstream riverine habitat of the Platte River in Nebraska |
|----------------------|------------|---|

Preble's meadow jumping mouse: The Preble's meadow jumping mouse (Preble's) is a small rodent in the Zapodidae family and is 1 of 12 recognized subspecies of the species *Z. hudsonius*, the meadow jumping mouse. The diet of the Preble's consists of seeds, fruits, fungi and insects. Hibernation occurs from October to May in small underground burrows. Nests are made of grass, leaves or woody material in burrows the mouse excavates several centimeters underground. Preble's are primarily nocturnal or crepuscular, but have been observed during daylight. They occur in low undergrowth consisting of grasses, forbs, or a mix of both, in wet meadows and riparian corridors, or where tall shrubs and low trees provide adequate cover. Additionally, Preble's exhibits a preference for lush vegetation along watercourses or herbaceous

understories in wooded areas with close proximity to water. In Wyoming, Preble's has been recently documented in Albany, Laramie, Platte and Converse Counties, and may occur in Goshen County. If a proposed project will result in a disturbance to suitable habitat within any of these five counties, surveys should be conducted prior to any action. Due to the difficulty in identifying the Preble's, surveys should be conducted by knowledgeable biologists trained in conducting these surveys.

Colorado butterfly plant: The Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) is a perennial herb endemic to moist soils in wet meadows of flood plain areas in southeastern Wyoming, north-central Colorado, and extreme western Nebraska between elevations of 5,000 and 6,400 feet. These plants are often found in low depressions or along bends in wide meandering stream channels a short distance upslope of the actual channel. Threats to the plant include non-selective herbicide spraying, haying and mowing schedules that inhibit the setting of seed, land conversion for cultivation and competition from noxious weeds. The low numbers and limited distribution contribute to the plant's vulnerability. Surveys should be conducted during flowering season which normally occurs in August although some temporal variability exists from site to site and from year to year depending on annual climatic conditions. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the Colorado butterfly plant to experts who can provide training/services.

Critical habitat was proposed for the Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) on August 6, 2004 in Laramie and Platte counties in Wyoming, Kimball County in Nebraska, and Weld County in Colorado (69 FR 47834). For additional information see Federal Register notice (69 FR 47834). Management considerations for the Colorado butterfly plant include: maintaining surface and subsurface water flows that provide the essential hydrological regime that supports the species; appropriate restraints on application of herbicides used to control noxious weeds; preventing habitat degradation caused by plant community succession; and preventing harmful habitat fragmentation from residential and urban development that detrimentally affects plant-pollinator interactions, leads to a decline in species reproduction, and increases susceptibility to non-native plant species. Should ground disturbing activities occur in Sections 25 or 26 of Township 13 North, Range 68 West or Section 31 of Township 13 North, Range 67 West, this office should be contacted to ensure that known populations of Colorado butterfly plant within designated critical habitat or within areas covered by the conservation agreement with the City of Cheyenne are protected.

Platte River water depletions: Water depletions to the Platte River system may affect the federally listed whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), bald eagle (*Haliaeetus leucocephalus*), Eskimo curlew (*Numenius borealis*), and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or adverse modification of designated critical habitat for the whooping crane and the northern Great Plains breeding population of the piping plover. Depletions include evaporative losses and/or consumptive use, often characterized as diversions from the Platte River or its tributaries less

return flows. Project elements that could be associated with depletions to the Platte River system include, but are not limited to, ponds (detention/recreation/irrigation storage/stock watering), lakes (recreation/irrigation storage/municipal storage/power generation), reservoirs (recreation/irrigation storage/municipal storage/power generation), created or enhanced wetlands, hydrostatic testing of pipelines, wells, diversion structures, dust abatement, and water treatment facilities. Any actions that may result in a water depletion to the Platte River system should be identified. The document should include: an estimate of the amount and timing of average annual water use (both historic and new uses) and methods of arriving at such estimates; location of where water use or diversion occurs as specifically as possible; if and when the water will be returned to the system; and what the water is being used for. Note that if the project has peculiarities or oddities, the Service may have more specific questions regarding the potential consumptive use of water.

In accordance with section 7, we have determined that the proposed project will occur within the Platte River Watershed. Should the test wells be developed, this project will lead to water depletions (consumption) in the Platte River System, and impacts to threatened and endangered species inhabiting the downstream reaches of this system should be included in the evaluation.

Migratory birds: Please recognize that consultation on listed species may not remove your obligation to protect the many species of migratory birds, including eagles and other raptors protected under the MBTA or BGEPA. The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing.

Work that could lead to the take of a migratory bird including an eagle, their young, eggs, or nests (for example, if you are going to erect new well sites, roads, or power lines in the vicinity of a nest), should be coordinated with our office before any actions are taken. Removal or destruction of such nests, or causing abandonment of a nest could constitute violation of one or both of the above statutes. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. Mitigation, as determined by the local U.S. Fish and Wildlife Service field office, may be required for loss of these nests. No permits will be issued for an active nest of any migratory bird species, unless removal of an active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present on, or near the project area, timing is a significant consideration and needs to be addressed in project planning.

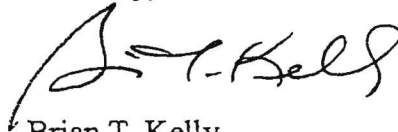
Sedimentation: Sedimentation is the number one pollutant of our Nation's waterways. Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion

control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

Additional Conservation Recommendations: The Service recommends that ground disturbance associated with drilling test wells for the Belvoir Ranch Water Supply project be greater than 300 feet from streams and ephemeral draws in the proposed project area. Maintaining a buffer width of at least 300 feet in addition to limiting sedimentation from drilling will provide protection for current populations and habitat of Colorado Butterfly Plant and habitat for Preble's Meadow Jumping Mouse.

If you have questions regarding our comments or your responsibility under the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 *et seq.*, please contact Jessica Homyack of my staff at the letterhead address or phone (307) 772-2374, extension 24.

Sincerely,

A handwritten signature in dark ink, appearing to read "B. T. Kelly", written in a cursive style.

Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc: DEQ, Water Quality Division, Cheyenne, WY (B. Mark)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)
WGFD, Non-Game Coordinator, Lander, WY (B. Oakleaf)
WWDC, Hydrologic Engineer, Cheyenne, WY (B. Brinkman)



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

OCT 26 2009

In Reply Refer To:
ES-61411/22/WY10SL0002

OCT 20 2009

COPY

MES

Mark E. Stacy, P.G.
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, Colorado 80525-3448

Dear Mr. Stacy:

Thank you for your letter of September 30, 2009, received in our office on October 1, regarding the project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells will be drilled to depths of up to approximately 4,000 feet depending on subsurface structural geologic conditions.

You have requested information regarding species listed under the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). In response to your request, the U.S. Fish and Wildlife Service (Service) is providing you with recommendations for protective measures for threatened and endangered species in accordance with the Act. We are also providing recommendations concerning migratory birds in accordance with the Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703 and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Wetlands are afforded protection under Executive Orders 11990 (wetland protection) and 11988 (floodplain management), as well as section 404 of the Clean Water Act. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j".

In accordance with Section 7(c) of the Act, we have determined that the following species or their designated critical habitat may be present in the proposed project area. We would appreciate receiving information as to the current status of each of these species within the proposed project area.

**Listed Species and Designated Critical Habitat
that may be affected by projects in the proposed Project Area**

| <u>SPECIES</u> | <u>STATUS</u> | <u>Expected Occurrence</u> |
|--|---------------|---|
| Colorado butterfly plant (<i>Gaura neomexicana</i> ssp. <i>coloradensis</i>) | Threatened | Wet meadows and riparian areas |
| Ute ladies'-tresses (<i>Spiranthes diluvialis</i>) | Threatened | Seasonally moist soils and wet meadows of drainages below 7,000 feet |

If the proposed action will lead to water depletion (consumption) in the Platte river system, impacts to the following species and critical habitat should be included in the evaluation:

| | | |
|--|------------|--|
| Interior least tern (<i>Sterna antillarum</i>) | Endangered | Platte River system downstream of Wyoming |
| Pallid sturgeon (<i>Scaphirhynchus albus</i>) | Endangered | Platte River system downstream of Wyoming |
| Piping plover (<i>Charadrius melodus</i>) | Threatened | Platte River system downstream of Wyoming |
| Western prairie fringed orchid (<i>Platanthera praeclara</i>) | Threatened | Platte River system downstream of Wyoming |
| Whooping crane (<i>Grus americana</i>) | Endangered | Platte River system downstream of Wyoming |
| Critical habitat for Whooping crane | Designated | Platte River system downstream of Wyoming |

Colorado butterfly plant: The Colorado butterfly plant (*Gaura neomexicana* ssp. *coloradensis*) is a perennial herb endemic to moist soils in wet meadows of flood plain areas in southeastern Wyoming, north-central Colorado, and extreme western Nebraska between elevations of 5,000 and 6,400 feet. These plants are often found in low depressions or along bends in wide meandering stream channels a short distance upslope of the actual channel. Threats to the plant include non-selective herbicide spraying, haying, and mowing schedules that inhibit the setting of seed, land conversion for cultivation, and competition from noxious weeds. The low numbers and limited distribution contribute to the plant's vulnerability. Surveys should be conducted during flowering season which normally occurs in August although some temporal variability exists from site to site and from year to year depending on annual climatic conditions. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the Colorado butterfly plant to experts who can provide training/services.

Platte River water depletions: Water depletions to the Platte River system may affect the Federally listed whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or adverse modification of designated critical habitat for the whooping crane. Depletions include evaporative losses and/or consumptive use, often characterized as diversions from the Platte River or its tributaries less return flows. Project elements that could be associated with depletions to the Platte River system include, but are not limited to, ponds (detention/recreation/irrigation storage/stock watering), lakes (recreation/irrigation storage/municipal storage/power generation), reservoirs (recreation/irrigation storage/municipal storage/power generation), created or enhanced wetlands, hydrostatic testing of pipelines, wells, diversion structures, dust abatement, and water treatment facilities. Any actions that may result in a water depletion to the Platte River system should be identified. The document should include: an estimate of the amount and timing of average annual water use (both historic and new uses) and methods of arriving at such estimates; location of where water use or diversion occurs as specifically as possible; if and when the water will be returned to the system; and for what purpose the water is being used. For more information on how to seek ESA coverage for water-related activities through the Platte River Recovery Implementation Program, please visit our web site at: <http://www.fws.gov/platteriver>.

Ute ladies'-tresses: Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial, terrestrial orchid, 8 to 20 inches tall, with white or ivory flowers clustered into a spike arrangement at the top of the stem. *S. diluvialis* typically blooms from late July through August; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. *S. diluvialis* is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams where it colonizes early successional point bars or sandy edges. The elevation range of known occurrences is 4,200 to 7,000 feet (although no known populations in Wyoming occur above 5,500 feet) in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Soils where *S. diluvialis* have been found typically range from fine silt/sand, to gravels and cobbles, as well as to highly organic and peaty soil types. *S. diluvialis* is not found in heavy or tight clay soils or in extremely saline or alkaline soils. *S. diluvialis* seems intolerant of shade and small scattered groups are found primarily in areas where vegetation is relatively open. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. *S. diluvialis* is difficult to survey for primarily due to its unpredictability of emergence of flowering parts and subsequent rapid desiccation of specimens. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the orchid to experts who can provide training or services.

Migratory Birds: The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations, and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing.

Work that could lead to the take of a migratory bird or eagle, their young, eggs, or nests (for example, if you are going to erect new roads, or power lines in the vicinity of a nest), should be coordinated with our office before any actions are taken. Removal or destruction of such nests, or causing abandonment of a nest could constitute violation of one or both of the above statutes. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. Mitigation, as determined by the local Service field office, may be required for loss of these nests. No permits will be issued for an active nest of any migratory bird species, unless removal of an active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present on, or near the project area, timing is a significant consideration and needs to be addressed in project planning.

If nest manipulation is proposed for this project, the project proponent should contact the Service's Migratory Bird Office in Denver at 303-236-8171 to see if a permit can be issued for this project. No nest manipulation is allowed without a permit. If a permit cannot be issued, the project may need to be modified to ensure take of a migratory bird or eagle, their young, eggs or nest will not occur. The Service's Wyoming Field Office has compiled a list of Migratory Bird Species of High Federal Interest (Enclosure) from the ongoing work among State and Federal agencies, non-governmental organizations, and the interested public that produced the Wyoming Bird Conservation Plan. This list will now serve as our list of Migratory Bird Species of Management Concern in Wyoming, in place of the previous list based on the Migratory Nongame Birds of Management Concern in the United States: the 1995 List.

Wetlands/Riparian Areas: Wetlands may be impacted by the proposed project. Wetlands perform significant ecological functions which include: (1) providing habitat for numerous aquatic and terrestrial wildlife species, (2) aiding in the dispersal of floods, (3) improving water quality through retention and assimilation of pollutants from storm water runoff, and (4) recharging the aquifer. Wetlands also possess aesthetic and recreational values. If wetlands may be destroyed or degraded by the proposed action, those wetlands in the project area should be inventoried and fully described in terms of their functions and values. Acreage of wetlands, by type, should be disclosed and specific actions should be outlined to avoid, minimize, and compensate for all unavoidable wetland impacts.

Riparian or streamside areas are a valuable natural resource and impacts to these areas should be avoided whenever possible. Riparian areas are the single most productive wildlife habitat type in North America. They support a greater variety of wildlife than any other habitat. Riparian vegetation plays an important role in protecting streams, reducing erosion and sedimentation as well as improving water quality, maintaining the water table, controlling flooding, and providing shade and cover. In view of their importance and relative scarcity, impacts to riparian areas should be avoided. Any potential, unavoidable encroachment into these areas should be further avoided and minimized. Unavoidable impacts to streams should be assessed in terms of their functions and values, linear feet and vegetation type lost, potential effects on wildlife, and potential effects on bank stability and water quality. Measures to compensate for unavoidable losses of riparian areas should be developed and implemented as part of the project.

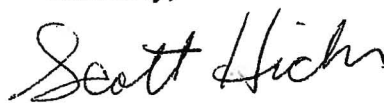

Plans for mitigating unavoidable impacts to wetland and riparian areas should include mitigation goals and objectives, methodologies, time frames for implementation, success criteria, and monitoring to determine if the mitigation is successful. The mitigation plan should also include a contingency plan to be implemented should the mitigation not be successful. In addition, wetland restoration, creation, enhancement, and/or preservation does not compensate for loss of stream habitat; streams and wetlands have different functions and provide different habitat values for fish and wildlife resources.

Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

For our internal tracking purposes, the Service would appreciate notification of any decision made on this project (such as issuance of a permit or signing of a Record of Decision or Decision Memo). Notification can be sent in writing to the letterhead address or by electronic mail to FW6_Federal_Activities_Cheyenne@fws.gov.

We appreciate your efforts to ensure the conservation of Wyoming's fish and wildlife resources. If you have questions regarding this letter or your responsibilities under the Act and/or other authorities or resources described above, please contact Alex Schubert of my office at the letterhead address or phone (307) 772-2374, extension 238.

Sincerely,


 Brian T. Kelly
Field Supervisor
Wyoming Field Office

Enclosure

cc: WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

February 11, 2010

Mr. Brian T. Kelly
Field Supervisor
Ecological Services
U.S. Fish and Wildlife Service
5353 Yellowstone Road, Suite 308A
Cheyenne, WY 82009

**RE: Belvoir Ranch Paleozoic Ground Water Supply Wells
USFW File #ES-61411/.22/WY10SL0002**

Dear Mr. Kelly:

Lidstone and Associates, Inc. (LA) has completed a wildlife and threatened and endangered species survey of eight prospective drill sites on Belvoir Ranch. Each of the drill sites is located within one of the five potential drilling areas that were identified in our September 30, 2009 letter. Please find a copy of the report by Ms. Amber Travsky enclosed for your review and comment.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.

Mark E. Stacy, P.G.
Senior Hydrogeologist

→ MES Spoke to Scott Hucker on 3/2/10
and found out that Alex Schubert worked
on what we sent in November
will check with Alex and have
him call.

MES:rce

Enclosure

cc: w/out Enc. Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail

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Wildlife and Threatened and Endangered Species Report

for the

Belvoir Ranch Paleozoic Ground Water Supply Wells

Prepared for

Wyoming Water Development Commission

6920 Yellowtail Road

Cheyenne, WY 82002

Cheyenne Board of Public Utilities

P.O. Box 1469

Cheyenne, WY 82003

And

Lidstone and Associates, Inc.

4025 Automation Way, Building E

Fort Collins, CO 80525

Prepared by

Real West Natural Resource Consulting

1116 Albin Street

Laramie, WY 82072

January 2010

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1.0 INTRODUCTION

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill up to eight test wells to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply.

Amber Travsky, a biologist with Real West Natural Resource Consulting (Real West), conducted a site survey of each of the eight possible drill sites and a 1-mile buffer around each on January 13, 2010. The purpose of this report is to assess and document the potential for threatened and endangered (T&E) species and other species of concern on the site and in the vicinity.

2.0 PROJECT DESCRIPTION

The project involves drilling four test wells, with the addition of up to four more based on funding availability. Actual number of wells is contingent on drilling depths and costs. A total of eight locations within the City of Cheyenne's Belvoir Ranch were inspected. The drill sites, as shown in Figure 2-1, include two sites each at Lone Tree Creek, Lone Tree Fault, Goose Creek and Duck Creek.

Access to each drill site will be limited to existing routes wherever possible. The legal location and latitude/longitude of each of the drill site are presented in Table 2-1. An area of approximately one-half acre may be disturbed during drilling of each test well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. Drilling is expected to begin in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Activity at each site would take approximately one month with drilling completion anticipated

during the summer of 2010. All disturbance areas will be reclaimed as soon as possible following completion of drilling operations.

Figure 2-1. Drill Site Locations.

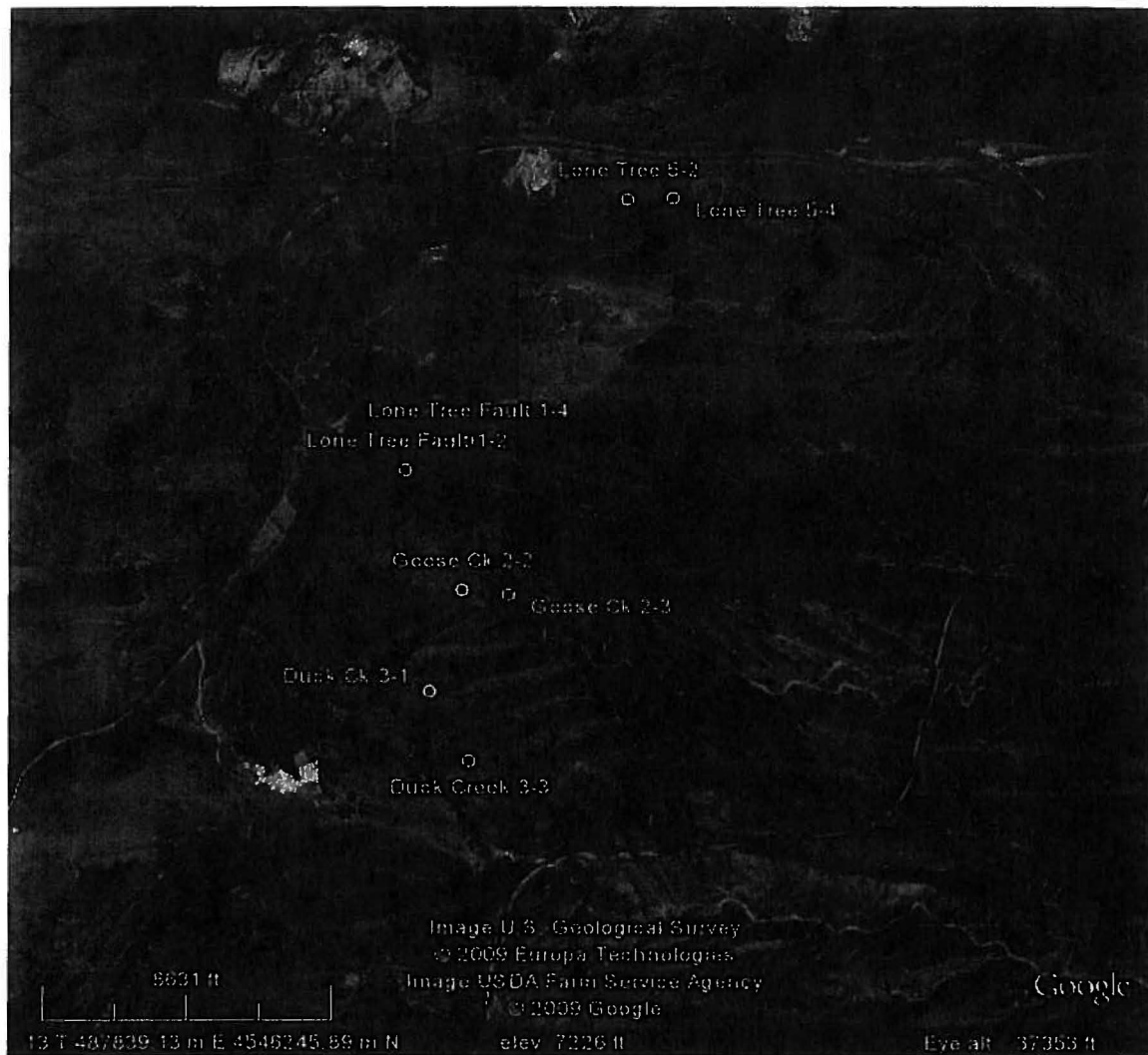


Table 2-1. Drill Site Locations.

| Prospect Name | Location (T, R, & Section) | Location (Latitude, Longitude) |
|---------------------|----------------------------|--------------------------------|
| Lone Tree 5-4 | T13N, R69W, Sec. 16NWSW | 41.095408; -105.134903 |
| Lone Tree 5-2 | T13N, R69W, Sec. 17NESE | 41.095267; -105.139953 |
| Lone Tree Fault 1-2 | T13N, R69W, Sec. 30NENW | 41.072600; -105.164151 |
| Lone Tree Fault 1-4 | T13N, R69W, Sec. 19SESE | 41.075111; -105.157506 |
| Goose Creek 2-2 | T13N, R69W, Sec. 30SESE | 41.062564; -105.158076 |
| Goose Creek 2-3 | T13N, R69W, Sec. 29SWSW | 41.062175; -105.153032 |
| Duck Creek 3-1 | T13N, R69W, Sec. 31SWNE | 41.054099; -105.161593 |
| Duck Creek 3-3 | T13N, R69W, Sec. 31SESE | 41.048295; -105.157354 |

3.0 METHODS

Amber Travsky, a biologist with Real West, conducted a wildlife habitat evaluation and survey on January 13, 2010. Also in attendance was Mark Stacy, hydrogeologist with LA, and Paul Sanders, archaeological survey manager with the State of Wyoming State Parks and Cultural Resources.

4.0 RESULTS

A general habitat description of the Belvoir Ranch in the vicinity of the drill sites as well as descriptions of each of the eight drill sites is provided below. Photographs of each of the sites are in Appendix A.

4.1 Habitat and Drill Site Descriptions

The Belvoir Ranch is located approximately 16 miles west of the City of Cheyenne and 27 miles southeast of the City of Laramie. It is immediately south of Interstate 80 and is accessed from

the Harriman interstate exit. Elevation on the project area ranges from 7,285 feet at the southern end of the site, to 7,100 feet at the northern boundary, adjacent to the Interstate. Terrain on the ranch is rolling with numerous ephemeral creek drainages extending primarily from the west to the east across the ranch property. A housing subdivision is immediate adjacent to the northwest.

Habitat in the area and on the proposed drill sites is primarily grassland prairie. Dominant species include grasses such as western wheatgrass (*Agropyron smithii*), prairie Junegrass (*Koeleria macrantha*), blue gramma (*Bouteloua gracilis*) and needle-and-thread (*Stipa comata*). Dominant forbs include field pussytoes (*Antennaria neglecta*), wild buckwheat (*Eriogonum* spp.), and wild onion (*Allium textile*) while the only shrub in any significant amount is fringed sagebrush (*Artemisia frigida*).

Habitat in the vicinity of the northern sites, but outside the drill sites, also includes mountain mahogany shrublands and willow bottomlands. The mountain mahogany habitat includes mountain mahogany (*Cercocarpus montanus*) with an understory similar to the grassland habitat. The willow bottomlands include scattered cottonwood trees (*Populus deltoides*) and willows (*Salix* spp.) with an understory of smooth brome (*Bromus inermis*), meadow foxtail (*Alopecurus pratensis*), and bluegrasses (*Poa* spp.).

Duck Creek 3-1

The site is near a ridgetop on rolling terrain. Habitat on the site and in the vicinity is prairie grassland with the dominant species being pussytoes, fringed sagebrush, prairie Junegrass and wheatgrasses. Vegetation ground cover is approximately 85%.

Duck Creek 3-3

The site is on a ridge top amid rolling terrain. Vegetation is the same as Duck Creek 3-1 with the addition of blue gramma, threadleaf sedge (*Carex filifolia*), and lupine (*Lupinus argenteus*). Vegetation ground cover is approximately 85%.

Goose Creek 2-2

The site is near the bottom of ephemeral Goose Creek drainage in an area of rolling terrain. The drill site is approximately 50 feet from the creek bottom, which consists primarily of a rocky bottom that was dry at the time of the January 13, 2010 survey. The site supports prairie grassland with western wheatgrass being the dominant species and with the addition of common yarrow (*Achillea millefolium*). The area also includes patches of Canada thistle (*Cirsium arvense*). Vegetation ground cover is approximately 90%.

Goose Creek 2-3

The site is approximately halfway up the hillside in the Goose Creek drainage. Vegetation is the same as Goose Creek 2-2, although the composition changes slightly with increased elevation rising out of the drainage bottom. The dense wheatgrass gradually decreases with an increase in forbs. Vegetation ground cover on the site is approximately 75%, which is reduced from the drainage bottom due to the increase in rock cover.

Lone Tree Fault 1-2

This site is on rolling to flat terrain with grassland prairie habitat. Grasses dominate with the prevalence of needle-and-thread, western wheatgrass and crested wheatgrass (*Agropyron cristatum*). Vegetation ground cover is approximately 90%.

Lone Tree Fault 1-4

The site is on rolling terrain within 500 yards of a residence in the adjacent housing subdivision. Vegetation is similar to the Lone Tree Fault 1-2 site but with a greater abundance of wheatgrasses and less needle-and-thread grass. Vegetation ground cover is slightly higher at 95%.

Lone Tree 5-2

The site is in the drainage bottom, approximately 150 feet north of the Lone Tree Creek. Terrain in the area is hilly with the hillsides rising steeply above the creek. Interstate 80 is approximately 400 yards to the north. The drill site is on prairie grassland habitat that is dominated by grass species with wheatgrasses, blue gramma, needle-and-thread, prairie

Junegrass and bluegrasses. Canada thistle is also prevalent. Vegetation ground cover is approximately 95%.

Along the creek corridor, the habitat is bottomland meadow with smooth brome, wheatgrasses, meadow foxtail, and bluegrasses. Willows and cottonwood trees are also present, although mostly in patches rather than a continuous riparian habitat corridor. Mountain mahogany shrubland is present to the north, between the well site and the interstate. Neither of these habitat types will be disturbed due to the well drilling.

Lone Tree 5-4

This site is in the Lone Tree Creek drainage, 0.25 mile east of Lone Tree 5-2. It is also in the drainage bottom but outside the bottomland meadow habitat. Vegetation is prairie grassland with the dominance of smooth brome. Vegetation ground cover is 95%.

Interstate 80 is approximately 300 yards to the north, with mountain mahogany shrubland extending up the northern hillside to the highway. A water pump station is 80 feet southeast of the site. During the site survey, water was flowing from an artesian well via a pipe outside the pump station. A small patch of wetland habitat, approximately 20 feet long and 4 feet wide, was present due to the water flow. These nearby habitats will not be disturbed by the proposed test well drilling.

4.2 Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service (USFWS) Web site (USFWS 2010) federally listed threatened and endangered species potentially occurring in Laramie County and their potential on the project site are listed in Table 4-1. In Laramie County, concerns with the interior least tern, piping plover, whooping crane, pallid sturgeon, and western prairie fringed orchid are due to water depletions or decreased water quality in the Platte River system. They are listed for Laramie County only because reduced water flow may affect the species and/or critical habitat in downstream reaches in other states. Since no river depletions will occur as a result of this project, no adverse aquatic effects will occur and these species will not be affected by the project. These species will not be discussed further.

Table 4-1. Federally Listed Threatened, Endangered, and Candidate Wildlife Species Potentially Occurring within Laramie County, Wyoming (last updated August 2009).

| Common Name | Scientific name | Status ¹ | Key Habitat Characteristics | Potential on site |
|---|---------------------------------------|---------------------|---|-------------------|
| Birds | | | | |
| Whooping crane ² | <i>Grus americana</i> | E | Wetland marshes. | Unlikely |
| Interior least tern ² | <i>Sterna antillarum athalassos</i> | E | Sandbars along rivers. | Unlikely |
| Piping plover ² | <i>Charadrius melodus</i> | T | Sandbars along rivers. | Unlikely |
| Amphibians | | | | |
| Wyoming Toad | <i>Bufo baxteri</i> | E | Wetlands within the Laramie Valley | Unlikely |
| Fish | | | | |
| Pallid sturgeon ² | <i>Scaphirhynchus albus</i> | E | Sand-covered portions of rivers. | Unlikely |
| Plants | | | | |
| Colorado Butterfly Plant | <i>Gaura neomexicana coloradensis</i> | T | Wet meadows and riparian areas. | Unlikely |
| Ute ladies'-tresses | <i>Spiranthes diluvialis</i> | T | Moist soils bordering perennial water. | Unlikely |
| Western prairie fringed orchid ² | <i>Plantanthera praeclara</i> | T | Highly calcareous (alkaline), stony soils in tall-grass prairie environments. | Unlikely |

¹ Federal Status Definitions:

E = Endangered. T = Threatened C = Candidate

²Water depletions may affect the species and/or critical habitat in downstream reaches in other states.

The potential for all of the remaining federally listed species to occur on the project area are discussed below.

4.2.1 Ute Ladies'-tresses

Ute ladies'-tresses orchid is a threatened species that occurs primarily on moist, sub-irrigated or seasonally flooded soils in valley bottoms, gravel bars, old oxbows, or floodplains bordering

springs, lakes, rivers, or perennial streams at elevations between 1,780 and 6,800 feet (USFWS 1995). Due to the lack of perennial streams on any of the eight drill test sites, the occurrence of this species is unlikely; therefore, there will be no effect on the Ute ladies'-tresses as a result of the proposed project.

4.2.2 Colorado Butterfly Plant

The Colorado butterfly plant typically occurs on subirrigated, alluvial (stream deposited) soils on level or low gradient floodplains and drainage bottoms at elevations of 5,000 to 6,400 feet. Subpopulations are often found in low depressions or along bends in wide, active, meandering stream channels just a short distance upslope of the active channel (Fertig 2000). This type of habitat is lacking on the proposed drill sites; therefore the proposed project will have “no effect” on this species.

4.3 Raptors

No raptor nests were located on or within a mile of any of the proposed drill sites. All of the sites lack nesting substrate in the form of trees or rock outcrops. Ground nesting species, such as northern harriers (*Circus cyaneus*) are possible, although unlikely due to the lack of dense grassland vegetation on the sites.

The only nesting substrate available in the vicinity of any of the sites is a lone cottonwood tree adjacent to an abandoned and dilapidated homestead along Goose Creek. Rock outcrops are also in the vicinity of the old homestead. Nesting substrate, in the form of cottonwood trees, is also present along Lone Tree Creek. No nests were found in any of the riparian areas, trees or rock outcrops.

It is likely that raptors forage on the site. Those species potentially flying over the area include golden eagles (*Aquila chrysaetos*), Swainson's hawks (*Buteo swainsoni*), American kestrels (*Falco sparverius*), great horned owls (*Bubo virginianus*), red-tailed hawks (*Buteo jamaicensis*), northern harriers, turkey vultures (*Cathartes aura*), and ferruginous hawk (*Buteo regalis*). Rough-legged hawks (*Buteo lagopus*) likely winter in the area.

4.4 Other Wildlife

During the site surveys the wildlife species observed on the site or in the vicinity included a number of pronghorn antelope (*Antilocapra americana*) and several common crows (*Corvus brachyrhynchos*). Evidence of the northern pocket gopher (*thomomys talpoides*) was observed on several sites, as well as burrows for badgers (*Taxidea taxus*). Ground squirrel burrows were also observed and likely are used by thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*) or, possibly, Richardson's ground squirrels (*Spermophilus elegans*).

Additional mammal species potentially occurring on the site or in the vicinity include typical prairie species such as the deer mouse (*Peromyscus maniculatus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and striped skunk (*Mephitis mephitis*). Avian species expected to be common in the area in the spring and summer include horned lark (*Eremophila alpestris*), brewer's blackbird (*Euphagus cyanocephalus*), and western meadowlark (*Sturnella neglecta*).

5.0 CONCLUSIONS

Suitable habitat for Ute ladies'-tresses and Colorado butterfly plant is lacking on the proposed drill sites; therefore the project will have no effect on either of these federally listed species. No additional water depletions will occur with the proposed drilling; therefore the project will have no effect on T&E plant, animal and fish species in downstream habitats. There are no raptor nests on the drill sites or within 1-mile.

Due to the lack of T&E species, raptors, raptor nesting habitat, or habitats of concern, no wildlife-related mitigation measures are recommended for this project.

6.0 LITERATURE CITED

- Fertig, W. 2000. State Species Abstract. *Gaura neomexicana* ssp. *coloradensis*, Colorado Butterfly Plant. Wyoming Natural Diversity Database. Laramie, Wyoming. Accessed December 17, 2001 http://uwadmnweb.uwyo.edu/wyndd/Plants/plant_species.htm
- U.S. Fish and Wildlife Service. 2010. Threatened and Endangered Species listing for Laramie County, Wyoming. Web site: <http://www.fws.gov>.
- U.S. Fish and Wildlife Service. 1995. Recommendations and Guidelines for Ute Ladies' Tresses Orchid (*Spiranthes diluvialis*) Recovery and Fulfilling Section 7 Consultation Responsibilities. Memo dated June 1, 1995.

Appendix A

Photographs of the Proposed Drill Sites



Figure A-1. Duck Creek 3-1 Site.



Figure A-2. Duck Creek 3-3 Site.



Figure A-3. Goose Creek 2-2 Site.



Figure A-4. Goose Creek 2-3 Site.



Figure A-5. Lone Tree Fault 1-2 Site.



Figure A-6. Lone Tree Fault 1-4 Site.



Figure A-7. Lone Tree 5-2 Site.



Figure A-8. Lone Tree 5-4 Site.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, Suite 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES-61411/WY10TA0150

MAR 09 2010

Mark E. Stacy, P.G.
Lidstone and Associates, Inc.
Engineering, Geology, and Water Resource Consultants
4025 Automation Way, Building E
Fort Collins, CO 80525-3448

Dear Mr. Stacy:

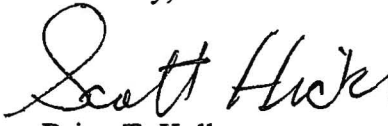

Thank you for your letter, dated February 11, 2010, and received in our office February 12, requesting that the U.S. Fish and Wildlife Service (Service) review the Wildlife and Threatened and Endangered Species Report for the Belvoir Ranch Paleozoic Ground Water Supply Wells (Report). The proposed project involves the drilling of up to eight test wells to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells will be drilled to depths of up to approximately 4,000 feet.

The Service has reviewed the Report in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act)(50 CFR §402). According to your memorandum, you determined that the proposed project will have "no effect" on the Colorado butterfly plant (*Gaura neomexicana coloradensis*), the Ute ladies'-tresses orchid (*Spiranthes diluvialis*) or listed species affected by water depletions to the Platte River system. The Service does not provide concurrence to "no effect" determinations and section 7 consultation is not required, although we appreciate you providing us with a thorough documentation of the rationale you used in making these determinations. You may consider this project, as proposed, to be in compliance with the Act.

This project should be re-analyzed if new information reveals effects of the action that may affect listed or proposed species or designated or proposed critical habitat; if the action is subsequently modified in a manner that causes an effect to a listed species or designated or proposed critical habitat; and/or, if a new species is listed or critical habitat is designated that may be affected by this project.

We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species. If you have further questions regarding this letter or your responsibilities under the Act, please contact Alex Schubert at the letterhead address or phone (307) 772-2374, ext. 238.

Sincerely,


 Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc: WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (M. Flanderka)



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Ms. Mary Hopkins
Interim SHPO
Wyoming State Historic Preservation Office
2301 Central Avenue, Barrett Building, 3rd Floor
Cheyenne, WY 82002

*Response sketched
10/14/09 -*

attached

Further Action -

*→ need to submit arch site
report -*

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Ms. Hopkins:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Previous correspondence for this project area can be found under SHPO File #0605RLC008. Please note that the test well locations included herein are different from those previously identified. For your reference, I have attached a copy of your letters dated June 10 and 29, 2005, in response to States West 2005 request for site review.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Once final locations are selected, LA will have a cultural resource survey completed at each of the selected drill locations, and will submit that report to Wyoming State Historic Preservation Office for your review. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous agency responses, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well drilling, development, and aquifer testing activities. Disturbed areas will also be reseeded upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
SHPO Letters dated June 10 and 29, 2005
cc: w/ Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail
K:\OPENWYWDC\109\ER Letters\SHPO.doc

ARTS. PARKS. HISTORY.

Wyoming Department of State Parks and Cultural Resources

WYOMING STATE HISTORIC PRESERVATION OFFICE

Claudia Nissley

State Historic Preservation Officer

BARRETT BUILDING, 2301 CENTRAL AVE, CHEYENNE, WY 82002

(307) 777-7697

June 29, 2005

Jack Meena, PE
States West Water Resources Corporation
P.O. Box 2092
Cheyenne, WY 82003

Re: States West Water Resources Corporation, State Revolving Fund Loan for the Cheyenne
BOPU Belvoir Ranch Paleozoic Groundwater Exploration Project (SHPO File #
0605RLC008)

Dear Mr. Meena:

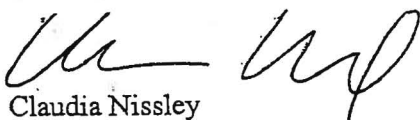
Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that no historic properties, as defined in 36 CFR § 800.16(l)(1), will be affected by the project as planned.

We recommend the Wyoming Department of Environmental Quality allow the project to proceed in accordance with state and federal laws subject to the following stipulation:

If any cultural materials are discovered during construction, work in the area shall halt immediately, the federal agency must be contacted, and the materials evaluated by an archaeologist or historian meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983).

This letter should be retained in your files as documentation of a SHPO concurrence on your finding of no historic properties affected. Please refer to SHPO project #0605RLC008 on any future correspondence regarding this project. If you have any questions, please contact Richard L. Currit, Senior Archaeologist, at 307-777-5497.

Sincerely,



Claudia Nissley
State Historic Preservation Officer



Dave Freudenthal, Governor
Phil Noble, Director

ARTS. PARKS. HISTORY.

Wyoming Department of State Parks and Cultural Resources

WYOMING STATE HISTORIC PRESERVATION OFFICE

Claudia Nissley

State Historic Preservation Officer

BARRETT BUILDING, 2301 CENTRAL AVE, CHEYENNE, WY 82002

(307) 777-7697

June 10, 2005

Jack Meena, PE
States West Water Resources Corporation
P.O. Box 2092
Cheyenne, WY 82003

Re: States West Water Resources Corporation, State Revolving Fund Loan for the
Cheyenne BOPU Belvoir Ranch Paleozoic Groundwater Exploration Project
(SHPO File # 0605RLC008)

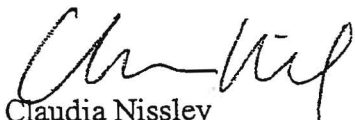
Dear Mr. Meena:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

Your letter of May 31, 2005 indicates that a cultural resources survey either has "been completed or are scheduled to be conducted". We will comment on the effect of the project on historic properties when the documentation for the survey has been submitted to us and we have reviewed it.

Please refer to SHPO project #0605RLC008 on any future correspondence regarding this project. If you have any questions, please contact Richard L. Currit, Senior Archaeologist, at 307-777-5497.

Sincerely,



Claudia Nissley
State Historic Preservation Officer



Dave Freudenthal, Governor
Phil Noble, Director

ARTS. PARKS. HISTORY.

Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
<http://wyoshpo.state.wy.us>

OCT 14 2009

October 12, 2009

Mark E. Stacy, P.G., Senior Hydrogeologist
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, CO 80525-3448

re: State Revolving Fund Loan/Rural Utilities Service Loan for the Cheyenne BOPU Belvoir Ranch Paleozoic Ground Water Supply Wells (SHPO File # 0605RLC008)

Dear Mr. Stacy:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

Your letter of September 30, 2009 indicates that a cultural resources survey of the project area will be completed and submitted to our office for review. We will comment on project effect when we have reviewed the documentation of this survey.

Please refer to SHPO project #0605RLC008 on any future correspondence regarding this project. If you have any questions, please contact Richard L. Currit, Senior Archaeologist, at 307-777-5497.

Sincerely,



Richard L. Currit
Senior Archaeologist



Dave Freudenthal, Governor
Milward Simpson, Director

**THE 2010 CLASS III CULTURAL RESOURCE INVENTORY
OF EIGHT PROPOSED WELL LOCATIONS AT THE BELVOIR RANCH,
LARAMIE COUNTY, WYOMING**

By

Paul H. Sanders

Prepared for

Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E
Fort Collins, CO 80525-3448

Submitted by

Office of the Wyoming State Archaeologist
Wyoming Department of State Parks and Cultural Resources
Dept 3431, 1000 E. University Avenue
Laramie, Wyoming 82071

OWSA Project Number WY-57-2009

February 2010

ABSTRACT

A class III cultural resource inventory of eight proposed well locations, totaling 7.36 acres, was conducted by the Office of the Wyoming State Archaeologist for Lidstone and Associates, Inc. The inventory is for geologic and water development investigations at the City of Cheyenne's Belvoir Ranch in Laramie County, Wyoming. No historic properties will be affected as a result of the proposed project. Cultural clearance is recommended with the standard stipulations that should archaeological remains be uncovered during construction, the appropriate state regulatory agencies be contacted immediately.

SURVEY REPORT COVER PAGE

| | |
|--|-----------------------------|
| Consultant Project No: WY-57-2009 | Agency No: |
| Review and Compliance No: | Cultural Records Office No: |

AUTHOR(S): **Paul H. Sanders**

REPORT TITLE (include client name, undertaking name, survey project type, and report number): **The 2010 Class III Cultural Resource Inventory of Eight Proposed Well Locations at the Belvoir Ranch, Laramie County, Wyoming**

DATE OF REPORT (MO/DY/YR): **February 2, 2010**

LEAD AGENCY (e.g., BLM ADMINISTRATIVE UNIT): **There is no lead federal agency, although the project could have some federal funding from various sources.**

SURVEY ORGANIZATION/NAME: **Office of the Wyoming State Archaeologist (OWSA)**

FEDERAL PERMIT NO. (e.g. BLM Cultural Resource Use Permit and Expiration Date):

BRIEF DESCRIPTION OF UNDERTAKING: **Lidstone and Associates, Inc. proposes to drill up to eight wells within the Belvoir Ranch property.**

SURVEY METHODS:

☐ Standard 30 Meter Transects ☒ Non-Standard (20 meter transects)

Survey Width (All Linear Inventory): ☐ 100 feet (individual road or pipeline corridor)
☐ 150 feet (parallel road/pipeline corridor)
☐ Other (indicate width: feet)

COUNTY(IES):* **Laramie**

USGS QUAD MAPS (NAME, DATE):* **Granite (1978)**

LANDOWNER:* ☐ BLM ☐ BuREC ☐ FS ☐ NPS ☒ PRIVATE ☐ STATE ☐ USFWS
☐ OTHER (Specify)

LEGAL DESCRIPTION (T/R/Sec/up to 4 qtrs and identify template corner):*

Well Locality 3-1

T13N, R69W, Section 31, portions of the NE/NE/SW/SW/NE;

Well Locality 3-3

T13N, R69W, Section 31, portions of the SW/NE/NW/SE/SE;

Well Locality 2-2

T13N, R69W, Section 30, portions of the SW/NE/NW/SE/SE;

Well Locality 2-3

T13N, R69W, Section 29, portions of the SW/NW/SW/SW;

Well Locality 1-2

T13N, R69W, Section 30, portions of the NE/NE/SE/NE/NW;

Well Locality 1-4**T13N, R69W, Section 19, portions of the C/SW/SE/SE;****Well Locality 5-2****T13N, R69W, Section 17, portions of the SW/NW/NW/NE/SE;****Well Locality 5-4****T13N, R69W, Section 16, portions of the NW/NW/NW/NW/SW****ACREAGE:**

| | | | | |
|-----------------|-------------------|---------|-------------------|----------------|
| FEDERAL SURFACE | BLOCK: | LINEAR: | TOTAL: | TOTAL ACREAGE: |
| NON-FED SURFACE | BLOCK: 7.36 acres | LINEAR: | TOTAL: 7.36 acres | 7.36 acres |

FILE SEARCH DATE(S): December 18, 2009**FIELD WORK DATE(S) (MO/DY/YR): January 13, 2010****FIELD PERSONNEL: + Paul H. Sanders****SURVEY RESULTS: _XX_ NO CULTURAL MATERIAL ___ #ISOLATED FIND(S) ___ #SITE(S)****+ attach continuation sheets for additional data * check all that pertain**

PROJECT SETTING

The project area is south of the Harriman exit off of Interstate 80, between Laramie and Cheyenne (Figures 1 and 2). The eight localities are scattered across an area approximately 3.2 miles wide from Lone Tree Creek on the north to Duck Creek to the south. The area is comprised of a gently sloping (2-10 degrees) and rolling upland landform dissected by the east-flowing, Lone Tree, Willow, Goose, and Duck creeks, and other small unnamed ephemeral tributary drainages. From south to north, the two Duck Creek project areas (3-1 and 3-3) occur on the upper slopes of a broad ridge that overlooks Duck Creek to the south (Figure 3). Well localities 2-2 and 2-3 occur along the Goose Creek drainage valley (Figure 4). The former locality is about 25 m north of Goose Creek, while locality 2-3 is about 150 m north of the drainage. Well localities 1-2 and 1-4 are also situated on top of broad ridges (Figure 5). Localities 5-2 and 5-4 are situated at the bottom of Lone Tree Creek (Figure 6).

Most of the bedrock in the general project area consists of Upper Miocene Rocks comprised of light colored tuffaceous claystone, sandstone, and conglomerate with Quaternary alluvium in the bottom of the major drainages (Love and Christiansen 1985). A small outcrop of Lower Cretaceous age, Cloverly formation occurs near well locality 2-2 in Goose Creek, which is comprised of rusty sandstone at the top underlain by brightly variegated bentonitic claystone with chert-pebble conglomerate at base (Love and Christiansen 1985). West and upslope of the project area, bedrock consists of the Lower Permian and Upper and Middle Pennsylvanian age, Casper formation (gray, tan and red thick bedded sandstone underlain by interbedded sandstone and pink and gray limestone; may include some Devonian (?) sandstone) and Early Proterozoic age, Metasedimentary and Metavolcanic Rocks (pelitic schist, marble, granite gneiss, layered amphibolite, hornblende, gneiss, and amphibolite (Love and Christiansen 1985). Rocks from these latter formations have eroded downslope onto the present project area and have been incorporated into the surface soils. Soil over much of the project area generally consists of a pebbly to gravelly (mostly grus), reddish brown sandy loam. Soil in the Lone Tree Creek drainage bottom is a dark brown sandy to silty loam with some small pebbles.

Vegetation consists of a sagebrush grassland community with fringed sage, buckwheat, junegrass, wheatgrass, wild onion, and other grasses and forbs (Figures 3-6). The drainage channels contained thicker grasses and some willows. Surface visibility is estimated at 0-5 percent. Elevations range from 2152-2243 m (7060-7360 ft). Weather conditions during this inventory were cool and dry. Some snow cover was present in the general project area, but all the well localities were clear of snow, except for the Lone Tree Creek well locality 5-4. At this locality, snow covered approximately 10 percent of the 200 by 200 foot

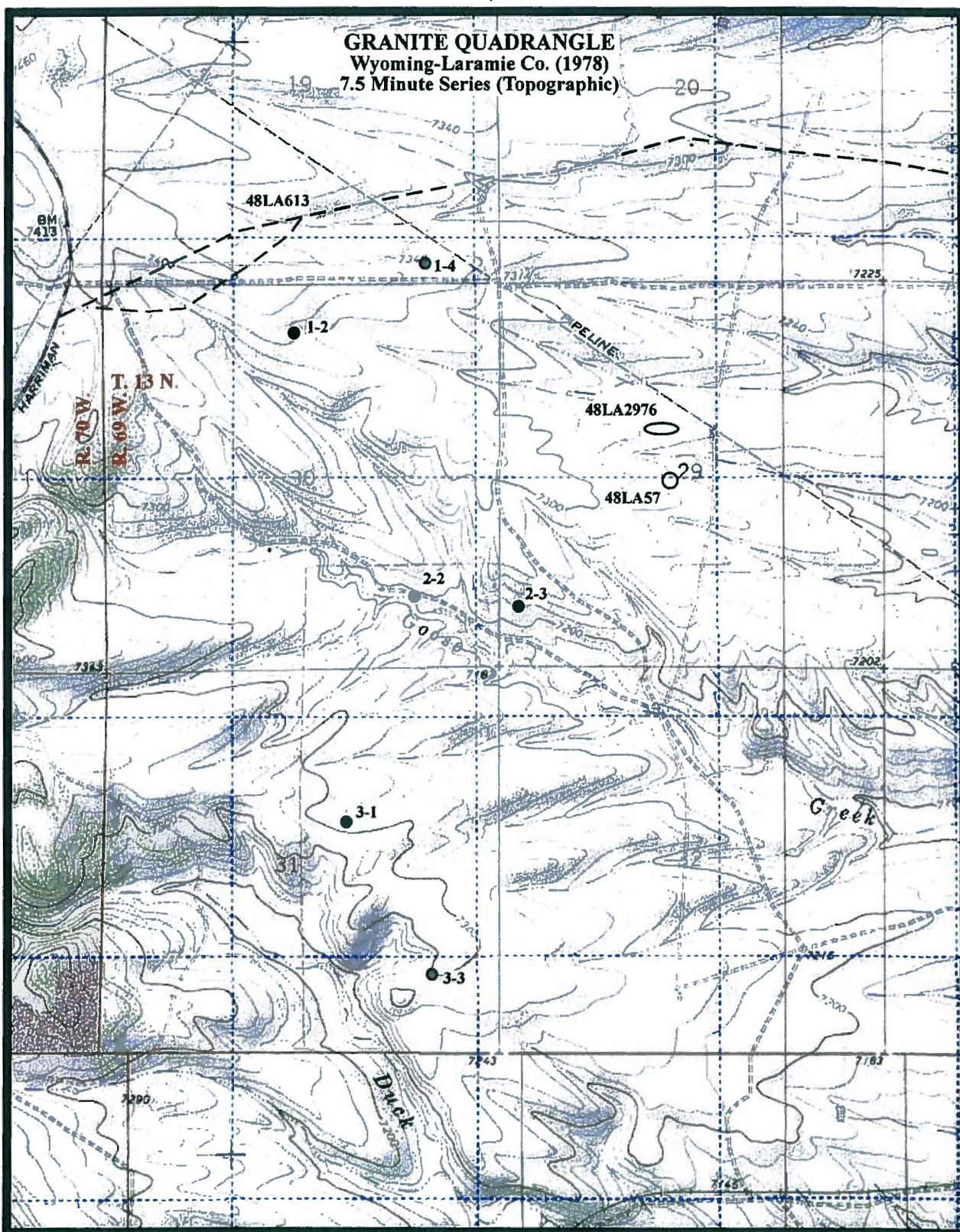


Figure 1. Map of project areas and previously recorded sites.



View to the northwest at the Duck Creek 3-1 project area



View to the southwest at the Duck Creek 3-3 project area

Figure 3. Photographs of the Duck Creek project areas.

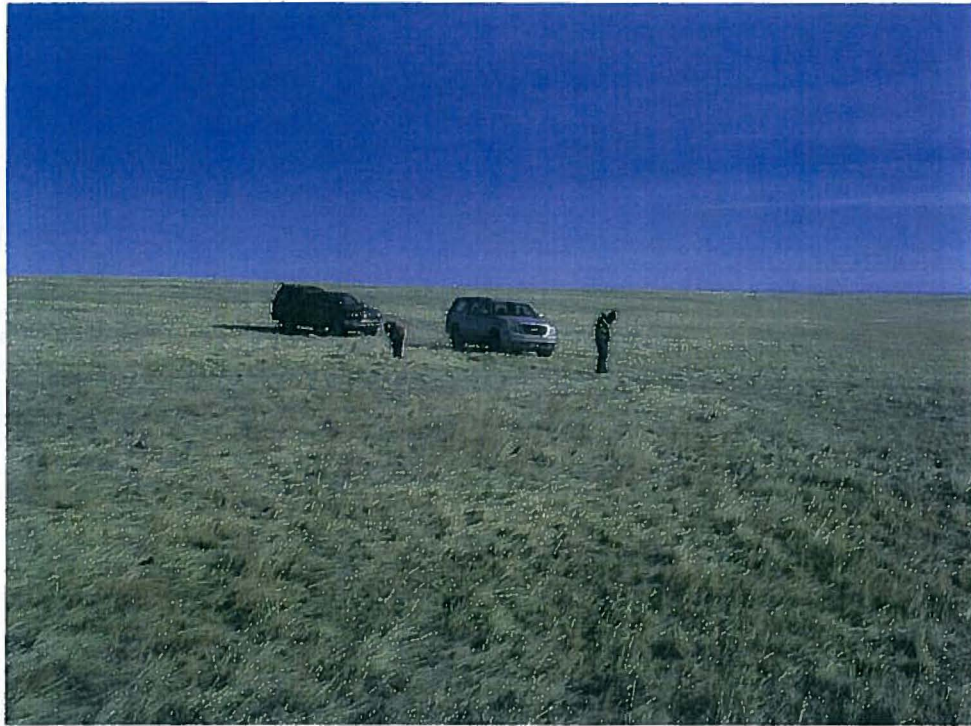


View to the northeast at the Goose Creek 2-2 project area

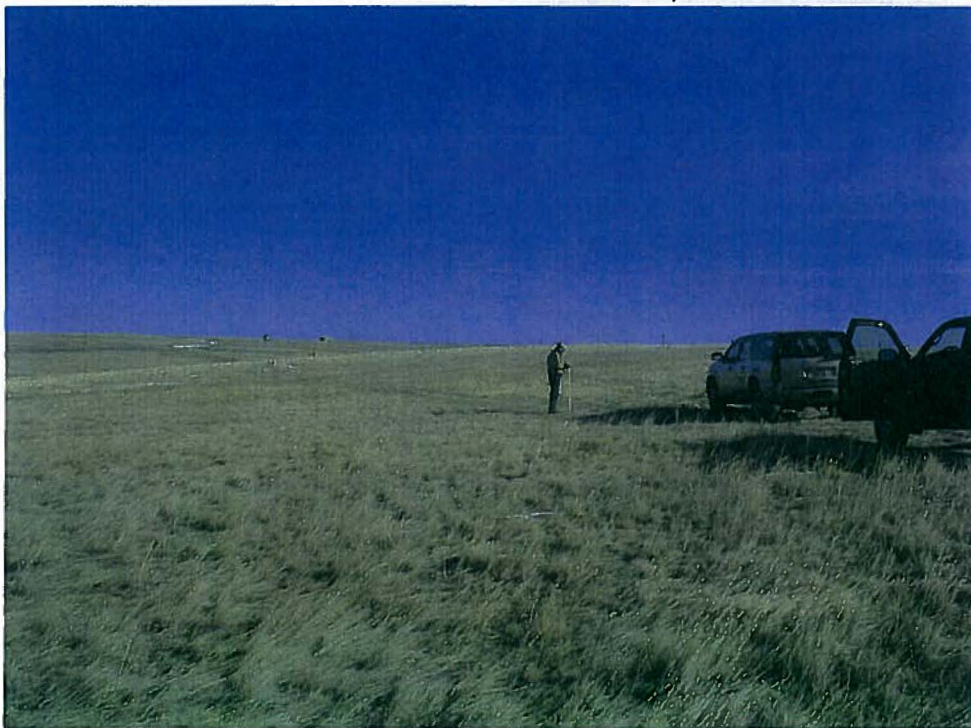


View to the east at the Goose Creek 2-3 project area

Figure 4. Photographs of the Goose Creek project areas.



View to the east at the Lone Tree Creek Fault 1-2 project area



View to the east at the Lone Tree Creek Fault 1-4 project area

Figure 5. Photographs of the Lone Tree Creek Fault project areas.



View to the east at the Lone Tree Creek 5-2 project area



View to the northeast at the Lone Tree Creek 5-4 project area

Figure 6. Photographs of the Lone Tree Creek project areas.

project area. However, as noted in the **File Search Results**, this specific locality had been previously inventoried by Eckles (2005).

PROJECT DESCRIPTION

The inventory consists of eight 200 by 200 foot survey areas (0.92 acres each) with the proposed well location placed in the center. The eight well location project areas comprise a total of 7.36 acres. Lidstone and Associates, Inc. proposes to drill a test well hole at each location to test for Casper Aquifer groundwater production and better understand the Belvoir Ranch geology. Limited blading or leveling flattening of the ground may occur at those proposed well locations where sloping ground becomes an issue. In these cases an area up to 100 by 20 feet may be bladed, but overall, very little surface disturbance is anticipated. Each drilled well will have its casing left in place, which will be capped and extend about 2 feet out of the ground.

FILE SEARCH RESULTS

A documents search was conducted by OWSA of the records within the Wyoming State Historic Preservation Office (SHPO), Cultural Records Office (WYCRO) on December 18, 2009. The search resulted in 10 accessioned projects and six previously recorded sites.

Nine of the 10 accessioned projects are linear inventories related to gas pipelines, powerlines, or fiber optic lines. Five of the pipeline projects (Cities Service Gas pipeline [Accession No. 77-422], Trailblazer pipeline [Accession No. 79-1963], Entrega pipeline [Accession No. 04-2167 and 04-2167-A], and the Overland Pass pipeline [06-1621-6]), and one of the powerline projects (Accession No. 99-1140) passes near the well locality 1-4. Only one site (48LA2976) was recorded in the vicinity of the present project area; an ineligible historic rock cairn. The site was recorded by SWCA-Denver for the Overland Pass pipeline project, but will not be affected by the present project.

The fiber optic line projects (Accession Nos. 86-834 and 87-339) parallel and occur north of I-80 and outside of the present project area. No sites were recorded as a part of these inventories in the vicinity of the present project area. The other powerline project (Accession No. 99-1706) also occurs north of I-80. The latter project was conducted by LTA, Inc. for High West and resulted in the recording of segments of the original 1868 railroad grade (48LA1399). This eligible site is outside of the present project area and will not be affected. It cannot be seen from the Lone Tree Creek drainage, which contains the closest well localities.

The last accessioned project (No. 05-1659) was conducted by OWSA for States West Water Resources Corporation. This project inventoried a number of proposed well drillings within the Belvoir Ranch property. One of the well localities (Test Hole 2, Kennedy Log Well) is in the bottom of Lone Tree Creek (Eckles 2005:Figure 1) and is at the same location as our well locality 5-4, while another of the test holes is about 200 m to the west northwest of well locality 5-2. No sites were recorded by Eckles at any of the these test holes.

The other four archaeological sites listed in the file search are 48LA6, 48LA57, 48LA117, and 48LA613. Site 48LA6 is an unevaluated prehistoric site comprised of six stone circle. The site is located along Lone Tree Creek and was recorded in 1955 by Carling Malouf with the University of Montana (Accession No. 55-1) (Figure 2). It is located approximately 200 m southeast of well locality 5-4 and will not be affected by the present project.

Site 48LA57 is a destroyed (looted) fire hearth that was recorded in 1975 by John Bellar, Bureau of Land Management archaeologist (Figure 1). It is well outside the present project areas and will not be affected.

Site 48LA117 is the eligible Lincoln Highway (Figure 2). Nearby segments were recorded by the SHPO as a part of accessioned project no. 00-1621. The Lincoln Highway is located on the north side of I-80 and parallels it. The site is outside of the present project area and has very limited visibility due to intervening topography. It will not be affected.

Site 48LA613 is the eligible Cheyenne-Twin Mountain Wagon Road that was recorded by Rosenberg Historical Consultants (Figure 1). The route of this road passes approximately 250 m north of well locality 1-4, and a segment of this road passes approximately 300 m northwest of well locality 1-2. Most of the area in Section 19 where the road is plotted has been developed into residential ranchettes that have likely already affected the site. Any visual impacts from the proposed well drilling will be very temporary and overall will not affect this site.

Given the numerous cultural resource inventories (especially the parallel linear surveys) and the limited number of recorded sites, it is believed that there is a low potential for additional cultural resources to be encountered.

INVENTORY METHODS

The present inventory followed standard archaeological inventory procedures accepted by the Wyoming SHPO and the BLM. Personnel was spaced at no more than 20 m intervals. In areas with lower surface visibility, special attention was paid to areas of subsurface disturbance (e.g., rodent burrows, animal trails, road cuts, cutbanks, etc.).

For this inventory, a site was defined using the present SHPO site definitions as consisting of 15 or more prehistoric artifacts within 30 m of each other or one or more features for prehistoric sites, and 50 or more historic artifacts. Items with less than these thresholds were classified as isolated resources. Road trash and objects less than 50 years old were not recorded. A handheld Garmin 12XL GPS was used to map project and site locations and any appropriate artifacts, features, etc, using the NAD 83 Datum. Appropriate photographs were taken of the project area and any sites or features that might be present. All field notes, maps, photographs, etc. will be held at OWSA. No cultural materials were collected.

SURVEY RESULTS

No cultural resources were located within any of the present project areas. However, a small (1 m wide by 20 cm deep) irrigation ditch crosses east-west through the northern portion of the Lone Tree 5-2 well locality. Two ditches (Nielson No. 5 and No. 6) were appropriated to the Nielson Bros in April 18, 1905 in this area (Permit Nos. 6577 and 6578) with a total flow of 0.25 cubic feet per second (State Engineers Office 1992:588). Irrigation ditches of this sort do not meet the SHPO threshold to qualify as cultural resources, and it was not recorded.

In addition, remnants of a historic homestead occur approximately 10 m outside of the Lone Tree 5-4 well locality. The Belvoir Ranch and Big Hole Master Plan notes this site as the William Williams homestead (City of Cheyenne 2008:31). The homestead consists of a house with collapsed rock walls and various outbuildings. Since this site is outside of the present project area, it was not recorded. Any visual impacts to the site will be very temporary and limited to the time the drilling rig is on-site.

The locality 5-4 well will be capped and consist of a metal casing extending approximately two feet out of the ground. A similar capped well head occurs just west of the 5-4 well locality and is illustrated in Figure 7. In addition an existing flowing well occurs immediately to the south of the 5-4 well locality. This small concrete block building is illustrated in Figure 7, already intrudes visually onto the historic homestead. However a dense grove of willows (ca. 20-30 feet high) shields most of the homestead from the existing well



View to the west at an existing, capped well head just west of locality 5-4



View to the south at an existing flowing well building along the southern edge of the locality 5-4 project area

Figure 7. Photographs of existing wells.

building. If the 5-4 well produces a suitable flow of water, it will be eventually incorporated into the Cheyenne water system and covered by a similar small building. This small building would not intrude onto the historic homestead any more than the existing well building.

It should also be noted that the Master Plan proposes to construct a Retreat/Conference center in the Lone Tree Creek drainage bottom in the same area as well localities 5-2 and 5-4, as well as some local trail developments (City of Cheyenne 2008). Road improvements to the proposed center may also occur. The present access road to well locality 5-4 passes through the Williams homestead and may also be improved. Should these developments occur, this historic site will be impacted and the site will need to be recorded. As a part of this recording, it should also be evaluated by a qualified historian. The Master Plan does recognize that additional cultural resource inventories will need to be conducted if and when the various developments occur (City of Cheyenne 2008).

MANAGEMENT RECOMMENDATIONS

A class III cultural resource inventory of eight proposed well locations, totaling 7.36 acres, was conducted by the Office of the Wyoming State Archaeologist for Lidstone and Associates, Inc. The inventory is for geologic and water development investigations at the City of Cheyenne's Belvoir Ranch in Laramie County, Wyoming. No historic properties will be affected as a result of the proposed project. Cultural clearance is recommended with the standard stipulations that should archaeological remains be uncovered during construction, the appropriate state regulatory agencies be contacted immediately.

REFERENCES CITED

City of Cheyenne

- 2008 *The Belvoir Ranch and Big Hole Master Plan*. City of Cheyenne, Wyoming. Electronic document, <http://www.belvoirranch.org/Belvoir%20Plan%20Final%20PDFs/BVR%20Complete%20Plan.pdf>, accessed January 14, 2010.

Eckles, David

- 2005 *A Class III Cultural Resource Survey Water Well Test Hole Sites, Belvoir Ranch Paleozoic Groundwater Exploration Project, Laramie County, Wyoming*. Office of the Wyoming State Archaeologist. On file Wyoming State Historic Preservation Office, Cultural Records Office, Laramie, Wyoming.

Love, J. D., and Ann Coe Christiansen (compilers)

- 1985 *Explanation for the Geologic Map of Wyoming*. Geological Survey of Wyoming, Laramie, Wyoming.

State Engineer's Office

- 1992 *Tabulation of Adjudicated Surface Water Rights of the State of Wyoming, Water Division Number One*. State Engineer's Office, Cheyenne, Wyoming.

ARTS. PARKS. HISTORY.

Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
<http://wyoshpo.state.wy.us>

FEB 22 2010

February 18, 2010

Mark E. Stacy, P.G.
Senior Hydrologist
Lidstone and Associates, Inc.
4025 Automation Way, Building E.
Fort Collins, CO 80525-3448

re: Belvoir Ranch Paleozoic Ground Water Supply Wells (SHPO File # 0605RLC008)

Dear Mr. Stacy:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that no historic properties, as defined in 36 CFR § 800.16(l)(1), will be affected by the project as planned.

We recommend the Wyoming Water Development Commission allow the project to proceed in accordance with state laws subject to the following stipulation:

If any cultural materials are discovered during construction, work in the area shall halt immediately, the Wyoming Water Development Commission agency be contacted, and the materials evaluated by an archaeologist or historian meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983).

This letter should be retained in your files as documentation of a SHPO concurrence on your finding of no historic properties affected. Please refer to SHPO project #0605RLC008 on any future correspondence regarding this project. If you have any questions, please contact me at 307-777-5497.

Sincerely,



Richard L. Currit
Senior Archaeologist



Dave Freudenthal, Governor
Milward Simpson, Director

**THE 2010 CLASS III CULTURAL RESOURCE INVENTORY
OF THE GOOSE CREEK 2-1E AND 2-2C AND LONE TREE
CREEK FAULT 1-5 PROPOSED WELL LOCATIONS
AT THE BELVOIR RANCH, LARAMIE COUNTY, WYOMING**

By

Paul H. Sanders

Prepared for

Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E
Fort Collins, CO 80525-3448

Submitted by

Office of the Wyoming State Archaeologist
Wyoming Department of State Parks and Cultural Resources
Dept 3431, 1000 E. University Avenue
Laramie, Wyoming 82071

OWSA Project Number WY-31-2010

October 2010

ABSTRACT

A class III cultural resource inventory of three proposed well locations, totaling 19.85 acres, was conducted by the Office of the Wyoming State Archaeologist for Lidstone and Associates, Inc. The inventory is for geologic and water development investigations at the City of Cheyenne's Belvoir Ranch in Laramie County, Wyoming, in association with the Wyoming Water Development Commission. At this time there is no federal involvement, but future involvement through permitting or funding is possible, therefore this cultural resource inventory was conducted. No cultural resources were located and therefore no historic properties will be affected as a result of the proposed project. Cultural clearance is recommended with the standard stipulations that should archaeological remains be uncovered during construction, the appropriate state regulatory agencies be contacted immediately.

SURVEY REPORT COVER PAGE

| | |
|--|-----------------------------|
| Consultant Project No: WY-31-2010 | Agency No: |
| Review and Compliance No: | Cultural Records Office No: |

AUTHOR(S): **Paul H. Sanders**

REPORT TITLE (include client name, undertaking name, survey project type, and report number): **The 2010 Class III Cultural Resource Inventory of the Goose Creek 2-1e and 2-2c and Lone Tree Creek Fault 1-5 Proposed Well Locations at the Belvoir Ranch, Laramie County, Wyoming**

DATE OF REPORT (MO/DY/YR): **October 1, 2010**

LEAD AGENCY (e.g., BLM ADMINISTRATIVE UNIT): **There is no lead federal agency, although the project could have some federal funding from various sources.**

SURVEY ORGANIZATION/NAME: **Office of the Wyoming State Archaeologist (OWSA)**

FEDERAL PERMIT NO. (e.g. BLM Cultural Resource Use Permit and Expiration Date):

BRIEF DESCRIPTION OF UNDERTAKING: **Lidstone and Associates, Inc. proposes to drill up to three wells within the Belvoir Ranch property.**

SURVEY METHODS:

☐ Standard 30 Meter Transects ☒ Non-Standard (20 meter transects)

Survey Width (All Linear Inventory): ☐ 100 feet (individual road or pipeline corridor)
☐ 150 feet (parallel road/pipeline corridor)
☐ Other (indicate width: feet)

COUNTY(IES):* **Laramie**

USGS QUAD MAPS (NAME, DATE):* **Granite (1978)**

LANDOWNER:* ☐ BLM ☐ BuREC ☐ FS ☐ NPS ☒ PRIVATE ☐ STATE ☐ USFWS
☐ OTHER (Specify)

LEGAL DESCRIPTION (T/R/Sec/up to 4 qtrs and identify template corner):*

Well Locality 1-5 (13.1 acres)

T13N, R69W, Section 20, portions of the N/SW/SW and NW/NW/SE/SW;

Well Locality 2-1e (2.75 acres)

T13N, R69W, Section 30, portions of the E/NW/SW/SE, and W/W/NE/SW/SE;

Well Locality 2-2c (4.0 acres)

T13N, R69W, Section 30, portions of the E/NE/SW/SE and W/W/NW/SE/SE

ACREAGE:

| | | | | |
|-----------------|---------------------------|---------|---------------------------|--------------------|
| FEDERAL SURFACE | BLOCK: | LINEAR: | TOTAL: | TOTAL ACREAGE: |
| NON-FED SURFACE | BLOCK: 19.85 acres | LINEAR: | TOTAL: 19.85 acres | 19.85 acres |

FILE SEARCH DATE(S): **September 30, 2010**

FIELD WORK DATE(S) (MO/DY/YR): **September 30, 2010**

FIELD PERSONNEL: *** Paul H. Sanders**

SURVEY RESULTS: **_XX_ NO CULTURAL MATERIAL** ___ #ISOLATED FIND(S) ___ #SITE(S)

+ attach continuation sheets for additional data * check all that pertain

PROJECT SETTING

The project area is south of the Harriman exit off of Interstate 80, between Laramie and Cheyenne (Figure 1). The area is comprised of a gently sloping (2-10 degrees) and rolling upland landform dissected by the east-flowing Lone Tree, Willow, Goose, and Duck creeks, and other small unnamed ephemeral tributary drainages. The Lone Tree Creek Fault 1-5 locality is situated along an ephemeral drainage valley, while well localities 2-1e and 2-2c occur along the Goose Creek drainage valley (Figures 2-3).

Most of the bedrock in the general project area consists of Upper Miocene Rocks comprised of light colored tuffaceous claystone, sandstone, and conglomerate with Quaternary alluvium in the bottom of the major drainages (Love and Christiansen 1985). A small outcrop of Lower Cretaceous age, Cloverly formation occurs near well locality 2-2c in Goose Creek, which is comprised of rusty sandstone at the top underlain by brightly variegated bentonitic claystone with chert-pebble conglomerate at base (Love and Christiansen 1985). Broken pieces of a translucent gray chert were observed on top of the sandstone outcrop. West and upslope of the project area, bedrock consists of the Lower Permian and Upper and Middle Pennsylvanian age, Casper formation (gray, tan and red thick bedded sandstone underlain by interbedded sandstone and pink and gray limestone; may include some Devonian (?) sandstone) and Early Proterozoic age, Metasedimentary and Metavolcanic Rocks (pelitic schist, marble, granite gneiss, layered amphibolite, hornblende, gneiss, and amphibolite (Love and Christiansen 1985). Rocks from these latter formations have eroded downslope onto the present project area and have been incorporated into the surface soils. Soils in the Lone Tree Creek Fault locality and Goose Creek drainage bottoms are a dark brown sandy to silty loam with some small pebbles. Holocene deposition is fairly shallow throughout the area.

Vegetation consists of a sagebrush grassland community with fringed sage, buckwheat, junegrass, wheatgrass, wild onion, and other grasses and forbs (Figures 2-4). The drainage channels contained thicker grasses. Surface visibility is estimated at 5-20 percent. Elevations range from 2195-2225 m (7200-7300 ft). Weather conditions during this inventory were warm and dry.

PROJECT DESCRIPTION

The inventory consists of three survey areas of varying size with the proposed well location generally placed near its center. The triangular-shaped Lone Tree Creek Fault 1-5 survey area was approximately 1200 feet east-west and ranged from 250 to 700 feet north-south. The 1-5 drill location is situated within a recent pipeline corridor and will likely be shifted to the east. As a result a larger area was inventoried to

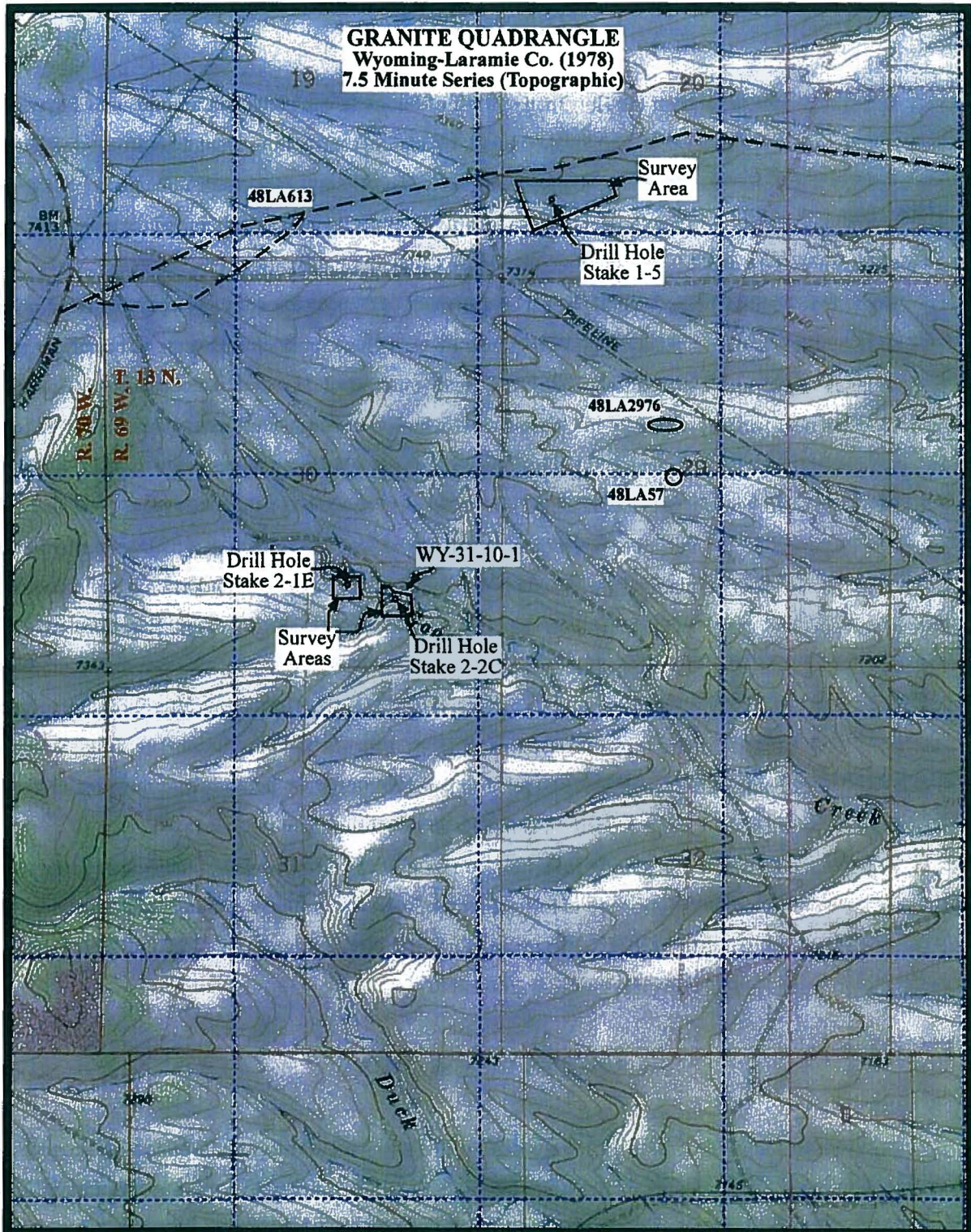
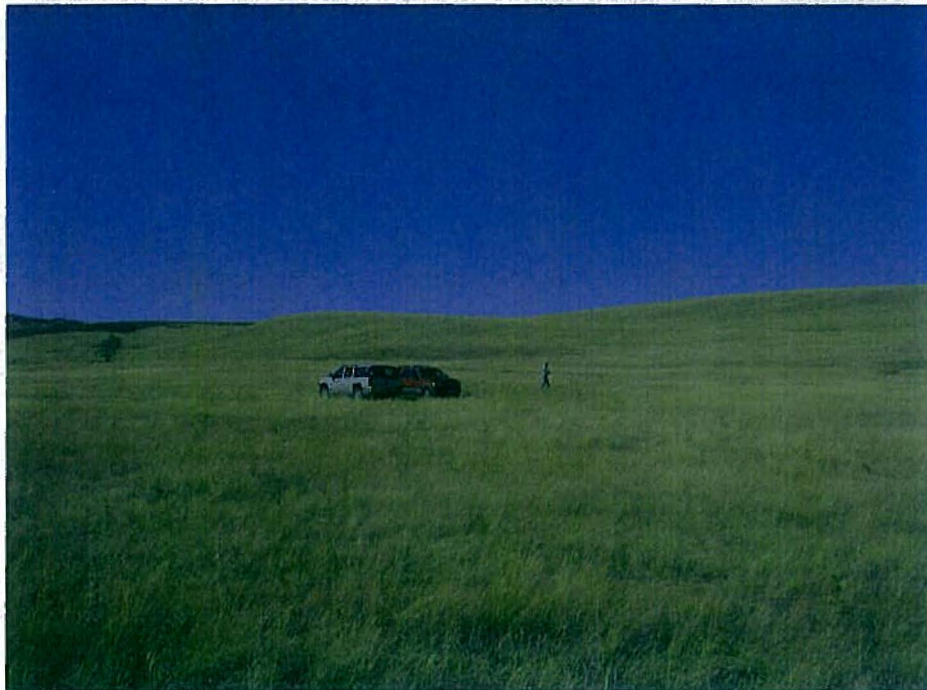


Figure 1. Map of project areas and previously recorded sites (UTM Grid is NAD27).



View to the south at the Lone Tree Creek Fault 1-5 locality and recent pipeline



View to the northwest up the Goose Creek valley from the southeast corner of the survey area

Figure 2. Photographs of the Lone Tree Creek Fault 1-5 and Goose Creek 2-1e survey areas.



View to the west at Goose Creek 2-2c well locality. Individual is at drill locality



View to the west at the WY-31-10-1 foundation, outside of the present APE

Figure 3. Photographs of the Goose Creek2-2c survey area.

accommodate this likely shift. The Goose Creek 2-1e locality was approximately 400 feet east-west by 300 feet north-south with the Goose Creek drainage forming the northern boundary. Goose Creek 2-2c survey area is 450 wide and extended 300-400 feet north-south. The drainage channel forms most of the northern project boundary. However, the northwestern corner of the survey area extended across the drainage channel to connect with the existing two track road that will allow access. The drill stake location within this survey area is was placed in the relatively flat terrace surface near about 20 m south of the drainage channel (Figure 3).

The three well location project areas comprise a total of 19.85 acres. Lidstone and Associates, Inc. proposes to drill a test well hole at each location to test for Casper Aquifer groundwater production and better understand the Belvoir Ranch geology. Limited blading or leveling flattening of the ground may occur at those proposed well locations where sloping ground becomes an issue. In these cases an area up to 200 feet may be bladed, but overall, very little surface disturbance is anticipated. Each drilled well will have its casing left in place, which will be capped and extend about 2 feet out of the ground.

FILE SEARCH RESULTS

A documents search was conducted by OWSA of the records within the Wyoming State Historic Preservation Office (SHPO), Cultural Records Office (WYCRO) on September 30, 2010. The search resulted in six accessioned projects and one previously recorded site.

Five of the six accessioned projects are linear inventories related to gas pipelines. These include Cities Service Gas pipeline (Accession No. 77-422), Trailblazer pipeline (Accession No. 79-1963), Entrega pipeline (Accession No. 04-2167 and 04-2167-A), and the Overland Pass pipeline (Accession No. 06-1621-6). No sites were recorded as a result of these projects within the sections included within the file search. However one site does occur within an adjacent section. This site (48LA2976) is an ineligible historic rock cairn that was recorded by SWCA-Denver for the Overland Pass pipeline project (Figure 1).

The last accessioned project (Accession No. 10-11) was conducted by OWSA for Lidstone and Associates (Sanders 2010). This project inventoried eight proposed well drillings within the Belvoir Ranch property. One of the well localities Goose Creek 2-2 is immediately adjacent to our Goose Creek 2-2c.

The only site that showed up in the file search is site 48LA613. This is the eligible Cheyenne-Twin Mountain Wagon Road that was recorded by Rosenberg Historical Consultants (Figure 1). The route of this road passes approximately 100 m north of the Lone Tree Creek Fault 1-5 well locality. The road in this area has been totally obliterated by the existing modern road. There will be no visual impacts from the proposed

well drilling to this site.

Another site from an adjacent section is site 48LA57, which is a destroyed (looted) fire hearth that was recorded in 1975 by John Bellar, Bureau of Land Management archaeologist (Figure 1). It is well outside the present project areas and will not be affected.

Given the numerous cultural resource inventories (especially the parallel linear surveys) and the limited number of recorded sites, it is believed that there is a low potential for additional cultural resources to be encountered.

INVENTORY METHODS

The present inventory followed standard archaeological inventory procedures accepted by the Wyoming SHPO and the BLM. Personnel was spaced at no more than 20 m intervals. In areas with lower surface visibility, special attention was paid to areas of subsurface disturbance (e.g., rodent burrows, animal trails, road cuts, cutbanks, etc.).

For this inventory, a site was defined using the present SHPO site definitions as consisting of 15 or more prehistoric artifacts within 30 m of each other or one or more features for prehistoric sites, and 50 or more historic artifacts. Items with less than these thresholds were classified as isolated resources. Road trash and objects less than 50 years old were not recorded. A handheld Garmin 12XL GPS was used to map project and site locations and any appropriate artifacts, features, etc, using the NAD 83 Datum. Appropriate photographs were taken of the project area and any sites or features that might be present. All field notes, maps, photographs, etc. will be held at OWSA. No cultural materials were collected.

SURVEY RESULTS

No cultural resources were located within any of the present project areas. However, an isolated historic foundation (labeled WY-31-10-1 on Figure 1) was found approximately 30 m north of the Goose Creek 2-2c project area boundary. The foundation consists of a single course of unshaped, local sandstone rocks. Overall, it measures approximately 15 m long by 11 m wide with a 120 degree orientation. No other cultural materials were observed around this foundation. Any visual impacts to this historic foundation will be very temporary and limited to the time the drilling rig is on-site.

Any of the wells will be capped that will consist of a metal casing extending approximately two feet out of the ground. A similar capped well head occurs in the Lone Tree Creek drainage valley that was



View of an existing, capped well head in the Lone Tree Creek drainage valley



View of an existing flowing well building in the Lone Tree Creek drainage valley

Figure 4. Photographs of existing wells.

encountered during a prior inventory (Sanders 2010) and is illustrated in Figure 4. If a well is developed, a small concrete block building will be constructed similar to that illustrated in Figure 4.

MANAGEMENT RECOMMENDATIONS

A class III cultural resource inventory of three proposed well locations, totaling 19.85 acres, was conducted by the Office of the Wyoming State Archaeologist for Lidstone and Associates, Inc. The inventory is for geologic and water development investigations at the City of Cheyenne's Belvoir Ranch in Laramie County, Wyoming, in association with the Wyoming Water Development Commission. At this time there is no federal involvement, but future involvement through permitting or funding is possible, therefore this cultural resource inventory was conducted. No cultural resources were located and therefore no historic properties will be affected as a result of the proposed project. Cultural clearance is recommended with the standard stipulations that should archaeological remains be uncovered during construction, the appropriate state regulatory agencies be contacted immediately.

REFERENCES CITED

- Love, J. D., and Ann Coe Christiansen (compilers)
1985 *Explanation for the Geologic Map of Wyoming*. Geological Survey of Wyoming, Laramie, Wyoming.
- Sanders, Paul H.
2010 *The 2010 Class III Cultural Resource Inventory of Eight Proposed Well Locations at the Belvoir Ranch, Laramie County, Wyoming*. Office of the Wyoming State Archaeologist. On file Wyoming State Historic Preservation Office, Cultural Records Office, Laramie, Wyoming.



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Mr. Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office
US Army Corps of Engineers, Omaha District
2232 Dell Range Blvd., Suite 210
Cheyenne, WY 82009-4942

Response obtained 10/19/09 - attached
Further Action
- wetland delineation 10/14/09

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Bilodeau:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified. For your reference, I have attached a copy of your letter dated June 16, 2005, in response to States West 2005 request for site review.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous response from other state and federal agencies, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well drilling, development, and aquifer testing activities. Disturbed areas will also be reseeded upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
USCOE Letter dated June 16, 2005
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail



DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

Reply to
Attention of:

June 16, 2005

Wyoming Regulatory Office

Mr. Tim Wilson
Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, Wyoming 82001

Dear Mr. Wilson:

This letter is in response to the request we received on June 3, 2005, from States West Water Resources Corporation (SWWRC), for a jurisdictional determination on areas that could be affected during the construction of four water supply test wells within the Belvoir Ranch, west of Cheyenne. The wells are located in the northwest quarter of Section 16, the northeast quarter of Section 17, the southwest quarter of Section 31, Township 13 North, Range 69 West, and the northwest quarter of Section 12, Township 12 North, Range 70 West, Laramie County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations were published in the November 13, 1986, edition of the *Federal Register* (Vol. 51, No. 219) at 33 CFR Parts 320 through 330. Information on Section 404 program requirements in Wyoming can be obtained from our web site at <http://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm>.

Based on the information provided, the National Wetlands Inventory (NWI) map for the area, and the 7.5-minute topographic map for the Granite quadrangle, it has been determined that there are no wetlands or other waters of the United States where the four test wells will be located. Therefore, Department of the Army authorization is not required for the project because it will not require the discharge of fill material in wetlands or other waters of the United States. This determination does not eliminate the requirement to obtain any other applicable federal, state, tribal, or local permits that may be required.

In the March 28, 2000, edition of the *Federal Register* (Vol. 65, No. 60), the Corps implemented an administrative appeals process for jurisdictional determinations. This letter serves as an approved jurisdictional determination. Enclosed is a Notification of Administrative Appeal Options and Process (NAO) form. You may appeal the determination to the Division

Engineer's appeal officer, Mr. Mores Bergman. Section "D" of the NAO explains the procedures for an appeal. The NAO form must be submitted to Mr. Bergman at the address shown on the NAO form prior to **August 15, 2005**, or you will forfeit your right to an administrative appeal.

Please be aware that the landowner is responsible for obtaining authorization prior to commencing with any activities that include a discharge of dredged or fill material in waters of the United States. Many activities with minor impacts are authorized by general permits known as nationwide permits. On March 18, 2002, our office issued a public notice describing all of the nationwide permits currently in effect in Wyoming based upon information contained in Part II of the *Federal Register* published on January 15, 2002 (Volume 67, No. 10). A copy of the public notice is available from our web site. A standard (individual) permit would be required if a project's total impacts on waters of the U.S. exceeds the nationwide permit criteria. A permit application (ENG Form 4345) is also available from our web site.

This verification is valid for a period of five years, until **June 16, 2010**, unless new information warrants a modification. Any deviations from the plans and specifications for the project, as provided by SWWRC on May 31st and June 16, 2005, could require additional review from this office.

Thank you for your interest in cooperating with the requirements of the U.S. Army Corps of Engineers regulatory program. If you have any questions regarding this determination, please contact Mr. Michael Borgan in our office at (307) 772-2300 and reference file No. 200540131.

Sincerely,



Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

Enclosure

Copy Furnished:

Jack Meena (w/o enclosures)
States West Water Resources Corporation
1904 East 15th Street
Cheyenne, Wyoming 82001



Reply to
Attention of:

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

October 14, 2009

Wyoming Regulatory Office

10/19/2009

Mr. Tim Wilson
Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, Wyoming 82001

Dear Mr. Wilson:

This letter is in response to a request dated September 30, 2009, that we received from Mr. Mark Stacy of Lidstone and Associates, Inc., for a jurisdictional determination concerning possible impacts to waters of the United States that could result from the drilling of test drinking water wells on five areas within the Belvoir Ranch southwest of Cheyenne. The areas include: the Lone Tree Creek area in portions of S-16 & 17, T-13N, R-69W; the Lone Tree Fault area in portions of S-19, 20, and 30, T-13N, R-69W; the Goose Creek Structure in portions of S-29 through 32, T-13N, R-69W, and S-25, T-13N, R-70W; the Duck Creek Structure in portions of S-30 through 32, T-13N, R-69W, S-25 and 36, T-13N, R-70W, and S-25 and 36, T-13N, R-70W; and the Spottlewood Structure in portions of S-6 and 7, T-12N, R-69W, and S-1 and 12, T-12N, R-70W, all in Laramie County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. Wetlands are defined as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are characterized by growth of vegetation such as bulrush, cattails, rushes, sedges, and willows.

The Corps regulations are published in the Code of Federal regulations at 33 CFR Parts 320 through 330. Copies of the regulations and other important information on Section 404 program requirements in Wyoming can be found on the internet by visiting our web site at <https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm>.

I reviewed the National Wetlands Inventory map for the project area, the 7.5-minute topographic map for the Emkay and Granite quadrangles, and false color infrared images of the area available on the University of Wyoming's Geographic Information Service Center's website at <http://whisky.wygisc.uwyo.edu/natrona11/doqq/>. Based upon these sources of remote sensing

data, it appears that there are potential wetland areas adjacent to Duck Creek, Goose Creek and Lone Tree Creek, Spottlewood Creek, and several unnamed tributaries to these creeks that could be considered to be waters of the United States. Please be aware that the information sources listed above do not provide an official wetland delineation. They simply provide an idea of the potential presence or absence of wetlands. However, they generally provide a good indication of approximate wetland boundaries. An on-site wetland delineation will be required to determine if there are waters of the United States within the project area that are subject to regulation, and to establish their exact locations and boundaries. A wetland delineation consultant should be contacted to complete a report identifying all waterways and wetlands, including intermittent, ephemeral, and seasonal water features within the project area. If any water features are identified, that report must be submitted to our office for review and approval. A list of consultants is available from our web site.

Please be aware that the landowner is responsible for obtaining authorization prior to commencing with any activities that include a discharge of dredged or fill material in wetlands or other waters of the U.S. The type of authorization depends on the extent of impacts to wetlands and other waters of the U.S. Existing general permits known as nationwide permits authorize many activities with minor impacts. Our office issued a Public Notice effective on March 18, 2002, describing all of the nationwide permits currently in effect in Wyoming based upon information contained in Part II of the *Federal Register* published on January 15, 2002 (Volume 67, No. 10). A copy of the Public Notice is also available from our web site. **Please pay particular attention to nationwide permit (NWP) 14 with regards to construction of roads, and NWP 12 with regards to any utility lines that might be required to complete the project. If a pre-construction notification (PCN) is required, please ensure you include all the information specified in the associated instructions.** A standard (individual) permit would be required if the cumulative effects on waters of the U.S. for a single and complete project exceed the nationwide permit criteria. A permit application with instructions is also available from our web site.

If you have any questions concerning this determination or would like to discuss our permit requirements in more detail, please contact me at (307) 772-2300 and reference file No. 200540131.

Sincerely,



Michael A. Burgan
Project Manager
Wyoming Regulatory Office

Copy Furnished:

✓ Mark Stacy
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, Colorado 82525-3448



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Ms. Paige Smith
Air Quality Planning Program Manager
Wyoming DEQ, Air Quality Division
122 West 25th Street
Herschler Building, 2E
Cheyenne, WY 82002

*response
obtained
10/6/09 - attached*

No further Action

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Ms. Smith:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified. For your reference, I have attached a copy of your letter dated June 14, 2005, in response to States West 2005 request for site review. The issues raised in your June 2005 letter will be addressed in our Environmental Report.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous regulatory response, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well development and aquifer testing activities. Disturbed areas will also be reseeded and reclaimed upon the completion of all onsite activities. In addition, fugitive dust will be mitigated as necessary during well drilling and construction. All trash will be disposed of properly offsite and no onsite burning will be allowed.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
DEQ Letter dated June 14, 2005

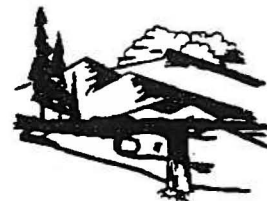
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission

Send By: Regular Mail
K:\OPEN\WY\WDC109\ER Letters\DEQ AQD.doc



Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.



John Corra, Director

June 14, 2005

Mr. Jack Meena, P.E.
Project Manager
States West Water Resources Corporation
P.O. Box 2092
Cheyenne, Wyoming 82003

RE: Air Quality Division Review of the Cheyenne BOPU Belvoir Ranch Paleozoic Groundwater Exploration Project,

Dear Mr. Meena:

The Air Quality Division has reviewed your letter submitted May 31, 2005 regarding the Cheyenne BOPU Belvoir Ranch Paleozoic Groundwater Exploration Project. With funding provided by The Wyoming Water Development Commission, the project will consist of drilling four test holes to explore the aquifer characteristics and water quality of the Casper Aquifer on the western end of the Belvoir Ranch in southern Laramie County. The Lone Tree Creek Monocline location is SWNE Section 17, T13N, R69W; the Kennedy Log Well location is NWSW Section 16, T13N, R69W; the Duck Creek Anticline location is NWSW Section 31, T13N, R69W; and the Spottewood Creek Anticline location is NWSE Section 12, T12N, R70W. At each site, it is estimated that less than 1/2 acre will be temporarily disturbed for a period of three days. Upon completion of the drilling program, the sites will be returned to their existing condition. Drilling is anticipated to commence in late summer to early fall of 2005. Based on your letter, two sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the planned construction activities. These sections are WAQSR Chapter 3, Section 2(f) regarding fugitive dust control and Chapter 10, Section 2 regarding open burning.

Chapter 3, Section 2(f) requires persons engaged in the clearing or leveling of land, earthmoving, excavation, movement of trucks or construction equipment over access roads or cleared land, and demolition activities to control fugitive dust emissions using frequent watering and/or chemical stabilization of the affected areas. This section also requires prompt removal of earth or other materials from paved streets. As long as such control measures are taken during completion of this project, the Division expects the impact on ambient air quality from active construction activities will be minimized.

The Division notes that, due to the scope of the well project, a large area of cleared land will most likely be generated. As a result, the Division highly recommends that all areas of cleared land be scarified to prevent wind generated fugitive dust. Such areas that will remain construction free and/or without cover for approximately four weeks or more should be scarified and have straw crimped into the ground to prevent fugitive dust generation. Areas that will remain construction free



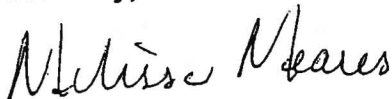
and/or without cover for extended periods of time, eight weeks or more, should be seeded as well. Silt or plastic fencing designed to act as a wind break should also be utilized near residential areas and local businesses to help protect these areas from fugitive dust, blowing straw, and construction debris.

In regard to Chapter 10, Section 2, this regulation prohibits the disposal of any trade wastes, including wood, construction materials, or other discarded materials, by open burning. All such materials generated by the project should be disposed of by an alternative means.

It appears, based on your letter, that no building demolition or renovation activities will take place during the completion of this project. If this turns out not to be the case, please be aware that Chapter 3, Section 8 regarding asbestos removal applies to these types of activities. Chapter 3, Section 8 requires an initial work-site inspection prior to any demolition or renovation activities at a work site. This includes a thorough inspection of the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos. This section also contains specific notification requirements and procedures for asbestos emissions control which may be applicable. Please contact Mr. Gerald Blackwell or Mr. Robert Rodriguez with the Division at (307) 777-7394 and (307) 777-7584, respectively, for further information.

If you have any questions regarding this matter, please feel free to contact me at (307) 777-3771 or at the address listed on the previous page.

Sincerely,



Melissa J. Meares
Environmental Specialist
Air Quality Division

MJM/mjm

xc: Dan Olson, Air Quality Division Administrator
Glenn Spangler, SSC District Engineer
Laramie County Compliance File



Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.



Dave Freudenthal, Governor

John Corra, Director

October 6, 2009

Mr. Mark Stacy, PG
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Ft. Collins, CO 80525-3448

**RE: Air Quality Division Environmental Review of the Board of Public Utilities Belvoir Ranch
Paleozoic Groundwater Exploration Project**

Dear Mr. Stacy:

This letter is in response to your request dated September 30, 2009, regarding the Board of Public Utilities compliance with Federal Authorities to obtain in the future a State Revolving Loan Fund for the Belvoir Ranch Paleozoic Ground Water Supply Wells of liquid in southern Laramie County, Wyoming. The current project, funded through the Wyoming Water Development Commission, will consist of drilling two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir. Locations are as follows:

- **Lone Tree Creek:** Section 16 and 17, T13N, R69W
- **Lone Tree Fault:** Section 19, 20, 29, and 30, T13N, R69W
- **Goose Creek Structure:** Sections 29 through 32, T13N, R69W; Section 25, T13N, R70W
- **Duck Creek Structure:** Sections 30 through 32, T13N, R69W; Sections 25 and 36, T13N, R70W; Sections 5 and 6, T12N, R69W
- **Spottlewood Structure:** Sections 6 and 7, T12N, R69W; Sections 1 and 12, T12N, R70W

Upon completion of the drilling program, the sites will be returned to their existing conditions.

Your letter has been reviewed and the submitted information evaluated with respect to compliance with existing air quality rules and regulations. Based on the Division's review, two (2) sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the proposed project should it be initiated. These sections are WAQSR Chapter 3, Section 2(f)(i) regarding fugitive dust control; and Chapter 10, Section 2 regarding open burning.

Chapter 3, Section 2(f)(i-ii) requires persons engaged in the clearing or in the leveling of land, earthmoving, excavation, movement of trucks or construction equipment over access roads, or cleared land, and demolition activities to control fugitive dust emissions, using frequent watering and/or chemical stabilization of the affected areas. This section also requires prompt removal of earth or other materials from paved streets. During completion of this project, as long as such control measures are taken the Division expects the impact on ambient air quality from active construction activities will be minimized.

Herschler Building • 122 West 25th Street • Cheyenne, WY 82002 • <http://deq.state.wy.us>

ADMIN/OUTREACH
(307) 777-7937
FAX 777-3610

ABANDONED MINES
(307) 777-6145
FAX 777-6462

AIR QUALITY
(307) 777-7391
FAX 777-5616

INDUSTRIAL SITING
(307) 777-7369
FAX 777-5073

LAND QUALITY
(307) 777-7756
FAX 777-5864

SOLID & HAZ. WASTE
(307) 777-7752
FAX 777-5073

WATER QUALITY
(307) 777-7781
FAX 777-5073



If large areas of cleared land will be generated by the project, then the Division **highly recommends** that all areas of cleared land be scarified to prevent wind generated fugitive dust. Silt or plastic fencing designed to act as a wind break should also be utilized near residential areas and local businesses to help protect these areas from fugitive dust, blowing straw, and construction debris.

In regard to Chapter 10, Section 2, this regulation prohibits the disposal of any trade wastes, including wood, construction materials, or any other discarded materials by open burning. All such materials generated by the project should be disposed of by an alternative means.

If you have any questions regarding this matter, please feel free to contact me at (307) 777-3783 or at the address listed on the previous page.

Sincerely,



Carla Mlinar, Air Quality Engineer
Air Quality Division

CJM/cjm

xc: Dave Finley, Air Quality Division Administrator
Linda Dewitt, Asbestos Program Coordinator
Glenn Spangler, District 1 Engineer
Laramie County Compliance File

Wyoming Water Development Commission
Attn: Kevin Boyce, Project Manager
6920 Yellowtail Rd.
Cheyenne, WY 82002

Cheyenne Board of Public Utilities
Attn: Tim Wilson, Director
P.O. Box 1469
Cheyenne, WY 82003-1469



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Mr. J. Xavier Montoya
Wyoming State Conservationist
US Department of Agriculture, NRCS
Federal Building
P.O. Box 33124
Casper, WY 82602

*Response offered
12/7/09 - attached*

No further Action

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Montoya:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified. For your reference, I have attached a copy of your letter dated June 13, 2005, in response to States West 2005 request for site review. The issues raised in your June 2005 letter will be addressed in our Environmental Report.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous regulatory response, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well drilling, development, and aquifer testing activities. Disturbed areas will also be reseeded and reclaimed upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
NRCS Letter dated June 13, 2005

cc: w/out Enc. Brian Mark, WyEQ/WQD
Alana Cannon, RUS, PO Box 11005
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission

Send By: Regular Mail

United States Department of Agriculture



Natural Resources Conservation Service
100 East B Street, Room 3124
P.O. Box 33124
Casper, Wyoming 82602

DEC - 7 2009

Date: 12/3/2009

Lidstone and Associates, Inc.
Attn: Mark E. Stacy, Senior Hydrologist
4025 Automation Way, Building E
Fort Collins, Colorado 80525-3448

Dear Mr. Stacy:

The Natural Resources Conservation Service (NRCS) has reviewed the proposal for the **Belvoir Ranch Ground Water, Level II Project** dated September 30, 2009.

The Agriculture and Food Act of 1981, (Public Law 97-98) containing the Farmland Protection Policy Act (FPPA)—Subtitle I of Title XV, Section 1539-1549, is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a federal agency or with assistance from a federal agency.

It does not appear there will be any permanent conversion of irrigated agricultural land to non-agricultural use based on the information you provided. As such, we do not believe the work will adversely impact prime farmland. However, we recommend prompt re-vegetation of the disturbed areas to minimize soil erosion and weed encroachment. If you need assistance developing a seeding plan or would like a review of an existing seeding plan to ensure suitability for the soil types impacted, feel free to contact the local NRCS office in Cheyenne. A good point of contact would be Jim Pike, the District Conservationist, at (307) 772-2314 extension 110.

If you have any questions, or need to discuss this comment, please contact Casey Sheley at (307) 233-6770.

Sincerely,



J. XAVIER MONTOYA
State Conservationist

Cc: Jim Pike, District Conservationist, Cheyenne Field Office
Tom Watson, Area Conservationist, Douglas Area Office

Helping People Help the Land

An Equal Opportunity Provider and Employer

Date: June 13, 2005

States West Water Resources Corporation
Jack Meena, PE
P.O. Box 2092
Cheyenne, WY 82003

Dear Mr. Meena,

The Natural Resources Conservation Service has reviewed the information on the Cheyenne BOPU Belvoir Ranch Paleozoic Groundwater Exploration Project.

The NRCS does not have any concerns with the project.

If you have any questions, or need to discuss this comment with us, please contact either myself at 307-233-6750 or please contact Doug Gasseling, Conservation Agronomist, Cheyenne, Wyoming, at 307-772-2320, ext. 101.

Sincerely,

 acting

LINCOLN "ED" BURTON
State Conservationist



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Mr. Matthew Hoobler
North Platte Coordinator
Wyoming State Engineer's Office
122 West 25th Street
Herschler Building, 4 East
Cheyenne, WY 82002

Approved - Attached
10/16/09
No further Action

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Hoobler:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well in the South Platte River Basin to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs. The amount of ground water that may be developed is uncertain at this time.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous agency response, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well drilling, development, and aquifer testing activities. Disturbed areas will also be reseeded and reclaimed upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Brian Kelly, US Fish and Wildlife
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail

Attachment A
Location Descriptions of the Cheyenne Belvoir Ranch
Potential Well Drilling Areas

Please refer to the attached map, Cheyenne Belvoir Ranch. All five areas are within the Belvoir Ranch Boundary.

Lone Tree Creek

Sections 16 and 17, T 13N, R 69W

Lone Tree Fault

Sections 19, 20, 29, and 30, T 13N, R 69W

Goose Creek Structure

Sections 29 through 32, T 13N, R 69W

Section 25, T 13N, R 70W

Duck Creek Structure

Sections 30 through 32, T 13N, R 69W

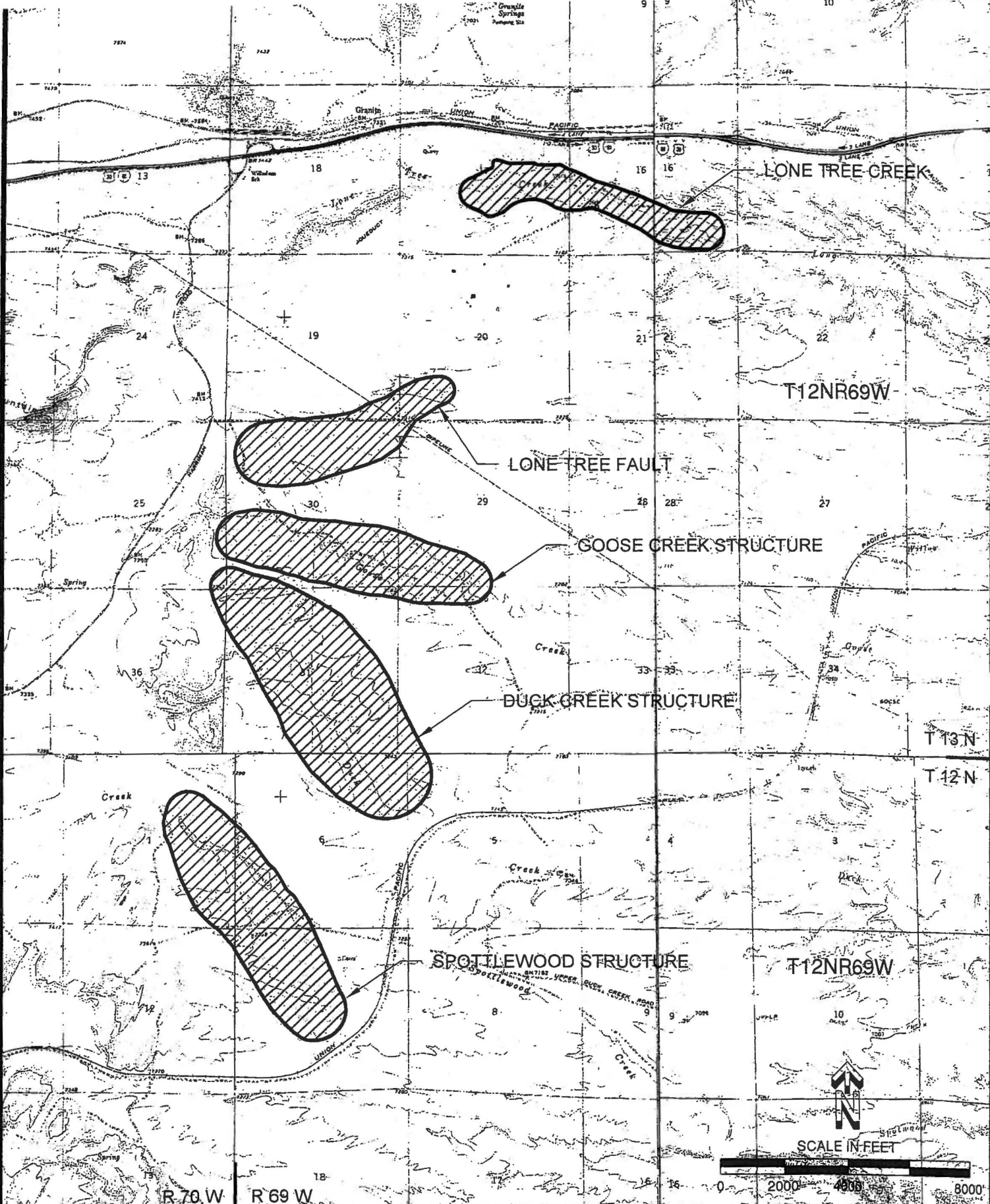
Sections 25 and 36, T 13N, R 70W

Sections 5 and 6, T 12N, R 69W

Spottlewood Structure

Sections 6 and 7, T 12N, R 69W

Sections 1 and 12, T 12N, R 70W



| |
|------------------------------------|
| PROJECT: WYDC109 |
| DATE: 9/21/09 |
| DESIGN/DRAWN: MES/SOM |
| CHECKED: MES |
| REVISIONS: |
| FILE: WYDC 09 BELVOIR 24K BASE.DWG |

FIGURE 1
POTENTIAL DRILLING AREAS MAP



\\WYDC109 - Belvoir\ACAD\WYDC_09_BELVOIR 24K BASE.dwg, DRILL LOC. MAP, 9/24/2009 11:17:23 AM, som, Letter



State Engineer's Office

HERSCHLER BUILDING, 4-E CHEYENNE, WYOMING 82002
(307) 777-7354 FAX (307) 777-5451
seoleg@seo.wyo.gov

DAVE FREUDENTHAL
GOVERNOR

PATRICK TYRRELL
STATE ENGINEER

OCT 16 2009

October 14, 2009

Mark E. Stacy, P.G.
Lidstone and Associates, Inc.
4025 Automation Way, Building E
Fort Collins, CO 80525-3448

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Stacy:

Thank you for the opportunity to provide comment relative to the proposed project. The Wyoming State Engineer's Office provides the following comments relative to the test well drilling and aquifer characterization portion of the proposed project:

The project proponents must secure approved test well permits from the State Engineer's Office prior to the commencement of construction of any test well or production well at the proposed sites. It does not appear that the project proponents have attempted to secure these permits at this time.

Depending on the results of the test well drilling and aquifer characterization, the State Engineer's Office may have additional comments or concerns should the project proponents ultimately intend to develop production wells or well fields at the proposed sites.

This constitutes the body of comment of the State Engineer's Office relative to the proposed project at this time.

Should you have additional questions regarding this matter, feel free to contact me at 307-777-5063.

Sincerely,

A handwritten signature in black ink, appearing to read "Lisa Lindemann", is written over a horizontal line.

Lisa Lindemann, Administrator
Ground Water Division

Cc: Matt Hoobler, North Platte River Coordinator



Lidstone and Associates, Inc.

Engineering, Geology and Water Resource Consultants

September 30, 2009

Mr. Don Beard
Director
Laramie County Public Works
2503 E. Fox Farm Road
Cheyenne, WY 82007

- left voicemail and emailed on 11/7/10
- met *James* to City on 11/7/10
No further action

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Mr. Beard:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified.

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Based on previous agency response, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well development and aquifer testing activities. Disturbed areas will also be reseeded and reclaimed upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
cc: w/ Enc. Cathy Heatherington, Laramie County Planning
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail

Attachment A
Location Descriptions of the Cheyenne Belvoir Ranch
Potential Well Drilling Areas

Please refer to the attached map, Cheyenne Belvoir Ranch. All five areas are within the Belvoir Ranch Boundary.

Lone Tree Creek

Sections 16 and 17, T 13N, R 69W

Lone Tree Fault

Sections 19, 20, 29, and 30, T 13N, R 69W

Goose Creek Structure

Sections 29 through 32, T 13N, R 69W

Section 25, T 13N, R 70W

Duck Creek Structure

Sections 30 through 32, T 13N, R 69W

Sections 25 and 36, T 13N, R 70W

Sections 5 and 6, T 12N, R 69W

Spottlewood Structure

Sections 6 and 7, T 12N, R 69W

Sections 1 and 12, T 12N, R 70W

PROJECT NO. WY WDC 109

LIDSTONE AND ASSOCIATES, INC.
4025 AUTOMATION WAY, BUILDING E
FORT COLLINS CO 80525-3448
☎ (970) 223-4705 Fax (970) 223-4706

FAX TRANSMITTAL

DATE: 1/7/10 TIME: _____

TO: Cathy HEATHENWORTH

BUSINESS PHONE: _____ FAX: 307-633-4319

NUMBER OF PAGES TO FOLLOW: 3

FROM: Mark Smith

COMMENTS:

Cathy,
I just wanted to follow up on our correspondence from
September 2009. I look forward to hearing from you soon.
- Mark

Original documents will:

- ☐ be sent regular mail
- ☐ be sent through Federal Express
- ☒ not be sent

Mark E. Stacy

From: Cathy Heatherington [cheatherington@laramiecounty.com]
Sent: Thursday, January 07, 2010 2:56 PM
To: Mark E. Stacy
Subject: RE: Belvoir Ranch Floodplain Question

I spoke to Don Beard, Laramie County Floodplain Administrator regarding your project and he has no comments or requirements.

From: Mark E. Stacy [mailto:MES@lidstone.com]
Sent: Thursday, January 07, 2010 11:18 AM
To: Cathy Heatherington
Subject: Belvoir Ranch Floodplain Question

Cathy,

We spoke last September regarding our intent to drill several test wells on Belvoir Ranch. Lidstone sent a letter dated September 30, 2009, to Mr. Don Beard regarding our intent. To date, I have not seen a response to this letter that I'd cc'd you on. Would you please contact me and let me know the status of things? I'd appreciate hearing from you soon. Thank you for your attention to this request.

Respectfully,
Mark Stacy
Senior Hydrogeologist
Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E
Fort Collins, CO 80525

Phone: 970-223-4705
Fax: 970-223-4706
Email: mes@lidstone.com



Lidstone and Associates, Inc.
Engineering, Geology and Water Resource Consultants

September 30, 2009

Ms. Jane Francis
Water Quality Division
Wyoming Department of Environmental Quality
122 West 25th Street
Herschler Building, 4 West
Cheyenne, WY 82002

*called and left message to follow up
on 1/5/10.*

Applicants:

Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002
Attn: Kevin Boyce, Project Manager
307-777-7626

Cheyenne Board of Public Utilities
P.O. Box 1469
Cheyenne, WY 82003-1469
Attn: Tim Wilson, Director
307-637-6460

RE: Compliance with Federal Requirements to obtain a State Revolving Fund/Rural Utilities Service Loan for the Belvoir Ranch Paleozoic Ground Water Supply Wells

Dear Ms. Francis:

Lidstone and Associates, Inc. (LA) is preparing an Environmental Report pursuant to the National Environmental Policy Act for the Cheyenne Board of Public Utilities' (BOPU) Belvoir Ranch Ground Water, Level II Project. The Wyoming Water Development Commission is funding the current project to drill two additional test wells and one production well in the South Platte River Basin to evaluate the aquifer characteristics and yield potential of the Casper Aquifer on the western end of the Belvoir Ranch Property in southern Laramie County. The wells may be drilled to depths of up to approximately 4,000 feet, depending upon subsurface structural geologic conditions. If this exploration effort encounters suitable quantities of good quality water, the BOPU may decide to acquire the wells and incorporate them into the City's municipal water supply. At that time, the City may seek funding through the State Revolving Fund/Rural Utilities Service Loan programs to help finance the well costs. The amount of ground water that may be developed is uncertain at this time.

Under a previous ground water grant project for the BOPU, two Casper Aquifer test wells were completed at the ranch in 2006. States West Water Resources Corporation (States West) completed an Environmental Report for these wells in August 2005. Please note that the test well locations included herein are different from those previously identified.

As shown on the attached map, LA has identified five potential drill site areas, and is currently working to identify specific drill site locations. The drill site areas are labeled on the attached map, and include Lone Tree Creek, Lone Tree Fault, Goose Creek Structure, Duck Creek Structure, and Spottlewood Structure. Final drill site locations will soon be selected based on hydrogeologic information and geophysical data interpretation. Access to each drill site will be limited to existing routes wherever possible. A short description and the legal locations of each drill site area are presented in **Attachment A**. An area of approximately one-half acre may be disturbed during drilling of each test/production well. Ground disturbance is anticipated to be minimal with the exceptions of the borehole and any pits that are dug to contain drilling fluids, drill cuttings, and/or formation water. We hope to begin drilling in the winter of 2010, depending upon weather conditions and the drilling contractor's schedule. Drilling completion is anticipated during the summer of 2010.

Based on previous agency response, LA plans to drill the test wells at locations in excess of 300 feet from streams and ephemeral draws, and will use best management practices to limit sedimentation during well drilling, development, and aquifer testing activities. Disturbed areas will also be reseeded and reclaimed upon the completion of all onsite activities.

The Wyoming State Revolving Fund Program and the federal funding agency, the USEPA Region VIII, are committed to complying with federal requirements and Executive Orders that apply in federal financial assistance. We are contacting you to ensure this project complies with applicable authorities under your agency's jurisdiction. Please review this project with respect to your agency's concerns and provide us with a written response. Within your letter of response, please indicate what form of permitting action, if any, will be required for each proposed drill site area. If your agency has concerns and will not issue clearance, please contact me at your earliest convenience concerning what steps must be taken to address your concerns.

If you require additional information, please contact Kate Laudon or me at (970) 223-4705. Thank you for your attention to this matter.

Sincerely,
LIDSTONE AND ASSOCIATES, INC.



Mark E. Stacy, P.G.
Senior Hydrogeologist

MES:rce

Enclosures: Attachment A - Location Descriptions of Potential Well Drilling Areas
Map of proposed test drilling areas
cc: w/out Enc. Brian Mark, WDEQ/WQD
Alana Cannon, RUS
Tim Wilson, Cheyenne Board of Public Utilities
Kevin Boyce, Wyoming Water Development Commission
Send By: Regular Mail

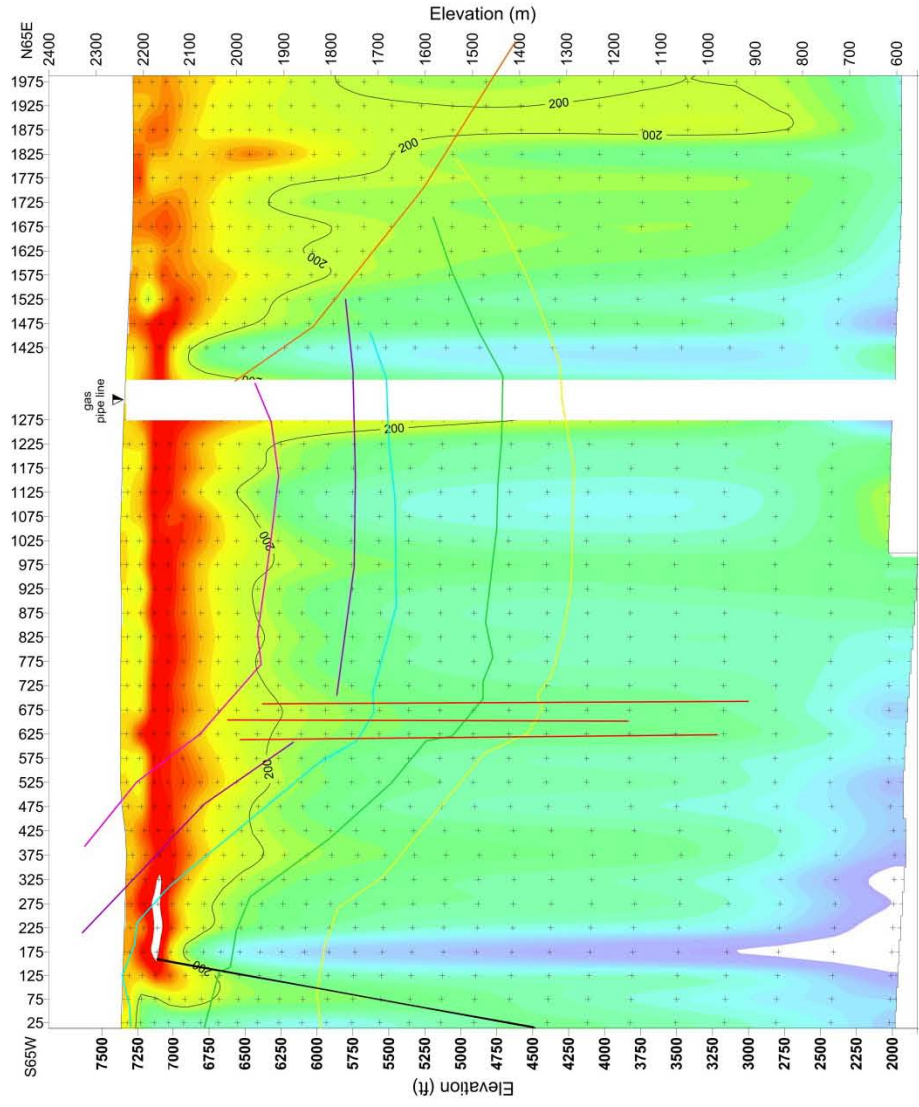
Appendix C

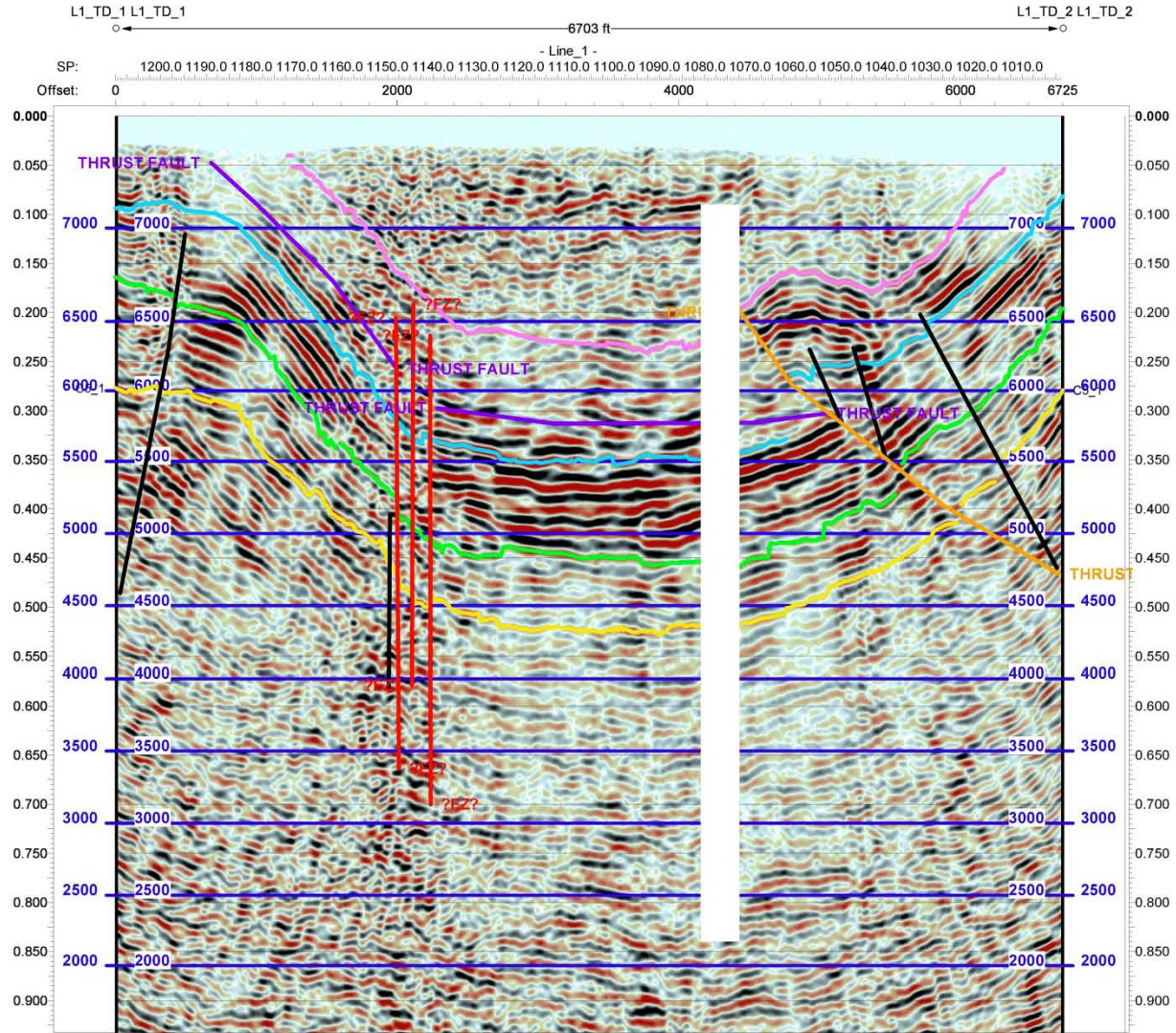
Pre-Drilling Geophysical Interpreted Sections, November 2009

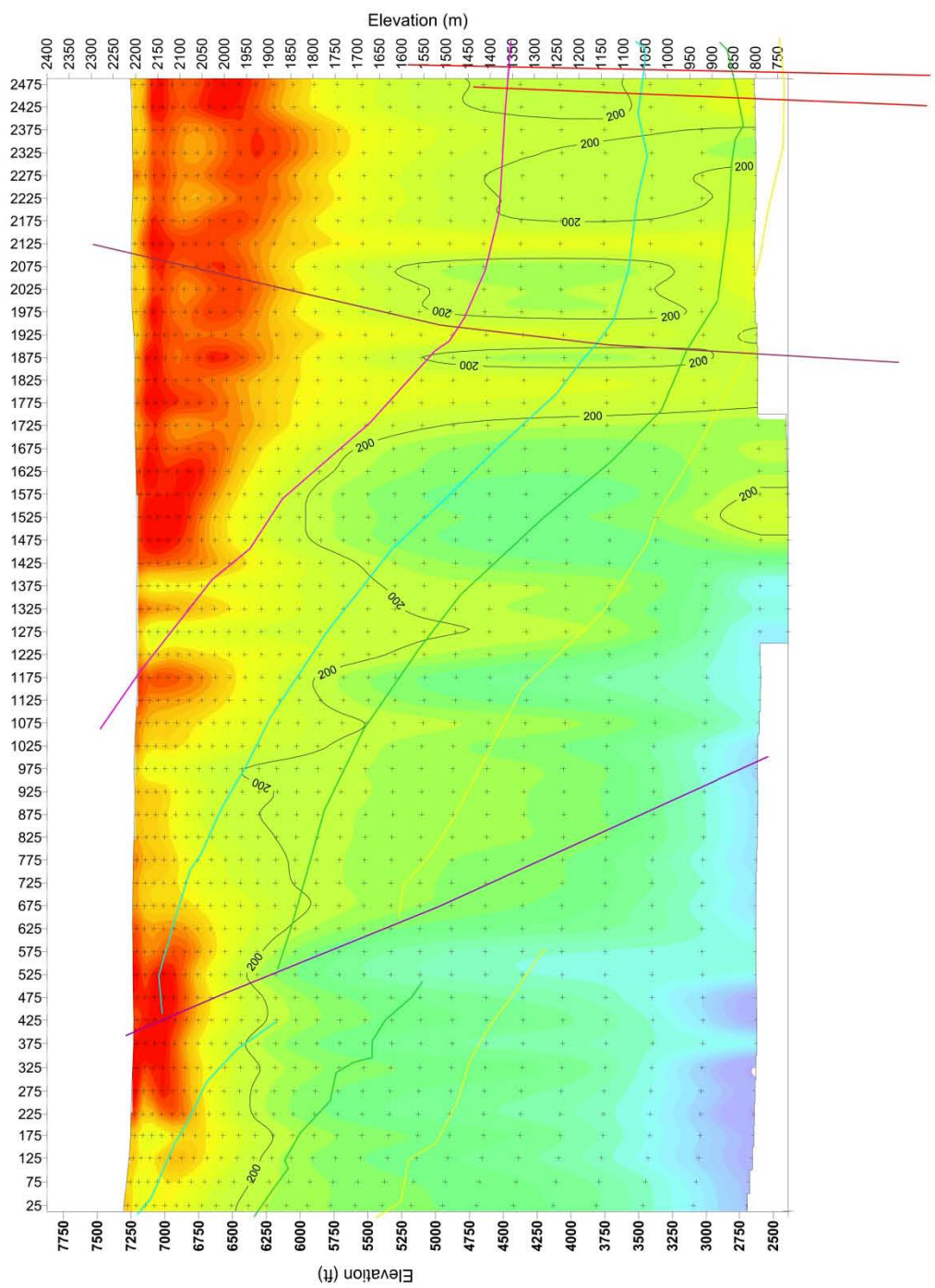


This appendix includes the geophysical data for each surveyed line in cross section form. The interpretations shown on the figures represent those that were made prior to drilling Duck Creek 3-1, and were used to select and rank the initial drill sites at the Ranch.

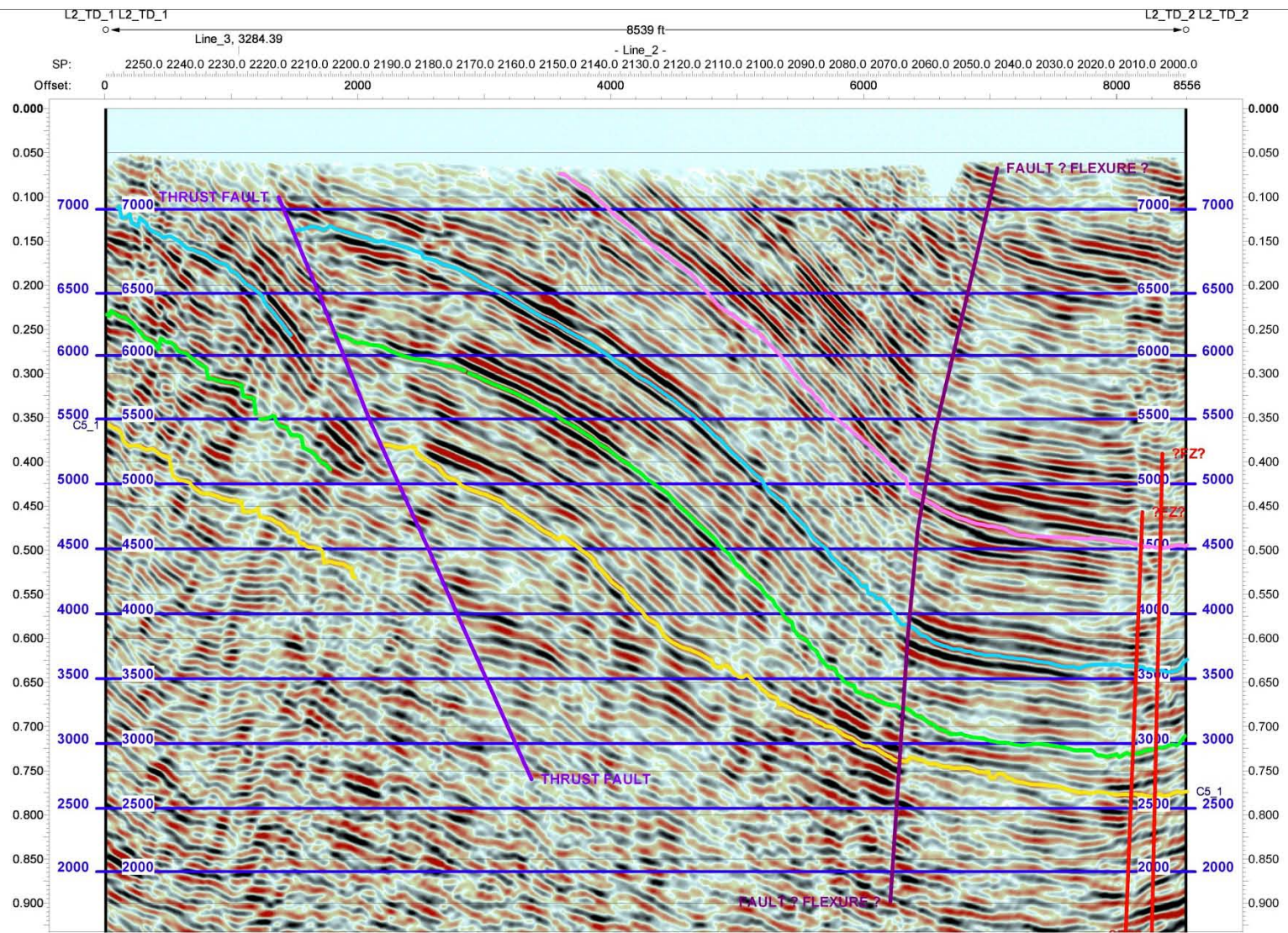
With respect to the interpreted geophysical data presented by line herein, the following notes must be presented in order to understand what is illustrated in these sections. The pink or fuchsia colored line is the interpreted Casper Formation top. The light blue, green, and yellow lines highlight reflective horizons on the rock units below the interpreted Casper Formation top. The black, red, orange, and dark blue or purple lines represent interpreted faults. These color overlaid lines reflect the interpretation of the seismic data and are shown relative to both the seismic reflection and electrical resistivity data on these sections. The blue horizontal lines on the seismic sections correspond to elevation. Line station locations are shown across the top of each section.



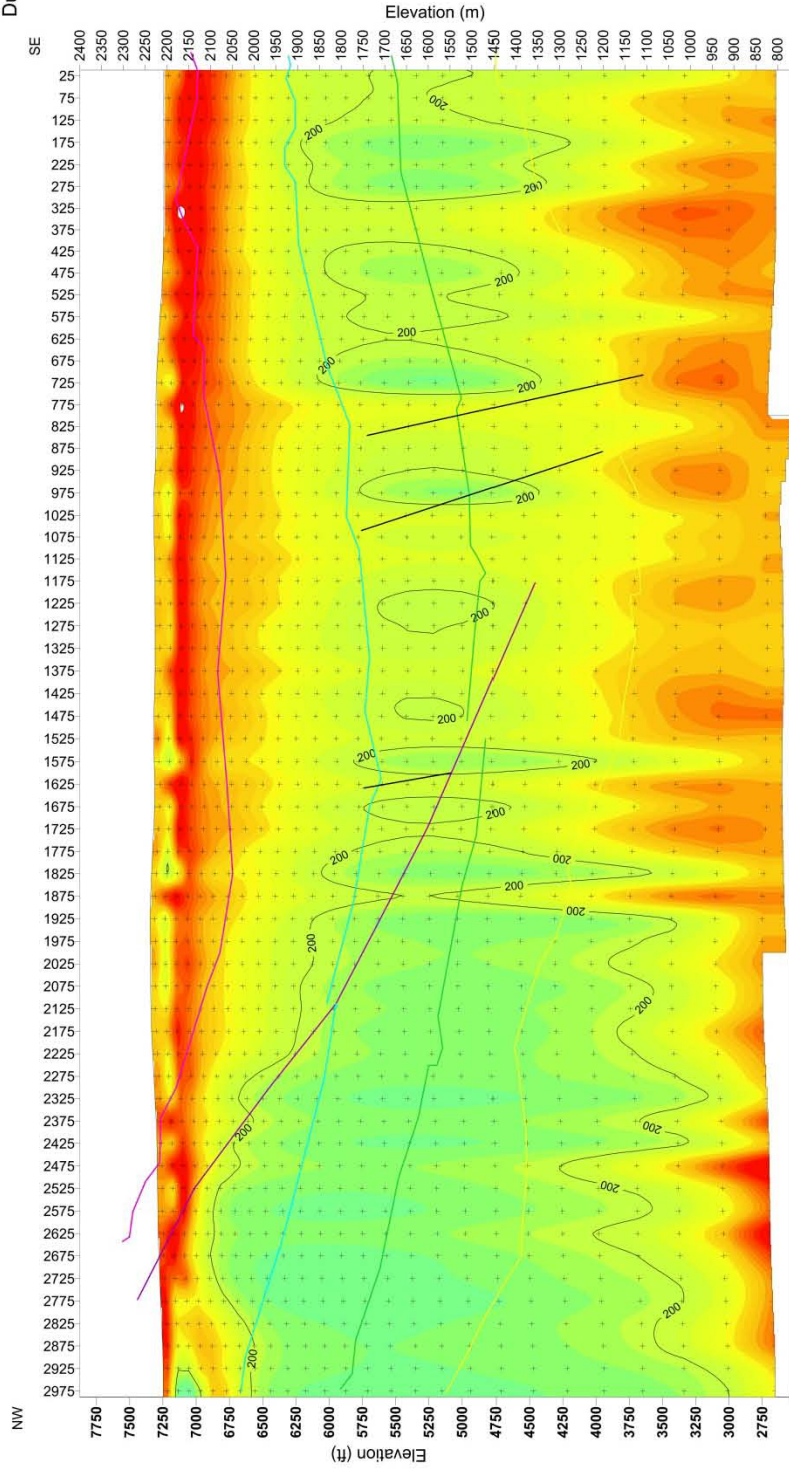




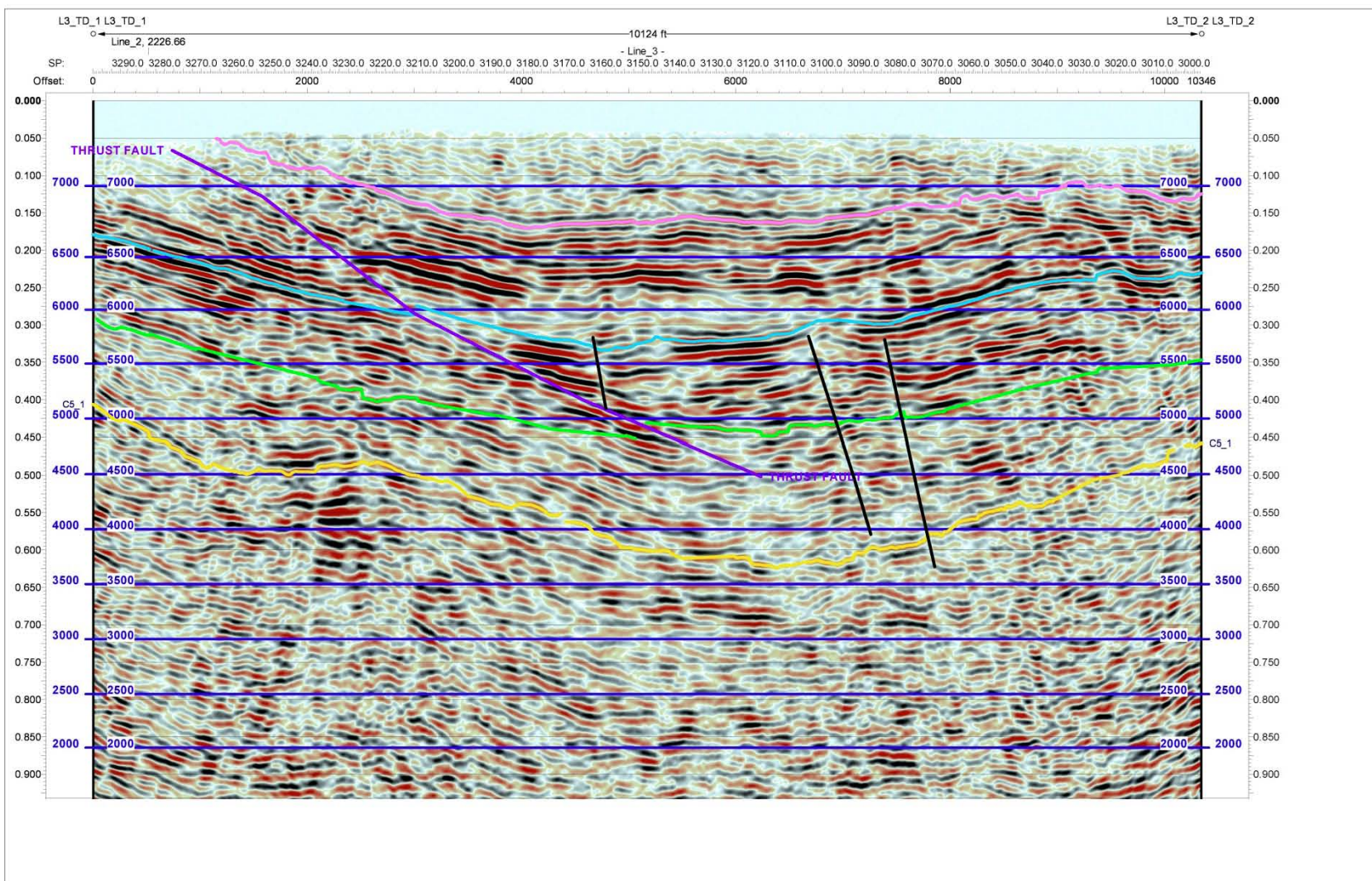
Faults and contacts
from seismic interpretation.

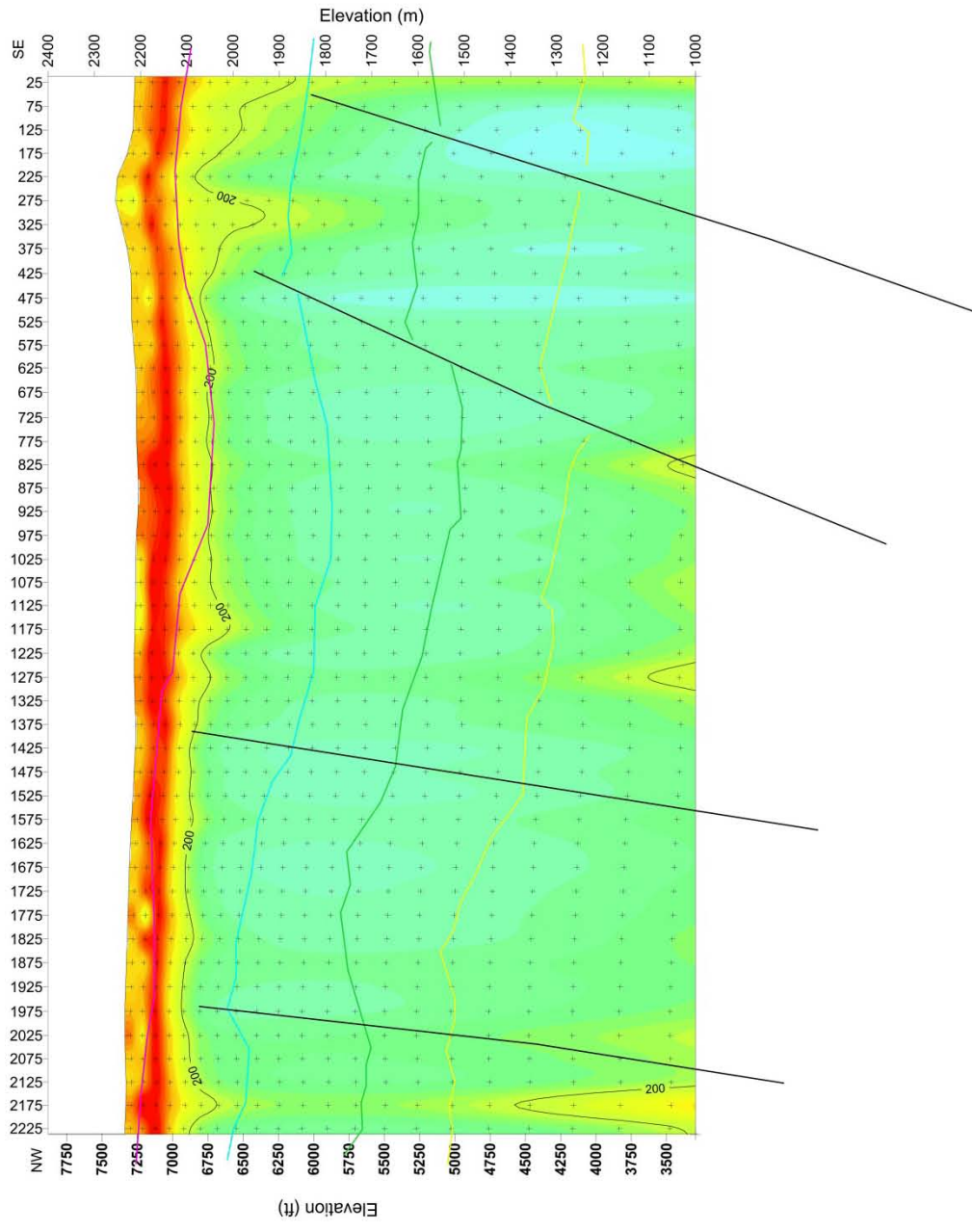


Duck Creek- Line 3



Preliminary





Faults and contacts overlaid from seismic interpretation.

Preliminary

L4_TD_1 L4_TD_1

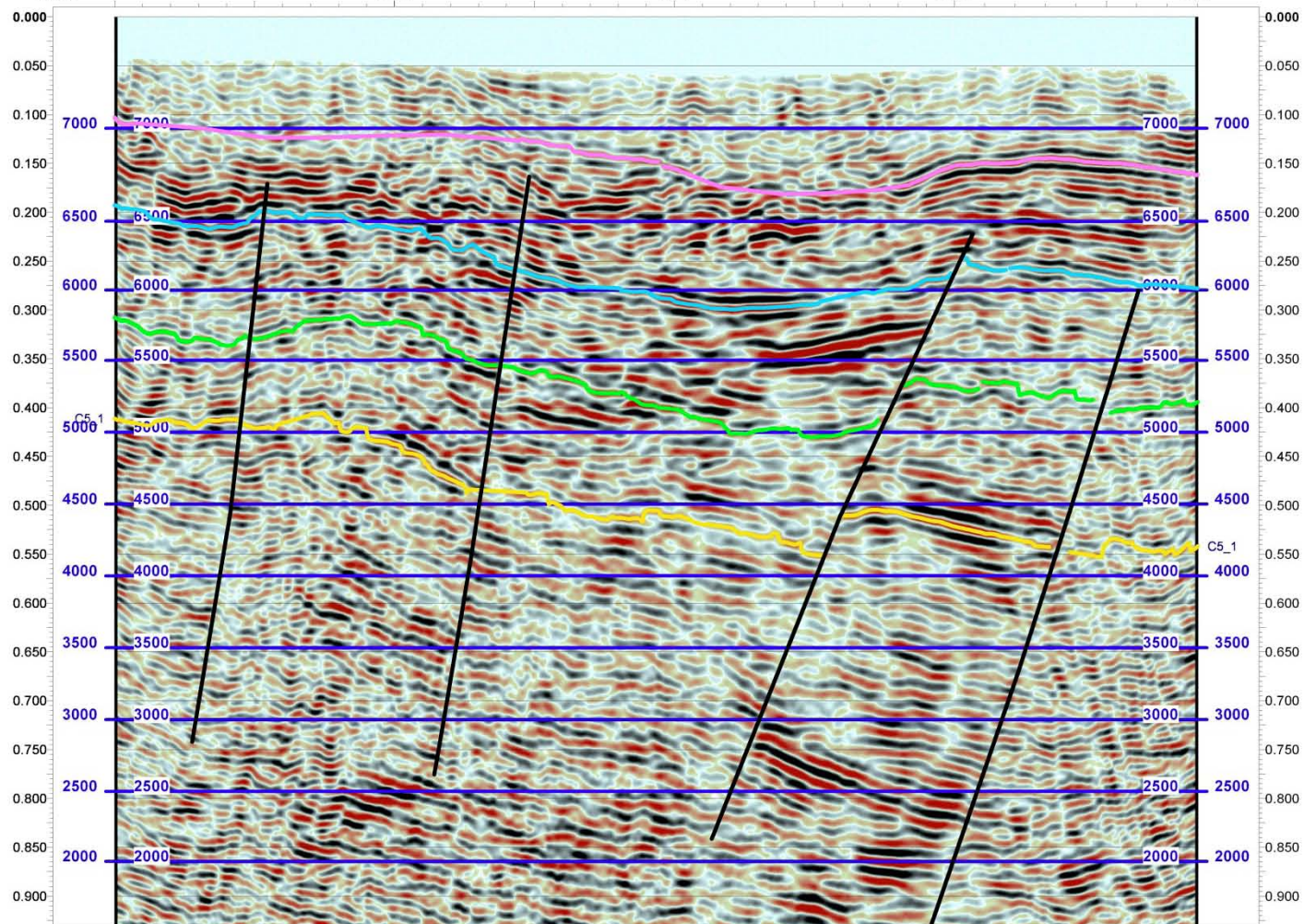
L4_TD_2 L4_TD_2

7723 ft

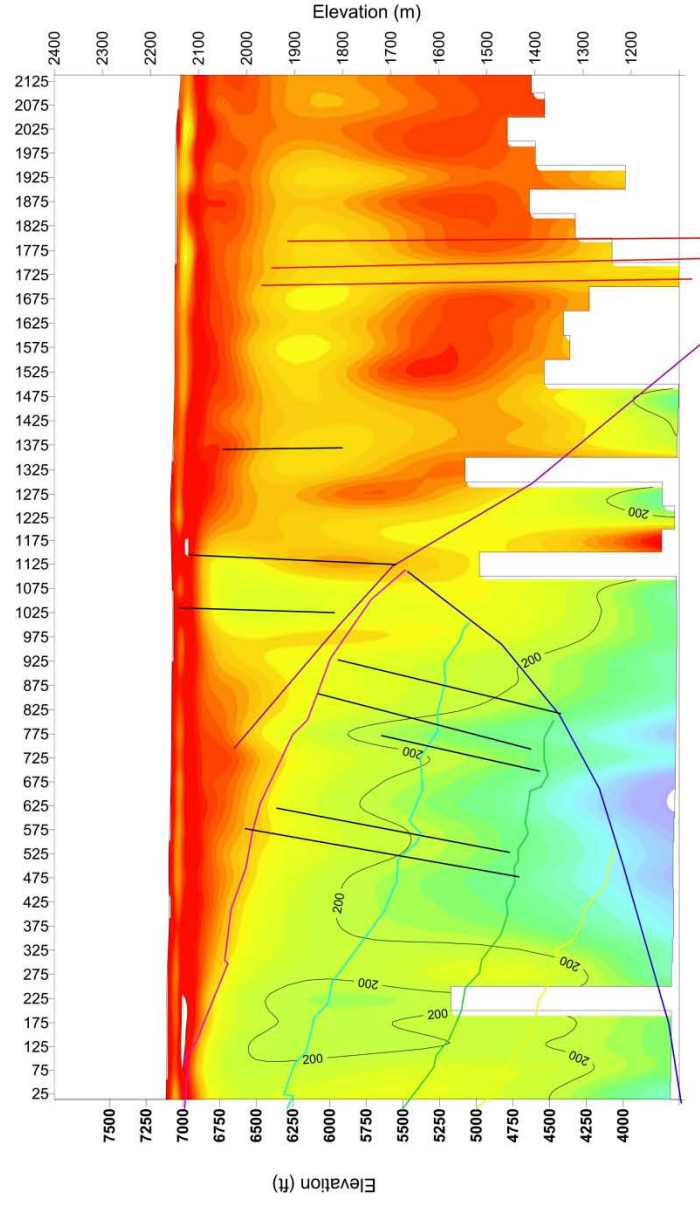
- Line 4 -

SP: 4230.0 4220.0 4210.0 4200.0 4190.0 4180.0 4170.0 4160.0 4150.0 4140.0 4130.0 4120.0 4110.0 4100.0 4090.0 4080.0 4070.0 4060.0 4050.0 4040.0 4030.0 4020.0 4010.0 4000.0

Offset: 0 2000 4000 6000 7739

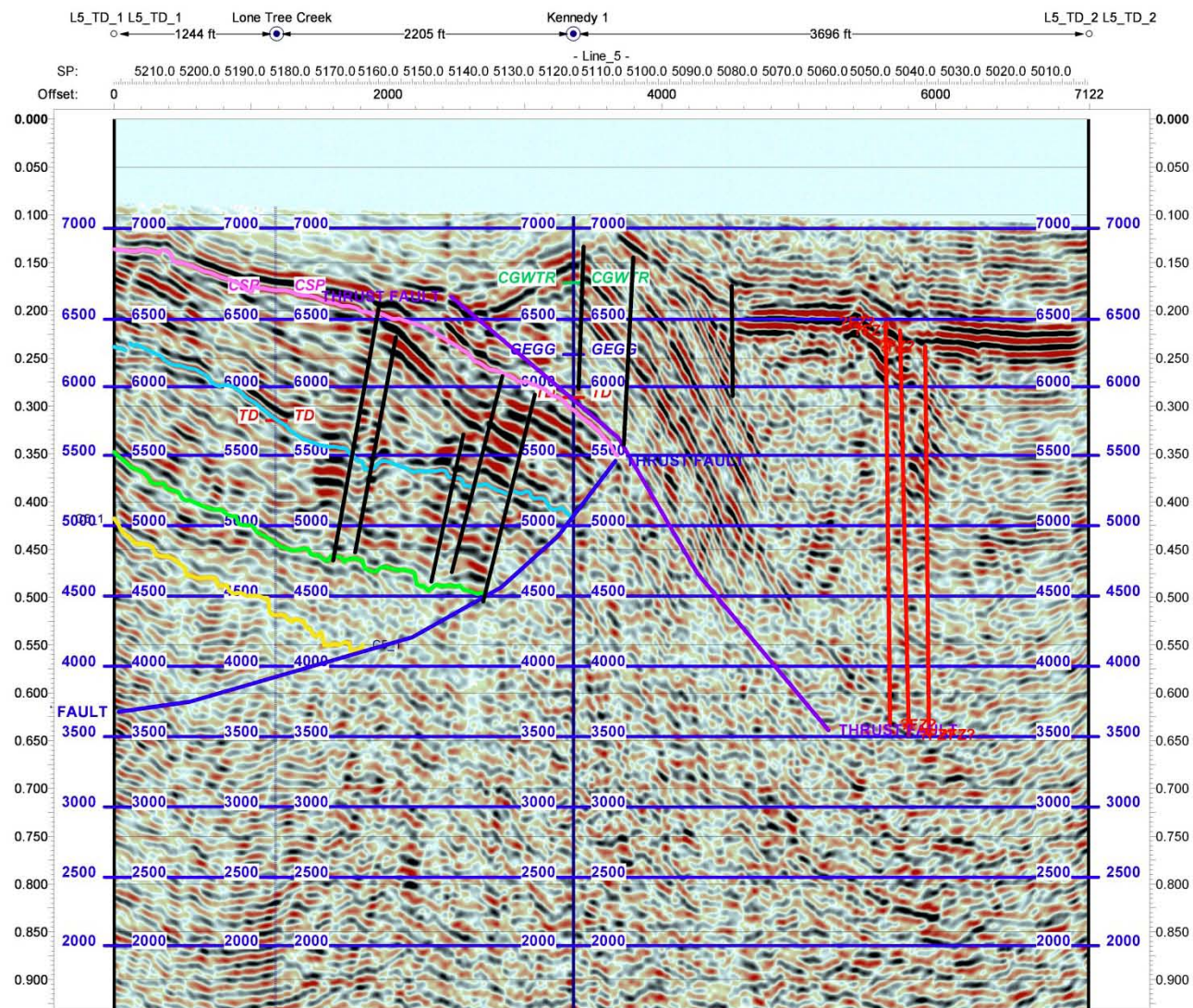


Line 5 - Lone Tree Creek

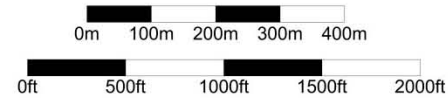
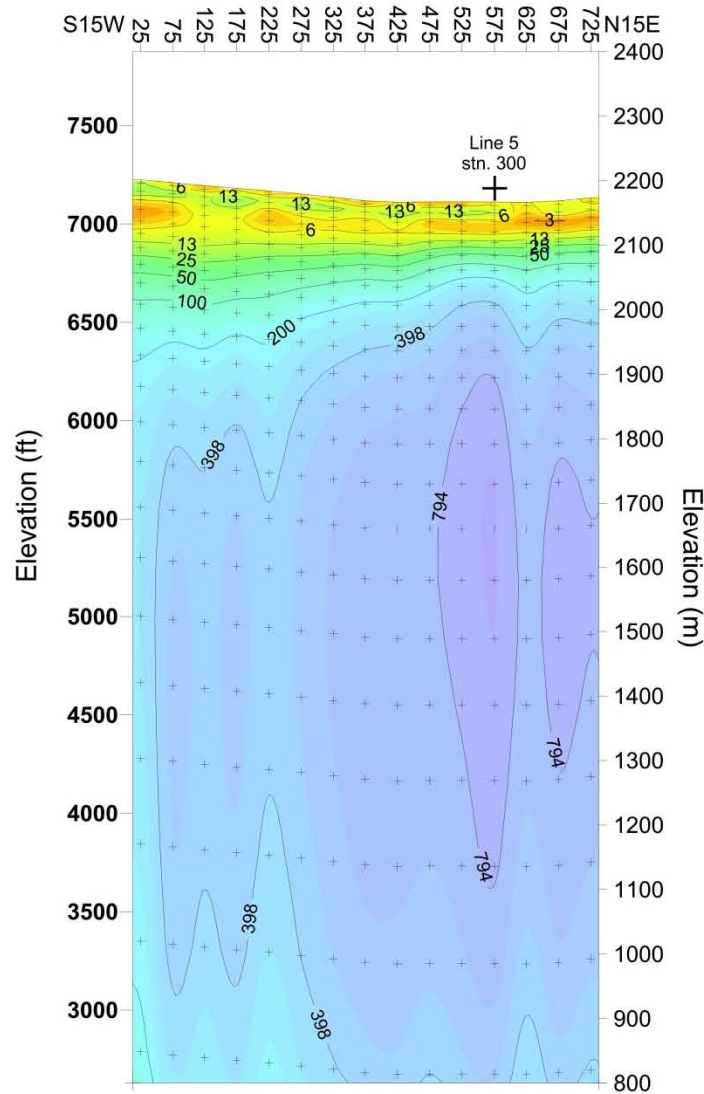


(Faults and contacts overlaid
from seismic interpretation.)

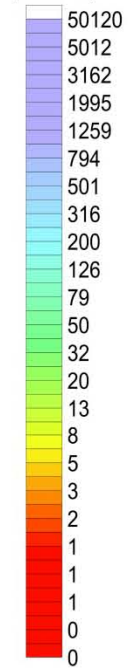
Preliminary



Belvoir Ranch Line 6 N



Model Resistivity
(ohm-m)



Bipole Transmitter Data:
Length = 1278 m
Orient. = N15E
Center at 496242E,4546473N
Distance = 8600 m
Receiver Data:
Length = 50 m
Orient. = N15E
Inversion control parameters:
dpW=1, dxW=1, dzW=2

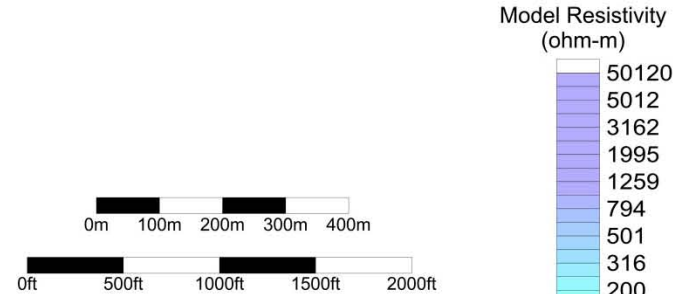
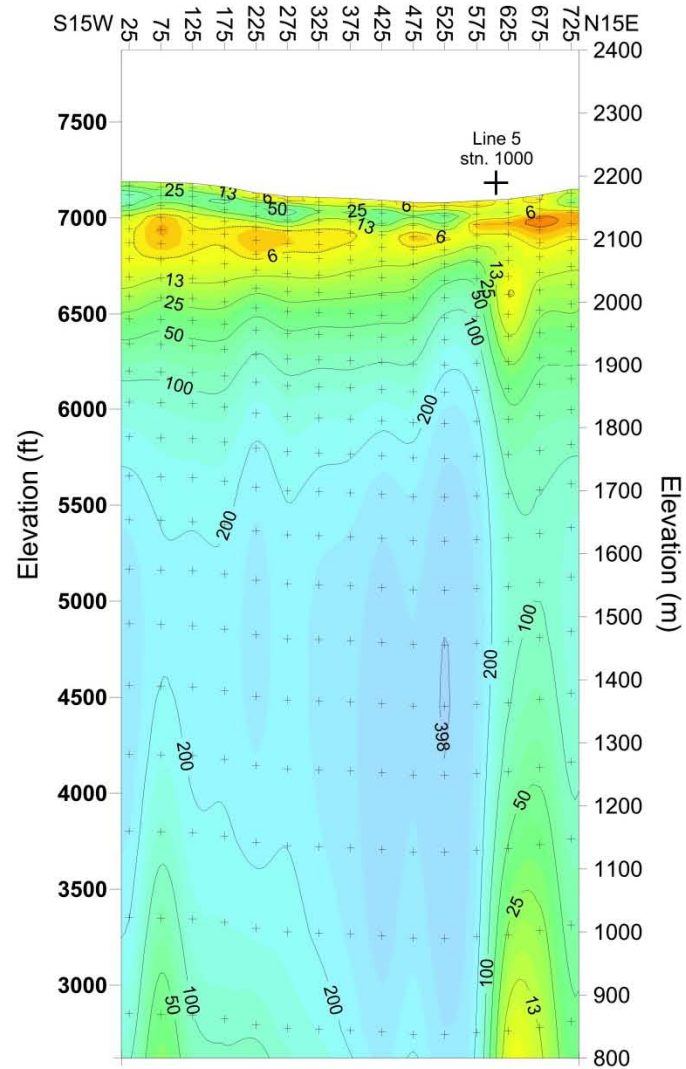
Preliminary

Lidstone
Line 6 N

1D Smooth-Model Inversion
Scalar CSAMT Data

| AUTHOR | DRAWN | DATE | SCALE | REPORT |
|----------------|-------|----------|---------|---------|
| Zonge | CMM | 29/09/09 | 1:10000 | Job 964 |
| REFLine6CS.m1d | | | | |

Belvoir Ranch Line 7 N



Bipole Transmitter Data:
Length = 1278 m
Orient. = N15E
Center at 496242E,4546473N
Distance = 8020 m
Receiver Data:
Length = 50 m
Orient. = N15E
Inversion control parameters:
dpW=1, dxW=1, dzW=2

Preliminary

Lidstone
Line 7 N

1D Smooth-Model Inversion
Scalar CSAMT Data

| AUTHOR | DRAWN | DATE | SCALE | REPORT |
|----------------|-------|----------|---------|---------|
| Zonge | Zonge | 29/09/09 | 1:10000 | Job 964 |
| REFLine7CS.m1d | | | | |

Appendix D

Test Well Water Quality Analytical Reports



Appendix D

Contents

Duck Creek 3-1

Lone Tree Fault 1-2

Goose Creek 2-2C

Lone Tree Fault 1-5

Duck Creek 3-1

ANALYTICAL SUMMARY REPORT

September 17, 2010

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C10080825

Quote ID: C2698

Project Name: WWDC

Energy Laboratories, Inc. received the following 1 sample for Lidstone and Associates on 8/24/2010 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|------------------|----------------|--------------|----------------|--|
| C10080825-001 | Belvoir Ranch | 08/23/10 16:40 | 08/24/10 | Drinking Water | Metals by ICP/ICPMS, Drinking Water Alkalinity Bacteria, Iron Related Bacteria, SDWA Conductivity E300.0 Anions pH Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Stephanie D Waldrop
Reporting Supervisor

Digitally signed by
Stephanie Waldrop
Date: 2010.09.17 13:54:19 -06:00



LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC
Client Sample ID: Belvoir Ranch
Sampled By: Kalpesh B. Patel
Lab ID: C10080825-001E

Report Date: 09/17/10
Collection Date: 08/23/10 16:40
Received Date: 08/24/10 09:30
Matrix: Drinking Water

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|---------------------------|---------|-------|---------------|-----------|---------|----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Present | | UNSAFE | | A9223 B | 08/24/10 12:35 / dkh |
| Bacteria, E-Coli Coliform | Absent | | | | A9223 B | 08/24/10 12:35 / dkh |
| ~ 7 days incubation | | | | | | |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.



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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: WWDC
Lab ID: C10080825-001
Client Sample ID: Belvoir Ranch

Revised Date: 07/12/11
Report Date: 09/17/10
Collection Date: 08/23/10 16:40
Date Received: 08/24/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|----------|-----------|--------|-------------|-----------|----------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related ~ 7 days incubation | 170 | CFU/ml | | 1.0 | | IRB-BART | 08/24/10 11:10 / dkh |
| MAJOR IONS | | | | | | | |
| Alkalinity, Total as CaCO ₃ | 161 | mg/L | | 1 | | A2320 B | 08/27/10 15:44 / jba |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 08/27/10 15:44 / jba |
| Bicarbonate as HCO ₃ | 197 | mg/L | | 1 | | A2320 B | 08/27/10 15:44 / jba |
| Calcium | 35 | mg/L | | 0.5 | | E200.7 | 08/27/10 18:55 / cp |
| Chloride | 3 | mg/L | | 1 | | E300.0 | 09/01/10 16:25 / ljl |
| Magnesium | 14 | mg/L | | 0.5 | | E200.7 | 08/27/10 18:55 / cp |
| Potassium | 1.4 | mg/L | | 0.5 | | E200.7 | 08/27/10 18:55 / cp |
| Sodium | 5.1 | mg/L | D | 0.6 | | E200.7 | 08/27/10 18:55 / cp |
| Sulfate | 6 | mg/L | | 1 | | E300.0 | 09/01/10 16:25 / ljl |
| PHYSICAL PROPERTIES | | | | | | | |
| Conductivity @ 25 C | 299 | umhos/cm | | 1 | | A2510 B | 08/24/10 14:40 / lr |
| pH | 7.93 | s.u. | | 0.01 | | A4500-H B | 08/24/10 14:40 / lr |
| Solids, Total Dissolved TDS @ 180 C | 160 | mg/L | | 10 | | A2540 C | 08/25/10 11:31 / dnp |
| METALS - TOTAL | | | | | | | |
| Aluminum | ND | mg/L | | 0.1 | 0.2 | E200.8 | 09/07/10 12:45 / sml |
| Antimony | ND | mg/L | | 0.001 | 0.006 | E200.8 | 09/07/10 12:45 / sml |
| Arsenic | 0.002 | mg/L | | 0.001 | 0.01 | E200.8 | 09/07/10 12:45 / sml |
| Barium | ND | mg/L | | 0.1 | 2 | E200.8 | 09/07/10 12:45 / sml |
| Beryllium | ND | mg/L | | 0.001 | 0.004 | E200.8 | 09/07/10 12:45 / sml |
| Boron | ND | mg/L | | 0.1 | | E200.7 | 08/27/10 18:55 / cp |
| Cadmium | ND | mg/L | | 0.001 | 0.005 | E200.8 | 09/07/10 12:45 / sml |
| Chromium | ND | mg/L | | 0.05 | 0.1 | E200.8 | 09/07/10 12:45 / sml |
| Copper | ND | mg/L | | 0.01 | 1.3 | E200.8 | 09/07/10 12:45 / sml |
| Iron | 0.12 | mg/L | | 0.03 | 0.3 | E200.7 | 08/27/10 18:55 / cp |
| Lead | 0.003 | mg/L | | 0.001 | 0.015 | E200.8 | 09/07/10 12:45 / sml |
| Manganese | ND | mg/L | | 0.01 | 0.05 | E200.7 | 08/27/10 18:55 / cp |
| Nickel | ND | mg/L | | 0.05 | | E200.8 | 09/07/10 12:45 / sml |
| Selenium | ND | mg/L | | 0.001 | 0.05 | E200.8 | 09/07/10 12:45 / sml |
| Silver | ND | mg/L | | 0.01 | 0.1 | E200.8 | 09/07/10 12:45 / sml |
| Thallium | ND | mg/L | | 0.0004 | 0.002 | E200.8 | 09/07/10 12:45 / sml |
| Uranium | 0.0023 | mg/L | | 0.0003 | 0.03 | E200.8 | 09/07/10 12:45 / sml |
| Zinc | 0.01 | mg/L | | 0.01 | 5 | E200.8 | 09/07/10 12:45 / sml |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | -1 | pCi/L | U | | 15 | E900.0 | 08/30/10 19:19 / ep |
| Gross Alpha precision (±) | 1.2 | pCi/L | | | | E900.0 | 08/30/10 19:19 / ep |
| Gross Alpha MDC | 1.3 | pCi/L | | | | E900.0 | 08/30/10 19:19 / ep |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.



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Gillette, WY 866-686-7175 • Rapid City, SD 888-872-1225 • College Station, TX 888-690-2218

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: WWDC
Lab ID: C10080825-001
Client Sample ID: Belvoir Ranch

Revised Date: 07/12/11
Report Date: 09/17/10
Collection Date: 08/23/10 16:40
Date Received: 08/24/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--------|-------|-----------|----|-------------|-------------|----------------------|
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Beta | 0.9 | pCi/L | U | | 50 | E900.0 | 08/30/10 19:19 / ep |
| Gross Beta precision (±) | 1.5 | pCi/L | | | | E900.0 | 08/30/10 19:19 / ep |
| Gross Beta MDC | 1.5 | pCi/L | | | | E900.0 | 08/30/10 19:19 / ep |
| Radium 226 | 0.2 | pCi/L | | | | E903.0 | 09/14/10 18:13 / trs |
| Radium 226 precision (±) | 0.1 | pCi/L | | | | E903.0 | 09/14/10 18:13 / trs |
| Radium 226 MDC | 0.08 | pCi/L | | | | E903.0 | 09/14/10 18:13 / trs |
| Radium 228 | -0.07 | pCi/L | U | | | RA-05 | 09/09/10 17:52 / plj |
| Radium 228 precision (±) | 0.9 | pCi/L | | | | RA-05 | 09/09/10 17:52 / plj |
| Radium 228 MDC | 0.9 | pCi/L | | | | RA-05 | 09/09/10 17:52 / plj |
| Radium 226 + Radium 228 | 0.1 | pCi/L | U | | 5 | A7500-RA | 09/15/10 11:56 / res |
| Radium 226 + Radium 228 precision (±) | 0.4 | pCi/L | | | | A7500-RA | 09/15/10 11:56 / res |
| Radium 226 + Radium 228 MDC | 0.9 | pCi/L | | | | A7500-RA | 09/15/10 11:56 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -4.13 | % | | | | Calculation | 07/12/11 11:16 / sec |
| Anions | 3.43 | meq/L | | | | Calculation | 07/12/11 11:16 / sec |
| Cations | 3.15 | meq/L | | | | Calculation | 07/12/11 11:16 / sec |
| Solids, Total Dissolved Calculated | 181 | mg/L | | | | Calculation | 07/12/11 11:16 / sec |
| TDS Balance (0.80 - 1.20) | 0.880 | | | | | Calculation | 07/12/11 11:16 / sec |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R136592 |
| Sample ID: MBLK | 3 | Method Blank | | | | | Run: MANTECH_100827A | | | 08/27/10 13:14 |
| Alkalinity, Total as CaCO ₃ | | ND | mg/L | 1 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1 | | | | | | |
| Bicarbonate as HCO ₃ | | ND | mg/L | 1 | | | | | | |
| Sample ID: LCS1 | | Laboratory Control Sample | | | | | Run: MANTECH_100827A | | | 08/27/10 13:30 |
| Alkalinity, Total as CaCO ₃ | | 213 | mg/L | 5.0 | 106 | 90 | 110 | | | |
| Sample ID: C10080829-002ADUP | 3 | Sample Duplicate | | | | | Run: MANTECH_100827A | | | 08/27/10 16:09 |
| Alkalinity, Total as CaCO ₃ | | 214 | mg/L | 5.0 | | | | 0.3 | 10 | |
| Carbonate as CO ₃ | | ND | mg/L | 5.0 | | | | | 10 | |
| Bicarbonate as HCO ₃ | | 262 | mg/L | 5.0 | | | | 0.3 | 10 | |
| Sample ID: C10080829-002AMS | | Sample Matrix Spike | | | | | Run: MANTECH_100827A | | | 08/27/10 16:17 |
| Alkalinity, Total as CaCO ₃ | | 347 | mg/L | 5.0 | 106 | 80 | 120 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|---|--------|----------|-----|------|--------------------------|-------------------------------------|-----|----------------|----------------|
| Method: A2510 B | | | | | | | Analytical Run: ORION555A-2_100824A | | | |
| Sample ID: ICV2_100824_1 | Initial Calibration Verification Standard | | | | | | | | | 08/24/10 13:53 |
| Conductivity @ 25 C | | 1380 | umhos/cm | 1.0 | 98 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | Batch: 100824_1_PH-W_555A-2 | | | |
| Sample ID: MBLK1_100824_1 | Method Blank | | | | | Run: ORION555A-2_100824A | | | 08/24/10 13:48 | |
| Conductivity @ 25 C | | 0.8 | umhos/cm | 0.2 | | | | | | |
| Sample ID: C10080823-001ADUP | Sample Duplicate | | | | | Run: ORION555A-2_100824A | | | 08/24/10 14:23 | |
| Conductivity @ 25 C | | 409 | umhos/cm | 1.0 | | | | 0.5 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|----|------|--------------------|------------|----------------------------|----------------|------|
| Method: A2540 C | | | | | | | | Batch: 100825_1_SLDS-TDS-W | | |
| Sample ID: MBLK1_100825 | Method Blank | | | | | Run: BAL-1_100827A | | | 08/25/10 11:21 | |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 10 | | | | | | |
| Sample ID: LCS1_100825 | Laboratory Control Sample | | | | | Run: BAL-1_100827A | | | 08/25/10 11:22 | |
| Solids, Total Dissolved TDS @ 180 C | | 999 | mg/L | 10 | 100 | 90 | 110 | | | |
| Sample ID: C10080823-005AMS | Sample Matrix Spike | | | | | Run: BAL-1_100827A | | | 08/25/10 11:30 | |
| Solids, Total Dissolved TDS @ 180 C | | 2240 | mg/L | 10 | 100 | 90 | 110 | | | |
| Sample ID: C10080823-005AMSD | Sample Matrix Spike Duplicate | | | | | Run: BAL-1_100827A | | | 08/25/10 11:31 | |
| Solids, Total Dissolved TDS @ 180 C | | 2230 | mg/L | 10 | 101 | 90 | 110 | 0.5 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|-------|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A4500-H B | | | | | | | | Analytical Run: ORION555A-2_100824A | | |
| Sample ID: ICV1_100824_1 | | Initial Calibration Verification Standard | | | | | | | | 08/24/10 13:50 |
| pH | | 6.85 | s.u. | 0.010 | 100 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | | Batch: 100824_1_PH-W_555A-2 | | |
| Sample ID: C10080823-001ADUP | | Sample Duplicate | | | | | | | | |
| | | Run: ORION555A-2_100824A | | | | | | | | 08/24/10 14:23 |
| pH | | 7.99 | s.u. | 0.010 | | | | 0.2 | 10 | |

Qualifiers:

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MDC - Minimum detectable concentration



QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|--------|------|-----------|---------------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R136584 |
| Sample ID: MB-100827A | 3 | Method Blank | | | | | Run: ICP2-C_100827A | | | 08/27/10 14:47 |
| Boron | | ND | mg/L | 0.009 | | | | | | |
| Iron | | ND | mg/L | 0.002 | | | | | | |
| Manganese | | ND | mg/L | 0.0004 | | | | | | |
| Sample ID: LFB-100827A | 3 | Laboratory Fortified Blank | | | | | Run: ICP2-C_100827A | | | 08/27/10 14:51 |
| Boron | | 0.938 | mg/L | 0.10 | 94 | 85 | 115 | | | |
| Iron | | 0.958 | mg/L | 0.030 | 96 | 85 | 115 | | | |
| Manganese | | 0.930 | mg/L | 0.010 | 93 | 85 | 115 | | | |
| Sample ID: C10080825-001BMS2 | 3 | Sample Matrix Spike | | | | | Run: ICP2-C_100827A | | | 08/27/10 18:59 |
| Boron | | 2.1 | mg/L | 0.10 | 102 | 70 | 130 | | | |
| Iron | | 2.2 | mg/L | 0.030 | 100 | 70 | 130 | | | |
| Manganese | | 2.0 | mg/L | 0.010 | 97 | 70 | 130 | | | |
| Sample ID: C10080825-001BMSD | 3 | Sample Matrix Spike Duplicate | | | | | Run: ICP2-C_100827A | | | 08/27/10 19:04 |
| Boron | | 2.0 | mg/L | 0.10 | 98 | 70 | 130 | 3.6 | 20 | |
| Iron | | 2.1 | mg/L | 0.030 | 95 | 70 | 130 | 4.9 | 20 | |
| Manganese | | 1.9 | mg/L | 0.010 | 94 | 70 | 130 | 2.7 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|---------|-----------------------|-----------|------------|-----|----------------|----------------|
| Method: E200.8 | | | | | | | | | | Batch: R136941 |
| Sample ID: LRB | 15 Method Blank | | | | Run: ICPMS2-C_100907A | | | | 09/07/10 11:58 | |
| Aluminum | | ND | mg/L | 0.0001 | | | | | | |
| Antimony | | 0.0001 | mg/L | 7E-05 | | | | | | |
| Arsenic | | ND | mg/L | 6E-05 | | | | | | |
| Barium | | ND | mg/L | 3E-05 | | | | | | |
| Beryllium | | ND | mg/L | 3E-05 | | | | | | |
| Cadmium | | 3E-05 | mg/L | 1E-05 | | | | | | |
| Chromium | | ND | mg/L | 4E-05 | | | | | | |
| Copper | | ND | mg/L | 7E-05 | | | | | | |
| Lead | | ND | mg/L | 3E-05 | | | | | | |
| Nickel | | ND | mg/L | 0.0007 | | | | | | |
| Selenium | | ND | mg/L | 0.0002 | | | | | | |
| Silver | | 5E-05 | mg/L | 3E-05 | | | | | | |
| Thallium | | ND | mg/L | 1E-05 | | | | | | |
| Uranium | | ND | mg/L | 1E-05 | | | | | | |
| Zinc | | 0.001 | mg/L | 0.0003 | | | | | | |
| Sample ID: LFB | 15 Laboratory Fortified Blank | | | | Run: ICPMS2-C_100907A | | | | 09/07/10 12:05 | |
| Aluminum | | 0.0483 | mg/L | 0.0010 | 97 | 85 | 115 | | | |
| Antimony | | 0.0527 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Arsenic | | 0.0530 | mg/L | 0.0010 | 106 | 85 | 115 | | | |
| Barium | | 0.0528 | mg/L | 0.0010 | 106 | 85 | 115 | | | |
| Beryllium | | 0.0522 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Cadmium | | 0.0519 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Chromium | | 0.0512 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Copper | | 0.0504 | mg/L | 0.0010 | 101 | 85 | 115 | | | |
| Lead | | 0.0524 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Nickel | | 0.0511 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Selenium | | 0.0524 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Silver | | 0.0177 | mg/L | 0.0010 | 88 | 85 | 115 | | | |
| Thallium | | 0.0522 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Uranium | | 0.0536 | mg/L | 0.00030 | 107 | 85 | 115 | | | |
| Zinc | | 0.0527 | mg/L | 0.0010 | 103 | 85 | 115 | | | |
| Sample ID: C10081002-001CMS4 | 15 Sample Matrix Spike | | | | Run: ICPMS2-C_100907A | | | | 09/07/10 13:39 | |
| Aluminum | | 0.051 | mg/L | 0.0061 | 102 | 70 | 130 | | | |
| Antimony | | 0.053 | mg/L | 0.0010 | 107 | 70 | 130 | | | |
| Arsenic | | 0.054 | mg/L | 0.0010 | 103 | 70 | 130 | | | |
| Barium | | 0.12 | mg/L | 0.10 | 101 | 70 | 130 | | | |
| Beryllium | | 0.050 | mg/L | 0.0010 | 100 | 70 | 130 | | | |
| Cadmium | | 0.050 | mg/L | 0.0010 | 100 | 70 | 130 | | | |
| Chromium | | 0.050 | mg/L | 0.0010 | 96 | 70 | 130 | | | |
| Copper | | 0.050 | mg/L | 0.010 | 96 | 70 | 130 | | | |
| Lead | | 0.051 | mg/L | 0.0010 | 101 | 70 | 130 | | | |
| Nickel | | 0.051 | mg/L | 0.050 | 102 | 70 | 130 | | | |
| Selenium | | 0.053 | mg/L | 0.0010 | 106 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|---------|------|-----------------------|------------|-----|----------|----------------|
| Method: E200.8 | | | | | | | | | | Batch: R136941 |
| Sample ID: C10081002-001CMS4 | 15 | Sample Matrix Spike | | | | Run: ICPMS2-C_100907A | | | | 09/07/10 13:39 |
| Silver | | 0.019 | mg/L | 0.010 | 95 | 70 | 130 | | | |
| Thallium | | 0.051 | mg/L | 0.00040 | 101 | 70 | 130 | | | |
| Uranium | | 0.054 | mg/L | 0.00030 | 104 | 70 | 130 | | | |
| Zinc | | 0.065 | mg/L | 0.010 | 125 | 70 | 130 | | | |
| Sample ID: C10081002-001CMSD | 15 | Sample Matrix Spike Duplicate | | | | Run: ICPMS2-C_100907A | | | | 09/07/10 13:46 |
| Aluminum | | 0.052 | mg/L | 0.0061 | 104 | 70 | 130 | 1.8 | 20 | |
| Antimony | | 0.057 | mg/L | 0.0010 | 115 | 70 | 130 | 7.6 | 20 | |
| Arsenic | | 0.057 | mg/L | 0.0010 | 109 | 70 | 130 | 5.2 | 20 | |
| Barium | | 0.12 | mg/L | 0.10 | 110 | 70 | 130 | 3.5 | 20 | |
| Beryllium | | 0.054 | mg/L | 0.0010 | 107 | 70 | 130 | 6.9 | 20 | |
| Cadmium | | 0.053 | mg/L | 0.0010 | 106 | 70 | 130 | 6.5 | 20 | |
| Chromium | | 0.053 | mg/L | 0.0010 | 104 | 70 | 130 | 7.5 | 20 | |
| Copper | | 0.052 | mg/L | 0.010 | 101 | 70 | 130 | 4.9 | 20 | |
| Lead | | 0.054 | mg/L | 0.0010 | 107 | 70 | 130 | 6 | 20 | |
| Nickel | | 0.051 | mg/L | 0.050 | 102 | 70 | 130 | 0.4 | 20 | |
| Selenium | | 0.054 | mg/L | 0.0010 | 108 | 70 | 130 | 2.3 | 20 | |
| Silver | | 0.020 | mg/L | 0.010 | 100 | 70 | 130 | 5.1 | 20 | |
| Thallium | | 0.054 | mg/L | 0.00040 | 107 | 70 | 130 | 5.9 | 20 | |
| Uranium | | 0.058 | mg/L | 0.00030 | 111 | 70 | 130 | 6.2 | 20 | |
| Zinc | | 0.054 | mg/L | 0.010 | 104 | 70 | 130 | 17 | 20 | |

Qualifiers:

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QA/QC Summary Report

Client: Lidstone and Associates
Project: WWDC

Report Date: 09/17/10
Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|--------------------|------------|-----|----------|----------------|
| Method: E300.0 | | | | | | | | | | Batch: R136840 |
| Sample ID: LCS | 2 | Laboratory Control Sample | | | | Run: IC2-C_100901A | | | | 09/01/10 12:20 |
| Chloride | | 9.56 | mg/L | 1.0 | 96 | 90 | 110 | | | |
| Sulfate | | 38.6 | mg/L | 1.0 | 96 | 90 | 110 | | | |
| Sample ID: MBLK | 2 | Method Blank | | | | Run: IC2-C_100901A | | | | 09/01/10 12:34 |
| Chloride | | ND | mg/L | 0.2 | | | | | | |
| Sulfate | | ND | mg/L | 0.04 | | | | | | |
| Sample ID: C10080829-004AMS | 2 | Sample Matrix Spike | | | | Run: IC2-C_100901A | | | | 09/01/10 17:37 |
| Chloride | | 48.0 | mg/L | 1.0 | 106 | 80 | 120 | | | |
| Sulfate | | 252 | mg/L | 1.6 | 105 | 80 | 120 | | | |
| Sample ID: C10080829-004AMSD | 2 | Sample Matrix Spike Duplicate | | | | Run: IC2-C_100901A | | | | 09/01/10 17:52 |
| Chloride | | 48.3 | mg/L | 1.0 | 107 | 80 | 120 | 0.6 | 20 | |
| Sulfate | | 252 | mg/L | 1.6 | 104 | 80 | 120 | 0.2 | 20 | |

Qualifiers:

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QA/QC Summary Report

Client: Lidstone and Associates

Project: WWDC

Report Date: 09/17/10

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|--------------------|------------|-----|----------|------------------|
| Method: E900.0 | | | | | | | | | | Batch: GrAB-0954 |
| Sample ID: MB-GrAB-0954 | 6 | Method Blank | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Alpha | | -2 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.7 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 0.9 | pCi/L | | | | | | | |
| Gross Beta | | -2 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 1 | pCi/L | | | | | | | |
| Gross Beta MDC | | 1 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-0954 | | Laboratory Control Sample | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Alpha | | 100 | pCi/L | 101 | | 70 | 130 | | | |
| Sample ID: Cs137-GrAB-0954 | | Laboratory Control Sample | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Beta | | 85 | pCi/L | 98 | | 70 | 130 | | | |
| Sample ID: C10080778-002AMS | | Sample Matrix Spike | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Alpha | | 87 | pCi/L | 88 | | 70 | 130 | | | |
| Sample ID: C10080778-002AMSD | | Sample Matrix Spike Duplicate | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Alpha | | 85 | pCi/L | 86 | | 70 | 130 | 2 | 18.7 | |
| Sample ID: C10080778-002AMS | | Sample Matrix Spike | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Beta | | 85 | pCi/L | 96 | | 70 | 130 | | | |
| Sample ID: C10080778-002AMSD | | Sample Matrix Spike Duplicate | | | | Run: G542M_100828A | | | | 08/30/10 04:24 |
| Gross Beta | | 84 | pCi/L | 95 | | 70 | 130 | 1.2 | 16.1 | |
| Sample ID: C10080831-001ADUP | 6 | Sample Duplicate | | | | Run: G542M_100828A | | | | 08/30/10 19:19 |
| Gross Alpha | | -4.8 | pCi/L | | | | | 24 | 89.7 | U |
| Gross Alpha precision (±) | | 2.2 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 2.7 | pCi/L | | | | | | | |
| Gross Beta | | 2.9 | pCi/L | | | | | 31 | 149.1 | |
| Gross Beta precision (±) | | 1.8 | pCi/L | | | | | | | |
| Gross Beta MDC | | 1.7 | pCi/L | | | | | | | |

Qualifiers:

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MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/17/10

Project: WWDC

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual | |
|------------------------------|-------------------------------|--------------|-------|-----|------|-------------------------|-------------------------|-------------------|----------------|----------------|--|
| Method: E903.0 | | | | | | | | Batch: RA226-4769 | | | |
| Sample ID: C10080824-001FMS | Sample Matrix Spike | | | | | Run: TENNELEC-3_100903B | | | 09/14/10 18:13 | | |
| Radium 226 | 16 | pCi/L | | 101 | | 70 | 130 | | | | |
| Sample ID: C10080824-001FMSD | Sample Matrix Spike Duplicate | | | | | Run: TENNELEC-3_100903B | | | 09/14/10 18:13 | | |
| Radium 226 | 14 | pCi/L | | 88 | | 70 | 130 | 14 | 21.9 | | |
| Sample ID: MB-RA226-4769 | 3 | Method Blank | | | | | Run: TENNELEC-3_100903B | | | 09/14/10 18:13 | |
| Radium 226 | | 0.08 | pCi/L | | | | | | | U | |
| Radium 226 precision (±) | | 0.08 | pCi/L | | | | | | | | |
| Radium 226 MDC | | 0.1 | pCi/L | | | | | | | | |
| Sample ID: LCS-RA226-4769 | Laboratory Control Sample | | | | | Run: TENNELEC-3_100903B | | | 09/14/10 18:13 | | |
| Radium 226 | | 0.059 | pCi/L | | | 70 | 130 | | | US | |

- LCS response is outside of the acceptance range due to the analyst apparently forgetting to add the spike. Since the MB, MS, and MSD are acceptable the batch is approved.

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

U - Not detected at minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Project: WWDC

Report Date: 09/17/10

Work Order: C10080825

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------|-------------------------------|--------------|-------|------|-------------------------|------------|-------------------|----------------|------|
| Method: RA-05 | | | | | | | | Batch: RA228-3357 | | |
| Sample ID: LCS-228-RA226-4769 | | Laboratory Control Sample | | | | Run: TENNELEC-3_100903A | | | 09/09/10 17:52 | |
| Radium 228 | | 6.8 | pCi/L | | 96 | 70 | 130 | | | |
| Sample ID: MB-RA226-4769 | | 3 | Method Blank | | | Run: TENNELEC-3_100903A | | | 09/09/10 17:52 | |
| Radium 228 | | -0.3 | pCi/L | | | | | | | U |
| Radium 228 precision (±) | | | 0.8 | pCi/L | | | | | | |
| Radium 228 MDC | | | 0.9 | pCi/L | | | | | | |
| Sample ID: C10080824-002FMS | | Sample Matrix Spike | | | | Run: TENNELEC-3_100903A | | | 09/09/10 17:52 | |
| Radium 228 | | 16 | pCi/L | | 104 | 70 | 130 | | | |
| Sample ID: C10080824-002FMSD | | Sample Matrix Spike Duplicate | | | | Run: TENNELEC-3_100903A | | | 09/09/10 17:52 | |
| Radium 228 | | 16 | pCi/L | | 104 | 70 | 130 | 0 | 41.2 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C10080825

Login completed by: Halley Ackerman

Date Received: 8/24/2010

Reviewed by: BL2000\tedwards

Received by: em

Reviewed Date: 8/30/2010

Carrier name: FedEx

| | | | |
|---|---|-----------------------------|--|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 3°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input checked="" type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

None



Chain of Custody and Analytical Request Record

Page 1 of 2

PLEASE PRINT (Provide as much information as possible.)

| | | | |
|--|--|-------------------------------------|---|
| Company Name: Lidstone And Associates | Project Name, PWS, Permit, Etc. WWDC | Sample Origin State: WV | EPA/State Compliance: Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> |
| Report Mail Address: 4025 Automation Way, Bldg E Fort Collins, Co 80525-3448 | Contact Name: Melissa Culver | Phone/Fax: (970) 223-4705 | Email: mes@lidstone.com |
| Invoice Address: Same as above | Invoice Contact & Phone: Same as above | Purchase Order: | Sampler: (Please Print) KALPESH B. PATEL |
| Special Report/Formats: | | | Quote/Bottle Order: 2698 |

- ☒ DW
☐ POTW/WWTP
☐ State: _____
☐ Other: _____
- ☐ EDD/EDT (Electronic Data)
Format: _____
☐ LEVEL IV
☐ NELAC

Number of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids
Vegetation Bioassay Other
DW - Drinking Water

ANALYSIS REQUESTED

| | | | | | | | | |
|------------|--------------|----------------|----|-------------------------|----|------------------|----------------------|--------------------|
| ALKALINITY | CONDUCTIVITY | EC-00-0 Anions | PH | Solids, Total Dissolved | DW | Metals by ICP/MS | Bacteria, Iron, Lead | Bacteria, SD, etc. |
| | | | | | | | | |

SEE ATTACHED

Standard Turnaround (TAT)

RUSH

Contact ELI prior to
RUSH sample submittal
for charges and
scheduling - See
Instruction Page

Comments:

Shipped by:

Rider

Cooler ID(s):

C-6637

Receipt Temp

3 °COn Ice: ☒ N

Custody Seal

On Bottle ☒ NOn Cooler ☒ NIntact ☒ NSignature Match ☒ N

LABORATORY USE ONLY

08/23/08

Page 17 of 18
**Custody
Record
MUST be
Signed**

Relinquished by (print): **KALPESH B PATEL** Date/Time: **Aug 23/5:05PM** Signature: **K.B. Patel**

Relinquished by (print): _____ Date/Time: _____ Signature: _____

Received by (print): _____ Date/Time: _____ Signature: _____

Received by (print): _____ Date/Time: _____ Signature: _____

Sample Disposal: Return to Client: _____ Lab Disposal: ☒

Received by (print): **MTM** Date/Time: **8-24-10 080** Signature: _____

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.



Chain of Custody and Analytical Request Record

Page 2 of 2

Company Name:

Lidstone And Associates

PLEASE PRINT (Provide as much information as possible.)

Project Name, PWS, Permit, Etc.

WWDC

Sample Origin

State: WY

EPA/State Compliance:

Yes ☒ No ☒

Report Mail Address:

4025 Automation Way Bldg E
Fore Collins, CO 80525-3408

Contact Name:

Phone/Fax:

melinda Currier
mark O'Steen

Email:

mes@lidstone.com

Sampler: (Please Print)

KALPESH B. PATEL

Invoice Address:

Same as above

Invoice Contact & Phone:

Same as above

Purchase Order:

Quote/Bottle Order:

2698

Special Report/Formats:

☒ DW☐ POTW/WWTP☐ State: _____☐ Other: _____☐ EDD/EDT (Electronic Data)

Format: _____

☐ LEVEL IV☐ NELACNumber of Containers
Sample Type: A W S V B O DW
Air Water Soils/Solids
Vegetation Bioassay Other
DW - Drinking Water

ANALYSIS REQUESTED

SEE ATTACHED

Standard Turnaround (TAT)

R
U
S
HContact ELI prior to
RUSH sample submittal
for charges and
scheduling - See
Instruction Page

Comments:

Shipped by:

FedEx

Cooler ID(s):

C-2637

Receipt Temp

3 °C

On Ice: ☒ Y ☐ N

Custody Seal

On Bottle ☒ Y ☐ NOn Cooler ☒ Y ☐ N

Intact

Signature

Match

☒ Y ☐ NSAMPLE IDENTIFICATION
(Name, Location, Interval, etc.)Collection
DateCollection
Time

MATRIX

1 WWDC, Beaver Ranch
Duck Creek 3-1

August 23

4:00 PM

DW

X

X

X

X

2

3

4

5

6

7

8

9

10

LABORATORY USE ONLY

CO080825

Custody
Record
MUST be
Signed

Relinquished by (print):

Date/Time:

Signature:

Relinquished by (print):

Date/Time:

Signature:

Received by (print):

Date/Time:

Signature:

Received by (print):

Date/Time:

Signature:

Received by Laboratory:

Date/Time:

Signature:

Sample Disposal: Return to Client:

Lab Disposal: ☒

L. M. PATEL

8-24-10 930

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.

This serves as notice of this possibility. All sub-contract data will be clearly noted on your analytical report.

Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ANALYTICAL SUMMARY REPORT

September 27, 2010

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C10081002 Quote ID: C2698 - WWDC

Project Name: WWDC-Duck Creek 3-1

Energy Laboratories, Inc. received the following 1 sample for Lidstone and Associates on 8/27/2010 for analysis.

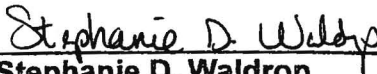
| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|---------------------|----------------|--------------|----------------|--|
| C10081002-001 | WWDC Duck Creek 3-1 | 08/26/10 16:05 | 08/27/10 | Drinking Water | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Drinking Water Acidity, Total as CaCO3 Alkalinity QA Calculations Bacteria, Iron Related Bacteria, Total Coliform Cyanide, SDWA Color Conductivity Corrosivity, Calculated Mercury, Drinking Water Mercury Analysis Prep Sample Filtering Fluoride Foaming Agents E515.1 Chlorinated Herbicides Hardness E300.0 Anions Nitrogen, Nitrite Nitrogen, Nitrate + Nitrite Odor pH Metals Preparation by EPA 200.2 504 sample microextraction E504 Pesticides Pesticides, Carbamates SDWA Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved 525-Semi-Volatile Organic Compounds, SDWA Turbidity E524.2 SDWA VOCs |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:


Stephanie D. Waldrop
Reporting Supervisor



CLIENT: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Sample Delivery Group: C10081002

Report Date: 09/27/10

CASE NARRATIVE

BRANCH LABORATORY SUBCONTRACT ANALYSIS

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
 Project: WWDC-Duck Creek 3-1
 Lab ID: C10081002-001
 Client Sample ID: WWDC Duck Creek 3-1

Report Date: 09/27/10
 Collection Date: 08/26/10 16:05
 Date Received: 08/27/10
 Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|----------|------------|-------|-------------|-------------|------------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related - 4 days incubation | 10000 | CFU/ml | | 1.0 | | IRB-BART | 08/27/10 13:11 / rlo |
| MAJOR IONS | | | | | | | |
| Acidity, Total as CaCO ₃ | ND | mg/L | | 5 | | A2310 B | 09/01/10 11:19 / ja |
| Alkalinity, Total as CaCO ₃ | 163 | mg/L | | 1 | | A2320 B | 08/31/10 16:35 / ja |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 08/31/10 16:35 / ja |
| Bicarbonate as HCO ₃ | 199 | mg/L | | 1 | | A2320 B | 08/31/10 16:35 / ja |
| Calcium | 37 | mg/L | | 0.5 | | E200.7 | 09/01/10 21:03 / rdw |
| Chloride | 2 | mg/L | | 1 | | E300.0 | 09/04/10 03:37 / ljl |
| Fluoride | 0.6 | mg/L | | 0.1 | | A4500-F C | 08/31/10 07:22 / ja |
| Magnesium | 14 | mg/L | | 0.5 | | E200.7 | 09/01/10 21:03 / rdw |
| Nitrogen, Nitrate+Nitrite as N | 0.9 | mg/L | | 0.1 | 10 | E353.2 | 09/06/10 15:16 / ljl |
| Nitrogen, Nitrite as N | ND | mg/L | | 0.1 | 1 | A4500-NO2 B | 08/27/10 16:21 / ja |
| Potassium | 1.5 | mg/L | | 0.5 | | E200.7 | 09/01/10 21:03 / rdw |
| Silica | 15.1 | mg/L | | 0.2 | | E200.7 | 09/10/10 18:01 / cp |
| Sodium | 5.1 | mg/L | D | 0.6 | | E200.7 | 09/01/10 21:03 / rdw |
| Sulfate | 7 | mg/L | | 1 | | E300.0 | 09/04/10 03:37 / ljl |
| NON-METALS | | | | | | | |
| Cyanide, Total | ND | mg/L | | 0.005 | 0.2 | Kelada mod | 09/01/10 14:01 / eli-b |
| PHYSICAL PROPERTIES | | | | | | | |
| Color | ND | c.u. | | 5.0 | | A2120 B | 08/27/10 12:37 / ja |
| Corrosivity | 0.3 | unitless | | | | Calculation | 09/15/10 15:00 / sdw |
| Conductivity @ 25 C | 308 | umhos/cm | | 1 | | A2510 B | 08/27/10 15:38 / dnp |
| Hardness as CaCO ₃ | 149 | mg/L | | 1 | | A2340 B | 09/01/10 21:03 / sdw |
| Odor | NOO | T.O.N. | | 1 | | A2150 B | 08/27/10 12:37 / ja |
| pH | 7.95 | s.u. | | 0.01 | | A4500-H B | 08/27/10 15:38 / dnp |
| Solids, Total Dissolved TDS @ 180 C | 173 | mg/L | | 10 | | A2540 C | 08/31/10 16:10 / lr |
| Surfactants, MBAS | < 1.0 | mg/L | | 1.0 | | A5540 C | 08/27/10 14:40 / ja |
| Turbidity | 0.8 | NTU | | 0.1 | | A2130 B | 08/27/10 14:49 / ja |
| - Color measured at pH 7.33. | | | | | | | |
| - NOO = No odor observed. | | | | | | | |
| METALS - TOTAL | | | | | | | |
| Aluminum | ND | mg/L | | 0.1 | 0.2 | E200.7 | 09/01/10 21:03 / rdw |
| Antimony | ND | mg/L | | 0.001 | 0.006 | E200.8 | 09/07/10 13:33 / sml |
| Arsenic | 0.002 | mg/L | | 0.001 | 0.01 | E200.8 | 09/07/10 13:33 / sml |
| Barium | ND | mg/L | | 0.1 | 2 | E200.7 | 09/01/10 21:03 / rdw |
| Beryllium | ND | mg/L | | 0.001 | 0.004 | E200.8 | 09/07/10 13:33 / sml |
| Boron | ND | mg/L | | 0.1 | | E200.7 | 09/01/10 21:03 / rdw |
| Cadmium | ND | mg/L | | 0.001 | 0.005 | E200.8 | 09/07/10 13:33 / sml |

Report Definitions: RL - Analyte reporting limit.
 QCL - Quality control limit.
 D - RL increased due to sample matrix.

MCL - Maximum contaminant level.
 ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Lab ID: C10081002-001
Client Sample ID: WWDC Duck Creek 3-1

Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Date Received: 08/27/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--|-------|------------|--|-------------|-------------|----------------------|
| METALS - TOTAL | | | | | | | |
| Chromium | ND | mg/L | | 0.05 | 0.1 | E200.8 | 09/07/10 13:33 / sml |
| Copper | ND | mg/L | | 0.01 | 1.3 | E200.8 | 09/07/10 13:33 / sml |
| Iron | ND | mg/L | | 0.03 | 0.3 | E200.7 | 09/01/10 21:03 / rdw |
| Lead | ND | mg/L | | 0.001 | 0.015 | E200.8 | 09/07/10 13:33 / sml |
| Manganese | ND | mg/L | | 0.01 | 0.05 | E200.8 | 09/07/10 13:33 / sml |
| Mercury | ND | mg/L | | 0.0002 | 0.002 | E245.1 | 08/30/10 10:41 / rdw |
| Nickel | ND | mg/L | | 0.05 | | E200.8 | 09/07/10 13:33 / sml |
| Selenium | ND | mg/L | | 0.001 | 0.05 | E200.8 | 09/07/10 13:33 / sml |
| Silver | ND | mg/L | | 0.01 | 0.1 | E200.8 | 09/07/10 13:33 / sml |
| Thallium | ND | mg/L | | 0.0004 | 0.002 | E200.8 | 09/07/10 13:33 / sml |
| Uranium | 0.0021 | mg/L | | 0.0003 | 0.03 | E200.8 | 09/07/10 13:33 / sml |
| Zinc | 0.03 | mg/L | | 0.01 | 5 | E200.7 | 09/01/10 21:03 / rdw |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | -0.8 | pCi/L | U | | 15 | E900.0 | 09/01/10 20:15 / ep |
| Gross Alpha precision (±) | 1.2 | pCi/L | | | | E900.0 | 09/01/10 20:15 / ep |
| Gross Alpha MDC | 1.4 | pCi/L | | | | E900.0 | 09/01/10 20:15 / ep |
| Gross Beta | 0.6 | pCi/L | U | | 50 | E900.0 | 09/01/10 20:15 / ep |
| Gross Beta precision (±) | 1.4 | pCi/L | | | | E900.0 | 09/01/10 20:15 / ep |
| Gross Beta MDC | 1.4 | pCi/L | | | | E900.0 | 09/01/10 20:15 / ep |
| Radium 226 | 0.09 | pCi/L | U | | | E903.0 | 09/15/10 13:59 / trs |
| Radium 226 precision (±) | 0.1 | pCi/L | | | | E903.0 | 09/15/10 13:59 / trs |
| Radium 226 MDC | 0.1 | pCi/L | | | | E903.0 | 09/15/10 13:59 / trs |
| Radium 228 | 0.2 | pCi/L | U | | | RA-05 | 09/09/10 15:35 / plj |
| Radium 228 precision (±) | 0.7 | pCi/L | | | | RA-05 | 09/09/10 15:35 / plj |
| Radium 228 MDC | 0.7 | pCi/L | | | | RA-05 | 09/09/10 15:35 / plj |
| Radium 226 + Radium 228 | 0.3 | pCi/L | U | | 5 | A7500-RA | 09/17/10 14:39 / res |
| Radium 226 + Radium 228 precision (±) | 0.3 | pCi/L | | | | A7500-RA | 09/17/10 14:39 / res |
| Radium 226 + Radium 228 MDC | 0.7 | pCi/L | | | | A7500-RA | 09/17/10 14:39 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -4.56 | % | | | | Calculation | 09/15/10 15:00 / sdw |
| Anions | 3.55 | meq/L | | | | Calculation | 09/15/10 15:00 / sdw |
| Cations | 3.24 | meq/L | | | | Calculation | 09/15/10 15:00 / sdw |
| Solids, Total Dissolved Calculated | 188 | mg/L | | | | Calculation | 09/15/10 15:00 / sdw |
| TDS Balance (0.80 - 1.20) | 0.920 | | | | | Calculation | 09/15/10 15:00 / sdw |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,1,1-Trichloroethane | ND | ug/L | | 0.50 | 200 | E524.2 | 09/02/10 03:05 / jlr |
| 1,1,2,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,1,2-Trichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| 1,1-Dichloroethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Report | RL - Analyte reporting limit. | | | MCL - Maximum contaminant level. | | | |
| Definitions: | QCL - Quality control limit. | | | ND - Not detected at the reporting limit. | | | |
| | MDC - Minimum detectable concentration | | | U - Not detected at minimum detectable concentration | | | |

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Lab ID: C10081002-001
Client Sample ID: WWDC Duck Creek 3-1

Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Date Received: 08/27/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|------------|------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1-Dichloroethene | ND | ug/L | | 0.50 | 7 | E524.2 | 09/02/10 03:05 / jlr |
| 1,1-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2,3-Trichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2,4-Trichlorobenzene | ND | ug/L | | 0.50 | 70 | E524.2 | 09/02/10 03:05 / jlr |
| 1,2,4-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,2-Dichlorobenzene | ND | ug/L | | 0.50 | 600 | E524.2 | 09/02/10 03:05 / jlr |
| 1,2-Dichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| 1,2-Dichloropropane | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| 1,3,5-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,3-Dichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,3-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 1,4-Dichlorobenzene | ND | ug/L | | 0.50 | 75 | E524.2 | 09/02/10 03:05 / jlr |
| 2,2-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 2-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| 4-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Benzene | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| Bromobenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Bromochloromethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Bromodichloromethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Bromoform | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Bromomethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Carbon tetrachloride | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| Chlorobenzene | ND | ug/L | | 0.50 | 100 | E524.2 | 09/02/10 03:05 / jlr |
| Chlorodibromomethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Chloroethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Chloroform | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Chloromethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| cis-1,2-Dichloroethene | ND | ug/L | | 0.50 | 70 | E524.2 | 09/02/10 03:05 / jlr |
| cis-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Dibromomethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Dichlorodifluoromethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Ethylbenzene | ND | ug/L | | 0.50 | 700 | E524.2 | 09/02/10 03:05 / jlr |
| Hexachlorobutadiene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Isopropylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| m+p-Xylenes | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Methyl tert-butyl ether (MTBE) | ND | ug/L | | 2.0 | | E524.2 | 09/02/10 03:05 / jlr |
| Methylene chloride | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| Naphthalene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| n-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| n-Propylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
 ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Lab ID: C10081002-001
Client Sample ID: WWDC Duck Creek 3-1

Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Date Received: 08/27/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|------------|--------|-------------|--------|------------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| o-Xylene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| p-Isopropyltoluene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| sec-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Styrene | ND | ug/L | | 0.50 | 100 | E524.2 | 09/02/10 03:05 / jlr |
| tert-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Tetrachloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| Toluene | ND | ug/L | | 0.50 | 1000 | E524.2 | 09/02/10 03:05 / jlr |
| trans-1,2-Dichloroethene | ND | ug/L | | 0.50 | 100 | E524.2 | 09/02/10 03:05 / jlr |
| trans-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Trichloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 09/02/10 03:05 / jlr |
| Trichlorofluoromethane | ND | ug/L | | 0.50 | | E524.2 | 09/02/10 03:05 / jlr |
| Vinyl chloride | ND | ug/L | | 0.50 | 2 | E524.2 | 09/02/10 03:05 / jlr |
| Xylenes, Total | ND | ug/L | | 0.50 | 10000 | E524.2 | 09/02/10 03:05 / jlr |
| Trihalomethanes, Total | ND | ug/L | | 0.50 | 80 | E524.2 | 09/02/10 03:05 / jlr |
| Surr: Dibromofluoromethane | 119 | %REC | | 70-130 | | E524.2 | 09/02/10 03:05 / jlr |
| Surr: p-Bromofluorobenzene | 103 | %REC | | 70-130 | | E524.2 | 09/02/10 03:05 / jlr |
| Surr: Toluene-d8 | 94.0 | %REC | | 70-130 | | E524.2 | 09/02/10 03:05 / jlr |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES | | | | | | | |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.020 | 0.2 | E504.1 | 09/08/10 01:27 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.010 | 0.05 | E504.1 | 09/08/10 01:27 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.050 | | E504.1 | 09/08/10 01:27 / jlr |
| Surr: 1,1,1,2-Tetrachloroethane | 97.0 | %REC | | 70-130 | | E504.1 | 09/08/10 01:27 / jlr |
| SYNTHETIC ORGANIC COMPOUNDS - HERBICIDES | | | | | | | |
| 2,4-D | ND | ug/L | | 1.0 | 70 | E515.1 | 09/04/10 10:15 / eli-b |
| 2,4-DB | ND | ug/L | | 2.5 | | E515.1 | 09/04/10 09:45 / eli-b |
| Dalapon | ND | ug/L | | 2.5 | 200 | E515.1 | 09/04/10 10:15 / eli-b |
| Dicamba | ND | ug/L | | 0.25 | | E515.1 | 09/04/10 10:15 / eli-b |
| Dichlorprop | ND | ug/L | | 1.0 | | E515.1 | 09/04/10 10:15 / eli-b |
| Dinoseb | ND | ug/L | | 1.0 | 7 | E515.1 | 09/04/10 10:15 / eli-b |
| Pentachlorophenol | ND | ug/L | | 0.040 | 1 | E515.1 | 09/04/10 10:15 / eli-b |
| Picloram | ND | ug/L | | 0.50 | 500 | E515.1 | 09/04/10 10:15 / eli-b |
| 2,4,5-TP (Silvex) | ND | ug/L | | 0.20 | 50 | E515.1 | 09/04/10 10:15 / eli-b |
| Surr: DCAA | 85.0 | %REC | | 70-130 | | E515.1 | 09/04/10 10:15 / eli-b |
| SEMI-VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Alachlor | ND | ug/L | | 0.10 | 2 | E525.2 | 09/08/10 04:33 / eli-b |
| Aldrin | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1016 | ND | ug/L | | 0.080 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1221 | ND | ug/L | | 2.0 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1232 | ND | ug/L | | 0.50 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1242 | ND | ug/L | | 0.30 | | E525.2 | 09/08/10 04:33 / eli-b |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
 ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Lab ID: C10081002-001
Client Sample ID: WWDC Duck Creek 3-1

Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Date Received: 08/27/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|------------|--------|-------------|--------|------------------------|
| SEMI-VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Aroclor 1248 | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1254 | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Aroclor 1260 | ND | ug/L | | 0.20 | | E525.2 | 09/08/10 04:33 / eli-b |
| Atrazine | ND | ug/L | | 0.10 | 3 | E525.2 | 09/08/10 04:33 / eli-b |
| Benzo(a)pyrene | ND | ug/L | | 0.10 | 0.2 | E525.2 | 09/08/10 04:33 / eli-b |
| bis(2-ethylhexyl)Adipate | ND | ug/L | | 0.50 | 400 | E525.2 | 09/08/10 04:33 / eli-b |
| bis(2-ethylhexyl)Phthalate | ND | ug/L | | 2.0 | 6 | E525.2 | 09/08/10 04:33 / eli-b |
| Butachlor | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Chlordane | ND | ug/L | | 1.0 | 2 | E525.2 | 09/08/10 04:33 / eli-b |
| Dieldrin | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Endrin | ND | ug/L | | 0.10 | 2 | E525.2 | 09/08/10 04:33 / eli-b |
| gamma-BHC (Lindane) | ND | ug/L | | 0.10 | 0.2 | E525.2 | 09/08/10 04:33 / eli-b |
| Heptachlor | ND | ug/L | | 0.10 | 0.4 | E525.2 | 09/08/10 04:33 / eli-b |
| Heptachlor epoxide | ND | ug/L | | 0.10 | 0.2 | E525.2 | 09/08/10 04:33 / eli-b |
| Hexachlorobenzene | ND | ug/L | | 0.10 | 1 | E525.2 | 09/08/10 04:33 / eli-b |
| Hexachlorocyclopentadiene | ND | ug/L | | 0.10 | 50 | E525.2 | 09/08/10 04:33 / eli-b |
| Methoxychlor | ND | ug/L | | 0.10 | 40 | E525.2 | 09/08/10 04:33 / eli-b |
| Metolachlor | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Metribuzin | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Opachlor | ND | ug/L | | 0.10 | | E525.2 | 09/08/10 04:33 / eli-b |
| Proflumizone | ND | ug/L | | 0.10 | 4 | E525.2 | 09/08/10 04:33 / eli-b |
| Toxaphene | ND | ug/L | | 2.0 | 3 | E525.2 | 09/08/10 04:33 / eli-b |
| Surr: 1,3-Dimethyl-2-nitrobenzene | 108 | %REC | | 70-130 | | E525.2 | 09/08/10 04:33 / eli-b |
| Surr: Perylene-d12 | 98.0 | %REC | | 70-130 | | E525.2 | 09/08/10 04:33 / eli-b |
| Surr: Pyrene-d10 | 109 | %REC | | 70-130 | | E525.2 | 09/08/10 04:33 / eli-b |
| Surr: Triphenylphosphate | 107 | %REC | | 70-130 | | E525.2 | 09/08/10 04:33 / eli-b |
| - Note: The federal MCL for total PCB's is 0.5 ug/L as Decachlorobiphenyl (DCB). PCB screening at the reporting limits given for the individual Aroclors meets or exceeds federal and state requirements for "Total PCB" monitoring if Aroclors are not detected. | | | | | | | |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES, CARBAMATES | | | | | | | |
| Aldicarb | ND | ug/L | | 0.50 | 3 | E531.1 | 09/02/10 23:55 / swc |
| Aldicarb sulfone | ND | ug/L | | 0.50 | 2 | E531.1 | 09/02/10 23:55 / swc |
| Aldicarb sulfoxide | ND | ug/L | | 0.50 | 4 | E531.1 | 09/02/10 23:55 / swc |
| Carbaryl | ND | ug/L | | 0.50 | | E531.1 | 09/02/10 23:55 / swc |
| Carbofuran | ND | ug/L | | 0.50 | 40 | E531.1 | 09/02/10 23:55 / swc |
| 3-Hydroxycarbofuran | ND | ug/L | | 0.50 | | E531.1 | 09/02/10 23:55 / swc |
| Methiocarb | ND | ug/L | | 0.50 | | E531.1 | 09/02/10 23:55 / swc |
| Methomyl | ND | ug/L | | 0.50 | | E531.1 | 09/02/10 23:55 / swc |
| Oxamyl | ND | ug/L | | 0.50 | 200 | E531.1 | 09/02/10 23:55 / swc |
| Baygon | ND | ug/L | | 0.50 | | E531.1 | 09/02/10 23:55 / swc |
| Surr: BDMC | 98.0 | %REC | | 70-130 | | E531.1 | 09/02/10 23:55 / swc |

Report Definitions: RL - Analyte reporting limit.
 QCL - Quality control limit.

MCL - Maximum contaminant level.
 ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Client Sample ID: WWDC Duck Creek 3-1
Sampled By: Kalpesh B. Patel
Lab ID: C10081002-001N

Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Received Date: 08/27/10 09:00
Matrix: Drinking Water

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|--------------------------|--------|-------|-------------|-----------|---------|----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Absent | | SAFE | | A9221 D | 08/27/10 13:11 / rlo |
| Bacteria, Fecal Coliform | Absent | | | | A9221 D | 08/27/10 13:11 / rlo |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2120 B | | | | | | | | | | Batch: R136562 |
| Sample ID: MB-R136562 | | Method Blank | | | | | Run: ANALYST_100827C | | | 08/27/10 12:37 |
| Color | | ND | c.u. | 5.0 | | | | | | |
| - Color measured at pH 6.43. | | | | | | | | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | | Run: ANALYST_100827C | | | 08/27/10 12:37 |
| Color | | ND | c.u. | 5.0 | | | | | | 10 |
| - Color measured at pH 7.43. | | | | | | | | | | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

JC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|--|-------|------|------|---------------------|------------|-----|----------|--------------------------------|
| Method: A2130 B | | | | | | | | | | Analytical Run: TURB-1_100827A |
| Sample ID: ICV-1_100827 | | Initial Calibration Verification Standard | | | | | | | | 08/27/10 14:44 |
| Turbidity | | 1.07 | NTU | 0.10 | 107 | 90 | 110 | | | |
| Sample ID: CCV-1_100827 | | Continuing Calibration Verification Standard | | | | | | | | 08/27/10 14:44 |
| Turbidity | | 10.1 | NTU | 0.10 | 101 | 90 | 110 | | | |
| Method: A2130 B | | | | | | | | | | Batch: 100827_1_TURB-W |
| Sample ID: MBLK-1_100827 | | Method Blank | | | | Run: TURB-1_100827A | | | | 08/27/10 14:45 |
| Turbidity | | ND | NTU | 0.10 | | | | | | |
| Sample ID: LCS-1_100827 | | Laboratory Control Sample | | | | Run: TURB-1_100827A | | | | 08/27/10 14:45 |
| Turbidity | | 10.1 | NTU | 0.10 | 101 | 90 | 110 | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | Run: TURB-1_100827A | | | | 08/27/10 14:50 |
| Turbidity | | 0.756 | NTU | 0.10 | | | | 8.6 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|------------------|--------|-----|------|----------------------|------------|-----|----------------|------|
| Method: A2150 B | | | | | | | | | Batch: R136563 | |
| Sample ID: MB-R136563 | | Method Blank | | | | Run: ANALYST_100827D | | | 08/27/10 12:37 | |
| Odor | | NOO | T.O.N. | 1.0 | | | | | | |
| - NOO = No odor observed. | | | | | | | | | | |
| Sample ID: C10081002-001DDUP | | Sample Duplicate | | | | Run: ANALYST_100827D | | | 08/27/10 12:37 | |
| Odor | | NOO | T.O.N. | 1.0 | | | | | 20 | |
| - NOO = No odor observed. | | | | | | | | | | |

Qualifiers:

- Analyte reporting limit.
- LC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|-----------|------------|-----|----------|------------------------|
| Method: A2310 B | | | | | | | | | | Batch: 100901_1_ACID-W |
| Sample ID: MBLK-1_100901 | | Method Blank | | | | | | | | 09/01/10 10:58 |
| Acidity, Total as CaCO ₃ | | ND | mg/L | 5.0 | | | | | | |
| Sample ID: LCS-1_100901 | | Laboratory Control Sample | | | | | | | | 09/01/10 11:07 |
| Acidity, Total as CaCO ₃ | | 1050 | mg/L | 5.0 | 105 | 80 | 120 | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | | | | | 09/01/10 00:00 |
| Acidity, Total as CaCO ₃ | | ND | mg/L | 5.0 | | | | | | 20 |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R136704 |
| Sample ID: MBLK | 3 | Method Blank | | | | | Run: MANTECH_100831B | | | 08/31/10 13:41 |
| Alkalinity, Total as CaCO ₃ | | ND | mg/L | 1.0 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1.0 | | | | | | |
| Bicarbonate as HCO ₃ | | ND | mg/L | 1.0 | | | | | | |
| Sample ID: LCS1 | | Laboratory Control Sample | | | | | Run: MANTECH_100831B | | | 08/31/10 13:58 |
| Alkalinity, Total as CaCO ₃ | | 213 | mg/L | 5.0 | 106 | 90 | 110 | | | |
| Sample ID: C10081000-007ADUP | | Sample Duplicate | | | | | Run: MANTECH_100831B | | | 08/31/10 16:18 |
| Alkalinity, Total as CaCO ₃ | | 258 | mg/L | 5.0 | | | | 0.2 | 10 | |
| Sample ID: C10081000-007AMS | | Sample Matrix Spike | | | | | Run: MANTECH_100831B | | | 08/31/10 16:27 |
| Alkalinity, Total as CaCO ₃ | | 393 | mg/L | 5.0 | 108 | 80 | 120 | | | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

- Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|----------|-----|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A2510 B | | | | | | | | Analytical Run: ORION555A-2_100827B | | |
| Sample ID: ICV2_100827_2 | | Initial Calibration Verification Standard | | | | | | | | 08/27/10 14:19 |
| Conductivity @ 25 C | | 1380 | umhos/cm | 1.0 | 97 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | | Batch: 100827_2_PH-W_555A-2 | | |
| Sample ID: MBLK1_100827_2 | | Method Blank | | | | | | | | 08/27/10 14:11 |
| Conductivity @ 25 C | | 1.40 | umhos/cm | 1.0 | | | | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | | | | | 08/27/10 15:40 |
| Conductivity @ 25 C | | 303 | umhos/cm | 1.0 | | | | 1.6 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|----|------|--------------------|------------|----------------------------|----------------|------|
| Method: A2540 C | | | | | | | | Batch: 100831_2_SLDS-TDS-W | | |
| Sample ID: MBLK1_100831 | Method Blank | | | | | Run: BAL-1_100831C | | | 08/31/10 16:10 | |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 10 | | | | | | |
| Sample ID: LCS1_100831 | Laboratory Control Sample | | | | | Run: BAL-1_100831C | | | 08/31/10 16:10 | |
| Solids, Total Dissolved TDS @ 180 C | | 1000 | mg/L | 10 | 100 | 90 | 110 | | | |
| Sample ID: C10081049-008AMS | Sample Matrix Spike | | | | | Run: BAL-1_100831C | | | 08/31/10 16:12 | |
| Solids, Total Dissolved TDS @ 180 C | | 3990 | mg/L | 10 | 102 | 90 | 110 | | | |
| Sample ID: C10081049-008AMSD | Sample Matrix Spike Duplicate | | | | | Run: BAL-1_100831C | | | 08/31/10 16:12 | |
| Solids, Total Dissolved TDS @ 180 C | | 3990 | mg/L | 10 | 101 | 90 | 110 | 0.1 | 10 | |

Qualifiers:

- Analyte reporting limit.
- C - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|------|------|-----------|----------------------|-----|----------|----------------|
| Method: A4500-F C | | | | | | | | | | Batch: R136656 |
| Sample ID: MBLK | | Method Blank | | | | | Run: MANTECH_100831A | | | 08/31/10 06:57 |
| Fluoride | | ND | mg/L | 0.10 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_100831A | | | 08/31/10 07:00 |
| Fluoride | | 1.02 | mg/L | 0.10 | 102 | 90 | 110 | | | |
| Sample ID: C10081002-001AMS | | Sample Matrix Spike | | | | | Run: MANTECH_100831A | | | 08/31/10 07:29 |
| Fluoride | | 1.66 | mg/L | 0.10 | 101 | 80 | 120 | | | |
| Sample ID: C10081002-001AMSD | | Sample Matrix Spike Duplicate | | | | | Run: MANTECH_100831A | | | 08/31/10 07:32 |
| Fluoride | | 1.69 | mg/L | 0.10 | 104 | 80 | 120 | 1.8 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|-------|-------------------------------------|------|-----------|------------|-----|----------|----------------|
| Method: A4500-H B | | | | Analytical Run: ORION555A-2_100827B | | | | | | |
| Sample ID: ICV1_100827_2 | | Initial Calibration Verification Standard | | | | | | | | 08/27/10 14:14 |
| pH | | 6.83 | s.u. | 0.010 | 100 | 98 | 102 | | | |
| Method: A4500-H B | | | | Batch: 100827_2_PH-W_555A-2 | | | | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | | | | | 08/27/10 15:40 |
| pH | | 7.95 | s.u. | 0.010 | | | | 0 | 10 | |

Qualifiers:

- Analyte reporting limit.
- LC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------------------------------|-----------------------------|-------|--------------------------|------|-----------|----------------|-----|----------|------|
| Method: A4500-NO2 B | | Batch: A2010-08-27_6_NO2_01 | | | | | | | | |
| Sample ID: MBLK-1 | Method Blank | | | Run: HACH DR3000_100827D | | | 08/27/10 16:20 | | | |
| Nitrogen, Nitrite as N | | ND | mg/L | 0.10 | | | | | | |
| Sample ID: LCS-2 | Laboratory Control Sample | | | Run: HACH DR3000_100827D | | | 08/27/10 16:20 | | | |
| Nitrogen, Nitrite as N | | 1.03 | mg/L | 2.0 | 103 | 90 | 110 | | | |
| Sample ID: C10081002-001AMS | Sample Matrix Spike | | | Run: HACH DR3000_100827D | | | 08/27/10 16:21 | | | |
| Nitrogen, Nitrite as N | | 0.0479 | mg/L | 0.10 | 101 | 90 | 110 | | | |
| Sample ID: C10081002-001AMSD | Sample Matrix Spike Duplicate | | | Run: HACH DR3000_100827D | | | 08/27/10 16:21 | | | |
| Nitrogen, Nitrite as N | | 0.0484 | mg/L | 0.10 | 102 | 90 | 110 | 10 | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---------------------------|-------|-----|------|-----------|--------------------|-----|----------|----------------|
| Method: A5540 C | | | | | | | | | | Batch: R136569 |
| Sample ID: MB-R136569 | | Method Blank | | | | | Run: DS1-C_100827A | | | 08/27/10 14:40 |
| Surfactants, MBAS | | < 1.00 | mg/L | 1.0 | | | | | | |
| Sample ID: LCS-R136569 | | Laboratory Control Sample | | | | | Run: DS1-C_100827A | | | 08/27/10 14:40 |
| Surfactants, MBAS | | 1.00 | mg/L | 1.0 | 100 | 75 | 125 | | | |
| Sample ID: C10081002-001ADUP | | Sample Duplicate | | | | | Run: DS1-C_100827A | | | 08/27/10 14:40 |
| Surfactants, MBAS | | < 1.00 | mg/L | 1.0 | | | | | 20 | |

Qualifiers:

- Analyte reporting limit.
...JC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|---------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R136764 |
| Sample ID: MB-100901A | 9 | Method Blank | | Run: ICP2-C_100901A | | | | 09/01/10 13:09 | | |
| Aluminum | | ND | mg/L | 0.10 | | | | | | |
| Barium | | ND | mg/L | 0.10 | | | | | | |
| Boron | | ND | mg/L | 0.10 | | | | | | |
| Calcium | | ND | mg/L | 0.50 | | | | | | |
| Iron | | ND | mg/L | 0.030 | | | | | | |
| Magnesium | | ND | mg/L | 0.50 | | | | | | |
| Potassium | | ND | mg/L | 0.50 | | | | | | |
| Sodium | | ND | mg/L | 0.60 | | | | | | |
| Zinc | | ND | mg/L | 0.010 | | | | | | |
| Sample ID: LFB-100901A | 9 | Laboratory Fortified Blank | | Run: ICP2-C_100901A | | | | 09/01/10 13:13 | | |
| Aluminum | | 1.01 | mg/L | 0.10 | 99 | 85 | 115 | | | |
| Barium | | 0.987 | mg/L | 0.10 | 97 | 85 | 115 | | | |
| Boron | | 1.00 | mg/L | 0.10 | 98 | 85 | 115 | | | |
| Calcium | | 50.6 | mg/L | 0.50 | 99 | 85 | 115 | | | |
| Iron | | 0.998 | mg/L | 0.030 | 98 | 85 | 115 | | | |
| Magnesium | | 51.5 | mg/L | 0.50 | 101 | 85 | 115 | | | |
| Potassium | | 46.5 | mg/L | 0.50 | 91 | 85 | 115 | | | |
| Sodium | | 48.7 | mg/L | 0.50 | 95 | 85 | 115 | | | |
| Zinc | | 1.02 | mg/L | 0.010 | 100 | 85 | 115 | | | |
| Sample ID: C10081054-001BMS2 | 9 | Sample Matrix Spike | | Run: ICP2-C_100901A | | | | 09/01/10 19:21 | | |
| Aluminum | | 1.99 | mg/L | 0.10 | 98 | 70 | 130 | | | |
| Barium | | 1.93 | mg/L | 0.10 | 94 | 70 | 130 | | | |
| Boron | | 2.14 | mg/L | 0.10 | 97 | 70 | 130 | | | |
| Calcium | | 139 | mg/L | 1.0 | 96 | 70 | 130 | | | |
| Iron | | 1.94 | mg/L | 0.030 | 95 | 70 | 130 | | | |
| Magnesium | | 114 | mg/L | 1.0 | 97 | 70 | 130 | | | |
| Potassium | | 99.4 | mg/L | 1.0 | 94 | 70 | 130 | | | |
| Sodium | | 889 | mg/L | 1.0 | | 70 | 130 | | | A |
| Zinc | | 1.96 | mg/L | 0.010 | 96 | 70 | 130 | | | |
| Sample ID: C10081054-001BMSD | 9 | Sample Matrix Spike Duplicate | | Run: ICP2-C_100901A | | | | 09/01/10 19:25 | | |
| Aluminum | | 2.03 | mg/L | 0.10 | 100 | 70 | 130 | 2.1 | 20 | |
| Barium | | 1.95 | mg/L | 0.10 | 95 | 70 | 130 | 1 | 20 | |
| Boron | | 2.16 | mg/L | 0.10 | 99 | 70 | 130 | 1.3 | 20 | |
| Calcium | | 141 | mg/L | 1.0 | 98 | 70 | 130 | 1.5 | 20 | |
| Iron | | 1.95 | mg/L | 0.030 | 96 | 70 | 130 | 0.8 | 20 | |
| Magnesium | | 116 | mg/L | 1.0 | 98 | 70 | 130 | 1.1 | 20 | |
| Potassium | | 101 | mg/L | 1.0 | 95 | 70 | 130 | 1.9 | 20 | |
| Sodium | | 885 | mg/L | 1.0 | | 70 | 130 | 0.5 | 20 | A |
| Zinc | | 1.97 | mg/L | 0.010 | 96 | 70 | 130 | 0.1 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration



QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|------|------|-----------|---------------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R137125 |
| Sample ID: MB-100910A | | Method Blank | | | | | Run: ICP2-C_100910A | | | 09/10/10 12:18 |
| Silicon | | ND | mg/L | 0.10 | | | | | | |
| Sample ID: LFB-100910A | | Laboratory Fortified Blank | | | | | Run: ICP2-C_100910A | | | 09/10/10 12:22 |
| Silicon | | 0.472 | mg/L | 0.10 | 100 | 85 | 115 | | | |
| Sample ID: C10090120-001BMS2 | | Sample Matrix Spike | | | | | Run: ICP2-C_100910A | | | 09/10/10 18:14 |
| Silicon | | 2.94 | mg/L | 0.10 | 110 | 70 | 130 | | | |
| Sample ID: C10090120-001BMSD | | Sample Matrix Spike Duplicate | | | | | Run: ICP2-C_100910A | | | 09/10/10 18:18 |
| Silicon | | 2.98 | mg/L | 0.10 | 115 | 70 | 130 | 1.3 | 20 | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

LC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|----------------------------|-------|-----------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E200.8 | | | | | | | | | | Batch: R136941 |
| Sample ID: LRB | 13 | Method Blank | | Run: ICPMS2-C_100907A | | | | 09/07/10 11:58 | | |
| Antimony | | ND | mg/L | 0.0010 | | | | | | |
| Arsenic | | ND | mg/L | 0.0010 | | | | | | |
| Beryllium | | ND | mg/L | 0.0010 | | | | | | |
| Cadmium | | ND | mg/L | 0.0010 | | | | | | |
| Chromium | | ND | mg/L | 0.050 | | | | | | |
| Copper | | ND | mg/L | 0.010 | | | | | | |
| Lead | | ND | mg/L | 0.0010 | | | | | | |
| Manganese | | ND | mg/L | 0.010 | | | | | | |
| Nickel | | ND | mg/L | 0.050 | | | | | | |
| Selenium | | ND | mg/L | 0.0010 | | | | | | |
| Silver | | ND | mg/L | 0.010 | | | | | | |
| Thallium | | ND | mg/L | 0.00040 | | | | | | |
| Uranium | | ND | mg/L | 0.00030 | | | | | | |
| Sample ID: LFB | 13 | Laboratory Fortified Blank | | Run: ICPMS2-C_100907A | | | | 09/07/10 12:05 | | |
| Antimony | | 0.0527 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Arsenic | | 0.0530 | mg/L | 0.0010 | 106 | 85 | 115 | | | |
| Beryllium | | 0.0522 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Cadmium | | 0.0519 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Chromium | | 0.0512 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Copper | | 0.0504 | mg/L | 0.0010 | 101 | 85 | 115 | | | |
| Lead | | 0.0524 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Manganese | | 0.0516 | mg/L | 0.0010 | 103 | 85 | 115 | | | |
| Nickel | | 0.0511 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Selenium | | 0.0524 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Silver | | 0.0177 | mg/L | 0.0010 | 88 | 85 | 115 | | | |
| Thallium | | 0.0522 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Uranium | | 0.0536 | mg/L | 0.00030 | 107 | 85 | 115 | | | |
| Sample ID: C10081002-001CMS4 | 13 | Sample Matrix Spike | | Run: ICPMS2-C_100907A | | | | 09/07/10 13:39 | | |
| Antimony | | 0.053 | mg/L | 0.0010 | 107 | 70 | 130 | | | |
| Arsenic | | 0.054 | mg/L | 0.0010 | 103 | 70 | 130 | | | |
| Beryllium | | 0.050 | mg/L | 0.0010 | 100 | 70 | 130 | | | |
| Cadmium | | 0.050 | mg/L | 0.0010 | 100 | 70 | 130 | | | |
| Chromium | | 0.050 | mg/L | 0.0010 | 96 | 70 | 130 | | | |
| Copper | | 0.050 | mg/L | 0.010 | 96 | 70 | 130 | | | |
| Lead | | 0.051 | mg/L | 0.0010 | 101 | 70 | 130 | | | |
| Manganese | | 0.052 | mg/L | 0.010 | 98 | 70 | 130 | | | |
| Nickel | | 0.051 | mg/L | 0.050 | 102 | 70 | 130 | | | |
| Selenium | | 0.053 | mg/L | 0.0010 | 106 | 70 | 130 | | | |
| Silver | | 0.019 | mg/L | 0.010 | 95 | 70 | 130 | | | |
| Thallium | | 0.051 | mg/L | 0.00040 | 101 | 70 | 130 | | | |
| Uranium | | 0.054 | mg/L | 0.00030 | 104 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|--------|-------------------------------|---------|-----------------------|-----------|------------|-----|----------------|------|
| Method: E200.8 | | | | | | | | | Batch: R136941 | |
| Sample ID: C10081002-001CMSD | | 13 | Sample Matrix Spike Duplicate | | Run: ICPMS2-C_100907A | | | | 09/07/10 13:46 | |
| Antimony | | 0.057 | mg/L | 0.0010 | 115 | 70 | 130 | 7.6 | 20 | |
| Arsenic | | 0.057 | mg/L | 0.0010 | 109 | 70 | 130 | 5.2 | 20 | |
| Beryllium | | 0.054 | mg/L | 0.0010 | 107 | 70 | 130 | 6.9 | 20 | |
| Cadmium | | 0.053 | mg/L | 0.0010 | 106 | 70 | 130 | 6.5 | 20 | |
| Chromium | | 0.053 | mg/L | 0.0010 | 104 | 70 | 130 | 7.5 | 20 | |
| Copper | | 0.052 | mg/L | 0.010 | 101 | 70 | 130 | 4.9 | 20 | |
| Lead | | 0.054 | mg/L | 0.0010 | 107 | 70 | 130 | 6 | 20 | |
| Manganese | | 0.056 | mg/L | 0.010 | 105 | 70 | 130 | 6.8 | 20 | |
| Nickel | | 0.051 | mg/L | 0.050 | 102 | 70 | 130 | 0.4 | 20 | |
| Selenium | | 0.054 | mg/L | 0.0010 | 108 | 70 | 130 | 2.3 | 20 | |
| Silver | | 0.020 | mg/L | 0.010 | 100 | 70 | 130 | 5.1 | 20 | |
| Thallium | | 0.054 | mg/L | 0.00040 | 107 | 70 | 130 | 5.9 | 20 | |
| Uranium | | 0.058 | mg/L | 0.00030 | 111 | 70 | 130 | 6.2 | 20 | |

Qualifiers:

- Analyte reporting limit.
- LC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|---------|------|-----------|------------------------|-----|----------|----------------|
| Method: E245.1 | | | | | | | | | | Batch: 27249 |
| Sample ID: MB-27249 | | Method Blank | | | | | Run: CVAA_C203_100830C | | | 08/30/10 10:20 |
| Mercury | | ND | mg/L | 0.00020 | | | | | | |
| Sample ID: LCS-27249 | | Laboratory Control Sample | | | | | Run: CVAA_C203_100830C | | | 08/30/10 10:21 |
| Mercury | | 0.00517 | mg/L | 0.00020 | 103 | 90 | 110 | | | |
| Sample ID: C10081002-001CMS | | Sample Matrix Spike | | | | | Run: CVAA_C203_100830C | | | 08/30/10 10:43 |
| Mercury | | 0.00526 | mg/L | 0.00020 | 104 | 85 | 115 | | | |
| Sample ID: C10081002-001CMSD | | Sample Matrix Spike Duplicate | | | | | Run: CVAA_C203_100830C | | | 08/30/10 10:45 |
| Mercury | | 0.00526 | mg/L | 0.00020 | 104 | 85 | 115 | 0.2 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|-----|------|--------------------|------------|-----|----------|----------------|
| Method: E300.0 | | | | | | | | | | Batch: R136884 |
| Sample ID: LCS | 2 | Laboratory Control Sample | | | | Run: IC2-C_100902A | | | | 09/02/10 20:51 |
| Chloride | | 9.67 | mg/L | 1.0 | 97 | 90 | 110 | | | |
| Sulfate | | 38.7 | mg/L | 1.0 | 97 | 90 | 110 | | | |
| Sample ID: MBLK | 2 | Method Blank | | | | Run: IC2-C_100902A | | | | 09/02/10 21:05 |
| Chloride | | ND | mg/L | 1.0 | | | | | | |
| Sulfate | | ND | mg/L | 1.0 | | | | | | |
| Sample ID: C10080997-003AMS | 2 | Sample Matrix Spike | | | | Run: IC2-C_100902A | | | | 09/04/10 02:39 |
| Chloride | | 123 | mg/L | 2.0 | 108 | 80 | 120 | | | |
| Sulfate | | 1520 | mg/L | 8.0 | 99 | 80 | 120 | | | |
| Sample ID: C10080997-003AMSD | 2 | Sample Matrix Spike Duplicate | | | | Run: IC2-C_100902A | | | | 09/04/10 02:53 |
| Chloride | | 123 | mg/L | 2.0 | 109 | 80 | 120 | 0.3 | 20 | |
| Sulfate | | 1510 | mg/L | 8.0 | 96 | 80 | 120 | 0.7 | 20 | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

LC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------|-------|-------------------------------|-------|------|------|-----------|------------|-----|----------|----------------|
| Method: E353.2 | | | | | | | | | | Batch: R136887 |
| Sample ID: MBLK-1 | | Method Blank | | | | | | | | 09/06/10 14:41 |
| Nitrogen, Nitrate+Nitrite as N | | ND | mg/L | 0.10 | | | | | | |
| Run: TECHNICON_100906A | | | | | | | | | | |
| Sample ID: LCS-2 | | Laboratory Control Sample | | | | | | | | 09/06/10 14:44 |
| Nitrogen, Nitrate+Nitrite as N | | 2.48 | mg/L | 0.10 | 99 | 90 | 110 | | | |
| Run: TECHNICON_100906A | | | | | | | | | | |
| Sample ID: C10090120-001CMS | | Sample Matrix Spike | | | | | | | | 09/06/10 14:59 |
| Nitrogen, Nitrate+Nitrite as N | | 1.93 | mg/L | 0.10 | 96 | 90 | 110 | | | |
| Run: TECHNICON_100906A | | | | | | | | | | |
| Sample ID: C10090120-001CMSD | | Sample Matrix Spike Duplicate | | | | | | | | 09/06/10 15:01 |
| Nitrogen, Nitrate+Nitrite as N | | 1.96 | mg/L | 0.10 | 98 | 90 | 110 | 1.5 | 10 | |
| Run: TECHNICON_100906A | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|---------------------------|-------|-------|------|-----------|---------------------|-----|----------|----------------|
| Method: E504.1 | | | | | | | | | | Batch: 27356 |
| Sample ID: C10090022-002GMS | 4 | Sample Matrix Spike | | | | | Run: ECD1-C_100907A | | | 09/08/10 05:17 |
| 1,2-Dibromo-3-chloropropane | | 0.251 | ug/L | 0.020 | 100 | 65 | 135 | | | |
| 1,2-Dibromoethane | | 0.259 | ug/L | 0.010 | 104 | 65 | 135 | | | |
| 1,2,3-Trichloropropane | | 0.250 | ug/L | 0.050 | 100 | 65 | 135 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 104 | 70 | 130 | | | |
| Sample ID: LCS-27356 | 4 | Laboratory Control Sample | | | | | Run: ECD1-C_100907A | | | 09/07/10 23:29 |
| 1,2-Dibromo-3-chloropropane | | 0.244 | ug/L | 0.020 | 98 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 0.264 | ug/L | 0.010 | 106 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 0.233 | ug/L | 0.050 | 93 | 70 | 130 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 124 | 70 | 130 | | | |
| Sample ID: MB-27356 | 4 | Method Blank | | | | | Run: ECD1-C_100907A | | | 09/07/10 22:09 |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.020 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.010 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.050 | | | | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 106 | 70 | 130 | | | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

LC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|--------------|-------------------------------|-------|------------------|------------------|-----------|----------------|----------------|----------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_48788 |
| Sample ID: MB-48788 | Method Blank | | | Run: SUB-B153462 | | | 09/04/10 09:15 | | | |
| 2,4-DB | | ND | ug/L | 2.5 | | | | | | |
| Sample ID: MB-48788 | 9 | Method Blank | | | Run: SUB-B153463 | | | 09/04/10 09:45 | | |
| 2,4-D | | ND | ug/L | 1.0 | | | | | | |
| Dalapon | | ND | ug/L | 2.5 | | | | | | |
| Dicamba | | ND | ug/L | 0.25 | | | | | | |
| Dichlorprop | | ND | ug/L | 1.0 | | | | | | |
| Dinoseb | | ND | ug/L | 1.0 | | | | | | |
| Pentachlorophenol | | ND | ug/L | 0.040 | | | | | | |
| Picloram | | ND | ug/L | 0.50 | | | | | | |
| 2,4,5-TP (Silvex) | | ND | ug/L | 0.20 | | | | | | |
| Surr: DCAA | | | | 0.10 | 84 | 70 | 130 | | | |
| Sample ID: LCS-48788 | 8 | Laboratory Control Sample | | | Run: SUB-B153463 | | | 09/04/10 09:15 | | |
| 2,4-D | | 4.92 | ug/L | 1.0 | 98 | 70 | 130 | | | |
| Dicamba | | 4.85 | ug/L | 0.25 | 97 | 70 | 130 | | | |
| Dichlorprop | | 5.51 | ug/L | 1.0 | 110 | 70 | 130 | | | |
| Dinoseb | | 3.71 | ug/L | 1.0 | 74 | 70 | 130 | | | |
| Pentachlorophenol | | 4.41 | ug/L | 0.040 | 88 | 70 | 130 | | | |
| Picloram | | 4.58 | ug/L | 0.50 | 92 | 70 | 130 | | | |
| 2,4,5-TP (Silvex) | | 4.94 | ug/L | 0.20 | 99 | 70 | 130 | | | |
| Surr: DCAA | | | | 0.10 | 86 | 70 | 130 | | | |
| Sample ID: B10082723-001AMS | 8 | Sample Matrix Spike | | | Run: SUB-B153463 | | | 09/04/10 11:14 | | |
| 2,4-D | | 3.72 | ug/L | 1.0 | 74 | 65 | 135 | | | |
| Dicamba | | 4.39 | ug/L | 0.25 | 88 | 65 | 135 | | | |
| Dichlorprop | | 4.85 | ug/L | 1.0 | 97 | 65 | 135 | | | |
| Dinoseb | | 1.08 | ug/L | 1.0 | 22 | 65 | 135 | | | S |
| Pentachlorophenol | | 4.18 | ug/L | 0.040 | 84 | 65 | 135 | | | |
| Picloram | | 4.30 | ug/L | 0.50 | 86 | 65 | 135 | | | |
| 2,4,5-TP (Silvex) | | 4.88 | ug/L | 0.20 | 98 | 65 | 135 | | | |
| Surr: DCAA | | | | 0.10 | 76 | 70 | 130 | | | |
| Sample ID: B10082723-001AMSD | 8 | Sample Matrix Spike Duplicate | | | Run: SUB-B153463 | | | 09/04/10 11:44 | | |
| 2,4-D | | 4.22 | ug/L | 1.0 | 84 | 65 | 135 | 13 | 40 | |
| Dicamba | | 5.04 | ug/L | 0.25 | 101 | 65 | 135 | 14 | 40 | |
| Dichlorprop | | 5.62 | ug/L | 1.0 | 112 | 65 | 135 | 15 | 40 | |
| Dinoseb | | 0.714 | ug/L | 1.0 | 14 | 65 | 135 | | 40 | S |
| Pentachlorophenol | | 4.12 | ug/L | 0.040 | 82 | 65 | 135 | 1.4 | 40 | |
| Picloram | | 4.41 | ug/L | 0.50 | 88 | 65 | 135 | 2.5 | 40 | |
| 2,4,5-TP (Silvex) | | 4.76 | ug/L | 0.20 | 95 | 65 | 135 | 2.5 | 40 | |
| Surr: DCAA | | | | 0.10 | 91 | 70 | 130 | | | |
| Sample ID: LCS-48788 | 2 | Laboratory Control Sample | | | Run: SUB-B153462 | | | 09/04/10 08:45 | | |
| 2,4-DB | | 5.96 | ug/L | 2.5 | 119 | 70 | 130 | | | |
| Dalapon | | 5.57 | ug/L | 2.5 | 111 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|-----|------|------------------|------------|-----|----------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_48788 |
| Sample ID: B10082723-001AMS | 2 | Sample Matrix Spike | | | | Run: SUB-B153462 | | | | 09/04/10 10:45 |
| 2,4-DB | | 9.82 | ug/L | 2.5 | 196 | 65 | 135 | | | S |
| Dalapon | | 4.66 | ug/L | 2.5 | 93 | 65 | 135 | | | |
| Sample ID: B10082723-001AMSD | 2 | Sample Matrix Spike Duplicate | | | | Run: SUB-B153462 | | | | 09/04/10 11:14 |
| 2,4-DB | | 9.87 | ug/L | 2.5 | 197 | 65 | 135 | 0.5 | 40 | S |
| Dalapon | | 5.37 | ug/L | 2.5 | 107 | 65 | 135 | 14 | 40 | |

Modifiers:

- Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------|-------|---------------------------|-------|------|------|-----------------------|------------|-----|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R136763 |
| Sample ID: 090110_LCS_3 | 65 | Laboratory Control Sample | | | | Run: SATURNCA_100901A | | | | 09/01/10 10:41 |
| 1,1,1,2-Tetrachloroethane | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| 1,1,1-Trichloroethane | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| 1,1,2,2-Tetrachloroethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,1,2-Trichloroethane | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| 1,1-Dichloroethane | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| 1,1-Dichloroethene | | 9.84 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| 1,1-Dichloropropene | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,2,3-Trichlorobenzene | | 7.68 | ug/L | 0.50 | 77 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| 1,2,4-Trichlorobenzene | | 9.72 | ug/L | 0.50 | 97 | 70 | 130 | | | |
| 1,2,4-Trimethylbenzene | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| 1,2-Dibromo-3-chloropropane | | 9.76 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| 1,2-Dichlorobenzene | | 10.5 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| 1,2-Dichloroethane | | 8.72 | ug/L | 0.50 | 87 | 70 | 130 | | | |
| 1,2-Dichloropropane | | 9.68 | ug/L | 0.50 | 97 | 70 | 130 | | | |
| 1,3,5-Trimethylbenzene | | 10.5 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| 1,3-Dichlorobenzene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| 1,3-Dichloropropane | | 9.84 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| 1,4-Dichlorobenzene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| 2,2-Dichloropropane | | 11.0 | ug/L | 0.50 | 110 | 70 | 130 | | | |
| 2-Chlorotoluene | | 11.1 | ug/L | 0.50 | 111 | 70 | 130 | | | |
| 4-Chlorotoluene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| Benzene | | 9.84 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| Bromobenzene | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| Bromochloromethane | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| Bromodichloromethane | | 9.40 | ug/L | 0.50 | 94 | 70 | 130 | | | |
| Bromoform | | 9.48 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Bromomethane | | 14.5 | ug/L | 0.50 | 145 | 70 | 130 | | | S |
| Carbon tetrachloride | | 9.96 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Chlorobenzene | | 9.60 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Chlorodibromomethane | | 9.52 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Chloroethane | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| Chloroform | | 9.44 | ug/L | 0.50 | 94 | 70 | 130 | | | |
| Chloromethane | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| cis-1,2-Dichloroethene | | 9.44 | ug/L | 0.50 | 94 | 70 | 130 | | | |
| cis-1,3-Dichloropropene | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| Dibromomethane | | 9.52 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Dichlorodifluoromethane | | 8.12 | ug/L | 0.50 | 81 | 70 | 130 | | | |
| Ethylbenzene | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| Hexachlorobutadiene | | 9.76 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| Isopropylbenzene | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| m+p-Xylenes | | 19.5 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| Methyl tert-butyl ether (MTBE) | | 9.24 | ug/L | 2.0 | 92 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------|-------|---------------------------|-------|------|------|-----------------------|------------|-----|----------------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R136763 |
| Sample ID: 090110_LCS_3 | 65 | Laboratory Control Sample | | | | Run: SATURNCA_100901A | | | 09/01/10 10:41 | |
| Methylene chloride | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| Naphthalene | | 9.72 | ug/L | 0.50 | 97 | 70 | 130 | | | |
| n-Butylbenzene | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| n-Propylbenzene | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| o-Xylene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| p-Isopropyltoluene | | 10.3 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| sec-Butylbenzene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| Styrene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| tert-Butylbenzene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| Tetrachloroethene | | 9.96 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Toluene | | 9.92 | ug/L | 0.50 | 99 | 70 | 130 | | | |
| trans-1,2-Dichloroethene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| trans-1,3-Dichloropropene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| Trichloroethene | | 9.84 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| Trichlorofluoromethane | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Vinyl chloride | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| Xylenes, Total | | 30.1 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Trihalomethanes, Total | | 37.8 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 99 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 105 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 95 | 70 | 130 | | | |
| Sample ID: 090110_MBLK_6 | 65 | Method Blank | | | | Run: SATURNCA_100901A | | | 09/01/10 12:30 | |
| 1,1,1,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,1-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,3,5-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,4-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 2,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

MDL - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------|-------|--------------|-------|------|-----------------------|-----------|------------|-----|----------------|------|
| Method: E524.2 | | | | | | | | | Batch: R136763 | |
| Sample ID: 090110_MBLK_6 | 65 | Method Blank | | | Run: SATURNCA_100901A | | | | 09/01/10 12:30 | |
| 2-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |
| 4-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |
| Benzene | | ND | ug/L | 0.50 | | | | | | |
| Bromobenzene | | ND | ug/L | 0.50 | | | | | | |
| Bromochloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromodichloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromoform | | ND | ug/L | 0.50 | | | | | | |
| Bromomethane | | ND | ug/L | 0.50 | | | | | | |
| Carbon tetrachloride | | ND | ug/L | 0.50 | | | | | | |
| Chlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| Chlorodibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroform | | ND | ug/L | 0.50 | | | | | | |
| Chloromethane | | ND | ug/L | 0.50 | | | | | | |
| cis-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| cis-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Dibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Dichlorodifluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Ethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Hexachlorobutadiene | | ND | ug/L | 0.50 | | | | | | |
| Isopropylbenzene | | ND | ug/L | 0.50 | | | | | | |
| m+p-Xylenes | | ND | ug/L | 0.50 | | | | | | |
| Methyl tert-butyl ether (MTBE) | | ND | ug/L | 2.0 | | | | | | |
| Methylene chloride | | ND | ug/L | 0.50 | | | | | | |
| Naphthalene | | ND | ug/L | 0.50 | | | | | | |
| n-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| n-Propylbenzene | | ND | ug/L | 0.50 | | | | | | |
| o-Xylene | | ND | ug/L | 0.50 | | | | | | |
| p-Isopropyltoluene | | ND | ug/L | 0.50 | | | | | | |
| sec-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Styrene | | ND | ug/L | 0.50 | | | | | | |
| tert-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Tetrachloroethene | | ND | ug/L | 0.50 | | | | | | |
| Toluene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Trichloroethene | | ND | ug/L | 0.50 | | | | | | |
| Trichlorofluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Vinyl chloride | | ND | ug/L | 0.50 | | | | | | |
| Xylenes, Total | | ND | ug/L | 0.50 | | | | | | |
| Trihalomethanes, Total | | ND | ug/L | 0.50 | | | | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 98 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 98 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 92 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|-------|--------|-------|------|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E524.2 | | | | | | | | | | Batch: R136763 |
| Sample ID: C10080853-001AMS 26 Sample Matrix Spike | | | | | | | | | | Run: SATURNCA_100901A 09/01/10 18:32 |
| 1,1,1-Trichloroethane | | 121 | ug/L | 5.0 | 121 | 70 | 130 | | | |
| 1,1-Dichloroethene | | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | |
| 1,2-Dichlorobenzene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| 1,2-Dichloroethane | | 98.4 | ug/L | 5.0 | 98 | 70 | 130 | | | |
| 1,2-Dichloropropane | | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | |
| 1,4-Dichlorobenzene | | 122 | ug/L | 5.0 | 122 | 70 | 130 | | | |
| Benzene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| Bromodichloromethane | | 107 | ug/L | 5.0 | 98 | 70 | 130 | | | |
| Bromoform | | 81.2 | ug/L | 5.0 | 81 | 70 | 130 | | | |
| Carbon tetrachloride | | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | |
| Chlorobenzene | | 103 | ug/L | 5.0 | 103 | 70 | 130 | | | |
| Chlorodibromomethane | | 88.4 | ug/L | 5.0 | 86 | 70 | 130 | | | |
| Chloroform | | 202 | ug/L | 5.0 | 123 | 70 | 130 | | | |
| cis-1,2-Dichloroethene | | 115 | ug/L | 5.0 | 115 | 70 | 130 | | | |
| Ethylbenzene | | 104 | ug/L | 5.0 | 104 | 70 | 130 | | | |
| m+p-Xylenes | | 201 | ug/L | 5.0 | 100 | 70 | 130 | | | |
| o-Xylene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| Styrene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| Tetrachloroethene | | 101 | ug/L | 5.0 | 101 | 70 | 130 | | | |
| Toluene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | | | |
| trans-1,2-Dichloroethene | | 130 | ug/L | 5.0 | 130 | 70 | 130 | | | |
| Trichloroethene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| Vinyl chloride | | 120 | ug/L | 5.0 | 120 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 115 | 80 | 120 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 104 | 80 | 120 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 91 | 80 | 120 | | | |
| Sample ID: C10080853-001AMSD 26 Sample Matrix Spike Duplicate | | | | | | | | | | Run: SATURNCA_100901A 09/01/10 19:08 |
| 1,1,1-Trichloroethane | | 115 | ug/L | 5.0 | 115 | 70 | 130 | 5.1 | 20 | |
| 1,1-Dichloroethene | | 112 | ug/L | 5.0 | 112 | 70 | 130 | 4.6 | 20 | |
| 1,2-Dichlorobenzene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | 4.6 | 20 | |
| 1,2-Dichloroethane | | 101 | ug/L | 5.0 | 101 | 70 | 130 | 2.8 | 20 | |
| 1,2-Dichloropropane | | 106 | ug/L | 5.0 | 106 | 70 | 130 | 5.1 | 20 | |
| 1,4-Dichlorobenzene | | 121 | ug/L | 5.0 | 121 | 70 | 130 | 0.7 | 20 | |
| Benzene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | 0.4 | 20 | |
| Bromodichloromethane | | 94.4 | ug/L | 5.0 | 86 | 70 | 130 | 12 | 20 | |
| Bromoform | | 61.2 | ug/L | 5.0 | 61 | 70 | 130 | 28 | 20 | SR |
| Carbon tetrachloride | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 12 | 20 | |
| Chlorobenzene | | 99.2 | ug/L | 5.0 | 99 | 70 | 130 | 4 | 20 | |
| Chlorodibromomethane | | 69.6 | ug/L | 5.0 | 68 | 70 | 130 | 24 | 20 | SR |
| Chloroform | | 194 | ug/L | 5.0 | 115 | 70 | 130 | 4 | 20 | |
| cis-1,2-Dichloroethene | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 3.9 | 20 | |
| Ethylbenzene | | 106 | ug/L | 5.0 | 106 | 70 | 130 | 2.7 | 20 | |
| m+p-Xylenes | | 206 | ug/L | 5.0 | 103 | 70 | 130 | 2.4 | 20 | |
| o-Xylene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | 0.4 | 20 | |

Qualifiers:

- - Analyte reporting limit.
- MDC - Minimum detectable concentration
- S - Spike recovery outside of advisory limits.

- ND - Not detected at the reporting limit.
- R - RPD exceeds advisory limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|-------|--------|-------|------|------|-----------------------|------------|-----|----------------|------|
| Method: E524.2 | | | | | | | | | Batch: R136763 | |
| Sample ID: C10080853-001AMSD 26 Sample Matrix Spike Duplicate | | | | | | Run: SATURNCA_100901A | | | 09/01/10 19:08 | |
| Styrene | | 101 | ug/L | 5.0 | 101 | 70 | 130 | 1.2 | 20 | |
| Tetrachloroethene | | 103 | ug/L | 5.0 | 103 | 70 | 130 | 2 | 20 | |
| Toluene | | 104 | ug/L | 5.0 | 104 | 70 | 130 | 2.6 | 20 | |
| trans-1,2-Dichloroethene | | 127 | ug/L | 5.0 | 127 | 70 | 130 | 2.2 | 20 | |
| Trichloroethene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | 0 | 20 | |
| Vinyl chloride | | 114 | ug/L | 5.0 | 114 | 70 | 130 | 5.1 | 20 | |
| Surr: Dibromofluoromethane | | | | 0.50 | 106 | 80 | 120 | 0 | 10 | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 102 | 80 | 120 | 0 | 10 | |
| Surr: Toluene-d8 | | | | 0.50 | 93 | 80 | 120 | 0 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|---------------------------|-------|------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E525.2 | | | | | | | | | | Batch: B_48846 |
| Sample ID: MB-48846 | 25 | Method Blank | | Run: SUB-B153539 | | | | 09/07/10 16:23 | | |
| Alachlor | | ND | ug/L | 0.10 | | | | | | |
| Aldrin | | ND | ug/L | 0.10 | | | | | | |
| Atrazine | | ND | ug/L | 0.10 | | | | | | |
| Benzo(a)pyrene | | ND | ug/L | 0.10 | | | | | | |
| bis(2-ethylhexyl)Adipate | | ND | ug/L | 0.50 | | | | | | |
| bis(2-ethylhexyl)Phthalate | | ND | ug/L | 2.0 | | | | | | |
| Butachlor | | ND | ug/L | 0.10 | | | | | | |
| Chlordane | | ND | ug/L | 1.0 | | | | | | |
| Dieldrin | | ND | ug/L | 0.10 | | | | | | |
| Endrin | | ND | ug/L | 0.10 | | | | | | |
| gamma-BHC (Lindane) | | ND | ug/L | 0.10 | | | | | | |
| Heptachlor | | ND | ug/L | 0.10 | | | | | | |
| Heptachlor epoxide | | ND | ug/L | 0.10 | | | | | | |
| Hexachlorobenzene | | ND | ug/L | 0.10 | | | | | | |
| Hexachlorocyclopentadiene | | ND | ug/L | 0.10 | | | | | | |
| Methoxychlor | | ND | ug/L | 0.10 | | | | | | |
| Metolachlor | | ND | ug/L | 0.10 | | | | | | |
| Metribuzin | | ND | ug/L | 0.10 | | | | | | |
| Propachlor | | ND | ug/L | 0.10 | | | | | | |
| Simazine | | ND | ug/L | 0.10 | | | | | | |
| oxaphene | | ND | ug/L | 2.0 | | | | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 101 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 99 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 103 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 121 | 70 | 130 | | | |
| Sample ID: MB-48846 | 11 | Method Blank | | Run: SUB-B153539 | | | | 09/07/10 16:23 | | |
| Aroclor 1016 | | ND | ug/L | 0.080 | | | | | | |
| Aroclor 1221 | | ND | ug/L | 2.0 | | | | | | |
| Aroclor 1232 | | ND | ug/L | 0.50 | | | | | | |
| Aroclor 1242 | | ND | ug/L | 0.30 | | | | | | |
| Aroclor 1248 | | ND | ug/L | 0.10 | | | | | | |
| Aroclor 1254 | | ND | ug/L | 0.10 | | | | | | |
| Aroclor 1260 | | ND | ug/L | 0.20 | | | | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 91 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 103 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 107 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 129 | 70 | 130 | | | |
| Sample ID: LCS-48846 | 23 | Laboratory Control Sample | | Run: SUB-B153539 | | | | 09/07/10 17:01 | | |
| Alachlor | | 2.51 | ug/L | 0.10 | 125 | 70 | 130 | | | |
| Aldrin | | 2.56 | ug/L | 0.10 | 128 | 70 | 130 | | | |
| Atrazine | | 2.13 | ug/L | 0.10 | 106 | 70 | 130 | | | |
| Benzo(a)pyrene | | 1.64 | ug/L | 0.10 | 82 | 70 | 130 | | | |

Qualifiers:

- Analyte reporting limit.

ND - Not detected at the reporting limit.

LC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|---------------------------|-------|-------|------------------|-----------|------------|----------------|----------|----------------|
| Method: E525.2 | | | | | | | | | | Batch: B_48846 |
| Sample ID: LCS-48846 | 23 | Laboratory Control Sample | | | Run: SUB-B153539 | | | 09/07/10 17:01 | | |
| bis(2-ethylhexyl)Adipate | | 1.92 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 1.89 | ug/L | 2.0 | 94 | 70 | 130 | | | |
| Butachlor | | 2.51 | ug/L | 0.10 | 125 | 70 | 130 | | | |
| Dieldrin | | 2.14 | ug/L | 0.10 | 107 | 70 | 130 | | | |
| Endrin | | 1.79 | ug/L | 0.10 | 90 | 70 | 130 | | | |
| gamma-BHC (Lindane) | | 2.43 | ug/L | 0.10 | 122 | 70 | 130 | | | |
| Heptachlor | | 2.60 | ug/L | 0.10 | 130 | 70 | 130 | | | |
| Heptachlor epoxide | | 2.49 | ug/L | 0.10 | 125 | 70 | 130 | | | |
| Hexachlorobenzene | | 2.31 | ug/L | 0.10 | 116 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 1.57 | ug/L | 0.10 | 78 | 70 | 130 | | | |
| Methoxychlor | | 2.03 | ug/L | 0.10 | 101 | 70 | 130 | | | |
| Metolachlor | | 2.47 | ug/L | 0.10 | 124 | 70 | 130 | | | |
| Metribuzin | | 2.19 | ug/L | 0.10 | 109 | 70 | 130 | | | |
| Propachlor | | 2.48 | ug/L | 0.10 | 124 | 70 | 130 | | | |
| Simazine | | 1.80 | ug/L | 0.10 | 90 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 100 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 111 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 123 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 110 | 70 | 130 | | | |
| Sample ID: TOX-48846 | 5 | Laboratory Control Sample | | | Run: SUB-B153539 | | | 09/07/10 17:40 | | |
| Toxaphene | | 42.6 | ug/L | 2.0 | 106 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 111 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 107 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 114 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 113 | 70 | 130 | | | |
| Sample ID: AR1660-48846 | 6 | Laboratory Control Sample | | | Run: SUB-B153539 | | | 09/07/10 18:19 | | |
| Aroclor 1016 | | 2.33 | ug/L | 0.080 | 117 | 70 | 130 | | | |
| Aroclor 1260 | | 3.11 | ug/L | 0.20 | 155 | 70 | 130 | | | S |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 106 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 103 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 94 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 192 | 70 | 130 | | | S |
| Sample ID: B10082447-001DMS | 23 | Sample Matrix Spike | | | Run: SUB-B153539 | | | 09/07/10 18:57 | | |
| Alachlor | | 2.39 | ug/L | 0.10 | 120 | 70 | 130 | | | |
| Aldrin | | 2.34 | ug/L | 0.10 | 117 | 70 | 130 | | | |
| Atrazine | | 2.07 | ug/L | 0.10 | 103 | 70 | 130 | | | |
| Benzo(a)pyrene | | 1.69 | ug/L | 0.10 | 84 | 70 | 130 | | | |
| bis(2-ethylhexyl)Adipate | | 1.98 | ug/L | 0.50 | 99 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 2.76 | ug/L | 2.0 | 138 | 70 | 130 | | | S |
| Butachlor | | 2.70 | ug/L | 0.10 | 135 | 70 | 130 | | | S |
| Dieldrin | | 2.19 | ug/L | 0.10 | 109 | 70 | 130 | | | |
| Endrin | | 2.09 | ug/L | 0.10 | 104 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|----------------------------------|-------|------------------|------|-----------|------------|----------------|----------|------|
| Method: E525.2 | | | | | | | | Batch: B_48846 | | |
| Sample ID: B10082447-001DMS | | 23 Sample Matrix Spike | | Run: SUB-B153539 | | | | 09/07/10 18:57 | | |
| gamma-BHC (Lindane) | | 2.33 | ug/L | 0.10 | 117 | 70 | 130 | | | |
| Heptachlor | | 2.75 | ug/L | 0.10 | 138 | 70 | 130 | | | S |
| Heptachlor epoxide | | 2.49 | ug/L | 0.10 | 125 | 70 | 130 | | | |
| Hexachlorobenzene | | 2.30 | ug/L | 0.10 | 115 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 1.70 | ug/L | 0.10 | 85 | 70 | 130 | | | |
| Methoxychlor | | 2.09 | ug/L | 0.10 | 104 | 70 | 130 | | | |
| Metolachlor | | 2.62 | ug/L | 0.10 | 131 | 70 | 130 | | | S |
| Metribuzin | | 2.36 | ug/L | 0.10 | 118 | 70 | 130 | | | |
| Propachlor | | 2.07 | ug/L | 0.10 | 103 | 70 | 130 | | | |
| Simazine | | 1.83 | ug/L | 0.10 | 92 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 109 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 110 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 126 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 111 | 70 | 130 | | | |
| Sample ID: B10082447-001DMSD | | 23 Sample Matrix Spike Duplicate | | Run: SUB-B153539 | | | | 09/07/10 19:36 | | |
| Alachlor | | 2.26 | ug/L | 0.10 | 113 | 70 | 130 | 5.6 | 40 | |
| Aldrin | | 2.08 | ug/L | 0.10 | 104 | 70 | 130 | 12 | 40 | |
| Atrazine | | 1.92 | ug/L | 0.10 | 96 | 70 | 130 | 7.5 | 40 | |
| Benzo(a)pyrene | | 1.74 | ug/L | 0.10 | 87 | 70 | 130 | 2.9 | 40 | |
| bis(2-ethylhexyl)Adipate | | 2.05 | ug/L | 0.50 | 102 | 70 | 130 | 3.5 | 40 | |
| bis(2-ethylhexyl)Phthalate | | 2.83 | ug/L | 2.0 | 142 | 70 | 130 | 2.5 | 40 | S |
| Butachlor | | 2.23 | ug/L | 0.10 | 112 | 70 | 130 | 19 | 40 | |
| Dieldrin | | 2.13 | ug/L | 0.10 | 106 | 70 | 130 | 2.8 | 40 | |
| Endrin | | 2.14 | ug/L | 0.10 | 107 | 70 | 130 | 2.4 | 40 | |
| gamma-BHC (Lindane) | | 1.98 | ug/L | 0.10 | 99 | 70 | 130 | 16 | 40 | |
| Heptachlor | | 2.43 | ug/L | 0.10 | 122 | 70 | 130 | 12 | 40 | |
| Heptachlor epoxide | | 2.16 | ug/L | 0.10 | 108 | 70 | 130 | 14 | 40 | |
| Hexachlorobenzene | | 2.03 | ug/L | 0.10 | 101 | 70 | 130 | 12 | 40 | |
| Hexachlorocyclopentadiene | | 1.84 | ug/L | 0.10 | 92 | 70 | 130 | 7.9 | 40 | |
| Methoxychlor | | 2.13 | ug/L | 0.10 | 106 | 70 | 130 | 1.9 | 40 | |
| Metolachlor | | 2.25 | ug/L | 0.10 | 113 | 70 | 130 | 15 | 40 | |
| Metribuzin | | 2.18 | ug/L | 0.10 | 109 | 70 | 130 | 7.9 | 40 | |
| Propachlor | | 2.22 | ug/L | 0.10 | 111 | 70 | 130 | 7 | 40 | |
| Simazine | | 1.66 | ug/L | 0.10 | 83 | 70 | 130 | 9.7 | 40 | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 108 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 100 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 112 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 112 | 70 | 130 | | | |

Qualifiers:

- Analyte reporting limit.
- LC - Minimum detectable concentration

- ND - Not detected at the reporting limit.
- S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|--------|-------|-------|------|-----------|------------|---|----------|------|
| Method: E525.2 | | | | | | | | Analytical Run: B_R153539 | | |
| Sample ID: 525_CCV_5 | | | | | | | | 23 Continuing Calibration Verification Standard | | |
| | | | | | | | | 09/08/10 01:20 | | |
| Alachlor | | 2.37 | ug/L | 0.10 | 119 | 70 | 130 | | | |
| Aldrin | | 2.59 | ug/L | 0.10 | 129 | 70 | 130 | | | |
| Atrazine | | 2.20 | ug/L | 0.10 | 110 | 70 | 130 | | | |
| Benzo(a)pyrene | | 1.80 | ug/L | 0.10 | 90 | 70 | 130 | | | |
| bis(2-ethylhexyl)Adipate | | 2.12 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 2.00 | ug/L | 2.0 | 100 | 70 | 130 | | | |
| Butachlor | | 2.48 | ug/L | 0.10 | 124 | 70 | 130 | | | |
| Dieldrin | | 2.44 | ug/L | 0.10 | 122 | 70 | 130 | | | |
| Endrin | | 2.22 | ug/L | 0.10 | 111 | 70 | 130 | | | |
| gamma-BHC (Lindane) | | 2.20 | ug/L | 0.10 | 110 | 70 | 130 | | | |
| Heptachlor | | 2.78 | ug/L | 0.10 | 139 | 70 | 130 | | | S |
| Heptachlor epoxide | | 2.41 | ug/L | 0.10 | 121 | 70 | 130 | | | |
| Hexachlorobenzene | | 2.29 | ug/L | 0.10 | 115 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 2.18 | ug/L | 0.10 | 109 | 70 | 130 | | | |
| Methoxychlor | | 2.08 | ug/L | 0.10 | 104 | 70 | 130 | | | |
| Metolachlor | | 2.44 | ug/L | 0.10 | 122 | 70 | 130 | | | |
| Metribuzin | | 2.62 | ug/L | 0.10 | 131 | 70 | 130 | | | S |
| Propachlor | | 2.11 | ug/L | 0.10 | 105 | 70 | 130 | | | |
| Simazine | | 1.88 | ug/L | 0.10 | 94 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 102 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 90 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 117 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 102 | 70 | 130 | | | |
| Sample ID: CLD_CCV_5 | | | | | | | | 5 Continuing Calibration Verification Standard | | |
| | | | | | | | | 09/08/10 01:59 | | |
| Chlordane | | 18.3 | ug/L | 1.0 | 92 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 105 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 88 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 104 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 100 | 70 | 130 | | | |
| Sample ID: TOX_CCV_5 | | | | | | | | 5 Continuing Calibration Verification Standard | | |
| | | | | | | | | 09/08/10 02:38 | | |
| Toxaphene | | 36.2 | ug/L | 2.0 | 91 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 110 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 99 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 107 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 107 | 70 | 130 | | | |
| Sample ID: Ar1660_CCV_5 | | | | | | | | 6 Continuing Calibration Verification Standard | | |
| | | | | | | | | 09/08/10 03:16 | | |
| Aroclor 1016 | | 1.38 | ug/L | 0.080 | 86 | 70 | 130 | | | |
| Aroclor 1260 | | 3.95 | ug/L | 0.20 | 99 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 92 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 111 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 106 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---------------------|-------|---|-------|------|------|-----------|------------|-----|------------------------|-------------------------|
| Method: E531.1 | | | | | | | | | | Analytical Run: R136833 |
| Sample ID: ICV_09r | 11 | Initial Calibration Verification Standard | | | | | | | | 09/01/10 13:04 |
| Aldicarb | | 10 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Aldicarb sulfone | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 9.0 | ug/L | 0.41 | 91 | 80 | 120 | | | |
| Carbaryl | | 10 | ug/L | 0.40 | 103 | 80 | 120 | | | |
| Carbofuran | | 10 | ug/L | 0.40 | 103 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 10 | ug/L | 0.40 | 102 | 80 | 120 | | | |
| Methiocarb | | 10 | ug/L | 0.50 | 101 | 80 | 120 | | | |
| Methomyl | | 10 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Oxamyl | | 12 | ug/L | 0.40 | 116 | 80 | 120 | | | |
| Baygon | | 10 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 100 | 70 | 130 | | | |
| Method: E531.1 | | | | | | | | | | Batch: R136833 |
| Sample ID: MBLK_36r | 11 | Method Blank | | | | | | | Run: HPLC202-C_100901A | 09/02/10 08:41 |
| Aldicarb | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfone | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfoxide | | ND | ug/L | 0.41 | | | | | | |
| Carbaryl | | ND | ug/L | 0.40 | | | | | | |
| Carbofuran | | ND | ug/L | 0.40 | | | | | | |
| 3-Hydroxycarbofuran | | ND | ug/L | 0.40 | | | | | | |
| Methiocarb | | ND | ug/L | 0.50 | | | | | | |
| Methomyl | | ND | ug/L | 0.40 | | | | | | |
| Oxamyl | | ND | ug/L | 0.40 | | | | | | |
| Baygon | | ND | ug/L | 0.40 | | | | | | |
| Surr: BDMC | | | | 0.40 | 99 | 70 | 130 | | | |
| Sample ID: LFB_37r | 11 | Laboratory Fortified Blank | | | | | | | Run: HPLC202-C_100901A | 09/02/10 09:24 |
| Aldicarb | | 7.3 | ug/L | 0.40 | 91 | 80 | 120 | | | |
| Aldicarb sulfone | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 7.7 | ug/L | 0.41 | 96 | 80 | 120 | | | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Carbofuran | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Methiocarb | | 8.2 | ug/L | 0.50 | 103 | 80 | 120 | | | |
| Methomyl | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Oxamyl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Baygon | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 102 | 70 | 130 | | | |
| Sample ID: LFBD_38r | 11 | Laboratory Fortified Blank Duplicate | | | | | | | Run: HPLC202-C_100901A | 09/02/10 10:08 |
| Aldicarb | | 7.1 | ug/L | 0.40 | 89 | 80 | 120 | 2.2 | 20 | |
| Aldicarb sulfone | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | 0.4 | 20 | |
| Aldicarb sulfoxide | | 7.9 | ug/L | 0.41 | 98 | 80 | 120 | 1.9 | 20 | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | 0.8 | 20 | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 0.9 | 20 | |

Qualifiers:

- Analyte reporting limit.
- C - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------|--------------------------------------|-------|------|------|------------------------|------------|-----|----------------|----------------|
| Method: E531.1 | | | | | | | | | | Batch: R136833 |
| Sample ID: LFBD_38r | 11 | Laboratory Fortified Blank Duplicate | | | | Run: HPLC202-C_100901A | | | 09/02/10 10:08 | |
| 3-Hydroxycarbofuran | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | 3.9 | 20 | |
| Methiocarb | | 7.8 | ug/L | 0.50 | 98 | 80 | 120 | 5.4 | 20 | |
| Methomyl | | 8.1 | ug/L | 0.40 | 101 | 80 | 120 | 3.3 | 20 | |
| Oxamyl | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | 2.8 | 20 | |
| Baygon | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | 1.8 | 20 | |
| Surr: BDMC | | | | 0.40 | 102 | 70 | 130 | 0 | 20 | |
| Sample ID: C10080923-006G MS | 11 | Sample Matrix Spike | | | | Run: HPLC202-C_100901A | | | 09/02/10 11:35 | |
| Aldicarb | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | | | |
| Aldicarb sulfone | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 7.4 | ug/L | 0.41 | 92 | 80 | 120 | | | |
| Carbaryl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Carbofuran | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 8.0 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Methiocarb | | 8.0 | ug/L | 0.50 | 100 | 80 | 120 | | | |
| Methomyl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Oxamyl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Baygon | | 8.1 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 102 | 70 | 130 | | | |
| Sample ID: C10080923-006G MSD | 11 | Sample Matrix Spike Duplicate | | | | Run: HPLC202-C_100901A | | | 09/02/10 12:15 | |
| Aldicarb | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | 1.2 | 20 | |
| Aldicarb sulfone | | 7.6 | ug/L | 0.40 | 96 | 80 | 120 | 0.5 | 20 | |
| Aldicarb sulfoxide | | 7.9 | ug/L | 0.41 | 98 | 80 | 120 | 6.7 | 20 | |
| Carbaryl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 0.3 | 20 | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 1.6 | 20 | |
| 3-Hydroxycarbofuran | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 0.4 | 20 | |
| Methiocarb | | 7.8 | ug/L | 0.50 | 98 | 80 | 120 | 1.5 | 20 | |
| Methomyl | | 8.0 | ug/L | 0.40 | 101 | 80 | 120 | 1 | 20 | |
| Oxamyl | | 8.2 | ug/L | 0.40 | 102 | 80 | 120 | 2.7 | 20 | |
| Baygon | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 2.1 | 20 | |
| Surr: BDMC | | | | 0.40 | 99 | 70 | 130 | 0 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|-------------------------------|-------|--------------------|------|-----------|------------|------------------|----------|------|
| Method: E900.0 | | | | | | | | Batch: GrAB-0956 | | |
| Sample ID: MB-GrAB-0956 | 6 | Method Blank | | Run: G542M_100829A | | | | 09/01/10 02:55 | | |
| Gross Alpha | | -2.0 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.69 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 0.88 | pCi/L | | | | | | | |
| Gross Beta | | -1.7 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 1.3 | pCi/L | | | | | | | |
| Gross Beta MDC | | 1.3 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-0956 | | Laboratory Control Sample | | Run: G542M_100829A | | | | 09/01/10 02:55 | | |
| Gross Alpha | | 110 | pCi/L | 113 | | 70 | 130 | | | |
| Sample ID: Cs137-GrAB-0956 | | Laboratory Control Sample | | Run: G542M_100829A | | | | 09/01/10 02:55 | | |
| Gross Beta | | 81 | pCi/L | 93 | | 70 | 130 | | | |
| Sample ID: C10080920-003ADUP | 6 | Sample Duplicate | | Run: G542M_100829A | | | | 09/01/10 02:55 | | |
| Gross Alpha | | 5.7 | pCi/L | | | | | 5.2 | 90.5 | |
| Gross Alpha precision (±) | | 2.3 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 2.0 | pCi/L | | | | | | | |
| Gross Beta | | 8.9 | pCi/L | | | | | 34 | 60.9 | |
| Gross Beta precision (±) | | 2.0 | pCi/L | | | | | | | |
| Gross Beta MDC | | 1.9 | pCi/L | | | | | | | |
| Sample ID: C10081009-001AMS | | Sample Matrix Spike | | Run: G542M_100829A | | | | 09/01/10 20:15 | | |
| Gross Alpha | | 120 | pCi/L | 119 | | 70 | 130 | | | |
| Sample ID: C10081009-001AMSD | | Sample Matrix Spike Duplicate | | Run: G542M_100829A | | | | 09/01/10 20:15 | | |
| Gross Alpha | | 120 | pCi/L | 120 | | 70 | 130 | 1.1 | 17.1 | |
| Sample ID: C10081009-001AMS | | Sample Matrix Spike | | Run: G542M_100829A | | | | 09/01/10 20:15 | | |
| Gross Beta | | 88 | pCi/L | 95 | | 70 | 130 | | | |
| Sample ID: C10081009-001AMSD | | Sample Matrix Spike Duplicate | | Run: G542M_100829A | | | | 09/01/10 20:15 | | |
| Gross Beta | | 90 | pCi/L | 98 | | 70 | 130 | 3.2 | 15.6 | |

Qualifiers:

- Analyte reporting limit.
- LC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------------------------------|-------------------|-------|-----------------------------|------|-----------|----------------|------|----------|------|
| Method: E903.0 | | Batch: RA226-4770 | | | | | | | | |
| Sample ID: C10080992-002AMS | Sample Matrix Spike | | | Run: BERTHOLD 770-1_100902A | | | 09/15/10 13:59 | | | |
| Radium 226 | 13 | pCi/L | | 83 | 70 | 130 | | | | |
| Sample ID: C10080992-002AMSD | Sample Matrix Spike Duplicate | | | Run: BERTHOLD 770-1_100902A | | | 09/15/10 13:59 | | | |
| Radium 226 | 13 | pCi/L | | 81 | 70 | 130 | 2.5 | 25.4 | | |
| Sample ID: MB-RA226-4770 | 3 Method Blank | | | Run: BERTHOLD 770-1_100902A | | | 09/15/10 15:45 | | | |
| Radium 226 | | -0.041 | pCi/L | | | | | | | U |
| Radium 226 precision (±) | | 0.074 | pCi/L | | | | | | | |
| Radium 226 MDC | | 0.15 | pCi/L | | | | | | | |
| Sample ID: LCS-RA226-4770 | Laboratory Control Sample | | | Run: BERTHOLD 770-1_100902A | | | 09/15/10 15:45 | | | |
| Radium 226 | 5.3 | pCi/L | | 67 | 70 | 130 | | | | S |
| - LCS response is outside of the acceptance range for this analysis. Since the MB, MS, and MSD are acceptable the batch is approved. | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

U - Not detected at minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|-------|--------|------|-----------|------------|-----------------------------|----------|----------------|
| Method: Kelada mod | | | | | | | | Analytical Run: SUB-B153245 | | |
| Sample ID: ICV-1 | | Initial Calibration Verification Standard | | | | | | | | 09/01/10 10:02 |
| Cyanide, Total | | 0.152 | mg/L | 0.0050 | 101 | 90 | 110 | | | |
| Method: Kelada mod | | | | | | | | Batch: B_R153245 | | |
| Sample ID: LFB-2 | | Laboratory Fortified Blank | | | | | | | | 09/01/10 10:04 |
| Cyanide, Total | | 0.107 | mg/L | 0.0050 | 107 | 90 | 110 | | | |
| Sample ID: MBLK-3 | | Method Blank | | | | | | | | 09/01/10 10:06 |
| Cyanide, Total | | ND | mg/L | 0.0050 | | | | | | |
| Sample ID: B10082713-005EMS | | Sample Matrix Spike | | | | | | | | 09/01/10 13:24 |
| Cyanide, Total | | 0.106 | mg/L | 0.0050 | 106 | 90 | 110 | | | |
| Sample ID: B10082713-005EMSD | | Sample Matrix Spike Duplicate | | | | | | | | 09/01/10 13:26 |
| Cyanide, Total | | 0.106 | mg/L | 0.0050 | 106 | 90 | 110 | 0.2 | 10 | |

Qualifiers:

- Analyte reporting limit.
- MC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates

Report Date: 09/27/10

Project: WWDC-Duck Creek 3-1

Work Order: C10081002

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------|-------------------------------|--------------|----|-------------------------|-----------|------------|-------------------|----------|------|
| Method: RA-05 | | | | | | | | Batch: RA228-3356 | | |
| Sample ID: LCS-228-RA226-4770 | | Laboratory Control Sample | | | Run: TENNELEC-3_100902B | | | 09/09/10 15:35 | | |
| Radium 228 | | 6.3 | pCi/L | | 85 | 70 | 130 | | | |
| Sample ID: MB-RA226-4770 | | 3 | Method Blank | | Run: TENNELEC-3_100902B | | | 09/09/10 15:35 | | |
| Radium 228 | | -0.084 | pCi/L | | | | | | | U |
| Radium 228 precision (±) | | 0.54 | pCi/L | | | | | | | |
| Radium 228 MDC | | 0.57 | pCi/L | | | | | | | |
| Sample ID: C10080992-002AMS | | Sample Matrix Spike | | | Run: TENNELEC-3_100902B | | | 09/09/10 15:35 | | |
| Radium 228 | | 15 | pCi/L | | 81 | 70 | 130 | | | |
| Sample ID: C10080992-002AMSD | | Sample Matrix Spike Duplicate | | | Run: TENNELEC-3_100902B | | | 09/09/10 15:35 | | |
| Radium 228 | | 17 | pCi/L | | 90 | 70 | 130 | 8.7 | 36.2 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Energy Laboratories Inc

Workorder Receipt Checklist



C10081002

Lidstone and Associates

Login completed by: Halley Ackerman

Date Received: 8/27/2010

Reviewed by: BL2000\tedwards

Received by: tae

Reviewed Date: 8/31/2010

Carrier name: FedEx

| | | | |
|---|---|--|---|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 3°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

Sample for total metals was split and preserved in lab with 1mL HNO3 to a final pH of 2. Samples for dissolved metals were subsampled, filtered and preserved with 2 mL HNO3 in lab upon receipt to pH <2.

PLEASE PRINT (Provide as much information as possible.)

| | | | |
|--|---|-------------------------------------|--|
| Company Name: Lidstone And Associates | Project Name, PWS, Permit, Etc. WWDC - Duck Creek 3-1 | Sample Origin State: | EPA/State Compliance: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Report Mail Address: 4025 Automation Way, Bldg E Fort Collins, CO 80525-3448 | Contact Name: Mark Staci | Phone/Fax: (970) 223-4705 | Email: mes@lidstone.com |
| Invoice Address: Same as above | Invoice Contact & Phone: Same as above | Purchase Order: | Quote/Bottle Order: 2698 |

| | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|--|--|--|--|-----------------|--|---|--|--------------|--|--|--|--|--|--|--|--|--|---|--|---|---------------------|
| Special Report/Formats: | | | | ANALYSIS REQUESTED | | | | | | | | | | | | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page Comments: | Shipped by: FedEx Cooler ID(s): | | | | | | |
| <input checked="" type="checkbox"/> DW <input type="checkbox"/> POTW/WWTP <input type="checkbox"/> State: <input type="checkbox"/> Other: | | | | <input type="checkbox"/> EDD/EDT (Electronic Data) Format: <input type="checkbox"/> LEVEL IV <input type="checkbox"/> NELAC | | | | Number of Containers Sample Type: A W S V B O DW Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water | | | | | | | | | | | | Receipt Temp 3 °C On Ice: <input checked="" type="checkbox"/> N Custody Seal On Bottle Y N On Cooler <input checked="" type="checkbox"/> N Intact <input checked="" type="checkbox"/> N Signature Match <input checked="" type="checkbox"/> N | | | |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | | | | Collection Date | | Collection Time | | MATRIX | | SEE ATTACHED | | | | | | | | | | | | Standard Turnaround (TAT) R U S H | LABORATORY USE ONLY |
| 1 WWDC Duck Creek 3-1 | | | | 26 Aug | | 4:05 PM | | DW | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|--|---|-------------------------------------|----------------------------------|-------------------------|----------------------------------|----------------------------------|
| Custody Record MUST be Signed | Relinquished by (print): KALPESH R. PATEL | Date/Time: 26 Aug 14 2014 | Signature: <i>[Signature]</i> | Received by (print): | Date/Time: | Signature: |
| | Relinquished by (print): | Date/Time: | Signature: | Received by (print): | Date/Time: | Signature: |
| | Sample Disposal: | Return to Client: | Lab Disposal: | Received by Laboratory: | Date/Time: 8-27-10 900 | Signature: <i>[Signature]</i> |



ANALYTICAL SUMMARY REPORT

October 13, 2010

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C10081002 Quote ID: C2698 - WWDC

Project Name: WWDC-Duck Creek 3-1

Energy Laboratories, Inc. received the following 1 sample for Lidstone and Associates on 8/27/2010 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|---------------------|----------------|--------------|----------------|---|
| C10081002-001 | WWDC Duck Creek 3-1 | 08/26/10 16:05 | 08/27/10 | Drinking Water | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Drinking Water Acidity, Total as CaCO3 Alkalinity QA Calculations Bacteria, Iron Related Bacteria, Total Coliform Cyanide, SDWA Color Conductivity Corrosivity, Calculated Mercury, Drinking Water Mercury Analysis Prep Sample Filtering Fluoride Foaming Agents E515.1 Chlorinated Herbicides Hardness E300.0 Anions Nitrogen, Nitrite Nitrogen, Nitrate + Nitrite Odor pH Metals Preparation by EPA 200.2 504 sample microextraction E504 Pesticides Pesticides, Carbamates SDWA Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved Solids, Total Suspended 525-Semi-Volatile Organic Compounds, SDWA Turbidity E524.2 SDWA VOCs |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Stephanie D Waldrop
Reporting Supervisor

Digitally signed by
Stephanie Waldrop
Date: 2010.10.13 13:19:57 -06:00



LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: WWDC-Duck Creek 3-1
Lab ID: C10081002-001
Client Sample ID: WWDC Duck Creek 3-1

Revised Date: 10/13/10
Report Date: 09/27/10
Collection Date: 08/26/10 16:05
Date Received: 08/27/10
Matrix: Drinking Water

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|-------------------------------------|--------|-------|------------|----|-------------|---------|---------------------|
| PHYSICAL PROPERTIES | | | | | | | |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | H | 4 | | A2540 D | 10/06/10 08:20 / lr |

**Report
Definitions:**

RL - Analyte reporting limit.
QCL - Quality control limit.
H - Analysis performed past recommended holding time.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

Lone Tree Fault 1-2

ANALYTICAL SUMMARY REPORT

November 09, 2010

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C10091237 Quote ID: C2698 - WWDC

Project Name: Belvoir Paleozoic Groundwater

Energy Laboratories, Inc. received the following 1 sample for Lidstone and Associates on 9/30/2010 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|---------------------|----------------|--------------|---------|---|
| C10091237-001 | Lone Tree Fault 1-2 | 09/28/10 08:52 | 09/30/10 | Aqueous | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Drinking Water Acidity, Total as CaCO3 Alkalinity QA Calculations Conductivity Corrosivity, Calculated Mercury, Drinking Water Mercury Analysis Prep Sample Filtering Fluoride Hardness E300.0 Anions Nitrogen, Nitrate + Nitrite pH Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:


Reporting SupervisorDigitally signed by
Stephanie Waldrop
Date: 2010.11.09 10:56:44 -07:00

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater
Lab ID: C10091237-001
Client Sample ID: Lone Tree Fault 1-2

Report Date: 11/09/10
Collection Date: 09/28/10 08:52
Date Received: 09/30/10
Matrix: Aqueous

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|--|--------|----------|------------|--------|-------------|-------------|----------------------|
| MAJOR IONS | | | | | | | |
| Acidity, Total as CaCO ₃ | ND | mg/L | | 5 | | A2310 B | 10/07/10 09:25 / ja |
| Alkalinity, Total as CaCO ₃ | 123 | mg/L | | 1 | | A2320 B | 09/30/10 23:07 / ja |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 09/30/10 23:07 / ja |
| Bicarbonate as HCO ₃ | 150 | mg/L | | 1 | | A2320 B | 09/30/10 23:07 / ja |
| Calcium | 29 | mg/L | | 1 | | E200.7 | 10/05/10 19:36 / cp |
| Chloride | 2 | mg/L | | 1 | | E300.0 | 10/12/10 05:37 / ljl |
| Fluoride | 0.9 | mg/L | | 0.1 | | A4500-F C | 10/01/10 09:35 / ja |
| Magnesium | 9 | mg/L | | 1 | | E200.7 | 10/05/10 19:36 / cp |
| Nitrogen, Nitrate+Nitrite as N | 0.4 | mg/L | | 0.1 | 10 | E353.2 | 10/14/10 16:43 / dc |
| Potassium | 2 | mg/L | | 1 | | E200.7 | 10/05/10 19:36 / cp |
| Silica | 15.8 | mg/L | | 0.2 | | E200.7 | 10/05/10 19:36 / cp |
| Sodium | 5 | mg/L | | 1 | | E200.7 | 10/05/10 19:36 / cp |
| Sulfate | 7 | mg/L | | 1 | | E300.0 | 10/12/10 05:37 / ljl |
| PHYSICAL PROPERTIES | | | | | | | |
| Corrosivity | 0.5 | unitless | | | | Calculation | 10/26/10 14:48 / kbh |
| Conductivity @ 25 C | 238 | umhos/cm | | 1 | | A2510 B | 09/30/10 15:36 / lr |
| Hardness as CaCO ₃ | 112 | mg/L | | 1 | | A2340 B | 10/05/10 19:36 / kbh |
| pH | 8.29 | s.u. | | 0.01 | | A4500-H B | 09/30/10 15:36 / lr |
| Solids, Total Dissolved TDS @ 180 C | 197 | mg/L | | 10 | | A2540 C | 10/01/10 17:43 / lr |
| METALS - TOTAL | | | | | | | |
| Aluminum | ND | mg/L | | 0.1 | 0.2 | E200.8 | 10/18/10 20:37 / sml |
| Antimony | ND | mg/L | | 0.001 | 0.006 | E200.8 | 10/18/10 20:37 / sml |
| Arsenic | 0.002 | mg/L | | 0.001 | 0.01 | E200.8 | 10/21/10 03:02 / sml |
| Barium | ND | mg/L | | 0.1 | 2 | E200.8 | 10/18/10 20:37 / sml |
| Beryllium | ND | mg/L | | 0.001 | 0.004 | E200.8 | 10/18/10 20:37 / sml |
| Boron | ND | mg/L | | 0.1 | | E200.7 | 10/14/10 13:33 / cp |
| Cadmium | ND | mg/L | | 0.001 | 0.005 | E200.8 | 10/18/10 20:37 / sml |
| Chromium | ND | mg/L | | 0.05 | 0.1 | E200.8 | 10/18/10 20:37 / sml |
| Copper | ND | mg/L | | 0.01 | 1.3 | E200.8 | 10/18/10 20:37 / sml |
| Iron | 0.10 | mg/L | B | 0.03 | 0.3 | E200.7 | 10/14/10 13:33 / cp |
| Lead | ND | mg/L | | 0.001 | 0.015 | E200.8 | 10/18/10 20:37 / sml |
| Manganese | ND | mg/L | | 0.01 | 0.05 | E200.7 | 10/14/10 13:33 / cp |
| Mercury | ND | mg/L | | 0.0002 | 0.002 | E245.1 | 10/05/10 09:21 / rdw |
| Nickel | ND | mg/L | | 0.05 | | E200.8 | 10/18/10 20:37 / sml |
| Selenium | ND | mg/L | | 0.001 | 0.05 | E200.8 | 10/18/10 20:37 / sml |
| Silver | ND | mg/L | | 0.01 | 0.1 | E200.8 | 10/18/10 20:37 / sml |
| Thallium | ND | mg/L | | 0.0004 | 0.002 | E200.8 | 10/18/10 20:37 / sml |
| Uranium | 0.0018 | mg/L | | 0.0003 | 0.03 | E200.8 | 11/08/10 14:24 / sml |
| Zinc | ND | mg/L | | 0.01 | 5 | E200.8 | 10/18/10 20:37 / sml |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
B - The analyte was detected in the method blank.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater
Lab ID: C10091237-001
Client Sample ID: Lone Tree Fault 1-2

Report Date: 11/09/10
Collection Date: 09/28/10 08:52
Date Received: 09/30/10
Matrix: Aqueous

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--------|-------|------------|----|-------------|-------------|----------------------|
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | 3.2 | pCi/L | | | 15 | E900.0 | 10/14/10 22:50 / ep |
| Gross Alpha precision (±) | 1.3 | pCi/L | | | | E900.0 | 10/14/10 22:50 / ep |
| Gross Alpha MDC | 1.2 | pCi/L | | | | E900.0 | 10/14/10 22:50 / ep |
| Gross Beta | 3.4 | pCi/L | | | 50 | E900.0 | 10/14/10 22:50 / ep |
| Gross Beta precision (±) | 1.5 | pCi/L | | | | E900.0 | 10/14/10 22:50 / ep |
| Gross Beta MDC | 1.5 | pCi/L | | | | E900.0 | 10/14/10 22:50 / ep |
| Radium 226 | 0.2 | pCi/L | | | | E903.0 | 10/24/10 14:54 / trs |
| Radium 226 precision (±) | 0.2 | pCi/L | | | | E903.0 | 10/24/10 14:54 / trs |
| Radium 226 MDC | 0.1 | pCi/L | | | | E903.0 | 10/24/10 14:54 / trs |
| Radium 228 | 2.1 | pCi/L | | | | RA-05 | 10/19/10 09:32 / plj |
| Radium 228 precision (±) | 0.7 | pCi/L | | | | RA-05 | 10/19/10 09:32 / plj |
| Radium 228 MDC | 0.6 | pCi/L | | | | RA-05 | 10/19/10 09:32 / plj |
| Radium 226 + Radium 228 | 2.3 | pCi/L | | | 5 | A7500-RA | 10/25/10 16:25 / res |
| Radium 226 + Radium 228 precision (±) | 0.3 | pCi/L | | | | A7500-RA | 10/25/10 16:25 / res |
| Radium 226 + Radium 228 MDC | 0.6 | pCi/L | | | | A7500-RA | 10/25/10 16:25 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -5.10 | % | | | | Calculation | 10/26/10 14:48 / kbh |
| Anions | 2.76 | meq/L | | | | Calculation | 10/26/10 14:48 / kbh |
| Cations | 2.50 | meq/L | | | | Calculation | 10/26/10 14:48 / kbh |
| Solids, Total Dissolved Calculated | 152 | mg/L | | | | Calculation | 10/26/10 14:48 / kbh |
| TDS Balance (0.80 - 1.20) | 1.30 | | | | | Calculation | 10/26/10 14:48 / kbh |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.
MDC - Minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|---------------------------|--------|-------|-----|------|----------------------|------------|------------------------|----------|------|
| Method: A2310 B | | | | | | | | Batch: 101007_1_ACID-W | | |
| Sample ID: MBLK-1_101005 | Method Blank | | | | | Run: ACIDITY_101007A | | 10/07/10 09:13 | | |
| Acidity, Total as CaCO ₃ | | ND | mg/L | 1 | | | | | | |
| Sample ID: LCS-1_101005 | Laboratory Control Sample | | | | | Run: ACIDITY_101007A | | 10/07/10 09:20 | | |
| Acidity, Total as CaCO ₃ | | 1050 | mg/L | 5.0 | 105 | 80 | 120 | | | |
| Sample ID: C10091237-001ADUP | Sample Duplicate | | | | | Run: ACIDITY_101007A | | 10/07/10 09:29 | | |
| Acidity, Total as CaCO ₃ | | ND | mg/L | 5.0 | | | | 20 | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|----------------------|------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R137950 |
| Sample ID: MBLK | 3 | Method Blank | | | | Run: MANTECH_100930B | | | | 09/30/10 17:01 |
| Alkalinity, Total as CaCO ₃ | | ND | mg/L | 1 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1 | | | | | | |
| Bicarbonate as HCO ₃ | | ND | mg/L | 1 | | | | | | |
| Sample ID: LCS1 | | Laboratory Control Sample | | | | Run: MANTECH_100930B | | | | 09/30/10 17:21 |
| Alkalinity, Total as CaCO ₃ | | 217 | mg/L | 5.0 | 108 | 90 | 110 | | | |
| Sample ID: C10090349-001AMS | | Sample Matrix Spike | | | | Run: MANTECH_100930B | | | | 09/30/10 23:41 |
| Alkalinity, Total as CaCO ₃ | | 458 | mg/L | 5.0 | 111 | 80 | 120 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|----------|-----|------|-----------|-------------------------------------|-----|----------|----------------|
| Method: A2510 B | | | | | | | Analytical Run: ORION555A-2_100930B | | | |
| Sample ID: ICV2_100930_2 | | Initial Calibration Verification Standard | | | | | | | | 09/30/10 13:36 |
| Conductivity @ 25 C | | 1370 | umhos/cm | 1.0 | 97 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | Batch: 100930_2_PH-W_555A-2 | | | |
| Sample ID: MBLK1_100930_2 | | Method Blank | | | | | | | | 09/30/10 13:31 |
| Conductivity @ 25 C | | 0.3 | umhos/cm | 0.2 | | | | | | |
| Sample ID: C10091206-002ADUP | | Sample Duplicate | | | | | | | | 09/30/10 13:51 |
| Conductivity @ 25 C | | 799 | umhos/cm | 1.0 | | | | 0.1 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|----|------|--------------------|------------|----------------------------|----------|----------------|
| Method: A2540 C | | | | | | | | Batch: 101001_1_SLDS-TDS-W | | |
| Sample ID: MBLK1_101001 | Method Blank | | | | | Run: BAL-1_101001A | | | | 10/01/10 17:39 |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 10 | | | | | | |
| Sample ID: LCS1_101001 | Laboratory Control Sample | | | | | Run: BAL-1_101001A | | | | 10/01/10 17:40 |
| Solids, Total Dissolved TDS @ 180 C | | 1000 | mg/L | 10 | 100 | 90 | 110 | | | |
| Sample ID: C10091208-003AMS | Sample Matrix Spike | | | | | Run: BAL-1_101001A | | | | 10/01/10 17:42 |
| Solids, Total Dissolved TDS @ 180 C | | 4280 | mg/L | 10 | 105 | 90 | 110 | | | |
| Sample ID: C10091208-003AMSD | Sample Matrix Spike Duplicate | | | | | Run: BAL-1_101001A | | | | 10/01/10 17:42 |
| Solids, Total Dissolved TDS @ 180 C | | 4220 | mg/L | 10 | 102 | 90 | 110 | 1.5 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|------|------|-----------|------------|-----|----------|-------------------------------------|
| Method: A4500-F C | | | | | | | | | | Batch: R137978 |
| Sample ID: MBLK | Method Blank | | | | | | | | | |
| Fluoride | | ND | mg/L | 0.05 | | | | | | Run: MANTECH_101001A 10/01/10 08:55 |
| Sample ID: LCS | Laboratory Control Sample | | | | | | | | | |
| Fluoride | | 1.02 | mg/L | 0.10 | 102 | 90 | 110 | | | Run: MANTECH_101001A 10/01/10 08:58 |
| Sample ID: C10091208-006AMS | Sample Matrix Spike | | | | | | | | | |
| Fluoride | | 1.15 | mg/L | 0.10 | 99 | 80 | 120 | | | Run: MANTECH_101001A 10/01/10 09:21 |
| Sample ID: C10091208-006AMSD | Sample Matrix Spike Duplicate | | | | | | | | | |
| Fluoride | | 1.17 | mg/L | 0.10 | 101 | 80 | 120 | 1.7 | 10 | Run: MANTECH_101001A 10/01/10 09:25 |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|-------|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A4500-H B | | | | | | | | Analytical Run: ORION555A-2_100930B | | |
| Sample ID: ICV1_100930_2 | | Initial Calibration Verification Standard | | | | | | | | 09/30/10 13:33 |
| pH | | 6.86 | s.u. | 0.010 | 100 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | | Batch: 100930_2_PH-W_555A-2 | | |
| Sample ID: C10091206-002ADUP | | Sample Duplicate | | | | | | | | 09/30/10 13:51 |
| pH | | 8.15 | s.u. | 0.010 | | | | 0 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|-----------|---------------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R138144 |
| Sample ID: MB-101005A | 5 | Method Blank | | | | | Run: ICP2-C_101005A | | | 10/05/10 11:12 |
| Calcium | | ND | mg/L | 0.2 | | | | | | |
| Magnesium | | ND | mg/L | 0.05 | | | | | | |
| Potassium | | ND | mg/L | 0.02 | | | | | | |
| Silicon | | ND | mg/L | 0.007 | | | | | | |
| Sodium | | ND | mg/L | 0.3 | | | | | | |
| Sample ID: LFB-101005A | 5 | Laboratory Fortified Blank | | | | | Run: ICP2-C_101005A | | | 10/05/10 11:16 |
| Calcium | | 48.9 | mg/L | 0.50 | 98 | 85 | 115 | | | |
| Magnesium | | 51.3 | mg/L | 0.50 | 103 | 85 | 115 | | | |
| Potassium | | 46.1 | mg/L | 0.50 | 92 | 85 | 115 | | | |
| Silicon | | 0.468 | mg/L | 0.10 | 100 | 85 | 115 | | | |
| Sodium | | 49.4 | mg/L | 0.50 | 99 | 85 | 115 | | | |
| Sample ID: C10091234-001BMS2 | 5 | Sample Matrix Spike | | | | | Run: ICP2-C_101005A | | | 10/05/10 19:28 |
| Calcium | | 757 | mg/L | 1.1 | 89 | 70 | 130 | | | |
| Magnesium | | 471 | mg/L | 1.0 | 97 | 70 | 130 | | | |
| Potassium | | 280 | mg/L | 1.0 | 88 | 70 | 130 | | | |
| Silicon | | 14.2 | mg/L | 0.10 | | 70 | 130 | | | A |
| Sodium | | 307 | mg/L | 1.4 | 95 | 70 | 130 | | | |
| Sample ID: C10091234-001BMSD | 5 | Sample Matrix Spike Duplicate | | | | | Run: ICP2-C_101005A | | | 10/05/10 19:32 |
| Calcium | | 755 | mg/L | 1.1 | 88 | 70 | 130 | 0.3 | 20 | |
| Magnesium | | 466 | mg/L | 1.0 | 95 | 70 | 130 | 1 | 20 | |
| Potassium | | 286 | mg/L | 1.0 | 90 | 70 | 130 | 1.8 | 20 | |
| Silicon | | 14.2 | mg/L | 0.10 | | 70 | 130 | 0.2 | 20 | A |
| Sodium | | 313 | mg/L | 1.4 | 98 | 70 | 130 | 2 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|--------|------|---------------------|------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: 27798 |
| Sample ID: MB-27798 | 3 | Method Blank | | | | Run: ICP2-C_101014A | | | | 10/14/10 13:20 |
| Boron | | 0.02 | mg/L | 0.008 | | | | | | |
| Iron | | 0.04 | mg/L | 0.008 | | | | | | |
| Manganese | | ND | mg/L | 0.0008 | | | | | | |
| Sample ID: LCS3-27798 | 3 | Laboratory Control Sample | | | | Run: ICP2-C_101014A | | | | 10/14/10 13:29 |
| Boron | | 0.523 | mg/L | 0.10 | 101 | 85 | 115 | | | |
| Iron | | 2.76 | mg/L | 0.030 | 109 | 85 | 115 | | | |
| Manganese | | 2.65 | mg/L | 0.010 | 106 | 85 | 115 | | | |
| Sample ID: C10091239-001CMS3 | 3 | Sample Matrix Spike | | | | Run: ICP2-C_101014A | | | | 10/14/10 13:45 |
| Boron | | 0.876 | mg/L | 0.10 | 109 | 70 | 130 | | | |
| Iron | | 4.62 | mg/L | 0.030 | 126 | 70 | 130 | | | |
| Manganese | | 2.62 | mg/L | 0.010 | 102 | 70 | 130 | | | |
| Sample ID: C10091239-001CMSD | 3 | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_101014A | | | | 10/14/10 13:49 |
| Boron | | 0.863 | mg/L | 0.10 | 106 | 70 | 130 | 1.5 | 20 | |
| Iron | | 5.17 | mg/L | 0.030 | 148 | 70 | 130 | 11 | 20 | S |
| Manganese | | 2.56 | mg/L | 0.010 | 100 | 70 | 130 | 2.1 | 20 | |

Qualifiers:

RL - Analyte reporting limit.
 MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
 S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----------------------|------|-----------|----------------|-----|----------|--------------|
| Method: E200.8 | | | | | | | | | | Batch: 27798 |
| Sample ID: MB-27798 | 13 | Method Blank | | Run: ICPMS2-C_101018A | | | 10/18/10 20:17 | | | |
| Aluminum | | 0.006 | mg/L | 0.006 | | | | | | |
| Antimony | | ND | mg/L | 0.0003 | | | | | | |
| Barium | | ND | mg/L | 0.0002 | | | | | | |
| Beryllium | | ND | mg/L | 6E-05 | | | | | | |
| Cadmium | | ND | mg/L | 7E-05 | | | | | | |
| Chromium | | 0.003 | mg/L | 0.0005 | | | | | | |
| Copper | | 0.0005 | mg/L | 0.0002 | | | | | | |
| Lead | | ND | mg/L | 8E-05 | | | | | | |
| Nickel | | 0.0003 | mg/L | 9E-05 | | | | | | |
| Selenium | | ND | mg/L | 0.0008 | | | | | | |
| Silver | | ND | mg/L | 0.0002 | | | | | | |
| Thallium | | ND | mg/L | 0.0004 | | | | | | |
| Zinc | | ND | mg/L | 0.001 | | | | | | |
| Sample ID: LCS3-27798 | 13 | Laboratory Control Sample | | Run: ICPMS2-C_101018A | | | 10/18/10 20:24 | | | |
| Aluminum | | 2.6 | mg/L | 0.10 | 104 | 85 | 115 | | | |
| Antimony | | 0.61 | mg/L | 0.0010 | 123 | 85 | 115 | | | S |
| Barium | | 0.58 | mg/L | 0.10 | 116 | 85 | 115 | | | S |
| Beryllium | | 0.28 | mg/L | 0.0010 | 111 | 85 | 115 | | | |
| Cadmium | | 0.27 | mg/L | 0.0010 | 109 | 85 | 115 | | | |
| Chromium | | 0.55 | mg/L | 0.050 | 109 | 85 | 115 | | | |
| Copper | | 0.55 | mg/L | 0.010 | 109 | 85 | 115 | | | |
| Lead | | 0.58 | mg/L | 0.0010 | 115 | 85 | 115 | | | |
| Nickel | | 0.54 | mg/L | 0.050 | 108 | 85 | 115 | | | |
| Selenium | | 0.55 | mg/L | 0.0010 | 110 | 85 | 115 | | | |
| Silver | | 0.054 | mg/L | 0.010 | 107 | 85 | 115 | | | |
| Thallium | | 0.56 | mg/L | 0.00040 | 111 | 85 | 115 | | | |
| Zinc | | 0.52 | mg/L | 0.010 | 104 | 85 | 115 | | | |
| - Antimony and Barium response is above standard QA limit. This could indicate a high bias for the sample results. Since there were no detectable analyte responses, and the remainder of the run QA is within acceptance range, this batch is approved. | | | | | | | | | | |
| Sample ID: C10091239-001CMS3 | 13 | Sample Matrix Spike | | Run: ICPMS2-C_101018A | | | 10/18/10 20:50 | | | |
| Aluminum | | 4.7 | mg/L | 0.10 | 123 | 70 | 130 | | | |
| Antimony | | 0.59 | mg/L | 0.0010 | 118 | 70 | 130 | | | |
| Barium | | 0.60 | mg/L | 0.10 | 113 | 70 | 130 | | | |
| Beryllium | | 0.24 | mg/L | 0.0010 | 96 | 70 | 130 | | | |
| Cadmium | | 0.25 | mg/L | 0.0010 | 100 | 70 | 130 | | | |
| Chromium | | 0.48 | mg/L | 0.050 | 95 | 70 | 130 | | | |
| Copper | | 0.50 | mg/L | 0.010 | 99 | 70 | 130 | | | |
| Lead | | 0.57 | mg/L | 0.0010 | 113 | 70 | 130 | | | |
| Nickel | | 0.50 | mg/L | 0.050 | 99 | 70 | 130 | | | |
| Selenium | | 0.48 | mg/L | 0.0010 | 96 | 70 | 130 | | | |
| Silver | | 0.050 | mg/L | 0.010 | 99 | 70 | 130 | | | |
| Thallium | | 0.53 | mg/L | 0.00040 | 107 | 70 | 130 | | | |
| Zinc | | 0.48 | mg/L | 0.010 | 90 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----------------------|------|-----------|------------|----------------|----------|--------------|
| Method: E200.8 | | | | | | | | | | Batch: 27798 |
| Sample ID: C10091239-001CMSD | 13 | Sample Matrix Spike Duplicate | | Run: ICPMS2-C_101018A | | | | 10/18/10 21:24 | | |
| Aluminum | | 5.4 | mg/L | 0.10 | 149 | 70 | 130 | 13 | 20 | S |
| Antimony | | 0.59 | mg/L | 0.0010 | 117 | 70 | 130 | 0.8 | 20 | |
| Barium | | 0.59 | mg/L | 0.10 | 112 | 70 | 130 | 1.2 | 20 | |
| Beryllium | | 0.23 | mg/L | 0.0010 | 93 | 70 | 130 | 2.8 | 20 | |
| Cadmium | | 0.25 | mg/L | 0.0010 | 98 | 70 | 130 | 2.3 | 20 | |
| Chromium | | 0.47 | mg/L | 0.050 | 93 | 70 | 130 | 2.1 | 20 | |
| Copper | | 0.49 | mg/L | 0.010 | 98 | 70 | 130 | 1.9 | 20 | |
| Lead | | 0.56 | mg/L | 0.0010 | 112 | 70 | 130 | 0.8 | 20 | |
| Nickel | | 0.48 | mg/L | 0.050 | 96 | 70 | 130 | 2.9 | 20 | |
| Selenium | | 0.47 | mg/L | 0.0010 | 95 | 70 | 130 | 1.3 | 20 | |
| Silver | | 0.048 | mg/L | 0.010 | 97 | 70 | 130 | 2.7 | 20 | |
| Thallium | | 0.53 | mg/L | 0.00040 | 106 | 70 | 130 | 0.6 | 20 | |
| Zinc | | 0.47 | mg/L | 0.010 | 90 | 70 | 130 | 0.6 | 20 | |
| Method: E200.8 | | | | | | | | | | Batch: 27798 |
| Sample ID: MB-27798 | | Method Blank | | Run: ICPMS2-C_101020A | | | | 10/21/10 02:47 | | |
| Arsenic | | ND | mg/L | 0.0008 | | | | | | |
| Sample ID: LCS3-27798 | | Laboratory Control Sample | | Run: ICPMS2-C_101020A | | | | 10/21/10 02:52 | | |
| Arsenic | | 0.55 | mg/L | 0.0010 | 110 | 85 | 115 | | | |
| Sample ID: C10091239-001CMS3 | | Sample Matrix Spike | | Run: ICPMS2-C_101020A | | | | 10/21/10 03:13 | | |
| Arsenic | | 0.54 | mg/L | 0.0010 | 108 | 70 | 130 | | | |
| Sample ID: C10091239-001CMSD | | Sample Matrix Spike Duplicate | | Run: ICPMS2-C_101020A | | | | 10/21/10 03:39 | | |
| Arsenic | | 0.53 | mg/L | 0.0010 | 105 | 70 | 130 | 2 | 20 | |
| Method: E200.8 | | | | | | | | | | Batch: 28073 |
| Sample ID: MB-28073 | | Method Blank | | Run: ICPMS2-C_101108A | | | | 11/08/10 14:12 | | |
| Uranium | | ND | mg/L | 6E-05 | | | | | | |
| Sample ID: LCS3-28073 | | Laboratory Control Sample | | Run: ICPMS2-C_101108A | | | | 11/08/10 14:16 | | |
| Uranium | | 0.56 | mg/L | 0.00030 | 111 | 85 | 115 | | | |
| Sample ID: C10110089-001AMS3 | | Sample Matrix Spike | | Run: ICPMS2-C_101108A | | | | 11/08/10 14:53 | | |
| Uranium | | 0.59 | mg/L | 0.00030 | 119 | 70 | 130 | | | |
| Sample ID: C10110089-001AMSD | | Sample Matrix Spike Duplicate | | Run: ICPMS2-C_101108A | | | | 11/08/10 14:57 | | |
| Uranium | | 0.58 | mg/L | 0.00030 | 116 | 70 | 130 | 2.2 | 20 | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|---------|-------|---------|------|-----------|------------|-----|----------|----------------|
| Method: E245.1 | | | | | | | | | | Batch: 27681 |
| Sample ID: MB-27681 | Method Blank | | | | | | | | | 10/05/10 09:03 |
| Mercury | | 0.0001 | mg/L | 8E-06 | | | | | | |
| Sample ID: LCS-27681 | Laboratory Control Sample | | | | | | | | | 10/05/10 09:05 |
| Mercury | | 0.00500 | mg/L | 0.0010 | 97 | 85 | 115 | | | |
| Sample ID: C10091172-001BMS | Sample Matrix Spike | | | | | | | | | 10/05/10 09:25 |
| Mercury | | 0.00566 | mg/L | 0.00010 | 110 | 85 | 115 | | | |
| Sample ID: C10091172-001BMSD | Sample Matrix Spike Duplicate | | | | | | | | | 10/05/10 09:26 |
| Mercury | | 0.00568 | mg/L | 0.00010 | 111 | 85 | 115 | 0.2 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|--------------------|------------|-----|----------|----------------|
| Method: E300.0 | | | | | | | | | | Batch: R138489 |
| Sample ID: LCS | 2 | Laboratory Control Sample | | | | Run: IC2-C_101011A | | | | 10/11/10 17:02 |
| Chloride | | 9.55 | mg/L | 1.0 | 95 | 90 | 110 | | | |
| Sulfate | | 38.2 | mg/L | 1.0 | 96 | 90 | 110 | | | |
| Sample ID: MBLK | 2 | Method Blank | | | | Run: IC2-C_101011A | | | | 10/11/10 17:19 |
| Chloride | | ND | mg/L | 0.06 | | | | | | |
| Sulfate | | ND | mg/L | 0.2 | | | | | | |
| Sample ID: C10091238-004AMS | 2 | Sample Matrix Spike | | | | Run: IC2-C_101011A | | | | 10/12/10 07:00 |
| Chloride | | 125 | mg/L | 1.0 | 101 | 80 | 120 | | | |
| Sulfate | | 367 | mg/L | 4.0 | 102 | 80 | 120 | | | |
| Sample ID: C10091238-004AMSD | 2 | Sample Matrix Spike Duplicate | | | | Run: IC2-C_101011A | | | | 10/12/10 07:16 |
| Chloride | | 124 | mg/L | 1.0 | 100 | 80 | 120 | 0.6 | 20 | |
| Sulfate | | 366 | mg/L | 4.0 | 101 | 80 | 120 | 0.3 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|-----------|------------------------|-----|----------|----------------|
| Method: E353.2 | | | | | | | | | | Batch: R138546 |
| Sample ID: MBLK-1 | | Method Blank | | | | | Run: TECHNICON_101014A | | | 10/14/10 13:08 |
| Nitrogen, Nitrate+Nitrite as N | | ND | mg/L | 0.04 | | | | | | |
| Sample ID: LCS-2 | | Laboratory Control Sample | | | | | Run: TECHNICON_101014A | | | 10/14/10 13:10 |
| Nitrogen, Nitrate+Nitrite as N | | 2.47 | mg/L | 0.10 | 99 | 90 | 110 | | | |
| Sample ID: C10091237-001EMS | | Sample Matrix Spike | | | | | Run: TECHNICON_101014A | | | 10/14/10 16:48 |
| Nitrogen, Nitrate+Nitrite as N | | 2.38 | mg/L | 0.10 | 97 | 90 | 110 | | | |
| Sample ID: C10091237-001EMSD | | Sample Matrix Spike Duplicate | | | | | Run: TECHNICON_101014A | | | 10/14/10 16:51 |
| Nitrogen, Nitrate+Nitrite as N | | 2.47 | mg/L | 0.10 | 102 | 90 | 110 | 3.7 | 10 | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|---------------------|------------|-----|----------|------------------|
| Method: E900.0 | | | | | | | | | | Batch: GrAB-0979 |
| Sample ID: MB-GrAB-0979 | 6 | Method Blank | | | | Run: G5000W_101013A | | | | 10/14/10 22:50 |
| Gross Alpha | | -1 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.7 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 0.9 | pCi/L | | | | | | | |
| Gross Beta | | 0.1 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 1 | pCi/L | | | | | | | |
| Gross Beta MDC | | 1 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-0979 | | Laboratory Control Sample | | | | Run: G5000W_101013A | | | | 10/14/10 22:50 |
| Gross Alpha | | 110 | pCi/L | 111 | | 70 | 130 | | | |
| Sample ID: Cs137-GrAB-0979 | | Laboratory Control Sample | | | | Run: G5000W_101013A | | | | 10/14/10 22:50 |
| Gross Beta | | 86 | pCi/L | 97 | | 70 | 130 | | | |
| Sample ID: C10100001-002EDUP | 6 | Sample Duplicate | | | | Run: G5000W_101013A | | | | 10/16/10 00:18 |
| Gross Alpha | | 76.0 | pCi/L | | | | | 6.3 | 24.7 | |
| Gross Alpha precision (±) | | 5.68 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 4.01 | pCi/L | | | | | | | |
| Gross Beta | | 27.8 | pCi/L | | | | | 25 | 28.6 | |
| Gross Beta precision (±) | | 2.37 | pCi/L | | | | | | | |
| Gross Beta MDC | | 3.20 | pCi/L | | | | | | | |
| Sample ID: C10100001-007EMS | | Sample Matrix Spike | | | | Run: G5000W_101013A | | | | 10/16/10 00:18 |
| Gross Alpha | | 113 | pCi/L | 109 | | 70 | 130 | | | |
| Sample ID: C10100001-007EMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_101013A | | | | 10/16/10 00:18 |
| Gross Alpha | | 99.3 | pCi/L | 96 | | 70 | 130 | 13 | 19.1 | |
| Sample ID: C10100001-007EMS | | Sample Matrix Spike | | | | Run: G5000W_101013A | | | | 10/16/10 00:18 |
| Gross Beta | | 93.3 | pCi/L | 95 | | 70 | 130 | | | |
| Sample ID: C10100001-007EMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_101013A | | | | 10/16/10 00:18 |
| Gross Beta | | 94.8 | pCi/L | 97 | | 70 | 130 | 1.6 | 15.8 | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------------------------------|--------------|-------|-----------------------------|------|-----------|----------------|-----|-------------------|------|
| Method: E903.0 | | | | | | | | | Batch: RA226-4881 | |
| Sample ID: C10091222-001FMS | Sample Matrix Spike | | | Run: BERTHOLD 770-2_101008A | | | 10/24/10 14:54 | | | |
| Radium 226 | 15 | pCi/L | | 92 | | 70 | 130 | | | |
| Sample ID: C10091222-001FMSD | Sample Matrix Spike Duplicate | | | Run: BERTHOLD 770-2_101008A | | | 10/24/10 14:54 | | | |
| Radium 226 | 17 | pCi/L | | 101 | | 70 | 130 | 7.6 | 25.4 | |
| Sample ID: MB-RA226-4881 | 3 | Method Blank | | Run: BERTHOLD 770-2_101008A | | | 10/24/10 16:36 | | | |
| Radium 226 | | -0.1 | pCi/L | | | | | | | U |
| Radium 226 precision (±) | | 0.08 | pCi/L | | | | | | | |
| Radium 226 MDC | | 0.2 | pCi/L | | | | | | | |
| Sample ID: LCS-RA226-4881 | Laboratory Control Sample | | | Run: BERTHOLD 770-2_101008A | | | 10/24/10 16:36 | | | |
| Radium 226 | 8.9 | pCi/L | | 114 | | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

QA/QC Summary Report

Client: Lidstone and Associates
Project: Belvoir Paleozoic Groundwater

Report Date: 11/09/10
Work Order: C10091237

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------------------------------|--------------|-------|----|-------------------------|-----------|------------|-------------------|----------|------|
| Method: RA-05 | | | | | | | | Batch: RA228-3425 | | |
| Sample ID: LCS-228-RA226-4881 | Laboratory Control Sample | | | | Run: TENNELEC-3_101008E | | | 10/19/10 09:32 | | |
| Radium 228 | | 6.7 | pCi/L | | 84 | 70 | 130 | | | |
| Sample ID: MB-RA226-4881 | 3 | Method Blank | | | Run: TENNELEC-3_101008E | | | 10/19/10 09:32 | | |
| Radium 228 | | 0.5 | pCi/L | | | | | | | U |
| Radium 228 precision (±) | | 0.6 | pCi/L | | | | | | | |
| Radium 228 MDC | | 0.6 | pCi/L | | | | | | | |
| Sample ID: C10100016-001NMS | Sample Matrix Spike | | | | Run: TENNELEC-3_101008E | | | 10/19/10 09:32 | | |
| Radium 228 | | 13 | pCi/L | | 88 | 70 | 130 | | | |
| Sample ID: C10100016-001NMSD | Sample Matrix Spike Duplicate | | | | Run: TENNELEC-3_101008E | | | 10/19/10 09:32 | | |
| Radium 228 | | 13 | pCi/L | | 82 | 70 | 130 | 6.1 | 34.7 | |

Qualifiers:

RL - Analyte reporting limit.
MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C10091237

Login completed by: Tabitha Edwards

Date Received: 9/30/2010

Reviewed by: BL2000\hackerman

Received by: tae

Reviewed Date: 10/6/2010

Carrier name: Ground

| | | | |
|---|---|--|--|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> | |
| Container/Temp Blank temperature: | 5°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input checked="" type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

Called Mark Stacey 09/30/10 @11:00 regarding the following:

The sample for Nitrate analysis was split and preserved with 1mL of H2SO4 past the 48 hour holding time as per Mark Stacey.

The sample for Cyanide analysis was cancelled per Mark Stacey due to not being preserved immediately in the field.

The sample for Iron Bacteria, Total Coliform Bacteria, and Odor was cancelled per Mark Stacey due to not being in the proper container.

Turbidity, Foaming Agents, Color, and Nitrite were all cancelled per Mark Stacey due to being received past the holding time.

The sample for dissolved metals was subsampled, filtered and preserved with 2 mL of HNO3 in the lab upon receipt to pH <2.

The sample for total metals was preserved with 2 mLs of HNO3 upon receipt to a pH <2 in the laboratory. In accordance with the Clean Water Act, these samples must be held for 24 hours prior to analysis.



Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT (Provide as much information as possible.)

| | | | | | | | | | | | |
|--|--|--|--|--------------------|--|--|-----------------------------------|--|--|----------------------------------|--|
| Company Name: <i>LIPSTONE and Associates, Inc.</i> | | | Project Name, PWS, Permit, Etc. <i>Bellevue Palisades Groundwater</i> | | | Sample Origin State: <i>NY</i> | | EPA/State Compliance: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | | | |
| Report Mail Address: <i>4025 Automation Way, Bldg. E Ft. Collins, CO 80525</i> | | | Contact Name: <i>Mark Stacy</i> | | Phone/Fax: <i>970-223-4705 / 970-223-4706</i> | | Email: <i>MBA@LIPSTONE.COM</i> | | Sampler: (Please Print) <i>MARK STACY</i> | | |
| Invoice Address: <i>Same</i> | | | Invoice Contact & Phone: <i>Melinda Culver - 970-223-4705</i> | | | Purchase Order: <i>WYWDG109</i> | | Quote/Bottle Order: _____ | | | |
| Special Report/Formats: <input type="checkbox"/> DW <input type="checkbox"/> POTWWTP <input type="checkbox"/> State: _____ <input type="checkbox"/> Other: _____ <input checked="" type="checkbox"/> EDD/EDT (Electronic Data) Format: <i>PDF</i> <input type="checkbox"/> LEVEL IV <input type="checkbox"/> NELAC | | | ANALYSIS REQUESTED Number of Containers Sample Type: A W S V B O DW Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water <i>WYWDG-FINAL</i> <i>W/OUT ORGANICS</i> SEE ATTACHED Standard Turnaround (TAT) <i>RUSH</i> | | | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page Comments: | | Shipped by: <i>WAS-G</i> | | | |
| | | | | | | | | Cooler ID(s): <i>2953</i> | | | |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | | | Collection Date | Collection Time | MATRIX | | | Receipt Temp <i>5</i> °C | | | |
| 1 <i>LONE TREE FAULT 1-2</i> | | | <i>9/28/10</i> | <i>0852</i> | <i>3W</i> | <i>X</i> | <i>X</i> | <i>X</i> | On Ice: <input checked="" type="radio"/> Y <input type="radio"/> N | | |
| 2 | | | | | | | | | Custody Seal On Bottle <input checked="" type="radio"/> Y <input type="radio"/> N On Cooler <input checked="" type="radio"/> Y <input type="radio"/> N | | |
| 3 | | | | | | | | | Intact <input checked="" type="radio"/> Y <input type="radio"/> N | | |
| 4 | | | | | | | | | Signature Match <input checked="" type="radio"/> Y <input type="radio"/> N | | |
| 5 | | | | | | | | | LABORATORY USE ONLY <i>C10091237</i> | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| Custody Record MUST be Signed | | | Relinquished by (print): <i>MARK STACY</i> | | Date/Time: <i>9/28/10/1346</i> | | Signature: <i>[Signature]</i> | | Received by (print): <i>MALEN COAR</i> | | |
| | | | Relinquished by (print): | | Date/Time: | | Signature: | | Received by (print): | | |
| | | | Date/Time: | | Signature: | | Date/Time: | | Signature: | | |
| Sample Disposal: Return to Client: | | | Lab Disposal: <i>X</i> | | | Received by Laboratory: | | Date/Time: <i>9/30/10 09:30</i> | | Signature: <i>[Signature]</i> | |

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

Goose Creek 2-2C



ANALYTICAL SUMMARY REPORT

April 19, 2011

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C11030482

Project Name: Goose Creek 2-2C

Energy Laboratories, Inc. Casper WY received the following 1 sample for Lidstone and Associates on 3/16/2011 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|------------------|----------------|--------------|---------|--|
| C11030482-001 | Goose Creek 2-2 | 03/15/11 14:06 | 03/16/11 | Aqueous | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Total Alkalinity Bacteria, Iron Related Bacteria, SDWA Conductivity Sample Filtering pH Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta Radium 226, Total Radium 228, Total Solids, Total Dissolved Solids, Total Suspended |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Stephanie D Waldrop
Reporting Supervisor

Digitally signed by
Stephanie Waldrop
Date: 2011.04.19 10:33:03 -06:00



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Gillette, WY 866-686-7175 • Rapid City, SD 888-672-1225 • College Station, TX 888-690-2218

CLIENT: Lidstone and Associates
Project: Goose Creek 2-2C
Sample Delivery Group: C11030482

Revised Date: 04/19/11

Report Date: 04/13/11

CASE NARRATIVE

REVISED/SUPPLEMENTAL REPORT

The attached analytical report has been revised from a previously submitted report due to the request by Mark Stacy on 4/18/11 to change the project and sample name from Duck Creek 2-2 to Goose Creek 2-2. The data presented here is from this change.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Collection Date: 03/15/11 14:06

Received Date: 03/16/11 09:15

Matrix: Aqueous

Client: Lidstone and Associates
Project: Goose Creek 2-2C
Client Sample ID: Goose Creek 2-2
Sampled By: Jason Hayes
Lab ID: C11030482-001A

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|---------------------------|--------|-------|-------------|-----------|---------|-----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Absent | | SAFE | | A9223 B | 03/16/11 12:36 / rodh |
| Bacteria, E-Coli Coliform | Absent | | | | A9223 B | 03/16/11 12:36 / rodh |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C
Lab ID: C11030482-001
Client Sample ID: Goose Creek 2-2

Revised Date: 04/19/11
Report Date: 04/13/11
Collection Date: 03/15/11 14:06
Date Received: 03/16/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|----------|-----------|--------|-------------|-----------|-----------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related ~ 4.5 days incubation | 4300 | CFU/ml | | 1.0 | | IRB-BART | 03/16/11 12:36 / rodh |
| MAJOR IONS | | | | | | | |
| Carbonate as CO ₃ | ND | mg/L | | 5 | | A2320 B | 03/16/11 23:37 / jba |
| Bicarbonate as HCO ₃ | 167 | mg/L | | 5 | | A2320 B | 03/16/11 23:37 / jba |
| Calcium | 32 | mg/L | | 1 | | E200.7 | 03/18/11 16:37 / rdw |
| Magnesium | 15 | mg/L | | 1 | | E200.7 | 03/23/11 11:13 / cp |
| Potassium | 1 | mg/L | | 1 | | E200.7 | 03/18/11 16:37 / rdw |
| Sodium | 5 | mg/L | | 1 | | E200.7 | 03/18/11 16:37 / rdw |
| PHYSICAL PROPERTIES | | | | | | | |
| Conductivity @ 25 C | 265 | umhos/cm | | 1 | | A2510 B | 03/17/11 09:53 / lmc |
| pH | 7.98 | s.u. | | 0.01 | | A4500-H B | 03/17/11 09:53 / lmc |
| Solids, Total Dissolved TDS @ 180 C | 145 | mg/L | | 10 | | A2540 C | 03/17/11 13:38 / lmc |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | D | 40 | | A2540 D | 03/17/11 15:37 / lmc |
| METALS - TOTAL | | | | | | | |
| Iron | 0.17 | mg/L | | 0.03 | | E200.7 | 03/30/11 14:52 / cp |
| Uranium | 0.0024 | mg/L | | 0.0003 | | E200.8 | 04/08/11 17:53 / smf |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | 1.9 | pCi/L | | | | E900.0 | 03/22/11 13:47 / ep |
| Gross Alpha precision (±) | 1.1 | pCi/L | | | | E900.0 | 03/22/11 13:47 / ep |
| Gross Alpha MDC | 1.6 | pCi/L | | | | E900.0 | 03/22/11 13:47 / ep |
| Gross Beta | 1.7 | pCi/L | U | | | E900.0 | 03/22/11 13:47 / ep |
| Gross Beta precision (±) | 1.6 | pCi/L | | | | E900.0 | 03/22/11 13:47 / ep |
| Gross Beta MDC | 2.6 | pCi/L | | | | E900.0 | 03/22/11 13:47 / ep |
| Radium 226 | 0.36 | pCi/L | | | | E903.0 | 04/05/11 08:41 / trs |
| Radium 226 precision (±) | 0.11 | pCi/L | | | | E903.0 | 04/05/11 08:41 / trs |
| Radium 226 MDC | 0.09 | pCi/L | | | | E903.0 | 04/05/11 08:41 / trs |
| Radium 228 | 0.28 | pCi/L | U | | | RA-05 | 03/29/11 12:00 / plj |
| Radium 228 precision (±) | 0.59 | pCi/L | | | | RA-05 | 03/29/11 12:00 / plj |
| Radium 228 MDC | 0.97 | pCi/L | | | | RA-05 | 03/29/11 12:00 / plj |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration
U - Not detected at minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Client: Lidstone and Associates

Report Date: 04/13/11

Project: Goose Creek 2-2C

Work Order: C11030482

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R143700 |
| Sample ID: MBLK | 3 | Method Blank | | | | | Run: MANTECH_110316A | | | 03/16/11 16:42 |
| Alkalinity, Total as CaCO ₃ | | 2 | mg/L | 1 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1 | | | | | | |
| Bicarbonate as HCO ₃ | | 2 | mg/L | 1 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_110316A | | | 03/16/11 16:55 |
| Alkalinity, Total as CaCO ₃ | | 212 | mg/L | 5.0 | 105 | 90 | 110 | | | |
| Sample ID: C11030450-002ADUP | | Sample Duplicate | | | | | Run: MANTECH_110316A | | | 03/16/11 17:22 |
| Alkalinity, Total as CaCO ₃ | | 269 | mg/L | 5.0 | | | | 3.3 | 10 | |
| Sample ID: C11030457-007AMS | | Sample Matrix Spike | | | | | Run: MANTECH_110316A | | | 03/16/11 18:51 |
| Alkalinity, Total as CaCO ₃ | | 451 | mg/L | 5.0 | 110 | 80 | 120 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Work Order: C11030482

Client: Lidstone and Associates

Project: Goose Creek 2-2C

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|----------|-----|------|-----------|-------------------------------------|-----|----------|----------------|
| Method: A2510 B | | | | | | | Analytical Run: ORION555A-2_110317A | | | |
| Sample ID: ICV2_110317_1 | | Initial Calibration Verification Standard | | | | | | | | 03/17/11 09:29 |
| Conductivity @ 25 C | | 1390 | umhos/cm | 1.0 | 98 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | Batch: 110317_1_PH-W_555A-2 | | | |
| Sample ID: MBLK1_110317_1 | | Method Blank | | | | | | | | 03/17/11 09:25 |
| Conductivity @ 25 C | | 0.6 | umhos/cm | 0.2 | | | | | | |
| Sample ID: C11030475-001ADUP | | Sample Duplicate | | | | | | | | 03/17/11 09:51 |
| Conductivity @ 25 C | | 1010 | umhos/cm | 1.0 | | | | 0.1 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Client: Lidstone and Associates

Project: Goose Creek 2-2C

Work Order: C11030482

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|----|------|-----------|--------------------|-----|----------|----------------|
| Method: A2540 C | | | | | | | | | | Batch: R143800 |
| Sample ID: MBLK1_ | | Method Blank | | | | | Run: BAL-1_110317B | | | 03/17/11 13:30 |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 4 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | | Run: BAL-1_110317B | | | 03/17/11 13:30 |
| Solids, Total Dissolved TDS @ 180 C | | 1010 | mg/L | 10 | 101 | 90 | 110 | | | |
| Sample ID: C11030458-006ADUP | | Sample Duplicate | | | | | Run: BAL-1_110317B | | | 03/17/11 13:32 |
| Solids, Total Dissolved TDS @ 180 C | | 276 | mg/L | 10 | | | | 0.8 | 10 | |
| Sample ID: C11030160-006BMS | | Sample Matrix Spike | | | | | Run: BAL-1_110317B | | | 03/17/11 13:40 |
| Solids, Total Dissolved TDS @ 180 C | | 2430 | mg/L | 10 | 101 | 90 | 110 | | | |

Qualifiers:

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MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Work Order: C11030482

Client: Lidstone and Associates

Project: Goose Creek 2-2C

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|--------------------|------------|----------------|----------|----------------|
| Method: A2540 D | | | | | | | | | | Batch: R143789 |
| Sample ID: MBLK1_ | | Method Blank | | | | Run: BAL-1_110317A | | 03/17/11 15:36 | | |
| Solids, Total Suspended TSS @ 105 C | | ND | mg/L | 2 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | Run: BAL-1_110317A | | 03/17/11 15:36 | | |
| Solids, Total Suspended TSS @ 105 C | | 146 | mg/L | 40 | 73 | 60 | 110 | | | |
| Sample ID: C11030515-007ADUP | | Sample Duplicate | | | | Run: BAL-1_110317A | | 03/17/11 15:38 | | |
| Solids, Total Suspended TSS @ 105 C | | 5440 | mg/L | 400 | | | | 1.1 | 10 | |

Qualifiers:

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MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Client: Lidstone and Associates

Project: Goose Creek 2-2C

Work Order: C11030482

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|-------|-------|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A4500-H B | | | | | | | | Analytical Run: ORION555A-2_110317A | | |
| Sample ID: ICV1_110317_1 | | Initial Calibration Verification Standard | | | | | | | | 03/17/11 09:27 |
| pH | | 6.90 | s.u. | 0.010 | 101 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | | Batch: 110317_1_PH-W_555A-2 | | |
| Sample ID: C11030475-001ADUP | | Sample Duplicate | | | | | | | | 03/17/11 09:51 |
| pH | | 7.77 | s.u. | 0.010 | | | | 0.3 | 3 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Work Order: C11030482

Client: Lidstone and Associates

Project: Goose Creek 2-2C

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|---------------------|------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R143807 |
| Sample ID: MB-110318A | 3 | Method Blank | | | | Run: ICP2-C_110318A | | | | 03/18/11 13:46 |
| Calcium | | ND | mg/L | 0.2 | | | | | | |
| Potassium | | ND | mg/L | 0.02 | | | | | | |
| Sodium | | ND | mg/L | 0.3 | | | | | | |
| Sample ID: LFB-110318A | 3 | Laboratory Fortified Blank | | | | Run: ICP2-C_110318A | | | | 03/18/11 14:03 |
| Calcium | | 50.8 | mg/L | 0.50 | 100 | 85 | 115 | | | |
| Potassium | | 46.3 | mg/L | 0.50 | 91 | 85 | 115 | | | |
| Sodium | | 45.1 | mg/L | 0.50 | 88 | 85 | 115 | | | |
| Sample ID: C11030466-004BMS2 | 3 | Sample Matrix Spike | | | | Run: ICP2-C_110318A | | | | 03/18/11 16:16 |
| Calcium | | 12600 | mg/L | 57 | 99 | 70 | 130 | | | |
| Potassium | | 10300 | mg/L | 4.9 | 80 | 70 | 130 | | | |
| Sodium | | 16200 | mg/L | 72 | 88 | 70 | 130 | | | |
| Sample ID: C11030466-004BMSD | 3 | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_110318A | | | | 03/18/11 16:20 |
| Calcium | | 12400 | mg/L | 57 | 97 | 70 | 130 | 1.6 | 20 | |
| Potassium | | 10400 | mg/L | 4.9 | 82 | 70 | 130 | 1.5 | 20 | |
| Sodium | | 16200 | mg/L | 72 | 88 | 70 | 130 | 0.0 | 20 | |
| Method: E200.7 | | | | | | | | | | Batch: R143980 |
| Sample ID: MB-110322A | | Method Blank | | | | Run: ICP2-C_110322A | | | | 03/22/11 11:43 |
| Magnesium | | ND | mg/L | 0.05 | | | | | | |
| Sample ID: LFB-110322A | | Laboratory Fortified Blank | | | | Run: ICP2-C_110322A | | | | 03/22/11 11:47 |
| Magnesium | | 47.2 | mg/L | 0.50 | 94 | 85 | 115 | | | |
| Sample ID: C11030458-003DMS2 | | Sample Matrix Spike | | | | Run: ICP2-C_110322A | | | | 03/22/11 16:17 |
| Magnesium | | 118 | mg/L | 1.0 | 97 | 70 | 130 | | | |
| Sample ID: C11030458-003DMSD | | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_110322A | | | | 03/22/11 16:21 |
| Magnesium | | 121 | mg/L | 1.0 | 100 | 70 | 130 | 2.7 | 20 | |
| Method: E200.7 | | | | | | | | | | Batch: 29369 |
| Sample ID: MB-29369 | | Method Blank | | | | Run: ICP2-C_110330A | | | | 03/30/11 14:35 |
| Iron | | ND | mg/L | 0.008 | | | | | | |
| Sample ID: LCS3-29369 | | Laboratory Control Sample | | | | Run: ICP2-C_110330A | | | | 03/30/11 14:39 |
| Iron | | 2.58 | mg/L | 0.030 | 103 | 85 | 115 | | | |
| Sample ID: C11030648-011AMS3 | | Sample Matrix Spike | | | | Run: ICP2-C_110330A | | | | 03/30/11 15:04 |
| Iron | | 2.96 | mg/L | 0.030 | 99 | 70 | 130 | | | |
| Sample ID: C11030648-011AMSD | | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_110330A | | | | 03/30/11 15:08 |
| Iron | | 3.24 | mg/L | 0.030 | 110 | 70 | 130 | 9.0 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Client: Lidstone and Associates

Report Date: 04/13/11

Project: Goose Creek 2-2C

Work Order: C11030482

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|---------|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E200.8 | | | | | | | | | | Batch: 29369 |
| Sample ID: MB-29369 | Method Blank | | | | | | | | | |
| Uranium | | ND | mg/L | 4E-05 | | | | | | Run: ICPMS2-C_110408A 04/08/11 17:33 |
| Sample ID: LCS3-29369 | Laboratory Control Sample | | | | | | | | | |
| Uranium | | 0.565 | mg/L | 0.00030 | 113 | 85 | 115 | | | Run: ICPMS2-C_110408A 04/08/11 17:40 |
| Sample ID: C11030648-011AMS3 | Sample Matrix Spike | | | | | | | | | |
| Uranium | | 0.541 | mg/L | 0.00030 | 108 | 70 | 130 | | | Run: ICPMS2-C_110408A 04/08/11 18:13 |
| Sample ID: C11030648-011AMSD | Sample Matrix Spike Duplicate | | | | | | | | | |
| Uranium | | 0.566 | mg/L | 0.00030 | 113 | 70 | 130 | 4.5 | 20 | Run: ICPMS2-C_110408A 04/08/11 18:20 |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Work Order: C11030482

Client: Lidstone and Associates

Project: Goose Creek 2-2C

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|-------------------------------|-------|----|------|---------------------|------------|-----|------------------|------|
| Method: E900.0 | | | | | | | | | Batch: GrAB-1060 | |
| Sample ID: MB-GrAB-1060 | 6 | Method Blank | | | | Run: G5000W_110318A | | | 03/22/11 01:38 | |
| Gross Alpha | | -0.3 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.6 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 1 | pCi/L | | | | | | | |
| Gross Beta | | -0.01 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 2 | pCi/L | | | | | | | |
| Gross Beta MDC | | 3 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-1060 | | Laboratory Control Sample | | | | Run: G5000W_110318A | | | 03/22/11 01:38 | |
| Gross Alpha | | 79.5 | pCi/L | | 78 | 80 | 120 | | | S |
| - LCS response is outside of the acceptance range for this analysis. Since the MB, MS, and MSD are acceptable the batch is approved. | | | | | | | | | | |
| Sample ID: C11030481-002CMS | | Sample Matrix Spike | | | | Run: G5000W_110318A | | | 03/22/11 01:38 | |
| Gross Beta | | 90 | pCi/L | | 102 | 70 | 130 | | | |
| Sample ID: C11030481-002CMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_110318A | | | 03/22/11 13:47 | |
| Gross Beta | | 83 | pCi/L | | 95 | 70 | 130 | 7.5 | 16.1 | |
| Sample ID: C11030492-011ADUP | 6 | Sample Duplicate | | | | Run: G5000W_110318A | | | 03/22/11 13:47 | |
| Gross Alpha | | 38.2 | pCi/L | | | | | 5.5 | 33.7 | |
| Gross Alpha precision (±) | | 4.46 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 4.04 | pCi/L | | | | | | | |
| Gross Beta | | 44.3 | pCi/L | | | | | 3.3 | 24.2 | |
| Gross Beta precision (±) | | 3.18 | pCi/L | | | | | | | |
| Gross Beta MDC | | 4.14 | pCi/L | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

U - Not detected at minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Client: Lidstone and Associates

Report Date: 04/13/11

Project: Goose Creek 2-2C

Work Order: C11030482

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------------------------------|--------------|-------|-------------------------|------|-----------|----------------|-------------------|----------|------|
| Method: E903.0 | | | | | | | | Batch: RA226-5247 | | |
| Sample ID: C11030378-003FMS | Sample Matrix Spike | | | Run: TENNELEC-3_110318H | | | 04/05/11 08:41 | | | |
| Radium 226 | 13 | pCi/L | | 96 | 70 | 130 | | | | |
| Sample ID: C11030378-003FMSD | Sample Matrix Spike Duplicate | | | Run: TENNELEC-3_110318H | | | 04/05/11 08:41 | | | |
| Radium 226 | 12 | pCi/L | | 90 | 70 | 130 | 5.7 | 24.2 | | |
| Sample ID: MB-RA226-5247 | 3 | Method Blank | | Run: TENNELEC-3_110318H | | | 04/05/11 08:41 | | | |
| Radium 226 | | 0.08 | pCi/L | U | | | | | | |
| Radium 226 precision (±) | | 0.07 | pCi/L | | | | | | | |
| Radium 226 MDC | | 0.1 | pCi/L | | | | | | | |
| Sample ID: LCS-RA226-5247 | Laboratory Control Sample | | | Run: TENNELEC-3_110318H | | | 04/05/11 08:41 | | | |
| Radium 226 | 6.2 | pCi/L | | 97 | 85 | 115 | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

U - Not detected at minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Revised Date: 04/19/11

Report Date: 04/13/11

Work Order: C11030482

Client: Lidstone and Associates

Project: Goose Creek 2-2C

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------------|-------|--------|-------------------------|----|------|-----------|------------|-----|----------|-------------------|
| Method: RA-05 | | | | | | | | | | Batch: RA228-3642 |
| Sample ID: LCS-228-RA226-5247 | | | | | | | | | | |
| Laboratory Control Sample | | | Run: TENNELEC-3_110318D | | | | | | | |
| Radium 228 | | 7.1 | pCi/L | 98 | | 80 | 120 | | | 03/29/11 12:00 |
| Sample ID: MB-RA226-5247 | | | | | | | | | | |
| 3 Method Blank | | | Run: TENNELEC-3_110318D | | | | | | | |
| Radium 228 | | 0.3 | pCi/L | | | | | | | 03/29/11 12:00 |
| Radium 228 precision (±) | | 0.7 | pCi/L | | | | | | | U |
| Radium 228 MDC | | 1 | pCi/L | | | | | | | |
| Sample ID: C11030474-001DMS | | | | | | | | | | |
| Sample Matrix Spike | | | Run: TENNELEC-3_110318D | | | | | | | |
| Radium 228 | | 15 | pCi/L | 96 | | 70 | 130 | | | 03/29/11 12:00 |
| Sample ID: C11030474-001DMSD | | | | | | | | | | |
| Sample Matrix Spike Duplicate | | | Run: TENNELEC-3_110318D | | | | | | | |
| Radium 228 | | 14 | pCi/L | 88 | | 70 | 130 | 7.1 | 31.5 | 03/29/11 12:00 |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C11030482

 Login completed by: Edith McPike
 Reviewed by: BL2000\tedwards
 Reviewed Date: 3/18/2011

Date Received: 3/16/2011

Received by: ha

 Carrier FedEx
 name:

| | | | |
|---|---|-----------------------------|--|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 2.4°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input checked="" type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

Samples for dissolved metals were subsampled, filtered and preserved with 2 mL HNO₃ in lab upon receipt to pH <2.



Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT (Provide as much information as possible.)

| | | | | | | | |
|--|---|--|--|---|--------------------------------|--|--|
| Company Name: WWDC | | Project Name, PWS, Permit, Etc.: Chayenne Belvoir Ranch Duck Cr. 2-2 | | Sample Origin: WY | | EPA/State Compliance: Yes <input type="checkbox"/> No <input type="checkbox"/> | |
| Report Mail Address: 4025 Automation Way, Unit E Fort Collins, CO 80525 | | Contact Name: Mark Stacy Phone/Fax: 970-223-9705 | | Email: | | Sampler: (Please Print) Jason Hayes | |
| Invoice Address: 4025 Automation Way, Unit E Fort Collins, CO 80525 | | Invoice Contact & Phone: | | Purchase Order: | | Quote/Bottle Order: | |
| Special Report/Formats: <input type="checkbox"/> DW <input type="checkbox"/> EDD/EDT (Electronic Data) <input type="checkbox"/> POTWW/WWTP <input type="checkbox"/> Format: _____ <input type="checkbox"/> State: _____ <input type="checkbox"/> LEVEL IV <input type="checkbox"/> Other: _____ <input type="checkbox"/> NELAC | | ANALYSIS REQUESTED Number of Containers: _____ Sample Type: A W S V B O DW Air Water Soils/Solids Vegetation Bioassay Other DW - Drinking Water RA 226 Gross Alpha Beta RA 226 K, Na, U, Co, Fe, Mg Iron Bacteria Total Coliform Bact. HCO₃, CO₃, Cond, pH, TOC | | SEE ATTACHED Standard Turnaround (TAT) R U S H | | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page | |
| | | | | | | Comments: | |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | | Collection Date | Collection Time | MATRIX | LABORATORY USE ONLY | | |
| 1 Duck Creek 2-2 (2L) | | 3/15/11 | 1406 | X | extra sample for the 2 above | | |
| 2 Duck Creek 2-2 (2L) | | 3/15/11 | 1406 | X | | | |
| 3 Duck Creek 2-2 (2L) | | 3/15/11 | 1406 | X | | | |
| 4 Duck Creek 2-2 (200L) | | 3/15/11 | 1406 | X | | | |
| 5 Duck Creek 2-2 (200L) | | 3/15/11 | 1406 | X | | | |
| 6 Duck Creek 2-2 (200L) | | 3/15/11 | 1406 | X | | | |
| 7 Duck Creek 2-2 (200L) | | 3/15/11 | 1406 | X | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| Custody Record MUST be Signed | Relinquished by (print): Jason Hayes | Date/Time: 3/15/11, 1500 | Signature: Jason Hayes | Received by (print): | Date/Time: | Signature: | |
| | Relinquished by (print): | Date/Time: | Signature: | Received by (print): | Date/Time: | Signature: | |
| | Sample Disposal: Return to Client: | Lab Disposal: | Received by Laboratory: 3-16-11 915 | Date/Time: | Signature: H. K. C. man | | |

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested.

This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.
Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.

ANALYTICAL SUMMARY REPORT

April 18, 2011

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C11030560

Project Name: Goose Creek 2-2C (Final Samples)

Energy Laboratories, Inc. Casper WY received the following 2 samples for Lidstone and Associates on 3/18/2011 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|------------------|---------------|--------------|---------|---|
| C11030560-001 | DC 2-2 | 03/17/11 0:00 | 03/18/11 | Aqueous | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Drinking Water Acidity, Total as CaCO3 Alkalinity QA Calculations Bacteria, Iron Related Bacteria, SDWA Cancelled Sample Cyanide, SDWA Color Conductivity Corrosivity, Calculated Mercury, Drinking Water Mercury Analysis Prep Sample Filtering Fluoride Foaming Agents E515.1 Chlorinated Herbicides Hardness E300.0 Anions Nitrogen, Nitrite Nitrogen, Nitrate + Nitrite Odor pH Metals Preparation by EPA 200.2 E504 Pesticides Pesticides, Carbamates SDWA Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved Solids, Total Suspended Turbidity E524.2 SDWA VOCs |
| C11030560-002 | Trip Blank | 03/17/11 0:00 | 03/18/11 | Aqueous | E524.2 SDWA VOCs |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:

Stephanie D Waldrop
Reporting Supervisor

Digitally signed by
Stephanie Waldrop
Date: 2011.04.19 10:22:47 -06:00



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Gillette, WY 866-686-7175 • Rapid City, SD 888-672-1225 • College Station, TX 888-690-2218

CLIENT: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Sample Delivery Group: C11030560

Report Date: 04/18/11

CASE NARRATIVE

BRANCH LABORATORY SUBCONTRACT ANALYSIS

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Client Sample ID: DC 2-2
Sampled By: Jason Hayes
Lab ID: C11030560-001B

Report Date: 04/18/11
Collection Date: 03/17/11
Received Date: 03/18/11 09:30
Matrix: Aqueous

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|---------------------------|--------|-------|-------------|-----------|---------|-----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Absent | | SAFE | | A9223 B | 03/18/11 12:18 / rodh |
| Bacteria, E-Coli Coliform | Absent | | | | A9223 B | 03/18/11 12:18 / rodh |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-001
Client Sample ID: DC 2-2

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|----------|-----------|-------|-------------|-------------|------------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related ~ 4 days incubation | 8600 | CFU/ml | | 1.0 | | IRB-BART | 03/18/11 12:18 / rodh |
| MAJOR IONS | | | | | | | |
| Acidity, Total as CaCO ₃ | ND | mg/L | | 5 | | A2310 B | 03/22/11 08:00 / jba |
| Alkalinity, Total as CaCO ₃ | 138 | mg/L | | 1 | | A2320 B | 03/18/11 18:52 / jba |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 03/18/11 18:52 / jba |
| Bicarbonate as HCO ₃ | 169 | mg/L | | 1 | | A2320 B | 03/18/11 18:52 / jba |
| Calcium | 30 | mg/L | | 1 | | E200.7 | 03/24/11 19:13 / cp |
| Chloride | 2 | mg/L | | 1 | | E300.0 | 03/23/11 00:50 / ljl |
| Fluoride | 0.6 | mg/L | | 0.1 | | A4500-F C | 03/23/11 12:54 / jba |
| Magnesium | 13 | mg/L | | 1 | | E200.7 | 03/24/11 19:13 / cp |
| Nitrogen, Nitrate+Nitrite as N | 0.5 | mg/L | | 0.1 | 10 | E353.2 | 03/24/11 15:16 / dc |
| Nitrogen, Nitrite as N | ND | mg/L | | 0.1 | 1 | A4500-NO2 B | 03/18/11 14:01 / lr |
| Potassium | 1 | mg/L | | 1 | | E200.7 | 03/24/11 19:13 / cp |
| Silica | 14.0 | mg/L | | 0.2 | | E200.7 | 03/24/11 19:13 / cp |
| Sodium | 5 | mg/L | | 1 | | E200.7 | 03/24/11 19:13 / cp |
| Sulfate | 7 | mg/L | | 1 | | E300.0 | 03/23/11 00:50 / ljl |
| NON-METALS | | | | | | | |
| Cyanide, Total | ND | mg/L | | 0.005 | 0.2 | Kelada mod | 03/24/11 14:09 / eli-b |
| PHYSICAL PROPERTIES | | | | | | | |
| Color | ND | c.u. | | 5.0 | | A2120 B | 03/18/11 12:50 / lmc |
| Corrosivity | 0.3 | unitless | | | | Calculation | 04/07/11 10:30 / kbh |
| Conductivity @ 25 C | 267 | umhos/cm | | 1 | | A2510 B | 03/18/11 14:14 / lmc |
| Hardness as CaCO ₃ | 129 | mg/L | | 1 | | A2340 B | 03/24/11 19:13 / kbh |
| Odor | NOO | T.O.N. | | 1 | | A2150 B | 03/18/11 12:50 / lmc |
| pH | 8.08 | s.u. | | 0.01 | | A4500-H B | 03/18/11 14:14 / lmc |
| Solids, Total Dissolved TDS @ 180 C | 147 | mg/L | | 10 | | A2540 C | 03/18/11 15:25 / lmc |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | D | 6 | | A2540 D | 03/24/11 15:27 / lmc |
| Surfactants, MBAS | < 1.0 | mg/L | | 1.0 | | A5540 C | 03/18/11 12:10 / jba |
| Turbidity | 1.2 | NTU | | 0.1 | | A2130 B | 03/18/11 14:01 / jba |
| - NOO = No odor observed. - Color measured at pH 7.88. | | | | | | | |
| METALS - TOTAL | | | | | | | |
| Aluminum | ND | mg/L | | 0.1 | 0.2 | E200.8 | 03/30/11 14:30 / sml |
| Antimony | 0.001 | mg/L | B | 0.001 | 0.006 | E200.8 | 03/30/11 14:30 / sml |
| Arsenic | 0.003 | mg/L | | 0.001 | 0.01 | E200.8 | 03/30/11 14:30 / sml |
| Barium | ND | mg/L | | 0.1 | 2 | E200.8 | 03/30/11 14:30 / sml |
| Beryllium | ND | mg/L | | 0.001 | 0.004 | E200.8 | 03/30/11 14:30 / sml |
| Boron | ND | mg/L | | 0.1 | | E200.7 | 03/30/11 16:09 / cp |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
B - The analyte was detected in the method blank.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
D - RL increased due to sample matrix.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-001
Client Sample ID: DC 2-2

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--------|-------|-----------|--------|-------------|-------------|----------------------|
| METALS - TOTAL | | | | | | | |
| Cadmium | ND | mg/L | | 0.001 | 0.005 | E200.8 | 03/30/11 14:30 / sml |
| Chromium | ND | mg/L | | 0.05 | 0.1 | E200.8 | 03/30/11 14:30 / sml |
| Copper | ND | mg/L | | 0.01 | 1.3 | E200.8 | 03/30/11 14:30 / sml |
| Iron | ND | mg/L | | 0.03 | 0.3 | E200.8 | 03/30/11 14:30 / sml |
| Lead | ND | mg/L | | 0.001 | 0.015 | E200.8 | 03/30/11 14:30 / sml |
| Manganese | 0.02 | mg/L | | 0.01 | 0.05 | E200.8 | 03/30/11 14:30 / sml |
| Mercury | ND | mg/L | | 0.0002 | 0.002 | E245.1 | 03/22/11 10:10 / rdw |
| Nickel | ND | mg/L | | 0.05 | | E200.8 | 03/30/11 14:30 / sml |
| Selenium | 0.001 | mg/L | | 0.001 | 0.05 | E200.8 | 03/30/11 14:30 / sml |
| Silver | ND | mg/L | | 0.01 | 0.1 | E200.8 | 03/30/11 14:30 / sml |
| Thallium | 0.0010 | mg/L | | 0.0004 | 0.002 | E200.8 | 03/30/11 14:30 / sml |
| Uranium | 0.0026 | mg/L | | 0.0003 | 0.03 | E200.8 | 03/30/11 14:30 / sml |
| Uranium, Activity | 1.7 | pCi/L | | 0.2 | | E200.8 | 03/30/11 14:30 / sml |
| Zinc | ND | mg/L | | 0.01 | 5 | E200.8 | 03/30/11 14:30 / sml |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | 1.1 | pCi/L | U | | 15 | E900.0 | 03/24/11 00:18 / ep |
| Gross Alpha precision (±) | 1.1 | pCi/L | | | | E900.0 | 03/24/11 00:18 / ep |
| Gross Alpha MDC | 1.1 | pCi/L | | | | E900.0 | 03/24/11 00:18 / ep |
| Gross Beta | 1.8 | pCi/L | | | 50 | E900.0 | 03/24/11 00:18 / ep |
| Gross Beta precision (±) | 1.5 | pCi/L | | | | E900.0 | 03/24/11 00:18 / ep |
| Gross Beta MDC | 1.5 | pCi/L | | | | E900.0 | 03/24/11 00:18 / ep |
| Radium 226 | 0.5 | pCi/L | | | | E903.0 | 04/05/11 21:57 / trs |
| Radium 226 precision (±) | 0.1 | pCi/L | | | | E903.0 | 04/05/11 21:57 / trs |
| Radium 226 MDC | 0.08 | pCi/L | | | | E903.0 | 04/05/11 21:57 / trs |
| Radium 228 | -0.2 | pCi/L | U | | | RA-05 | 03/31/11 14:54 / plj |
| Radium 228 precision (±) | 0.7 | pCi/L | | | | RA-05 | 03/31/11 14:54 / plj |
| Radium 228 MDC | 0.7 | pCi/L | | | | RA-05 | 03/31/11 14:54 / plj |
| Radium 226 + Radium 228 | 0.3 | pCi/L | U | | 5 | A7500-RA | 04/11/11 16:39 / res |
| Radium 226 + Radium 228 precision (±) | 0.7 | pCi/L | | | | A7500-RA | 04/11/11 16:39 / res |
| Radium 226 + Radium 228 MDC | 0.7 | pCi/L | | | | A7500-RA | 04/11/11 16:39 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -3.32 | % | | | | Calculation | 04/07/11 10:30 / kbh |
| Anions | 3.04 | meq/L | | | | Calculation | 04/07/11 10:30 / kbh |
| Cations | 2.85 | meq/L | | | | Calculation | 04/07/11 10:30 / kbh |
| Solids, Total Dissolved Calculated | 163 | mg/L | | | | Calculation | 04/07/11 10:30 / kbh |
| TDS Balance (0.80 - 1.20) | 0.900 | | | | | Calculation | 04/07/11 10:30 / kbh |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,1,1-Trichloroethane | ND | ug/L | | 0.50 | 200 | E524.2 | 03/22/11 04:00 / jlr |
| 1,1,2,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.
MDC - Minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-001
Client Sample ID: DC 2-2

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,2-Trichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| 1,1-Dichloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,1-Dichloroethene | ND | ug/L | | 0.50 | 7 | E524.2 | 03/22/11 04:00 / jlr |
| 1,1-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2,3-Trichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2,4-Trichlorobenzene | ND | ug/L | | 0.50 | 70 | E524.2 | 03/22/11 04:00 / jlr |
| 1,2,4-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,2-Dichlorobenzene | ND | ug/L | | 0.50 | 600 | E524.2 | 03/22/11 04:00 / jlr |
| 1,2-Dichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| 1,2-Dichloropropane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| 1,3,5-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,3-Dichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,3-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 1,4-Dichlorobenzene | ND | ug/L | | 0.50 | 75 | E524.2 | 03/22/11 04:00 / jlr |
| 2,2-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 2-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| 4-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Benzene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| Bromobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Bromochloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Bromodichloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Bromoform | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Bromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Carbon tetrachloride | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| Chlorobenzene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:00 / jlr |
| Chlorodibromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Chloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Chloroform | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Chloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| cis-1,2-Dichloroethene | ND | ug/L | | 0.50 | 70 | E524.2 | 03/22/11 04:00 / jlr |
| cis-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Dibromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Dichlorodifluoromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Ethylbenzene | ND | ug/L | | 0.50 | 700 | E524.2 | 03/22/11 04:00 / jlr |
| Hexachlorobutadiene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Isopropylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| m+p-Xylenes | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Methyl tert-butyl ether (MTBE) | ND | ug/L | | 2.0 | | E524.2 | 03/22/11 04:00 / jlr |
| Methylene chloride | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| Naphthalene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-001
Client Sample ID: DC 2-2

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|-----------|--------|-------------|--------|-------------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| n-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| n-Propylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| o-Xylene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| p-Isopropyltoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| sec-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Styrene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:00 / jlr |
| tert-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Tetrachloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| Toluene | ND | ug/L | | 0.50 | 1000 | E524.2 | 03/22/11 04:00 / jlr |
| trans-1,2-Dichloroethene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:00 / jlr |
| trans-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Trichloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:00 / jlr |
| Trichlorofluoromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:00 / jlr |
| Vinyl chloride | ND | ug/L | | 0.50 | 2 | E524.2 | 03/22/11 04:00 / jlr |
| Xylenes, Total | ND | ug/L | | 0.50 | 10000 | E524.2 | 03/22/11 04:00 / jlr |
| Trihalomethanes, Total | ND | ug/L | | 0.50 | 80 | E524.2 | 03/22/11 04:00 / jlr |
| Surr: Dibromofluoromethane | 96.0 | %REC | | 70-130 | | E524.2 | 03/22/11 04:00 / jlr |
| Surr: p-Bromofluorobenzene | 99.0 | %REC | | 70-130 | | E524.2 | 03/22/11 04:00 / jlr |
| Surr: Toluene-d8 | 108 | %REC | | 70-130 | | E524.2 | 03/22/11 04:00 / jlr |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES | | | | | | | |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.020 | 0.2 | E504.1 | 03/24/11 18:34 / eli-b2 |
| 1,2-Dibromoethane | ND | ug/L | | 0.010 | 0.05 | E504.1 | 03/24/11 18:34 / eli-b2 |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.050 | | E504.1 | 03/24/11 18:34 / eli-b2 |
| Surr: 1,1,1,2-Tetrachloroethane | 102 | %REC | | 70-130 | | E504.1 | 03/24/11 18:34 / eli-b2 |
| SYNTHETIC ORGANIC COMPOUNDS - HERBICIDES | | | | | | | |
| 2,4-D | ND | ug/L | | 1.0 | 70 | E515.1 | 03/25/11 15:22 / eli-b |
| 2,4-DB | ND | ug/L | | 2.5 | | E515.1 | 03/25/11 15:52 / eli-b |
| Dalapon | ND | ug/L | | 2.5 | 200 | E515.1 | 03/25/11 15:22 / eli-b |
| Dicamba | ND | ug/L | | 0.25 | | E515.1 | 03/25/11 15:22 / eli-b |
| Dichlorprop | ND | ug/L | | 1.0 | | E515.1 | 03/25/11 15:22 / eli-b |
| Dinoseb | ND | ug/L | | 1.0 | 7 | E515.1 | 03/25/11 15:22 / eli-b |
| Pentachlorophenol | ND | ug/L | | 0.040 | 1 | E515.1 | 03/25/11 15:22 / eli-b |
| Picloram | ND | ug/L | | 0.50 | 500 | E515.1 | 03/25/11 15:22 / eli-b |
| 2,4,5-TP (Silvex) | ND | ug/L | | 0.20 | 50 | E515.1 | 03/25/11 15:22 / eli-b |
| Surr: DCAA | 76.0 | %REC | | 70-130 | | E515.1 | 03/25/11 15:22 / eli-b |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES, CARBAMATES | | | | | | | |
| Aldicarb | ND | ug/L | | 0.50 | 3 | E531.1 | 03/22/11 20:58 / swc |
| Aldicarb sulfone | ND | ug/L | | 0.50 | 2 | E531.1 | 03/22/11 20:58 / swc |
| Aldicarb sulfoxide | ND | ug/L | | 0.50 | 4 | E531.1 | 03/22/11 20:58 / swc |
| Carbaryl | ND | ug/L | | 0.50 | | E531.1 | 03/22/11 20:58 / swc |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-001
Client Sample ID: DC 2-2

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|-----------|--------|-------------|--------|----------------------|
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES, CARBAMATES | | | | | | | |
| Carbofuran | ND | ug/L | | 0.50 | 40 | E531.1 | 03/22/11 20:58 / swc |
| 3-Hydroxycarbofuran | ND | ug/L | | 0.50 | | E531.1 | 03/22/11 20:58 / swc |
| Methiocarb | ND | ug/L | | 0.50 | | E531.1 | 03/22/11 20:58 / swc |
| Methomyl | ND | ug/L | | 0.50 | | E531.1 | 03/22/11 20:58 / swc |
| Oxamyl | ND | ug/L | | 0.50 | 200 | E531.1 | 03/22/11 20:58 / swc |
| Baygon | ND | ug/L | | 0.50 | | E531.1 | 03/22/11 20:58 / swc |
| Surr: BDMC | 101 | %REC | | 70-130 | | E531.1 | 03/22/11 20:58 / swc |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-002
Client Sample ID: Trip Blank

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,1,1-Trichloroethane | ND | ug/L | | 0.50 | 200 | E524.2 | 03/22/11 04:37 / jlr |
| 1,1,2,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,1,2-Trichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| 1,1-Dichloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,1-Dichloroethene | ND | ug/L | | 0.50 | 7 | E524.2 | 03/22/11 04:37 / jlr |
| 1,1-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2,3-Trichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2,4-Trichlorobenzene | ND | ug/L | | 0.50 | 70 | E524.2 | 03/22/11 04:37 / jlr |
| 1,2,4-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,2-Dichlorobenzene | ND | ug/L | | 0.50 | 600 | E524.2 | 03/22/11 04:37 / jlr |
| 1,2-Dichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| 1,2-Dichloropropane | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| 1,3,5-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,3-Dichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,3-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 1,4-Dichlorobenzene | ND | ug/L | | 0.50 | 75 | E524.2 | 03/22/11 04:37 / jlr |
| 2,2-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 2-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| 4-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Benzene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| Bromobenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Bromochloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Bromodichloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Bromoform | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Bromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Carbon tetrachloride | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| Chlorobenzene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:37 / jlr |
| Chlorodibromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Chloroethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Chloroform | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Chloromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| cis-1,2-Dichloroethene | ND | ug/L | | 0.50 | 70 | E524.2 | 03/22/11 04:37 / jlr |
| cis-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Dibromomethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Dichlorodifluoromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Ethylbenzene | ND | ug/L | | 0.50 | 700 | E524.2 | 03/22/11 04:37 / jlr |
| Hexachlorobutadiene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Isopropylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| m-p-Xylenes | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Goose Creek 2-2C (Final Samples)
Lab ID: C11030560-002
Client Sample ID: Trip Blank

Report Date: 04/18/11
Collection Date: 03/17/11
Date Received: 03/18/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|--------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Methyl tert-butyl ether (MTBE) | ND | ug/L | | 2.0 | | E524.2 | 03/22/11 04:37 / jlr |
| Methylene chloride | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| Naphthalene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| n-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| n-Propylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| o-Xylene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| p-Isopropyltoluene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| sec-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Styrene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:37 / jlr |
| tert-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Tetrachloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| Toluene | ND | ug/L | | 0.50 | 1000 | E524.2 | 03/22/11 04:37 / jlr |
| trans-1,2-Dichloroethene | ND | ug/L | | 0.50 | 100 | E524.2 | 03/22/11 04:37 / jlr |
| trans-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Trichloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 03/22/11 04:37 / jlr |
| Trichlorofluoromethane | ND | ug/L | | 0.50 | | E524.2 | 03/22/11 04:37 / jlr |
| Vinyl chloride | ND | ug/L | | 0.50 | 2 | E524.2 | 03/22/11 04:37 / jlr |
| Xylenes, Total | ND | ug/L | | 0.50 | 10000 | E524.2 | 03/22/11 04:37 / jlr |
| Trihalomethanes, Total | ND | ug/L | | 0.50 | 80 | E524.2 | 03/22/11 04:37 / jlr |
| Surr: Dibromofluoromethane | 102 | %REC | | 70-130 | | E524.2 | 03/22/11 04:37 / jlr |
| Surr: p-Bromofluorobenzene | 100 | %REC | | 70-130 | | E524.2 | 03/22/11 04:37 / jlr |
| Surr: Toluene-d8 | 106 | %REC | | 70-130 | | E524.2 | 03/22/11 04:37 / jlr |

Report Definitions: RL - Analyte reporting limit.
QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|------------------|-------|-----|----------------------|-----------|------------|-----|----------------|------|
| Method: A2120 B | | | | | | | | | Batch: R143796 | |
| Sample ID: MB-R143796 | | Method Blank | | | Run: ANALYST_110318C | | | | 03/18/11 12:50 | |
| Color | | ND | c.u. | 1 | | | | | | |
| -Color measured at pH 5.38. | | | | | | | | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | Run: ANALYST_110318C | | | | 03/18/11 12:50 | |
| Color | | ND | c.u. | 5.0 | | | | | 10 | |
| -Color measured at pH 7.86. | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|--|-------|------|------|---------------------|------------|--------------------------------|----------------|----------------|
| Method: A2130 B | | | | | | | | Analytical Run: TURB-1_110318A | | |
| Sample ID: ICV-1_110318 | | Initial Calibration Verification Standard | | | | | | | | 03/18/11 13:57 |
| Turbidity | | 0.922 | NTU | 0.10 | 92 | 90 | 110 | | | |
| Sample ID: CCV-1_110318 | | Continuing Calibration Verification Standard | | | | | | | | 03/18/11 13:58 |
| Turbidity | | 10.3 | NTU | 0.10 | 103 | 90 | 110 | | | |
| Method: A2130 B | | | | | | | | Batch: 110318_1_TURB-W | | |
| Sample ID: MBLK-1_110318 | | Method Blank | | | | Run: TURB-1_110318A | | | 03/18/11 13:58 | |
| Turbidity | | ND | NTU | 0.1 | | | | | | |
| Sample ID: LCS-1_110318 | | Laboratory Control Sample | | | | Run: TURB-1_110318A | | | 03/18/11 13:58 | |
| Turbidity | | 9.75 | NTU | 0.10 | 98 | 90 | 110 | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | Run: TURB-1_110318A | | | 03/18/11 14:02 | |
| Turbidity | | 1.23 | NTU | 0.10 | | | | 5.0 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|------------------|--------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2150 B | | | | | | | | | | Batch: R143794 |
| Sample ID: MB-R143794 | | Method Blank | | | | | Run: ANALYST_110318B | | | 03/18/11 12:50 |
| Odor | | ND | T.O.N. | 1 | | | | | | |
| - NOO = No odor observed. | | | | | | | | | | |
| Sample ID: C11030560-001NDUP | | Sample Duplicate | | | | | Run: ANALYST_110318B | | | 03/18/11 12:50 |
| Odor | | NOO | T.O.N. | 1.0 | | | | | | 20 |
| - NOO = No odor observed. | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|-----------|----------------------|------------------------|----------------|------|
| Method: A2310 B | | | | | | | | Batch: 110322_1_ACID-W | | |
| Sample ID: MBLK-1_110322 | | Method Blank | | | | | Run: ACIDITY_110322A | | 03/22/11 07:41 | |
| Acidity, Total as CaCO ₃ | 2 | | mg/L | 1 | | | | | | |
| Sample ID: LCS-1_110322 | | Laboratory Control Sample | | | | | Run: ACIDITY_110322A | | 03/22/11 07:47 | |
| Acidity, Total as CaCO ₃ | 1100 | | mg/L | 5.0 | 110 | 80 | 120 | | | |
| Sample ID: C11030552-003ADUP | | Sample Duplicate | | | | | Run: ACIDITY_110322A | | 03/22/11 07:56 | |
| Acidity, Total as CaCO ₃ | 115 | | mg/L | 5.0 | | | | 4.4 | 20 | |

Qualifiers:

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R143808 |
| Sample ID: MBLK | 3 | Method Blank | | | | | Run: MANTECH_110318A | | | 03/18/11 16:36 |
| Alkalinity, Total as CaCO ₃ | | 2 | mg/L | 1 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1 | | | | | | |
| Bicarbonate as HCO ₃ | | 2 | mg/L | 1 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_110318A | | | 03/18/11 16:51 |
| Alkalinity, Total as CaCO ₃ | | 209 | mg/L | 5.0 | 104 | 90 | 110 | | | |
| Sample ID: C11030525-008AMS | | Sample Matrix Spike | | | | | Run: MANTECH_110318A | | | 03/18/11 17:15 |
| Alkalinity, Total as CaCO ₃ | | 360 | mg/L | 5.0 | 108 | 80 | 120 | | | |
| Sample ID: C11030560-001CDUP | 3 | Sample Duplicate | | | | | Run: MANTECH_110318A | | | 03/18/11 19:01 |
| Alkalinity, Total as CaCO ₃ | | 139 | mg/L | 5.0 | | | | 0.1 | 10 | |
| Carbonate as CO ₃ | | ND | mg/L | 5.0 | | | | | 10 | |
| Bicarbonate as HCO ₃ | | 169 | mg/L | 5.0 | | | | 0.1 | 10 | |

Qualifiers:

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|----------|-----|------|-----------|-------------------------------------|-----|----------|----------------|
| Method: A2510 B | | | | | | | Analytical Run: ORION555A-2_110318A | | | |
| Sample ID: ICV2_110318_1 | | Initial Calibration Verification Standard | | | | | | | | 03/18/11 13:19 |
| Conductivity @ 25 C | | 1380 | umhos/cm | 1.0 | 98 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | Batch: 110318_1_PH-W_555A-2 | | | |
| Sample ID: MBLK1_110318_1 | | Method Blank | | | | | | | | 03/18/11 13:15 |
| Conductivity @ 25 C | | 0.6 | umhos/cm | 0.2 | | | | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | | | | | 03/18/11 14:16 |
| Conductivity @ 25 C | | 267 | umhos/cm | 1.0 | | | | 0.0 | 10 | |

Qualifiers:

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|----|------|-----------|--------------------|-----|----------|----------------|
| Method: A2540 C | | | | | | | | | | Batch: R143889 |
| Sample ID: MBLK1_ | | Method Blank | | | | | Run: BAL-1_110318C | | | 03/18/11 15:22 |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 4 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | | Run: BAL-1_110318C | | | 03/18/11 15:22 |
| Solids, Total Dissolved TDS @ 180 C | | 990 | mg/L | 10 | 99 | 90 | 110 | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | | Run: BAL-1_110318C | | | 03/18/11 15:25 |
| Solids, Total Dissolved TDS @ 180 C | | 145 | mg/L | 10 | | | | 0.8 | 10 | |
| Sample ID: C11030567-001AMS | | Sample Matrix Spike | | | | | Run: BAL-1_110318C | | | 03/18/11 15:29 |
| Solids, Total Dissolved TDS @ 180 C | | 2130 | mg/L | 10 | 103 | 90 | 110 | | | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|-----------|--------------------|-----|----------|----------------|
| Method: A2540 D | | | | | | | | | | Batch: R144048 |
| Sample ID: MBLK1_ | | Method Blank | | | | | Run: BAL-1_110324A | | | 03/24/11 15:27 |
| Solids, Total Suspended TSS @ 105 C | | ND | mg/L | 2 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | | Run: BAL-1_110324A | | | 03/24/11 15:27 |
| Solids, Total Suspended TSS @ 105 C | | 166 | mg/L | 12 | 83 | 60 | 110 | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | | Run: BAL-1_110324A | | | 03/24/11 15:27 |
| Solids, Total Suspended TSS @ 105 C | | ND | mg/L | 6.0 | | | | | | 10 |

Qualifiers:

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MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|-----------|----------------------|-----|----------|----------------|
| Method: A4500-F C | | | | | | | | | | Batch: R143974 |
| Sample ID: MBLK | | Method Blank | | | | | Run: MANTECH_110323B | | | 03/23/11 12:41 |
| Fluoride | | 0.02 | mg/L | 0.008 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_110323B | | | 03/23/11 12:44 |
| Fluoride | | 1.00 | mg/L | 0.10 | 98 | 90 | 110 | | | |
| Sample ID: C11030560-001CMS | | Sample Matrix Spike | | | | | Run: MANTECH_110323B | | | 03/23/11 12:59 |
| Fluoride | | 1.56 | mg/L | 0.10 | 96 | 80 | 120 | | | |
| Sample ID: C11030560-001CMSD | | Sample Matrix Spike Duplicate | | | | | Run: MANTECH_110323B | | | 03/23/11 13:02 |
| Fluoride | | 1.62 | mg/L | 0.10 | 102 | 80 | 120 | 3.8 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|-------|------|-----------|-------------------------------------|-----|----------|----------------|
| Method: A4500-H B | | | | | | | Analytical Run: ORION555A-2_110318A | | | |
| Sample ID: ICV1_110318_1 | | Initial Calibration Verification Standard | | | | | | | | 03/18/11 13:17 |
| pH | | 6.95 | s.u. | 0.010 | 101 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | Batch: 110318_1_PH-W_555A-2 | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | | | | | 03/18/11 14:16 |
| pH | | 8.08 | s.u. | 0.010 | | | | 0.0 | 3 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|-------|------|----------------------------|------------|-----------------------------|----------|------|
| Method: A4500-NO2 B | | | | | | | | Batch: A2011-03-18_6_NO2_01 | | |
| Sample ID: MBLK-1 | Method Blank | | | | | Run: HACH DR3000-2_110318B | | 03/18/11 13:59 | | |
| Nitrogen, Nitrite as N | | ND | mg/L | 0.003 | | | | | | |
| Sample ID: LCS-2 | Laboratory Control Sample | | | | | Run: HACH DR3000-2_110318B | | 03/18/11 13:59 | | |
| Nitrogen, Nitrite as N | | 1.01 | mg/L | 2.0 | 101 | 90 | 110 | | | |
| Sample ID: C11030560-001CMS | Sample Matrix Spike | | | | | Run: HACH DR3000-2_110318B | | 03/18/11 14:02 | | |
| Nitrogen, Nitrite as N | | 0.0490 | mg/L | 0.10 | 103 | 90 | 110 | | | |
| Sample ID: C11030560-001CMSD | Sample Matrix Spike Duplicate | | | | | Run: HACH DR3000-2_110318B | | 03/18/11 14:02 | | |
| Nitrogen, Nitrite as N | | 0.0485 | mg/L | 0.10 | 102 | 90 | 110 | | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|------|------|-----------|--------------------|-----|----------|----------------|
| Method: A5540 C | | | | | | | | | | Batch: R143799 |
| Sample ID: MB-R143799 | | Method Blank | | | | | Run: DS1-C_110318A | | | 03/18/11 12:10 |
| Surfactants, MBAS | | ND | mg/L | 0.02 | | | | | | |
| Sample ID: LCS-R143799 | | Laboratory Control Sample | | | | | Run: DS1-C_110318A | | | 03/18/11 12:10 |
| Surfactants, MBAS | | 1.00 | mg/L | 1.0 | 100 | 75 | 125 | | | |
| Sample ID: C11030560-001CDUP | | Sample Duplicate | | | | | Run: DS1-C_110318A | | | 03/18/11 12:10 |
| Surfactants, MBAS | | < 1.00 | mg/L | 1.0 | | | | | | 20 |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Project: Goose Creek 2-2C (Final Samples)

Report Date: 04/18/11

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|-----------|---------------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R144097 |
| Sample ID: MB-110324A | 5 | Method Blank | | | | | Run: ICP2-C_110324A | | | 03/24/11 12:41 |
| Calcium | | ND | mg/L | 0.2 | | | | | | |
| Magnesium | | ND | mg/L | 0.05 | | | | | | |
| Potassium | | ND | mg/L | 0.02 | | | | | | |
| Silicon | | ND | mg/L | 0.007 | | | | | | |
| Sodium | | ND | mg/L | 0.3 | | | | | | |
| Sample ID: LFB-110324A | 5 | Laboratory Fortified Blank | | | | | Run: ICP2-C_110324A | | | 03/24/11 12:45 |
| Calcium | | 48.6 | mg/L | 0.50 | 97 | 85 | 115 | | | |
| Magnesium | | 49.9 | mg/L | 0.50 | 100 | 85 | 115 | | | |
| Potassium | | 46.8 | mg/L | 0.50 | 94 | 85 | 115 | | | |
| Silicon | | 0.425 | mg/L | 0.10 | 91 | 85 | 115 | | | |
| Sodium | | 45.8 | mg/L | 0.50 | 92 | 85 | 115 | | | |
| Sample ID: C11030564-001BMS2 | 5 | Sample Matrix Spike | | | | | Run: ICP2-C_110324A | | | 03/24/11 19:29 |
| Calcium | | 259 | mg/L | 1.0 | 103 | 70 | 130 | | | |
| Magnesium | | 167 | mg/L | 1.0 | 100 | 70 | 130 | | | |
| Potassium | | 91.1 | mg/L | 1.0 | 87 | 70 | 130 | | | |
| Silicon | | 6.97 | mg/L | 0.10 | | 70 | 130 | | | A |
| Sodium | | 201 | mg/L | 1.0 | 98 | 70 | 130 | | | |
| Sample ID: C11030564-001BMSD | 5 | Sample Matrix Spike Duplicate | | | | | Run: ICP2-C_110324A | | | 03/24/11 19:33 |
| Calcium | | 249 | mg/L | 1.0 | 93 | 70 | 130 | 4.2 | 20 | |
| Magnesium | | 163 | mg/L | 1.0 | 97 | 70 | 130 | 2.1 | 20 | |
| Potassium | | 92.7 | mg/L | 1.0 | 89 | 70 | 130 | 1.7 | 20 | |
| Silicon | | 6.82 | mg/L | 0.10 | | 70 | 130 | 2.2 | 20 | A |
| Sodium | | 204 | mg/L | 1.0 | 101 | 70 | 130 | 1.5 | 20 | |
| Method: E200.7 | | | | | | | | | | Batch: 29387 |
| Sample ID: MB-29387 | | Method Blank | | | | | Run: ICP2-C_110330A | | | 03/30/11 16:00 |
| Boron | | 0.06 | mg/L | 0.008 | | | | | | |
| Sample ID: LCS3-29387 | | Laboratory Control Sample | | | | | Run: ICP2-C_110330A | | | 03/30/11 16:05 |
| Boron | | 0.534 | mg/L | 0.10 | 95 | 85 | 115 | | | |
| Sample ID: C11030715-005CMS3 | | Sample Matrix Spike | | | | | Run: ICP2-C_110330A | | | 03/30/11 17:05 |
| Boron | | 0.548 | mg/L | 0.10 | 103 | 70 | 130 | | | |
| Sample ID: C11030715-005CMSD | | Sample Matrix Spike Duplicate | | | | | Run: ICP2-C_110330A | | | 03/30/11 17:09 |
| Boron | | 0.564 | mg/L | 0.10 | 106 | 70 | 130 | 2.9 | 20 | |

Qualifiers:

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ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|--|-------|---------|-----------------------|-----------|------------|----------------------------------|----------|----------------|
| Method: E200.8 | | | | | | | | Analytical Run: ICPMS4-C_110330A | | |
| Sample ID: CCV | | Continuing Calibration Verification Standard | | | | | | | | 03/30/11 13:42 |
| Antimony | | 0.058 | mg/L | 0.0010 | 96 | 90 | 110 | | | |
| Sample ID: CCV | | Continuing Calibration Verification Standard | | | | | | | | 03/30/11 15:12 |
| Antimony | | 0.058 | mg/L | 0.0010 | 97 | 90 | 110 | | | |
| Method: E200.8 | | | | | | | | Batch: 29387 | | |
| Sample ID: MB-29387 | | 17 Method Blank | | | Run: ICPMS4-C_110330A | | | 03/30/11 12:53 | | |
| Aluminum | | 0.003 | mg/L | 0.0008 | | | | | | |
| Antimony | | 0.002 | mg/L | 0.0003 | | | | | | |
| Arsenic | | 0.0005 | mg/L | 5E-05 | | | | | | |
| Barium | | ND | mg/L | 0.0002 | | | | | | |
| Beryllium | | ND | mg/L | 3E-05 | | | | | | |
| Cadmium | | 0.0001 | mg/L | 4E-05 | | | | | | |
| Chromium | | 0.0005 | mg/L | 3E-05 | | | | | | |
| Copper | | 0.003 | mg/L | 5E-05 | | | | | | |
| Iron | | 0.004 | mg/L | 0.001 | | | | | | |
| Lead | | 7E-05 | mg/L | 5E-05 | | | | | | |
| Manganese | | ND | mg/L | 2E-05 | | | | | | |
| Nickel | | 9E-05 | mg/L | 4E-05 | | | | | | |
| Selenium | | 0.0003 | mg/L | 3E-05 | | | | | | |
| Silver | | 8E-05 | mg/L | 4E-05 | | | | | | |
| Thallium | | 0.0002 | mg/L | 0.0001 | | | | | | |
| Uranium | | ND | mg/L | 4E-05 | | | | | | |
| Zinc | | ND | mg/L | 0.001 | | | | | | |
| Sample ID: LCS3-29387 | | 16 Laboratory Control Sample | | | Run: ICPMS4-C_110330A | | | 03/30/11 13:00 | | |
| Aluminum | | 2.46 | mg/L | 0.10 | 98 | 85 | 115 | | | |
| Arsenic | | 0.508 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Barium | | 0.532 | mg/L | 0.10 | 106 | 85 | 115 | | | |
| Beryllium | | 0.258 | mg/L | 0.010 | 103 | 85 | 115 | | | |
| Cadmium | | 0.260 | mg/L | 0.010 | 104 | 85 | 115 | | | |
| Chromium | | 0.490 | mg/L | 0.050 | 98 | 85 | 115 | | | |
| Copper | | 0.500 | mg/L | 0.010 | 99 | 85 | 115 | | | |
| Iron | | 2.52 | mg/L | 0.030 | 101 | 85 | 115 | | | |
| Lead | | 0.526 | mg/L | 0.050 | 105 | 85 | 115 | | | |
| Manganese | | 2.52 | mg/L | 0.010 | 101 | 85 | 115 | | | |
| Nickel | | 0.496 | mg/L | 0.050 | 99 | 85 | 115 | | | |
| Selenium | | 0.543 | mg/L | 0.0010 | 108 | 85 | 115 | | | |
| Silver | | 0.0545 | mg/L | 0.010 | 109 | 85 | 115 | | | |
| Thallium | | 0.508 | mg/L | 0.10 | 101 | 85 | 115 | | | |
| Uranium | | 0.565 | mg/L | 0.00030 | 113 | 85 | 115 | | | |
| Zinc | | 0.512 | mg/L | 0.010 | 102 | 85 | 115 | | | |
| Sample ID: C11030715-005CMS3 | | 16 Sample Matrix Spike | | | Run: ICPMS4-C_110330A | | | 03/30/11 14:02 | | |
| Aluminum | | 4.71 | mg/L | 0.10 | 129 | 70 | 130 | | | |
| Arsenic | | 0.508 | mg/L | 0.0010 | 101 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|--------|-------|---------|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E200.8 | | | | | | | | | | Batch: 29387 |
| Sample ID: C11030715-005CMS3 16 Sample Matrix Spike | | | | | | | | | | Run: ICPMS4-C_110330A 03/30/11 14:02 |
| Barium | | 0.662 | mg/L | 0.10 | 107 | 70 | 130 | | | |
| Beryllium | | 0.238 | mg/L | 0.010 | 95 | 70 | 130 | | | |
| Cadmium | | 0.257 | mg/L | 0.010 | 103 | 70 | 130 | | | |
| Chromium | | 0.478 | mg/L | 0.050 | 95 | 70 | 130 | | | |
| Copper | | 0.490 | mg/L | 0.010 | 97 | 70 | 130 | | | |
| Iron | | 3.99 | mg/L | 0.030 | 103 | 70 | 130 | | | |
| Lead | | 0.538 | mg/L | 0.050 | 107 | 70 | 130 | | | |
| Manganese | | 2.54 | mg/L | 0.010 | 101 | 70 | 130 | | | |
| Nickel | | 0.486 | mg/L | 0.050 | 97 | 70 | 130 | | | |
| Selenium | | 0.538 | mg/L | 0.0010 | 108 | 70 | 130 | | | |
| Silver | | 0.0526 | mg/L | 0.010 | 105 | 70 | 130 | | | |
| Thallium | | 0.515 | mg/L | 0.10 | 103 | 70 | 130 | | | |
| Uranium | | 0.558 | mg/L | 0.00030 | 111 | 70 | 130 | | | |
| Zinc | | 0.513 | mg/L | 0.010 | 101 | 70 | 130 | | | |
| Sample ID: C11030715-005CMSD 16 Sample Matrix Spike Duplicate | | | | | | | | | | Run: ICPMS4-C_110330A 03/30/11 14:09 |
| Aluminum | | 4.90 | mg/L | 0.10 | 136 | 70 | 130 | 3.9 | 20 | S |
| Arsenic | | 0.530 | mg/L | 0.0010 | 105 | 70 | 130 | 4.1 | 20 | |
| Barium | | 0.676 | mg/L | 0.10 | 109 | 70 | 130 | 2.1 | 20 | |
| Beryllium | | 0.241 | mg/L | 0.010 | 97 | 70 | 130 | 1.3 | 20 | |
| Cadmium | | 0.262 | mg/L | 0.010 | 105 | 70 | 130 | 2.2 | 20 | |
| Chromium | | 0.495 | mg/L | 0.050 | 99 | 70 | 130 | 3.5 | 20 | |
| Copper | | 0.510 | mg/L | 0.010 | 101 | 70 | 130 | 3.9 | 20 | |
| Iron | | 4.17 | mg/L | 0.030 | 110 | 70 | 130 | 4.3 | 20 | |
| Lead | | 0.550 | mg/L | 0.050 | 110 | 70 | 130 | 2.2 | 20 | |
| Manganese | | 2.57 | mg/L | 0.010 | 102 | 70 | 130 | 1.3 | 20 | |
| Nickel | | 0.508 | mg/L | 0.050 | 101 | 70 | 130 | 4.5 | 20 | |
| Selenium | | 0.559 | mg/L | 0.0010 | 112 | 70 | 130 | 3.8 | 20 | |
| Silver | | 0.0545 | mg/L | 0.010 | 109 | 70 | 130 | 3.4 | 20 | |
| Thallium | | 0.534 | mg/L | 0.10 | 107 | 70 | 130 | 3.6 | 20 | |
| Uranium | | 0.581 | mg/L | 0.00030 | 116 | 70 | 130 | 4.0 | 20 | |
| Zinc | | 0.528 | mg/L | 0.010 | 104 | 70 | 130 | 2.9 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|---------|------|-----------|------------|-----|----------|---------------------------------------|
| Method: E245.1 | | | | | | | | | | Batch: 29318 |
| Sample ID: MB-29318 | | Method Blank | | | | | | | | |
| Mercury | | ND | mg/L | 1E-06 | | | | | | Run: CVAA_C203_110322A 03/22/11 10:01 |
| Sample ID: LCS-29318 | | Laboratory Control Sample | | | | | | | | |
| Mercury | | 0.00475 | mg/L | 0.00010 | 95 | 90 | 110 | | | Run: CVAA_C203_110322A 03/22/11 10:02 |
| Sample ID: C11030414-004EMS | | Sample Matrix Spike | | | | | | | | |
| Mercury | | 0.00496 | mg/L | 0.00010 | 99 | 85 | 115 | | | Run: CVAA_C203_110322A 03/22/11 10:20 |
| Sample ID: C11030414-004EMSD | | Sample Matrix Spike Duplicate | | | | | | | | |
| Mercury | | 0.00510 | mg/L | 0.00010 | 102 | 85 | 115 | 2.7 | 10 | Run: CVAA_C203_110322A 03/22/11 10:21 |

Qualifiers:

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MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|--------------------|------------|-----|----------|----------------|
| Method: E300.0 | | | | | | | | | | Batch: R143963 |
| Sample ID: LCS | 2 | Laboratory Control Sample | | | | Run: IC2-C_110322A | | | | 03/22/11 13:32 |
| Chloride | | 9.89 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sulfate | | 40.1 | mg/L | 1.0 | 100 | 90 | 110 | | | |
| Sample ID: MBLK | 2 | Method Blank | | | | Run: IC2-C_110322A | | | | 03/22/11 13:47 |
| Chloride | | ND | mg/L | 0.06 | | | | | | |
| Sulfate | | 0.3 | mg/L | 0.2 | | | | | | |
| Sample ID: LFB | 2 | Laboratory Fortified Blank | | | | Run: IC2-C_110322A | | | | 03/22/11 14:18 |
| Chloride | | 12.7 | mg/L | 1.0 | 101 | 90 | 110 | | | |
| Sulfate | | 51.5 | mg/L | 1.0 | 102 | 90 | 110 | | | |
| Sample ID: C11030561-001AMS | 2 | Sample Matrix Spike | | | | Run: IC2-C_110322A | | | | 03/23/11 01:52 |
| Chloride | | 16.1 | mg/L | 1.0 | 101 | 80 | 120 | | | |
| Sulfate | | 81.5 | mg/L | 1.0 | 98 | 80 | 120 | | | |
| Sample ID: C11030561-001AMSD | 2 | Sample Matrix Spike Duplicate | | | | Run: IC2-C_110322A | | | | 03/23/11 02:07 |
| Chloride | | 16.4 | mg/L | 1.0 | 104 | 80 | 120 | 2.1 | 10 | |
| Sulfate | | 83.1 | mg/L | 1.0 | 103 | 80 | 120 | 1.9 | 10 | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|-----------|------------------------|-----|----------|----------------|
| Method: E353.2 | | | | | | | | | | Batch: R144035 |
| Sample ID: MBLK-1 | | Method Blank | | | | | Run: TECHNICON_110324A | | | 03/24/11 12:31 |
| Nitrogen, Nitrate+Nitrite as N | | ND | mg/L | 0.06 | | | | | | |
| Sample ID: LCS-2 | | Laboratory Control Sample | | | | | Run: TECHNICON_110324A | | | 03/24/11 12:34 |
| Nitrogen, Nitrate+Nitrite as N | | 2.62 | mg/L | 0.10 | 105 | 90 | 110 | | | |
| Sample ID: C11030561-002DMS | | Sample Matrix Spike | | | | | Run: TECHNICON_110324A | | | 03/24/11 15:24 |
| Nitrogen, Nitrate+Nitrite as N | | 1.92 | mg/L | 0.10 | 98 | 90 | 110 | | | |
| Sample ID: C11030561-002DMSD | | Sample Matrix Spike Duplicate | | | | | Run: TECHNICON_110324A | | | 03/24/11 15:26 |
| Nitrogen, Nitrate+Nitrite as N | | 2.04 | mg/L | 0.10 | 104 | 90 | 110 | 6.1 | 10 | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|-------------------------------------|-------|-------|------|------------------|------------|-----|----------|----------------|
| Method: E504.1 | | | | | | | | | | Batch: B_52844 |
| Sample ID: B11031456-001AMS | 4 | Sample Matrix Spike | | | | Run: SUB-B163095 | | | | 03/24/11 20:30 |
| 1,2-Dibromo-3-chloropropane | | 0.268 | ug/L | 0.020 | 107 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 0.254 | ug/L | 0.010 | 102 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 0.292 | ug/L | 0.050 | 117 | 70 | 130 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 102 | 70 | 130 | | | |
| Sample ID: LCSDup-52844 | 4 | Laboratory Control Sample Duplicate | | | | Run: SUB-B163095 | | | | 03/24/11 16:19 |
| 1,2-Dibromo-3-chloropropane | | 0.274 | ug/L | 0.020 | 110 | 70 | 130 | 1.8 | 40 | |
| 1,2-Dibromoethane | | 0.264 | ug/L | 0.010 | 106 | 70 | 130 | 2.7 | 40 | |
| 1,2,3-Trichloropropane | | 0.307 | ug/L | 0.050 | 123 | 70 | 130 | 0.6 | 40 | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 104 | 70 | 130 | 0.0 | 40 | |
| Sample ID: LCS-52844 | 4 | Laboratory Control Sample | | | | Run: SUB-B163095 | | | | 03/24/11 16:00 |
| 1,2-Dibromo-3-chloropropane | | 0.269 | ug/L | 0.020 | 108 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 0.257 | ug/L | 0.010 | 103 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 0.309 | ug/L | 0.050 | 124 | 70 | 130 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 102 | 70 | 130 | | | |
| Sample ID: MDL-52844 | 4 | Laboratory Control Sample | | | | Run: SUB-B163095 | | | | 03/24/11 15:40 |
| 1,2-Dibromo-3-chloropropane | | 0.0131 | ug/L | 0.020 | 131 | 60 | 140 | | | |
| 1,2-Dibromoethane | | 0.0117 | ug/L | 0.010 | 117 | 60 | 140 | | | |
| 1,2,3-Trichloropropane | | 0.0121 | ug/L | 0.050 | 121 | 60 | 140 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 103 | 70 | 130 | | | |
| Sample ID: MB-52844 | 4 | Method Blank | | | | Run: SUB-B163095 | | | | 03/24/11 15:21 |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.020 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.010 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.050 | | | | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 103 | 70 | 130 | | | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------------------|-----------|------------|-----|----------------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_52815 |
| Sample ID: B11031815-001EMSD | 9 | Sample Matrix Spike Duplicate | | | Run: SUB-B163176 | | | | 03/25/11 22:53 | |
| 2,4-D | | 4.91 | ug/L | 1.0 | 98 | 65 | 135 | 2.9 | 40 | |
| Dalapon | | 5.08 | ug/L | 2.5 | 102 | 65 | 135 | 15 | 40 | |
| Dicamba | | 5.11 | ug/L | 0.25 | 102 | 65 | 135 | 0.6 | 40 | |
| Dichlorprop | | 5.57 | ug/L | 1.0 | 111 | 65 | 135 | 0.2 | 40 | |
| Dinoseb | | 2.37 | ug/L | 1.0 | 47 | 65 | 135 | 5.3 | 40 | S |
| Pentachlorophenol | | 4.17 | ug/L | 0.040 | 83 | 65 | 135 | 2.1 | 40 | |
| Picloram | | 4.23 | ug/L | 0.50 | 85 | 65 | 135 | 4.4 | 40 | |
| 2,4,5-TP (Silvex) | | 4.47 | ug/L | 0.20 | 89 | 65 | 135 | 2.4 | 40 | |
| Surr: DCAA | | | | 0.10 | 79 | 70 | 130 | | | |
| Sample ID: B11031815-001EMS | 9 | Sample Matrix Spike | | | Run: SUB-B163176 | | | | 03/25/11 22:23 | |
| 2,4-D | | 4.77 | ug/L | 1.0 | 95 | 65 | 135 | | | |
| Dalapon | | 5.88 | ug/L | 2.5 | 118 | 65 | 135 | | | |
| Dicamba | | 5.14 | ug/L | 0.25 | 103 | 65 | 135 | | | |
| Dichlorprop | | 5.56 | ug/L | 1.0 | 111 | 65 | 135 | | | |
| Dinoseb | | 2.50 | ug/L | 1.0 | 50 | 65 | 135 | | | S |
| Pentachlorophenol | | 4.26 | ug/L | 0.040 | 85 | 65 | 135 | | | |
| Picloram | | 4.42 | ug/L | 0.50 | 88 | 65 | 135 | | | |
| 2,4,5-TP (Silvex) | | 4.58 | ug/L | 0.20 | 92 | 65 | 135 | | | |
| Surr: DCAA | | | | 0.10 | 81 | 70 | 130 | | | |
| Sample ID: LCS-52815 | 9 | Laboratory Control Sample | | | Run: SUB-B163176 | | | | 03/25/11 23:23 | |
| 2,4-D | | 4.47 | ug/L | 1.0 | 89 | 70 | 130 | | | |
| Dalapon | | 3.99 | ug/L | 2.5 | 80 | 70 | 130 | | | |
| Dicamba | | 4.22 | ug/L | 0.25 | 84 | 70 | 130 | | | |
| Dichlorprop | | 5.10 | ug/L | 1.0 | 102 | 70 | 130 | | | |
| Dinoseb | | 3.49 | ug/L | 1.0 | 70 | 70 | 130 | | | |
| Pentachlorophenol | | 3.48 | ug/L | 0.040 | 70 | 70 | 130 | | | |
| Picloram | | 3.55 | ug/L | 0.50 | 71 | 70 | 130 | | | |
| 2,4,5-TP (Silvex) | | 4.49 | ug/L | 0.20 | 90 | 70 | 130 | | | |
| Surr: DCAA | | | | 0.10 | 72 | 70 | 130 | | | |
| Sample ID: MB-52815 | 9 | Method Blank | | | Run: SUB-B163176 | | | | 03/25/11 13:52 | |
| 2,4-D | | ND | ug/L | 1.0 | | | | | | |
| Dalapon | | ND | ug/L | 2.5 | | | | | | |
| Dicamba | | ND | ug/L | 0.25 | | | | | | |
| Dichlorprop | | ND | ug/L | 1.0 | | | | | | |
| Dinoseb | | ND | ug/L | 1.0 | | | | | | |
| Pentachlorophenol | | ND | ug/L | 0.040 | | | | | | |
| Picloram | | ND | ug/L | 0.50 | | | | | | |
| 2,4,5-TP (Silvex) | | ND | ug/L | 0.20 | | | | | | |
| Surr: DCAA | | | | 0.10 | 72 | 70 | 130 | | | |
| Sample ID: LCS-52815 | | Laboratory Control Sample | | | Run: SUB-B163178 | | | | 03/25/11 23:53 | |
| 2,4-DB | | 3.51 | ug/L | 2.5 | 70 | 70 | 130 | | | |

Qualifiers:

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S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|-----------|------------------|-----|----------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_52815 |
| Sample ID: MB-52815 | | Method Blank | | | | | Run: SUB-B163178 | | | 03/25/11 14:22 |
| 2,4-DB | | ND | ug/L | 2.5 | | | | | | |
| Sample ID: B11031815-001EMS | | Sample Matrix Spike | | | | | Run: SUB-B163178 | | | 03/25/11 22:53 |
| 2,4-DB | | 3.80 | ug/L | 2.5 | 76 | 65 | 135 | | | |
| Sample ID: B11031815-001EMSD | | Sample Matrix Spike Duplicate | | | | | Run: SUB-B163178 | | | 03/25/11 23:23 |
| 2,4-DB | | 3.68 | ug/L | 2.5 | 74 | 65 | 135 | 3.2 | 40 | |

Qualifiers:

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---------------------------------|-------|---------------------------|-------|------|------|-----------------------|------------|-----|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R143904 |
| Sample ID: 032111_LCS_10 | 65 | Laboratory Control Sample | | | | Run: SATURNCA_110321C | | | | 03/21/11 17:08 |
| 1,1,1,2-Tetrachloroethane | | 11.5 | ug/L | 0.50 | 115 | 70 | 130 | | | |
| 1,1,1-Trichloroethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,1,2,2-Tetrachloroethane | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| 1,1,2-Trichloroethane | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| 1,1-Dichloroethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,1-Dichloroethene | | 9.00 | ug/L | 0.50 | 90 | 70 | 130 | | | |
| 1,1-Dichloropropene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| 1,2,3-Trichlorobenzene | | 6.76 | ug/L | 0.50 | 68 | 70 | 130 | | | S |
| 1,2,3-Trichloropropane | | 10.5 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| 1,2,4-Trichlorobenzene | | 7.48 | ug/L | 0.50 | 75 | 70 | 130 | | | |
| 1,2,4-Trimethylbenzene | | 9.28 | ug/L | 0.50 | 93 | 70 | 130 | | | |
| 1,2-Dibromo-3-chloropropane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| 1,2-Dichlorobenzene | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,2-Dichloroethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| 1,2-Dichloropropane | | 10.9 | ug/L | 0.50 | 109 | 70 | 130 | | | |
| 1,3,5-Trimethylbenzene | | 9.88 | ug/L | 0.50 | 99 | 70 | 130 | | | |
| 1,3-Dichlorobenzene | | 10.3 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| 1,3-Dichloropropane | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| 1,4-Dichlorobenzene | | 9.44 | ug/L | 0.50 | 94 | 70 | 130 | | | |
| 2,2-Dichloropropane | | 9.16 | ug/L | 0.50 | 92 | 70 | 130 | | | |
| 2-Chlorotoluene | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| 4-Chlorotoluene | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| Benzene | | 10.6 | ug/L | 0.50 | 106 | 70 | 130 | | | |
| Bromobenzene | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| Bromochloromethane | | 10.3 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| Bromodichloromethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| Bromoform | | 11.8 | ug/L | 0.50 | 118 | 70 | 130 | | | |
| Bromomethane | | 9.60 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Carbon tetrachloride | | 10.9 | ug/L | 0.50 | 109 | 70 | 130 | | | |
| Chlorobenzene | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| Chlorodibromomethane | | 11.1 | ug/L | 0.50 | 111 | 70 | 130 | | | |
| Chloroethane | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Chloroform | | 11.2 | ug/L | 0.50 | 112 | 70 | 130 | | | |
| Chloromethane | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| cis-1,2-Dichloroethene | | 10.5 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| cis-1,3-Dichloropropene | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| Dibromomethane | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| Dichlorodifluoromethane | | 7.88 | ug/L | 0.50 | 79 | 70 | 130 | | | |
| Ethylbenzene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| Hexachlorobutadiene | | 8.40 | ug/L | 0.50 | 82 | 70 | 130 | | | |
| Isopropylbenzene | | 11.4 | ug/L | 0.50 | 114 | 70 | 130 | | | |
| m+p-Xylenes | | 19.2 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Methyl tert-butyl ether (MTBE) | | 9.96 | ug/L | 2.0 | 100 | 70 | 130 | | | |

Qualifiers:

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MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|----------------------------------|-------|---------------------------|-------|------|------|-----------------------|------------|-----|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R143904 |
| Sample ID: 032111_LCS_10 | 65 | Laboratory Control Sample | | | | Run: SATURNCA_110321C | | | | 03/21/11 17:08 |
| Methylene chloride | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| Naphthalene | | 8.08 | ug/L | 0.50 | 81 | 70 | 130 | | | |
| n-Butylbenzene | | 9.04 | ug/L | 0.50 | 90 | 70 | 130 | | | |
| n-Propylbenzene | | 9.80 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| o-Xylene | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| p-Isopropyltoluene | | 9.20 | ug/L | 0.50 | 92 | 70 | 130 | | | |
| sec-Butylbenzene | | 9.32 | ug/L | 0.50 | 93 | 70 | 130 | | | |
| Styrene | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| tert-Butylbenzene | | 9.52 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Tetrachloroethene | | 9.52 | ug/L | 0.50 | 95 | 70 | 130 | | | |
| Toluene | | 10.3 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| trans-1,2-Dichloroethene | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| trans-1,3-Dichloropropene | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| Trichloroethene | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Trichlorofluoromethane | | 9.16 | ug/L | 0.50 | 92 | 70 | 130 | | | |
| Vinyl chloride | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Xylenes, Total | | 28.8 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Trihalomethanes, Total | | 44.3 | ug/L | 0.50 | 111 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 96 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 108 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 108 | 70 | 130 | | | |
| Sample ID: 032111_MBLK_12 | 65 | Method Blank | | | | Run: SATURNCA_110321C | | | | 03/21/11 18:20 |
| 1,1,1,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,1-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,3,5-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,4-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 2,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 2-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|----------------------------------|-------|--------------|-------|-----------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R143904 |
| Sample ID: 032111_MBLK_12 | 65 | Method Blank | | Run: SATURNCA_110321C | | | | 03/21/11 18:20 | | |
| 4-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |
| Benzene | | ND | ug/L | 0.50 | | | | | | |
| Bromobenzene | | ND | ug/L | 0.50 | | | | | | |
| Bromochloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromodichloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromoform | | ND | ug/L | 0.50 | | | | | | |
| Bromomethane | | ND | ug/L | 0.50 | | | | | | |
| Carbon tetrachloride | | ND | ug/L | 0.50 | | | | | | |
| Chlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| Chlorodibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroform | | ND | ug/L | 0.50 | | | | | | |
| Chloromethane | | ND | ug/L | 0.50 | | | | | | |
| cis-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| cis-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Dibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Dichlorodifluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Ethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Hexachlorobutadiene | | ND | ug/L | 0.50 | | | | | | |
| Isopropylbenzene | | ND | ug/L | 0.50 | | | | | | |
| m+p-Xylenes | | ND | ug/L | 0.50 | | | | | | |
| Methyl tert-butyl ether (MTBE) | | ND | ug/L | 2.0 | | | | | | |
| Methylene chloride | | ND | ug/L | 0.50 | | | | | | |
| Naphthalene | | ND | ug/L | 0.50 | | | | | | |
| n-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| n-Propylbenzene | | ND | ug/L | 0.50 | | | | | | |
| o-Xylene | | ND | ug/L | 0.50 | | | | | | |
| p-Isopropyltoluene | | ND | ug/L | 0.50 | | | | | | |
| sec-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Styrene | | ND | ug/L | 0.50 | | | | | | |
| tert-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Tetrachloroethene | | ND | ug/L | 0.50 | | | | | | |
| Toluene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Trichloroethene | | ND | ug/L | 0.50 | | | | | | |
| Trichlorofluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Vinyl chloride | | ND | ug/L | 0.50 | | | | | | |
| Xylenes, Total | | ND | ug/L | 0.50 | | | | | | |
| Trihalomethanes, Total | | ND | ug/L | 0.50 | | | | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 96 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 103 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 104 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|--------|-------|-----|------|-----------|------------|-----|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R143904 |
| Sample ID: C11030422-001AMS | | | | | | | | | | 03/21/11 20:45 |
| 65 Sample Matrix Spike | | | | | | | | | | |
| Run: SATURNCA_110321C | | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | | 106 | ug/L | 5.0 | 106 | 70 | 130 | | | |
| 1,1,1-Trichloroethane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | | | |
| 1,1,2,2-Tetrachloroethane | | 104 | ug/L | 5.0 | 104 | 70 | 130 | | | |
| 1,1,2-Trichloroethane | | 98.0 | ug/L | 5.0 | 98 | 70 | 130 | | | |
| 1,1-Dichloroethane | | 89.6 | ug/L | 5.0 | 90 | 70 | 130 | | | |
| 1,1-Dichloroethene | | 96.0 | ug/L | 5.0 | 96 | 70 | 130 | | | |
| 1,1-Dichloropropene | | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | |
| 1,2,3-Trichlorobenzene | | 67.2 | ug/L | 5.0 | 67 | 70 | 130 | | | S |
| 1,2,3-Trichloropropane | | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | |
| 1,2,4-Trichlorobenzene | | 72.8 | ug/L | 5.0 | 73 | 70 | 130 | | | |
| 1,2,4-Trimethylbenzene | | 93.6 | ug/L | 5.0 | 94 | 70 | 130 | | | |
| 1,2-Dibromo-3-chloropropane | | 94.0 | ug/L | 5.0 | 94 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 101 | ug/L | 5.0 | 101 | 70 | 130 | | | |
| 1,2-Dichlorobenzene | | 106 | ug/L | 5.0 | 106 | 70 | 130 | | | |
| 1,2-Dichloroethane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | | | |
| 1,2-Dichloropropane | | 107 | ug/L | 5.0 | 107 | 70 | 130 | | | |
| 1,3,5-Trimethylbenzene | | 98.0 | ug/L | 5.0 | 98 | 70 | 130 | | | |
| 1,3-Dichlorobenzene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| 1,3-Dichloropropane | | 91.2 | ug/L | 5.0 | 91 | 70 | 130 | | | |
| 1,4-Dichlorobenzene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | | | |
| 2,2-Dichloropropane | | 104 | ug/L | 5.0 | 104 | 70 | 130 | | | |
| 2-Chlorotoluene | | 109 | ug/L | 5.0 | 109 | 70 | 130 | | | |
| 4-Chlorotoluene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| Benzene | | 103 | ug/L | 5.0 | 103 | 70 | 130 | | | |
| Bromobenzene | | 106 | ug/L | 5.0 | 106 | 70 | 130 | | | |
| Bromochloromethane | | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | |
| Bromodichloromethane | | 102 | ug/L | 5.0 | 97 | 70 | 130 | | | |
| Bromoform | | 114 | ug/L | 5.0 | 114 | 70 | 130 | | | |
| Bromomethane | | 94.4 | ug/L | 5.0 | 94 | 70 | 130 | | | |
| Carbon tetrachloride | | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | |
| Chlorobenzene | | 98.8 | ug/L | 5.0 | 99 | 70 | 130 | | | |
| Chlorodibromomethane | | 103 | ug/L | 5.0 | 103 | 70 | 130 | | | |
| Chloroethane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | | | |
| Chloroform | | 147 | ug/L | 5.0 | 118 | 70 | 130 | | | |
| Chloromethane | | 99.2 | ug/L | 5.0 | 99 | 70 | 130 | | | |
| cis-1,2-Dichloroethene | | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | |
| cis-1,3-Dichloropropene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| Dibromomethane | | 106 | ug/L | 5.0 | 106 | 70 | 130 | | | |
| Dichlorodifluoromethane | | 82.0 | ug/L | 5.0 | 82 | 70 | 130 | | | |
| Ethylbenzene | | 100 | ug/L | 5.0 | 100 | 70 | 130 | | | |
| Hexachlorobutadiene | | 80.4 | ug/L | 5.0 | 80 | 70 | 130 | | | |
| Isopropylbenzene | | 114 | ug/L | 5.0 | 114 | 70 | 130 | | | |
| m+p-Xylenes | | 183 | ug/L | 5.0 | 91 | 70 | 130 | | | |
| Methyl tert-butyl ether (MTBE) | | 101 | ug/L | 20 | 101 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R143904 |
| Sample ID: C11030422-001AMS | 65 | Sample Matrix Spike | | Run: SATURNCA_110321C | | | | 03/21/11 20:45 | | |
| Methylene chloride | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| Naphthalene | | 80.0 | ug/L | 5.0 | 80 | 70 | 130 | | | |
| n-Butylbenzene | | 90.4 | ug/L | 5.0 | 90 | 70 | 130 | | | |
| n-Propylbenzene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| o-Xylene | | 94.8 | ug/L | 5.0 | 95 | 70 | 130 | | | |
| p-Isopropyltoluene | | 93.2 | ug/L | 5.0 | 93 | 70 | 130 | | | |
| sec-Butylbenzene | | 92.8 | ug/L | 5.0 | 93 | 70 | 130 | | | |
| Styrene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | | | |
| tert-Butylbenzene | | 93.2 | ug/L | 5.0 | 93 | 70 | 130 | | | |
| Tetrachloroethene | | 88.4 | ug/L | 5.0 | 88 | 70 | 130 | | | |
| Toluene | | 101 | ug/L | 5.0 | 101 | 70 | 130 | | | |
| trans-1,2-Dichloroethene | | 107 | ug/L | 5.0 | 107 | 70 | 130 | | | |
| trans-1,3-Dichloropropene | | 111 | ug/L | 5.0 | 111 | 70 | 130 | | | |
| Trichloroethene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | | | |
| Trichlorofluoromethane | | 96.0 | ug/L | 5.0 | 96 | 70 | 130 | | | |
| Vinyl chloride | | 99.6 | ug/L | 5.0 | 100 | 70 | 130 | | | |
| Xylenes, Total | | 278 | ug/L | 5.0 | 93 | 70 | 130 | | | |
| Trihalomethanes, Total | | 466 | ug/L | 5.0 | 108 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 104 | 80 | 120 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 109 | 80 | 120 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 105 | 80 | 120 | | | |
| Sample ID: C11030422-001AMSD | 65 | Sample Matrix Spike Duplicate | | Run: SATURNCA_110321C | | | | 03/21/11 21:22 | | |
| 1,1,1,2-Tetrachloroethane | | 108 | ug/L | 5.0 | 108 | 70 | 130 | 2.2 | 20 | |
| 1,1,1-Trichloroethane | | 104 | ug/L | 5.0 | 104 | 70 | 130 | 5.6 | 20 | |
| 1,1,2,2-Tetrachloroethane | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 0.8 | 20 | |
| 1,1,2-Trichloroethane | | 101 | ug/L | 5.0 | 101 | 70 | 130 | 2.8 | 20 | |
| 1,1-Dichloroethane | | 94.4 | ug/L | 5.0 | 94 | 70 | 130 | 5.2 | 20 | |
| 1,1-Dichloroethene | | 93.6 | ug/L | 5.0 | 94 | 70 | 130 | 2.5 | 20 | |
| 1,1-Dichloropropene | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 7.7 | 20 | |
| 1,2,3-Trichlorobenzene | | 68.4 | ug/L | 5.0 | 68 | 70 | 130 | 1.8 | 20 | S |
| 1,2,3-Trichloropropane | | 112 | ug/L | 5.0 | 112 | 70 | 130 | 5.2 | 20 | |
| 1,2,4-Trichlorobenzene | | 78.8 | ug/L | 5.0 | 79 | 70 | 130 | 7.9 | 20 | |
| 1,2,4-Trimethylbenzene | | 91.2 | ug/L | 5.0 | 91 | 70 | 130 | 2.6 | 20 | |
| 1,2-Dibromo-3-chloropropane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 16 | 20 | |
| 1,2-Dibromoethane | | 102 | ug/L | 5.0 | 102 | 70 | 130 | 1.6 | 20 | |
| 1,2-Dichlorobenzene | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 0.8 | 20 | |
| 1,2-Dichloroethane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 0.7 | 20 | |
| 1,2-Dichloropropane | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 3.3 | 20 | |
| 1,3,5-Trimethylbenzene | | 94.0 | ug/L | 5.0 | 94 | 70 | 130 | 4.2 | 20 | |
| 1,3-Dichlorobenzene | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 2.6 | 20 | |
| 1,3-Dichloropropane | | 92.4 | ug/L | 5.0 | 92 | 70 | 130 | 1.3 | 20 | |
| 1,4-Dichlorobenzene | | 106 | ug/L | 5.0 | 106 | 70 | 130 | 0.4 | 20 | |
| 2,2-Dichloropropane | | 99.2 | ug/L | 5.0 | 99 | 70 | 130 | 4.7 | 20 | |
| 2-Chlorotoluene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | 0.7 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|--------|-------|----------------------------------|------|-----------------------|------------|-----|----------------|------|
| Method: E524.2 | | | | | | | | | Batch: R143904 | |
| Sample ID: C11030422-001AMSD | | | | 65 Sample Matrix Spike Duplicate | | Run: SATURNCA_110321C | | | 03/21/11 21:22 | |
| 4-Chlorotoluene | | 116 | ug/L | 5.0 | 116 | 70 | 130 | 7.5 | 20 | |
| Benzene | | 98.4 | ug/L | 5.0 | 98 | 70 | 130 | 4.4 | 20 | |
| Bromobenzene | | 106 | ug/L | 5.0 | 106 | 70 | 130 | 0.4 | 20 | |
| Bromochloromethane | | 116 | ug/L | 5.0 | 116 | 70 | 130 | 0.7 | 20 | |
| Bromodichloromethane | | 102 | ug/L | 5.0 | 97 | 70 | 130 | 0.0 | 20 | |
| Bromoform | | 113 | ug/L | 5.0 | 113 | 70 | 130 | 0.7 | 20 | |
| Bromomethane | | 98.8 | ug/L | 5.0 | 99 | 70 | 130 | 4.6 | 20 | |
| Carbon tetrachloride | | 109 | ug/L | 5.0 | 109 | 70 | 130 | 2.5 | 20 | |
| Chlorobenzene | | 102 | ug/L | 5.0 | 102 | 70 | 130 | 3.6 | 20 | |
| Chlorodibromomethane | | 106 | ug/L | 5.0 | 106 | 70 | 130 | 2.7 | 20 | |
| Chloroethane | | 104 | ug/L | 5.0 | 104 | 70 | 130 | 6.0 | 20 | |
| Chloroform | | 139 | ug/L | 5.0 | 109 | 70 | 130 | 5.9 | 20 | |
| Chloromethane | | 96.0 | ug/L | 5.0 | 96 | 70 | 130 | 3.3 | 20 | |
| cis-1,2-Dichloroethene | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 2.5 | 20 | |
| cis-1,3-Dichloropropene | | 110 | ug/L | 5.0 | 110 | 70 | 130 | 1.5 | 20 | |
| Dibromomethane | | 103 | ug/L | 5.0 | 103 | 70 | 130 | 2.7 | 20 | |
| Dichlorodifluoromethane | | 79.6 | ug/L | 5.0 | 80 | 70 | 130 | 3.0 | 20 | |
| Ethylbenzene | | 101 | ug/L | 5.0 | 101 | 70 | 130 | 0.8 | 20 | |
| Hexachlorobutadiene | | 81.2 | ug/L | 5.0 | 81 | 70 | 130 | 1.0 | 20 | |
| Isopropylbenzene | | 112 | ug/L | 5.0 | 112 | 70 | 130 | 1.8 | 20 | |
| m+p-Xylenes | | 181 | ug/L | 5.0 | 91 | 70 | 130 | 0.9 | 20 | |
| Methyl tert-butyl ether (MTBE) | | 104 | ug/L | 20 | 104 | 70 | 130 | 3.1 | 20 | |
| Methylene chloride | | 100 | ug/L | 5.0 | 100 | 70 | 130 | 2.4 | 20 | |
| Naphthalene | | 84.0 | ug/L | 5.0 | 84 | 70 | 130 | 4.9 | 20 | |
| n-Butylbenzene | | 89.2 | ug/L | 5.0 | 89 | 70 | 130 | 1.3 | 20 | |
| n-Propylbenzene | | 99.2 | ug/L | 5.0 | 99 | 70 | 130 | 2.4 | 20 | |
| o-Xylene | | 96.0 | ug/L | 5.0 | 96 | 70 | 130 | 1.3 | 20 | |
| p-Isopropyltoluene | | 89.6 | ug/L | 5.0 | 90 | 70 | 130 | 3.9 | 20 | |
| sec-Butylbenzene | | 93.6 | ug/L | 5.0 | 94 | 70 | 130 | 0.9 | 20 | |
| Styrene | | 108 | ug/L | 5.0 | 108 | 70 | 130 | 1.5 | 20 | |
| tert-Butylbenzene | | 93.6 | ug/L | 5.0 | 94 | 70 | 130 | 0.4 | 20 | |
| Tetrachloroethene | | 90.0 | ug/L | 5.0 | 90 | 70 | 130 | 1.8 | 20 | |
| Toluene | | 98.4 | ug/L | 5.0 | 98 | 70 | 130 | 2.4 | 20 | |
| trans-1,2-Dichloroethene | | 105 | ug/L | 5.0 | 105 | 70 | 130 | 2.3 | 20 | |
| trans-1,3-Dichloropropene | | 112 | ug/L | 5.0 | 112 | 70 | 130 | 1.4 | 20 | |
| Trichloroethene | | 104 | ug/L | 5.0 | 104 | 70 | 130 | 2.7 | 20 | |
| Trichlorofluoromethane | | 90.8 | ug/L | 5.0 | 91 | 70 | 130 | 5.6 | 20 | |
| Vinyl chloride | | 96.8 | ug/L | 5.0 | 97 | 70 | 130 | 2.9 | 20 | |
| Xylenes, Total | | 277 | ug/L | 5.0 | 92 | 70 | 130 | 0.1 | 20 | |
| Trihalomethanes, Total | | 459 | ug/L | 5.0 | 106 | 70 | 130 | 1.4 | 20 | |
| Surr: Dibromofluoromethane | | | | 0.50 | 99 | 80 | 120 | 0.0 | 10 | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 113 | 80 | 120 | 0.0 | 10 | |
| Surr: Toluene-d8 | | | | 0.50 | 106 | 80 | 120 | 0.0 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|----------------------------|-------|---|-------|------|------|-----------|------------|-----|----------|---------------------------------------|
| Method: E531.1 | | | | | | | | | | Analytical Run: R143918 |
| Sample ID: ICV_09r | 11 | Initial Calibration Verification Standard | | | | | | | | 03/22/11 13:43 |
| Aldicarb | | 10.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Aldicarb sulfone | | 10 | ug/L | 0.40 | 103 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 9.6 | ug/L | 0.41 | 97 | 80 | 120 | | | |
| Carbaryl | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Carbofuran | | 9.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Methiocarb | | 9.8 | ug/L | 0.50 | 98 | 80 | 120 | | | |
| Methomyl | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Oxamyl | | 9.7 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Baygon | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 97 | 70 | 130 | | | |
| Method: E531.1 | | | | | | | | | | Batch: R143918 |
| Sample ID: MBLK_10r | 11 | Method Blank | | | | | | | | Run: HPLC202-C_110322A 03/22/11 14:26 |
| Aldicarb | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfone | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfoxide | | ND | ug/L | 0.41 | | | | | | |
| Carbaryl | | ND | ug/L | 0.40 | | | | | | |
| Carbofuran | | ND | ug/L | 0.40 | | | | | | |
| 3-Hydroxycarbofuran | | ND | ug/L | 0.40 | | | | | | |
| Methiocarb | | ND | ug/L | 0.50 | | | | | | |
| Methomyl | | ND | ug/L | 0.40 | | | | | | |
| Oxamyl | | ND | ug/L | 0.40 | | | | | | |
| Baygon | | ND | ug/L | 0.40 | | | | | | |
| Surr: BDMC | | | | 0.40 | 99 | 70 | 130 | | | |
| Sample ID: LFB_11r | 11 | Laboratory Fortified Blank | | | | | | | | Run: HPLC202-C_110322A 03/22/11 15:10 |
| Aldicarb | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Aldicarb sulfone | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 7.6 | ug/L | 0.41 | 95 | 80 | 120 | | | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Carbofuran | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Methiocarb | | 7.9 | ug/L | 0.50 | 98 | 80 | 120 | | | |
| Methomyl | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | | | |
| Oxamyl | | 8.2 | ug/L | 0.40 | 102 | 80 | 120 | | | |
| Baygon | | 7.9 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 99 | 70 | 130 | | | |
| Sample ID: LFB_12r | 11 | Laboratory Fortified Blank Duplicate | | | | | | | | Run: HPLC202-C_110322A 03/22/11 15:53 |
| Aldicarb | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | 2.2 | 20 | |
| Aldicarb sulfone | | 8.3 | ug/L | 0.40 | 104 | 80 | 120 | 6.5 | 20 | |
| Aldicarb sulfoxide | | 8.0 | ug/L | 0.41 | 100 | 80 | 120 | 5.6 | 20 | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | 0.3 | 20 | |
| Carbofuran | | 7.6 | ug/L | 0.40 | 96 | 80 | 120 | 1.7 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------------|-------|--------------------------------------|-------|------|------|------------------------|------------|-----|----------|----------------|
| Method: E531.1 | | | | | | | | | | Batch: R143918 |
| Sample ID: LFBD_12r | 11 | Laboratory Fortified Blank Duplicate | | | | Run: HPLC202-C_110322A | | | | 03/22/11 15:53 |
| 3-Hydroxycarbofuran | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | 0.1 | 20 | |
| Methiocarb | | 7.6 | ug/L | 0.50 | 95 | 80 | 120 | 3.1 | 20 | |
| Methomyl | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | 1.4 | 20 | |
| Oxamyl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 2.4 | 20 | |
| Baygon | | 7.9 | ug/L | 0.40 | 98 | 80 | 120 | 0.1 | 20 | |
| Surr: BDMC | | | | 0.40 | 98 | 70 | 130 | 0.0 | 20 | |
| Sample ID: C11030437-001D MS | 11 | Sample Matrix Spike | | | | Run: HPLC202-C_110322A | | | | 03/22/11 17:20 |
| Aldicarb | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | | | |
| Aldicarb sulfone | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 8.1 | ug/L | 0.41 | 101 | 80 | 120 | | | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Methiocarb | | 7.8 | ug/L | 0.50 | 98 | 80 | 120 | | | |
| Methomyl | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | | | |
| Oxamyl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Baygon | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 100 | 70 | 130 | | | |
| Sample ID: C11030437-001D MSD | 11 | Sample Matrix Spike Duplicate | | | | Run: HPLC202-C_110322A | | | | 03/22/11 18:04 |
| Aldicarb | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | 0.3 | 20 | |
| Aldicarb sulfone | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 2.8 | 20 | |
| Aldicarb sulfoxide | | 8.6 | ug/L | 0.41 | 107 | 80 | 120 | 6.2 | 20 | |
| Carbaryl | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | 1.6 | 20 | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 0.4 | 20 | |
| 3-Hydroxycarbofuran | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 2.4 | 20 | |
| Methiocarb | | 7.8 | ug/L | 0.50 | 97 | 80 | 120 | 0.5 | 20 | |
| Methomyl | | 7.4 | ug/L | 0.40 | 93 | 80 | 120 | 3.7 | 20 | |
| Oxamyl | | 8.0 | ug/L | 0.40 | 99 | 80 | 120 | 0.9 | 20 | |
| Baygon | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | 2.9 | 20 | |
| Surr: BDMC | | | | 0.40 | 99 | 70 | 130 | 0.0 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|--------------------|------------|-----|------------------|------|
| Method: E900.0 | | | | | | | | | Batch: GrAB-1061 | |
| Sample ID: MB-GrAB-1061 | 6 | Method Blank | | | | Run: G542M_110322A | | | 03/24/11 00:17 | |
| Gross Alpha | | -1.0 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.6 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 1 | pCi/L | | | | | | | |
| Gross Beta | | -0.3 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 1 | pCi/L | | | | | | | |
| Gross Beta MDC | | 2 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-1061 | | Laboratory Control Sample | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Alpha | | 109 | pCi/L | 107 | | 80 | 120 | | | |
| Sample ID: Cs137-GrAB-1061 | | Laboratory Control Sample | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Beta | | 94.5 | pCi/L | 107 | | 80 | 120 | | | |
| Sample ID: C11030560-001FMS | | Sample Matrix Spike | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Alpha | | 110 | pCi/L | 103 | | 70 | 130 | | | |
| Sample ID: C11030560-001FMSD | | Sample Matrix Spike Duplicate | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Alpha | | 99 | pCi/L | 96 | | 70 | 130 | 7.6 | 17.6 | |
| Sample ID: C11030560-001FMS | | Sample Matrix Spike | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Beta | | 92 | pCi/L | 102 | | 70 | 130 | | | |
| Sample ID: C11030560-001FMSD | | Sample Matrix Spike Duplicate | | | | Run: G542M_110322A | | | 03/24/11 00:18 | |
| Gross Beta | | 90 | pCi/L | 100 | | 70 | 130 | 1.9 | 15.9 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|-------|-------------------------------|--------------|-----|-------------------------|-----------|------------|-------------------|----------|------|
| Method: E903.0 | | | | | | | | Batch: RA226-5256 | | |
| Sample ID: C11030573-001AMS | | Sample Matrix Spike | | | Run: TENNELEC-3_110323D | | | 04/05/11 21:58 | | |
| Radium 226 | 11 | pCi/L | | 88 | 80 | 120 | | | | |
| Sample ID: C11030573-001AMSD | | Sample Matrix Spike Duplicate | | | Run: TENNELEC-3_110323D | | | 04/05/11 21:58 | | |
| Radium 226 | 9.6 | pCi/L | | 74 | 80 | 120 | 17 | 26.6 | S | |
| - Spike response is outside of the acceptance range for this analysis. Since the LCS and the MS are acceptable the batch is approved. | | | | | | | | | | |
| Sample ID: MB-RA226-5256 | | 3 | Method Blank | | Run: TENNELEC-3_110323D | | | 04/05/11 21:57 | | |
| Radium 226 | 0.1 | pCi/L | | | | | | | | |
| Radium 226 precision (±) | 0.10 | pCi/L | | | | | | | | |
| Radium 226 MDC | 0.09 | pCi/L | | | | | | | | |
| Sample ID: LCS-RA226-5256 | | Laboratory Control Sample | | | Run: TENNELEC-3_110323D | | | 04/05/11 21:57 | | |
| Radium 226 | 6.8 | pCi/L | | 106 | 90 | 110 | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|--------|------|-----------|------------|-----------------------------|----------|----------------|
| Method: Kelada mod | | | | | | | | Analytical Run: SUB-B163047 | | |
| Sample ID: ICV-1 | | Initial Calibration Verification Standard | | | | | | | | 03/24/11 13:54 |
| Cyanide, Total | | 0.157 | mg/L | 0.0050 | 104 | 90 | 110 | | | |
| Method: Kelada mod | | | | | | | | Batch: B_R163047 | | |
| Sample ID: B11032017-001DMSD | | Sample Matrix Spike Duplicate | | | | | | | | 03/24/11 14:35 |
| Cyanide, Total | | 0.110 | mg/L | 0.0050 | 104 | 90 | 110 | 1.0 | 10 | |
| Sample ID: B11032017-001DMS | | Sample Matrix Spike | | | | | | | | 03/24/11 14:33 |
| Cyanide, Total | | 0.108 | mg/L | 0.0050 | 103 | 90 | 110 | | | |
| Sample ID: MBLK-3 | | Method Blank | | | | | | | | 03/24/11 13:58 |
| Cyanide, Total | | ND | mg/L | 0.002 | | | | | | |
| Sample ID: LFB-2 | | Laboratory Fortified Blank | | | | | | | | 03/24/11 13:56 |
| Cyanide, Total | | 0.0993 | mg/L | 0.0050 | 99 | 90 | 110 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 04/18/11

Project: Goose Creek 2-2C (Final Samples)

Work Order: C11030560

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------|-------------------------------|--------------|----|------|-------------------------|------------|-----|-------------------|------|
| Method: RA-05 | | | | | | | | | Batch: RA228-3646 | |
| Sample ID: LCS-228-RA226-5256 | | Laboratory Control Sample | | | | Run: TENNELEC-3_110323C | | | 03/31/11 14:54 | |
| Radium 228 | | 6.9 | pCi/L | | 102 | 80 | 120 | | | |
| Sample ID: MB-RA226-5256 | | 3 | Method Blank | | | Run: TENNELEC-3_110323C | | | 03/31/11 14:54 | |
| Radium 228 | | -0.2 | pCi/L | | | | | | | U |
| Radium 228 precision (±) | | 0.8 | pCi/L | | | | | | | |
| Radium 228 MDC | | 0.8 | pCi/L | | | | | | | |
| Sample ID: C11030676-001AMS | | Sample Matrix Spike | | | | Run: TENNELEC-3_110323C | | | 03/31/11 14:54 | |
| Radium 228 | | 15 | pCi/L | | 111 | 70 | 130 | | | |
| Sample ID: C11030676-001AMSD | | Sample Matrix Spike Duplicate | | | | Run: TENNELEC-3_110323C | | | 03/31/11 14:54 | |
| Radium 228 | | 14 | pCi/L | | 102 | 70 | 130 | 7.4 | 39.1 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C11030560

Login completed by: Corinne Wagner

Date Received: 3/18/2011

Reviewed by: BL2000\hackerman

Received by: ha

Reviewed Date: 3/21/2011

 Carrier FedEx
 name:

| | | | |
|---|---|-----------------------------|---|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 2.2°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

None



Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT (Provide as much information as possible.)

| | | | | | | | | | | | | | | |
|---|--|--|---|--------------------|-----------------------------------|-----------------------------------|---------------|---|---|--|-------------------------------|--|--|--|
| Company Name: WNDC | | | Project Name, PWS, Permit, Etc.: Duck Creek 2-2 (Final Samples) | | | Sample Origin State: WY | | EPA/State Compliance: Yes <input type="checkbox"/> No <input type="checkbox"/> | | | | | | |
| Report Mail Address: 4025 Automation Way, Unit E Fort Collins, CO 80525 | | | Contact Name: Mark Stacy | | Phone/Fax: 970-223-4705 | | Email: | | Sampler: (Please Print) Jason Hayes | | | | | |
| Invoice Address: 4025 Automation Way, Unit E Fort Collins, CO 80525 | | | Invoice Contact & Phone: Mark Stacy 970-223-4705 | | | Purchase Order: | | Quote/Bottle Order: 32724 | | | | | | |
| Special Report/Formats: <input type="checkbox"/> DW <input type="checkbox"/> EDD/EDT (Electronic Data) <input type="checkbox"/> POTW/WWTP <input type="checkbox"/> Format: _____ <input type="checkbox"/> State: _____ <input type="checkbox"/> LEVEL IV <input type="checkbox"/> Other: _____ <input type="checkbox"/> NELAC | | | Number of Containers Sample Type: <input type="checkbox"/> A W <input type="checkbox"/> S V B O DW <input type="checkbox"/> Air Water Solids/Solids <input type="checkbox"/> Vegetation Bioassay Other <input type="checkbox"/> DW - Drinking Water | ANALYSIS REQUESTED | | | | | Standard Turnaround (TAT) R U S H | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page | | Shipped by: Red Ex Cooler ID(s): C-2593 | | |
| | | | | SEE ATTACHED | | | | | | Comments: | | Receipt Temp 2.2 °C | | On Ice: <input checked="" type="radio"/> N |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | | | Collection Date | | | | | | Collection Time | | | MATRIX | Custody Seal On Bottle <input checked="" type="radio"/> Y <input checked="" type="radio"/> N On Cooler <input checked="" type="radio"/> Y <input checked="" type="radio"/> N | |
| 1 DC 2-2: 1L Plastic (3) | | | 3/17/11 | | | | | | | | | | | |
| 2 DC 2-2: 500mL (1) | | | 3/17/11 | | | | | | | | | | | |
| 3 DC 2-2: 250mL (1) | | | 3/17/11 | | | | | | | | | | | |
| 4 DC 2-2: 2L Plastic (2) | | | 3/17/11 | | | | | | | | | | | |
| 5 DC 2-2: 500mL (2) | | | 3/17/11 | | | | | | | | | | | |
| 6 DC 2-2: 1L (2) | | | 3/17/11 | | | | | | | | | | | |
| 7 DC 2-2: 1L Glass (2) | | | 3/17/11 | | | | | | | | | | | |
| 8 DC 2-2: 40mL VOA (6) | | | 3/17/11 | | | | | | | | | | | |
| 9 DC 2-2: 40mL Glass (6) | | | 3/17/11 | | | | | | | | | | | |
| 10 DC 2-2: 100mL Plastic (2) | | | 3/17/11 | | | | | | | | | | | |
| Custody Record MUST be Signed | | | Relinquished by (print): Jason Hayes | | Date/Time: 3/17/11 | | Signature: | | Received by (print): | | Date/Time: | | Signature: | |
| | | | Relinquished by (print): | | Date/Time: | | Signature: | | Received by (print): | | Date/Time: | | Signature: | |
| | | | Sample Disposal: | | Return to Client: | | Lab Disposal: | | Received by Laboratory: | | Date/Time: 3/18/11 930 | | Signature: Jason Hayes | |

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

WWDC Final

| | | | | | | | |
|----------------------------------|---|-------------|---|--------|---------|----------------------------------|---|
| 1 Liter Plastic | 3 | E300.0 | E300.0 Anions | | | | 1 |
| | | - | Sample Filtering | 48 hrs | | | |
| | | A2340 B | Hardness | | | | |
| | | E200.7_8 | Metals by ICP/ICPMS, Dissolved | | | | |
| | | A2310 B | Acidity, Total as CaCO3 | | | | |
| | | A2320 B | Alkalinity | | | | |
| | | A2510 B | Conductivity | | | | |
| | | Calculation | Corrosivity, Calculated | | | | |
| | | A4500-F C | Fluoride | | | | |
| | | A4500-NO2 B | Nitrogen, Nitrite | 48 hrs | | | |
| | | A4500-H B | pH | | | | |
| | | A2540 C | Solids, Total Dissolved | | | | |
| | | A2130 B | Turbidity | 48 hrs | | | |
| | | A5540 C | Foaming Agents | 48 hrs | | | |
| | | A2120 B | Color | 48 hrs | | | |
| 500ML-AG-NM-UP | 1 | A2150 B | Odor | 48 hrs | | | 1 |
| 250 mL Plastic | 1 | E200.7_8 | Metals by ICP/ICPMS, Drinking Water | | ■ HNO3 | | 1 |
| | | E245.1 | Mercury, Drinking Water | | | | |
| 2 Liter Plastic | 2 | E900.0 | Gross Alpha, Gross Beta | | ■ HNO3 | | 1 |
| | | A7500-RA | Radium 226 + Radium 228 | | | | |
| | | E903.0 | Radium 226, Total | | | | |
| | | RA-05 | Radium 228, Total | | | | |
| 500 mL Plastic | 1 | E353.2 | Nitrogen, Nitrate + Nitrite | | ■ H2SO4 | | 1 |
| 500 mL Plastic | 1 | Kelada mod | Cyanide, SDWA | | ■ NaOH | | 1 |
| 1L-AG-NM-AA | 2 | E515.1 | E515.1 Chlorinated Herbicides | | | | 1 |
| 1 Liter Amber Glass Narrow Mouth | 2 | E525.2 | 525-Semi-Volatile Organic Compounds, SDWA | | ■ HCL | Do Not Rinse - Contains Additive | 1 |
| 40ML-CG-VOA-NATHIO | 3 | E504.1 | E504 Pesticides | | | | 1 |
| 40 mL Clear Glass VOA | 3 | E531.1 | Pesticides, Carbamates SDWA | | | Do Not Rinse - Contains Additive | 1 |
| 40ML-CG-VOA-HCL-AA | 3 | E524.2 | E524.2 SDWA VOCs | | | | 1 |

| | | | | | | | |
|------------------------|---|----------|------------------------|--------|--|--|---|
| 100 mL Plastic Sterile | 2 | IRB-BART | Bacteria, Iron Related | | | | 1 |
| | | A9223 B | Bacteria, SDWA | 30 hrs | | | |

☒ HNO₃ - Nitric Acid
 ☒ H₂SO₄ - Sulfuric Acid
 ☒ NaOH - Sodium Hydroxide
☒ ZnAc - Zinc Acetate
 ☒ HCl - Hydrochloric Acid
☐ H₃PO₄ - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

Lone Tree Fault 1-5

ANALYTICAL SUMMARY REPORT

June 30, 2011

Lidstone and Associates
4025 Automation Way Unit E
Fort Collins, CO 80525

Workorder No.: C11060017

Project Name: Belvoir Aquifer Level II

Energy Laboratories, Inc. Casper WY received the following 1 sample for Lidstone and Associates on 6/1/2011 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|---------------------|----------------|--------------|---------|--|
| C11060017-001 | Lone Tree Fault 1-5 | 05/31/11 12:15 | 06/01/11 | Aqueous | Metals by ICP/ICPMS, Drinking Water Alkalinity QA Calculations Bacteria, Iron Related Bacteria, SDWA Conductivity E300.0 Anions pH Metals Preparation by EPA 200.2 Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved Solids, Total Suspended |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:


Report Proofing Specialist

Digitally signed by
Kathy Hamre
Date: 2011.06.30 15:26:12 -06:00

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060017-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/30/11
Collection Date: 05/31/11 12:15
Date Received: 06/01/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--------|----------|-----------|--------|-------------|-------------|----------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related | 630 | CFU/ml | | 1.0 | | IRB-BART | 06/01/11 10:58 / rlo |
| MAJOR IONS | | | | | | | |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 06/02/11 11:39 / jba |
| Bicarbonate as HCO ₃ | 134 | mg/L | | 1 | | A2320 B | 06/02/11 11:39 / jba |
| Calcium | 28 | mg/L | | 1 | | E200.7 | 06/06/11 17:09 / cp |
| Chloride | 2 | mg/L | | 1 | | E300.0 | 06/03/11 04:27 / ljl |
| Magnesium | 10 | mg/L | | 1 | | E200.7 | 06/06/11 17:09 / cp |
| Potassium | 2 | mg/L | | 1 | | E200.7 | 06/06/11 17:09 / cp |
| Sodium | 5 | mg/L | | 1 | | E200.7 | 06/06/11 17:09 / cp |
| Sulfate | 8 | mg/L | | 1 | | E300.0 | 06/03/11 04:27 / ljl |
| PHYSICAL PROPERTIES | | | | | | | |
| Conductivity @ 25 C | 224 | umhos/cm | | 1 | | A2510 B | 06/01/11 14:40 / lmc |
| pH | 7.90 | s.u. | | 0.01 | | A4500-H B | 06/01/11 14:40 / lmc |
| Solids, Total Dissolved TDS @ 180 C | 111 | mg/L | | 10 | | A2540 C | 06/01/11 13:49 / lmc |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | | 4 | | A2540 D | 06/02/11 15:18 / wc |
| METALS - TOTAL | | | | | | | |
| Iron | 0.19 | mg/L | | 0.03 | 0.3 | E200.7 | 06/06/11 17:09 / cp |
| Uranium | 0.0013 | mg/L | | 0.0003 | 0.03 | E200.8 | 06/09/11 17:29 / sml |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | 0.3 | pCi/L | U | | 15 | E900.0 | 06/17/11 09:13 / ep |
| Gross Alpha precision (±) | 1.3 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Alpha MDC | 1.4 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta | -0.8 | pCi/L | U | | 50 | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta precision (±) | 1.5 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta MDC | 1.6 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Radium 226 | 0.09 | pCi/L | U | | 5 | E903.0 | 06/27/11 14:38 / trs |
| Radium 226 precision (±) | 0.1 | pCi/L | | | | E903.0 | 06/27/11 14:38 / trs |
| Radium 226 MDC | 0.1 | pCi/L | | | | E903.0 | 06/27/11 14:38 / trs |
| Radium 228 | 0.5 | pCi/L | U | | 5 | RA-05 | 06/20/11 12:17 / plj |
| Radium 228 precision (±) | 1.0 | pCi/L | | | | RA-05 | 06/20/11 12:17 / plj |
| Radium 228 MDC | 1.1 | pCi/L | | | | RA-05 | 06/20/11 12:17 / plj |
| Radium 226 + Radium 228 | 0.6 | pCi/L | U | | 5 | A7500-RA | 06/30/11 09:44 / res |
| Radium 226 + Radium 228 precision (±) | 1.0 | pCi/L | | | | A7500-RA | 06/30/11 09:44 / res |
| Radium 226 + Radium 228 MDC | 1.1 | pCi/L | | | | A7500-RA | 06/30/11 09:44 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -1.21 | % | | | | Calculation | 06/27/11 08:12 / kbh |
| Anions | 2.51 | meq/L | | | | Calculation | 06/27/11 08:12 / kbh |
| Cations | 2.45 | meq/L | | | | Calculation | 06/27/11 08:12 / kbh |
| Solids, Total Dissolved Calculated | 143 | mg/L | | | | Calculation | 06/27/11 08:12 / kbh |
| TDS Balance (0.80 - 1.20) | 0.780 | | | | | Calculation | 06/27/11 08:12 / kbh |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MDC - Minimum detectable concentration

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.
U - Not detected at minimum detectable concentration



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LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Client Sample ID: Lone Tree Fault 1-5
Sampled By: Mark Stacy
Lab ID: C11060017-001B

Report Date: 06/30/11
Collection Date: 05/31/11 12:15
Received Date: 06/01/11 08:50
Matrix: Aqueous

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|---------------------------|--------|-------|-------------|-----------|---------|----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Absent | | SAFE | | A9223 B | 06/01/11 10:52 / rlo |
| Bacteria, E-Coli Coliform | Absent | | | | A9223 B | 06/01/11 10:52 / rlo |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R146524 |
| Sample ID: MBLK | | Method Blank | | | | | Run: MANTECH_110602A | | | 06/02/11 11:08 |
| Alkalinity, Total as CaCO ₃ | | 2.39 | mg/L | 5.0 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_110602A | | | 06/02/11 11:24 |
| Alkalinity, Total as CaCO ₃ | | 209 | mg/L | 5.0 | 103 | 90 | 110 | | | |
| Sample ID: C11060017-001CDUP | | Sample Duplicate | | | | | Run: MANTECH_110602A | | | 06/02/11 11:47 |
| Alkalinity, Total as CaCO ₃ | | 110 | mg/L | 5.0 | | | | 0.3 | 10 | |
| Sample ID: C11060017-001CMS | | Sample Matrix Spike | | | | | Run: MANTECH_110602A | | | 06/02/11 11:55 |
| Alkalinity, Total as CaCO ₃ | | 239 | mg/L | 5.0 | 103 | 80 | 120 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Project: Belvoir Aquifer Level II

Report Date: 06/30/11

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|-------|-----|------|--------------------------|-------------------------------------|-----|----------------|------|
| Method: A2510 B | | | | | | | Analytical Run: ORION555A-2_110601B | | | |
| Sample ID: ICV2_110601_2 | | Initial Calibration Verification Standard | | | | | | | 06/01/11 14:36 | |
| Conductivity @ 25 C | | 1370 umhos/cm | | 1.0 | 97 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | Batch: 110601_2_PH-W_555A-2 | | | |
| Sample ID: MBLK1_110601_2 | | Method Blank | | | | Run: ORION555A-2_110601B | | | 06/01/11 14:33 | |
| Conductivity @ 25 C | | 0.8 umhos/cm | | 0.2 | | | | | | |
| Sample ID: C11060029-001BDUP | | Sample Duplicate | | | | Run: ORION555A-2_110601B | | | 06/01/11 15:08 | |
| Conductivity @ 25 C | | 428 umhos/cm | | 1.0 | | | | 0.2 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|----|------|-----------|--------------------|-----|----------|----------------|
| Method: A2540 C | | | | | | | | | | Batch: R146550 |
| Sample ID: MBLK1_ | | Method Blank | | | | | Run: BAL-1_110601A | | | 06/01/11 13:48 |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 4 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | | Run: BAL-1_110601A | | | 06/01/11 13:48 |
| Solids, Total Dissolved TDS @ 180 C | | 971 | mg/L | 10 | 97 | 90 | 110 | | | |
| Sample ID: C11060025-001ADUP | | Sample Duplicate | | | | | Run: BAL-1_110601A | | | 06/01/11 13:49 |
| Solids, Total Dissolved TDS @ 180 C | | 280 | mg/L | 10 | | | | 2.6 | 10 | |
| Sample ID: C11060029-001BMS | | Sample Matrix Spike | | | | | Run: BAL-1_110601A | | | 06/01/11 13:51 |
| Solids, Total Dissolved TDS @ 180 C | | 2280 | mg/L | 10 | 101 | 90 | 110 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Project: Belvoir Aquifer Level II

Report Date: 06/30/11

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|--------------------|------------|-----|----------|----------------|
| Method: A2540 D | | | | | | | | | | Batch: R146540 |
| Sample ID: MBLK1_ | | Method Blank | | | | Run: BAL-1_110602B | | | | 06/02/11 15:17 |
| Solids, Total Suspended TSS @ 105 C | | ND | mg/L | 2 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | Run: BAL-1_110602B | | | | 06/02/11 15:17 |
| Solids, Total Suspended TSS @ 105 C | | 158 | mg/L | 12 | 79 | 60 | 110 | | | |
| Sample ID: C11060025-001EDUP | | Sample Duplicate | | | | Run: BAL-1_110602B | | | | 06/02/11 15:19 |
| Solids, Total Suspended TSS @ 105 C | | 12.8 | mg/L | 4.0 | | | | 3.2 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|-------|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A4500-H B | | | | | | | | Analytical Run: ORION555A-2_110601B | | |
| Sample ID: ICV1_110601_2 | | Initial Calibration Verification Standard | | | | | | | | 06/01/11 14:34 |
| pH | | 6.88 | s.u. | 0.010 | 100 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | | Batch: 110601_2_PH-W_555A-2 | | |
| Sample ID: C11060029-001BDUP | | Sample Duplicate | | | | | | | | 06/01/11 15:08 |
| pH | | 7.68 | s.u. | 0.010 | | | | 0.1 | 3 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|---------------------|------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R146611 |
| Sample ID: MB-110606A | 5 | Method Blank | | | | Run: ICP2-C_110606A | | | | 06/06/11 13:13 |
| Calcium | | ND | mg/L | 0.1 | | | | | | |
| Iron | | ND | mg/L | 0.001 | | | | | | |
| Magnesium | | ND | mg/L | 0.05 | | | | | | |
| Potassium | | ND | mg/L | 0.05 | | | | | | |
| Sodium | | ND | mg/L | 0.2 | | | | | | |
| Sample ID: LFB-110606A | 5 | Laboratory Fortified Blank | | | | Run: ICP2-C_110606A | | | | 06/06/11 13:17 |
| Calcium | | 48.6 | mg/L | 0.50 | 97 | 85 | 115 | | | |
| Iron | | 0.978 | mg/L | 0.030 | 98 | 85 | 115 | | | |
| Magnesium | | 47.7 | mg/L | 0.50 | 95 | 85 | 115 | | | |
| Potassium | | 45.0 | mg/L | 0.50 | 90 | 85 | 115 | | | |
| Sodium | | 48.8 | mg/L | 0.50 | 98 | 85 | 115 | | | |
| Sample ID: C11060022-003BMS2 | 5 | Sample Matrix Spike | | | | Run: ICP2-C_110606A | | | | 06/06/11 17:17 |
| Calcium | | 120 | mg/L | 0.50 | 94 | 70 | 130 | | | |
| Iron | | 1.9 | mg/L | 0.030 | 95 | 70 | 130 | | | |
| Magnesium | | 100 | mg/L | 0.50 | 94 | 70 | 130 | | | |
| Potassium | | 94 | mg/L | 0.50 | 90 | 70 | 130 | | | |
| Sodium | | 110 | mg/L | 0.50 | 96 | 70 | 130 | | | |
| Sample ID: C11060022-003BMSD | 5 | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_110606A | | | | 06/06/11 17:21 |
| Calcium | | 120 | mg/L | 0.50 | 96 | 70 | 130 | 1.9 | 20 | |
| Iron | | 2.0 | mg/L | 0.030 | 98 | 70 | 130 | 3.1 | 20 | |
| Magnesium | | 100 | mg/L | 0.50 | 95 | 70 | 130 | 1.8 | 20 | |
| Potassium | | 94 | mg/L | 0.50 | 90 | 70 | 130 | 0.1 | 20 | |
| Sodium | | 110 | mg/L | 0.50 | 98 | 70 | 130 | 1.9 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|--------|-------|---------|------|-----------|------------|-----|----------|---|
| Method: E200.8 | | | | | | | | | | Batch: R146795 |
| Sample ID: LRB | Method Blank | | | | | | | | | |
| Uranium | | ND | mg/L | 1E-05 | | | | | | Run: ICPMS2-C_110609A 06/09/11 11:30 |
| Sample ID: LFB | Laboratory Fortified Blank | | | | | | | | | |
| Uranium | | 0.0490 | mg/L | 0.00030 | 98 | 85 | 115 | | | Run: ICPMS2-C_110609A 06/09/11 11:36 |
| Sample ID: C11060158-001DMS4 | Sample Matrix Spike | | | | | | | | | |
| Uranium | | 0.0490 | mg/L | 0.00030 | 98 | 70 | 130 | | | Run: ICPMS2-C_110609A 06/09/11 17:14 |
| Sample ID: C11060158-001DMSD | Sample Matrix Spike Duplicate | | | | | | | | | |
| Uranium | | 0.0506 | mg/L | 0.00030 | 101 | 70 | 130 | 3.2 | 20 | Run: ICPMS2-C_110609A 06/09/11 17:17 |
| Sample ID: C11060160-001DMS4 | Sample Matrix Spike | | | | | | | | | |
| Uranium | | 2.31 | mg/L | 0.00030 | | 70 | 130 | | | Run: ICPMS2-C_110609A 06/09/11 18:06 A |
| Sample ID: C11060160-001DMSD | Sample Matrix Spike Duplicate | | | | | | | | | |
| Uranium | | 2.32 | mg/L | 0.00030 | | 70 | 130 | 0.4 | 20 | Run: ICPMS2-C_110609A 06/09/11 18:09 A |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|------|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E300.0 | | | | | | | | | | Analytical Run: IC2-C_110602A |
| Sample ID: ICV-110602 | 2 | Initial Calibration Verification Standard | | | | | | | | 06/02/11 18:10 |
| Chloride | | 9.85 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sulfate | | 39.5 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Method: E300.0 | | | | | | | | | | Batch: R146552 |
| Sample ID: ICB-110602 | 2 | Method Blank | | | | | | | | Run: IC2-C_110602A 06/02/11 18:26 |
| Chloride | | 0.06 | mg/L | 0.04 | | | | | | |
| Sulfate | | 0.2 | mg/L | 0.1 | | | | | | |
| Sample ID: LFB-110602 | 2 | Laboratory Fortified Blank | | | | | | | | Run: IC2-C_110602A 06/02/11 18:41 |
| Chloride | | 9.73 | mg/L | 1.0 | 97 | 90 | 110 | | | |
| Sulfate | | 39.6 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sample ID: C11060027-001AMS | 2 | Sample Matrix Spike | | | | | | | | Run: IC2-C_110602A 06/03/11 05:59 |
| Chloride | | 266 | mg/L | 2.0 | 89 | 80 | 120 | | | |
| Sulfate | | 1110 | mg/L | 8.0 | 85 | 80 | 120 | | | |
| Sample ID: C11060027-001AMSD | 2 | Sample Matrix Spike Duplicate | | | | | | | | Run: IC2-C_110602A 06/03/11 06:15 |
| Chloride | | 266 | mg/L | 2.0 | 88 | 80 | 120 | 0.2 | 10 | |
| Sulfate | | 1110 | mg/L | 8.0 | 86 | 80 | 120 | 0.1 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|---------------------|------------|-----|------------------|------|
| Method: E900.0 | | | | | | | | | Batch: GrAB-1102 | |
| Sample ID: MB-GrAB-1102 | 6 | Method Blank | | | | Run: G5000W_110614A | | | 06/16/11 20:59 | |
| Gross Alpha | | -0.7 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.8 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 0.9 | pCi/L | | | | | | | |
| Gross Beta | | 1 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 2 | pCi/L | | | | | | | |
| Gross Beta MDC | | 2 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-1102 | | Laboratory Control Sample | | | | Run: G5000W_110614A | | | 06/16/11 20:59 | |
| Gross Alpha | | 100 | pCi/L | 101 | | 80 | 120 | | | |
| Sample ID: C11050935-001AMS | | Sample Matrix Spike | | | | Run: G5000W_110614A | | | 06/16/11 20:59 | |
| Gross Beta | | 86 | pCi/L | 96 | | 70 | 130 | | | |
| Sample ID: C11050935-001AMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_110614A | | | 06/16/11 20:59 | |
| Gross Beta | | 84 | pCi/L | 94 | | 70 | 130 | 2.1 | 16.2 | |
| Sample ID: C11060130-001ADUP | 6 | Sample Duplicate | | | | Run: G5000W_110614A | | | 06/17/11 09:13 | |
| Gross Alpha | | 60 | pCi/L | | | | | 9.6 | 27.2 | |
| Gross Alpha precision (±) | | 5.3 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 2.7 | pCi/L | | | | | | | |
| Gross Beta | | 22 | pCi/L | | | | | 6.1 | 31.9 | |
| Gross Beta precision (±) | | 2.4 | pCi/L | | | | | | | |
| Gross Beta MDC | | 2.0 | pCi/L | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|-------|-------------------------------|-------|--------------------|------|-----------|------------|-----|----------|-------------------|
| Method: E903.0 | | | | | | | | | | Batch: RA226-5416 |
| Sample ID: C11060030-001AMS | | | | | | | | | | |
| | | Sample Matrix Spike | | Run: G542M_110608A | | | | | | |
| Radium 226 | 15 | | pCi/L | 120 | | 80 | 120 | | | 06/27/11 14:38 |
| Sample ID: C11060030-001AMSD | | | | | | | | | | |
| | | Sample Matrix Spike Duplicate | | Run: G542M_110608A | | | | | | |
| Radium 226 | 15 | | pCi/L | 124 | | 80 | 120 | 3.3 | 25.1 | S |
| - Spike response is outside of the acceptance range for this analysis which indicates a possible high bias for this sample. Since the LCS and the RPD for the MS MSD pair are acceptable the batch is approved. | | | | | | | | | | |
| Sample ID: MB-RA226-5416 | | | | | | | | | | |
| | | 3 Method Blank | | Run: G542M_110608A | | | | | | |
| Radium 226 | | 0.04 | pCi/L | | | | | | | 06/27/11 16:11 |
| Radium 226 precision (±) | | 0.1 | pCi/L | | | | | | | U |
| Radium 226 MDC | | 0.1 | pCi/L | | | | | | | |
| Sample ID: LCS-RA226-5416 | | | | | | | | | | |
| | | Laboratory Control Sample | | Run: G542M_110608A | | | | | | |
| Radium 226 | | 7.0 | pCi/L | 110 | | 90 | 110 | | | 06/27/11 16:11 |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

U - Not detected at minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/30/11

Project: Belvoir Aquifer Level II

Work Order: C11060017

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------------|-------|--------|-------------------------|-----|------|-----------|------------|-----|----------|-------------------|
| Method: RA-05 | | | | | | | | | | Batch: RA228-3753 |
| Sample ID: LCS-228-RA226-5416 | | | | | | | | | | |
| Laboratory Control Sample | | | Run: TENNELEC-3_110608A | | | | | | | |
| Radium 228 | | 7.1 | pCi/L | 90 | | 80 | 120 | | | 06/20/11 10:41 |
| Sample ID: MB-RA226-5416 | | | | | | | | | | |
| 3 Method Blank | | | Run: TENNELEC-3_110608A | | | | | | | |
| Radium 228 | | 0.9 | pCi/L | | | | | | | 06/20/11 12:17 |
| Radium 228 precision (±) | | 1.0 | pCi/L | | | | | | | U |
| Radium 228 MDC | | 1.0 | pCi/L | | | | | | | |
| Sample ID: C11060030-002AMS | | | | | | | | | | |
| Sample Matrix Spike | | | Run: TENNELEC-3_110608A | | | | | | | |
| Radium 228 | | 14 | pCi/L | 105 | | 70 | 130 | | | 06/20/11 10:41 |
| Sample ID: C11060030-002AMSD | | | | | | | | | | |
| Sample Matrix Spike Duplicate | | | Run: TENNELEC-3_110608A | | | | | | | |
| Radium 228 | | 13 | pCi/L | 102 | | 70 | 130 | 2.7 | 40.1 | 06/20/11 10:41 |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C11060017

Login completed by: Halley Ackerman

Date Received: 6/1/2011

Reviewed by: BL2000\emcpike

Received by: ckw

Reviewed Date: 6/1/2011

 Carrier FedEx
 name:

| | | | |
|---|---|-----------------------------|--|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 8.2°C Melted Ice | | |
| Water - VOA vials have zero headspace? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input checked="" type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

None



Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT (Provide as much information as possible.)

| | | | | | | | | | | | | |
|--|---|--|--|-----------------|---|--|--------------------------------------|--|--|----------|---|--|
| Company Name: <u>LIDSTONE AND ASSOC.</u> | | | Project Name, PWS, Permit, Etc. <u>Belvoir Casper Aquifer Level II</u> | | | Sample Origin State: <u>WY</u> | | EPA/State Compliance: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | | | | |
| Report Mail Address: <u>4625 AUTUMN WAY, BLDG. E</u> <u>PO BOX 1111, CO 80525</u> | | | Contact Name: <u>MARK STACY</u> | | Phone/Fax: <u>970-223-4705/920-2234706</u> | | Email: <u>ME@LIDSTONE.COM</u> | | Sampler: (Please Print) <u>MARK STACY</u> | | | |
| Invoice Address: <u>SAME</u> | | | Invoice Contact & Phone: <u>MELINDA CULLEN; 970-223-4705</u> | | | Purchase Order: <u>WYWPC109</u> | | Quote/Bottle Order: <u>33233</u> | | | | |
| Special Report/Formats: <input type="checkbox"/> DW <input type="checkbox"/> POTW/WWTP <input type="checkbox"/> State: _____ <input type="checkbox"/> Other: _____ <input checked="" type="checkbox"/> EDD/EDT (Electronic Data) Format: <u>PDF</u> <input type="checkbox"/> LEVEL IV <input type="checkbox"/> NELAC | | | ANALYSIS REQUESTED Number of Containers: _____ Sample Type: <input type="checkbox"/> A <input type="checkbox"/> S <input type="checkbox"/> V <input type="checkbox"/> B <input type="checkbox"/> O <input type="checkbox"/> DW <input type="checkbox"/> Air <input type="checkbox"/> Water <input type="checkbox"/> Soils/Solids <input type="checkbox"/> Other <input type="checkbox"/> Vegetation <input type="checkbox"/> Bioassay <input type="checkbox"/> Other <input type="checkbox"/> DW - Drinking Water <u>WWPC MIDWAY</u> | | | SEE ATTACHED Standard Turnaround (TAT) <u>RUSH</u> | | | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page | | Shipped by: <u>FedEx</u> Cooler ID(s): <u>C3759</u> | |
| | | | | | | | | | Comments: | | Receipt Temp <u>8.2</u> °C On Ice: <u>me</u> Custody Seal On Bottle: <u>Y</u> On Cooler: <u>Y</u> Intact Signature Match: <u>Y</u> | |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | | | Collection Date | Collection Time | MATRIX | | | | | | | |
| 1 <u>LINE TREE FAULT 1-5</u> | | | <u>5/31/11</u> | <u>1215</u> | <u>7W</u> | <u>X</u> | | | | <u>X</u> | <u>Bottle order enclosed</u> | |
| 2 | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | <u>CHUGCOIT</u> | |
| 10 | | | | | | | | | | | | |
| Custody Record MUST be Signed | Relinquished by (print): <u>MARK STACY</u> | | Date/Time: <u>5/31/11 1358</u> | | Signature: <u>Mark Stacy</u> | | Received by (print): <u>FEDEx</u> | | Date/Time: <u>6/1/11 850</u> | | Signature: <u>CHUGCOIT</u> | |
| | Relinquished by (print): | | Date/Time: | | Signature: | | Received by (print): | | Date/Time: | | Signature: | |
| | Sample Disposal: | | Return to Client: | | Lab Disposal: | | <u>X</u> | | | | | |

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly noted on your analytical report.



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Gillette, WY 800-600-7175 • Rapid City, SD 800-672-1225 • College Station, TX 800-600-2210

BOTTLE ORDER 33233



SHIPPED TO: Lidstone and Associates

Contact: Mark Stacy
4025 Automation Way Unit E
Fort Collins CO 80525
Phone: (970) 223-4705
Project:

Order Created by: Tessa Parke
Shipped From: Casper, WY
Ship Date: 5/10/2011
VIA: Ground

| Bottle Size/Type | Bottles Per Samp | Method | Tests | Critical Hold Time | Preservative | Notes | Num of Samp |
|------------------|------------------|--------|-------|--------------------|--------------|-------|-------------|
|------------------|------------------|--------|-------|--------------------|--------------|-------|-------------|

| | | | | | | | |
|-----------------|---|---------|-------------------------|--|--|--|---|
| 1 Liter Plastic | 1 | A2540 D | Solids, Total Suspended | | | | 1 |
|-----------------|---|---------|-------------------------|--|--|--|---|

WWDC - Midway

| | | | | | | | |
|-----------------|---|-----------------|-------------------------------------|--|--------|------------------|---|
| 1 Liter Plastic | 1 | A2320 B | Alkalinity | | | + TSS per Tp. | 1 |
| | | A2510 B | Conductivity | | | | |
| | | E300.0 | E300.0 Anions | | | | |
| | | A4500-H B | pH | | | | |
| | | A2540 C | Solids, Total Dissolved | | | | |
| | | Data Assessment | Supervisor Review | | | | |
| 250 mL Plastic | 1 | E200.7_8 | Metals by ICP/ICPMS, Drinking Water | | ■ HNO3 | | 1 |
| | | Data Assessment | Supervisor Review | | | | |

| | | | | | | | |
|------------------------|---|-----------------|-------------------------|--------|--|--|---|
| 2 Liter Plastic | 2 | E900.0 | Gross Alpha, Gross Beta | | <input checked="" type="checkbox"/> HNO3 | | 1 |
| | | A7500-RA | Radium 226 + Radium 228 | | | | |
| | | E903.0 | Radium 228, Total | | | | |
| | | RA-05 | Radium 228, Total | | | | |
| | | Data Assessment | Supervisor Review | | | | |
| 100 mL Plastic Sterile | 2 | IRB-BART | Bacteria, Iron Related | | | | 1 |
| | | A9223 B | Bacteria, SDWA | 30 hrs | | | |

| | |
|---|---|
| <input checked="" type="checkbox"/> HNO3 - Nitric Acid <input type="checkbox"/> H2SO4 - Sulfuric Acid <input checked="" type="checkbox"/> NaOH - Sodium Hydroxide <input checked="" type="checkbox"/> ZnAc - Zinc Acetate <input checked="" type="checkbox"/> HCl - Hydrochloric Acid <input type="checkbox"/> H3PO4 - Phosphoric Acid | We strongly suggest that the samples are shipped the same day as they are collected. |
| Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets | |
| Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant. | |
| Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report. | |

ANALYTICAL SUMMARY REPORT

June 29, 2011

Lidstone and Associates
 4025 Automation Way Unit E
 Fort Collins, CO 80525

Workorder No.: C11060146

Project Name: Belvoir Aquifer Level II

Energy Laboratories, Inc. Casper WY received the following 2 samples for Lidstone and Associates on 6/3/2011 for analysis.

| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---------------|---------------------|----------------|--------------|---------|---|
| C11060146-001 | Lone Tree Fault 1-5 | 06/02/11 12:50 | 06/03/11 | Aqueous | Metals by ICP/ICPMS, Dissolved Metals by ICP/ICPMS, Drinking Water Acidity, Total as CaCO3 Alkalinity QA Calculations Bacteria, Iron Related Bacteria, SDWA Cyanide, SDWA Color Conductivity Corrosivity, Calculated Mercury, Drinking Water Mercury Analysis Prep Sample Filtering Fluoride Foaming Agents E515.1 Chlorinated Herbicides Hardness E300.0 Anions Nitrogen, Nitrite Nitrogen, Nitrate + Nitrite Odor pH Metals Preparation by EPA 200.2 504 sample microextraction E504 Pesticides Pesticides, Carbamates SDWA Gross Alpha, Gross Beta Radium 226 + Radium 228 Radium 226, Total Radium 228, Total Solids, Total Dissolved Solids, Total Suspended 525-Semi-Volatile Organic Compounds, SDWA Turbidity E524.2 SDWA VOCs |
| C11060146-002 | Trip Blank 6292 | 06/02/11 00:00 | 06/03/11 | Aqueous | E524.2 SDWA VOCs |

This report was prepared by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601. Any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.



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ANALYTICAL SUMMARY REPORT

The results as reported relate only to the item(s) submitted for testing.

If you have any questions regarding these test results, please call.

Report Approved By:


Report Proofing Specialist

Digitally signed by
Kathy Hamre
Date: 2011.06.29 10:55:05 -06:00



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Gillette, WY 866-686-7175 • Rapid City, SD 888-672-1225 • College Station, TX 888-690-2218

CLIENT: Lidstone and Associates
Project: Belvoir Aquifer Level II
Sample Delivery Group: C11060146

Report Date: 06/29/11

CASE NARRATIVE

BRANCH LABORATORY SUBCONTRACT ANALYSIS

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|--|--------|----------|-----------|-------|-------------|-------------------------|------------------------|
| MICROBIOLOGICAL | | | | | | | |
| Bacteria, Iron Related | 3200 | CFU/ml | | 1.0 | | IRB-BART | 06/03/11 15:10 / rlo |
| MAJOR IONS | | | | | | | |
| Acidity, Total as CaCO ₃ | ND | mg/L | | 5 | | A2310 B | 06/07/11 09:35 / jba |
| Alkalinity, Total as CaCO ₃ | 111 | mg/L | | 1 | | A2320 B | 06/03/11 13:18 / jba |
| Carbonate as CO ₃ | ND | mg/L | | 1 | | A2320 B | 06/03/11 13:18 / jba |
| Bicarbonate as HCO ₃ | 135 | mg/L | | 1 | | A2320 B | 06/03/11 13:18 / jba |
| Calcium | 28 | mg/L | | 1 | | E200.7 | 06/06/11 16:57 / cp |
| Chloride | 2 | mg/L | | 1 | | E300.0 | 06/07/11 09:23 / ljl |
| Fluoride | 0.9 | mg/L | | 0.1 | | A4500-F C | 06/09/11 09:23 / jba |
| Magnesium | 10 | mg/L | | 1 | | E200.7 | 06/06/11 16:57 / cp |
| Nitrogen, Nitrate+Nitrite as N | 0.4 | mg/L | | 0.1 | 10 | E353.2 | 06/10/11 13:56 / dc |
| Nitrogen, Nitrite as N | ND | mg/L | | 0.1 | 1 | A4500-NO ₂ B | 06/03/11 14:00 / jba |
| Potassium | 2 | mg/L | | 1 | | E200.7 | 06/06/11 16:57 / cp |
| Silica | 15.6 | mg/L | | 0.2 | | E200.7 | 06/06/11 16:57 / cp |
| Sodium | 5 | mg/L | | 1 | | E200.7 | 06/06/11 16:57 / cp |
| Sulfate | 8 | mg/L | | 1 | | E300.0 | 06/07/11 09:23 / ljl |
| NON-METALS | | | | | | | |
| Cyanide, Total | ND | mg/L | | 0.005 | 0.2 | Kelada mod | 06/09/11 12:14 / eli-b |
| PHYSICAL PROPERTIES | | | | | | | |
| Color | 5.0 | c.u. | | 5.0 | | A2120 B | 06/03/11 10:42 / lmc |
| Corrosivity | 0.2 | unitless | | | | Calculation | 06/17/11 08:50 / kbh |
| Conductivity @ 25 C | 223 | umhos/cm | | 1 | | A2510 B | 06/03/11 14:52 / lmc |
| Hardness as CaCO ₃ | 110 | mg/L | | 1 | | A2340 B | 06/06/11 16:57 / kbh |
| Odor | NOO | T.O.N. | | 1 | | A2150 B | 06/03/11 10:42 / lmc |
| pH | 8.02 | s.u. | | 0.01 | | A4500-H B | 06/03/11 14:52 / lmc |
| Solids, Total Dissolved TDS @ 180 C | 143 | mg/L | | 10 | | A2540 C | 06/03/11 13:51 / lmc |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | | 4 | | A2540 D | 06/07/11 15:28 / wc |
| Surfactants, MBAS | < 1.0 | mg/L | | 1.0 | | A5540 C | 06/03/11 10:16 / jba |
| Turbidity | 0.2 | NTU | | 0.1 | | A2130 B | 06/03/11 13:01 / jba |
| - Color measured at pH 7.86 | | | | | | | |
| - NOO = No odor observed. | | | | | | | |
| METALS - TOTAL | | | | | | | |
| Aluminum | ND | mg/L | | 0.1 | 0.2 | E200.7 | 06/06/11 17:25 / cp |
| Antimony | ND | mg/L | | 0.001 | 0.006 | E200.8 | 06/09/11 17:32 / sml |
| Arsenic | 0.002 | mg/L | | 0.001 | 0.01 | E200.8 | 06/09/11 17:32 / sml |
| Barium | ND | mg/L | | 0.1 | 2 | E200.8 | 06/09/11 17:32 / sml |
| Beryllium | ND | mg/L | | 0.001 | 0.004 | E200.8 | 06/09/11 17:32 / sml |
| Boron | ND | mg/L | | 0.1 | | E200.7 | 06/06/11 17:25 / cp |
| Cadmium | ND | mg/L | | 0.001 | 0.005 | E200.8 | 06/09/11 17:32 / sml |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---------------------------------------|--------|-------|-----------|--------|-------------|-------------|----------------------|
| METALS - TOTAL | | | | | | | |
| Chromium | ND | mg/L | | 0.05 | 0.1 | E200.8 | 06/09/11 17:32 / sml |
| Copper | ND | mg/L | | 0.01 | 1.3 | E200.8 | 06/09/11 17:32 / sml |
| Iron | 0.18 | mg/L | | 0.03 | 0.3 | E200.7 | 06/06/11 17:25 / cp |
| Lead | ND | mg/L | | 0.001 | 0.015 | E200.8 | 06/09/11 17:32 / sml |
| Manganese | 0.01 | mg/L | | 0.01 | 0.05 | E200.7 | 06/06/11 17:25 / cp |
| Mercury | ND | mg/L | | 0.0002 | 0.002 | E245.1 | 06/07/11 11:35 / rdw |
| Nickel | ND | mg/L | | 0.05 | | E200.8 | 06/09/11 17:32 / sml |
| Selenium | ND | mg/L | | 0.001 | 0.05 | E200.8 | 06/09/11 17:32 / sml |
| Silver | ND | mg/L | | 0.01 | 0.1 | E200.8 | 06/15/11 14:35 / sml |
| Thallium | ND | mg/L | | 0.0004 | 0.002 | E200.8 | 06/09/11 17:32 / sml |
| Uranium | 0.0013 | mg/L | | 0.0003 | 0.03 | E200.8 | 06/09/11 17:32 / sml |
| Zinc | ND | mg/L | | 0.01 | 5 | E200.8 | 06/09/11 17:32 / sml |
| RADIONUCLIDES - TOTAL | | | | | | | |
| Gross Alpha | 2.7 | pCi/L | | | 15 | E900.0 | 06/17/11 09:13 / ep |
| Gross Alpha precision (±) | 1.5 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Alpha MDC | 1.4 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta | 1.6 | pCi/L | U | | 50 | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta precision (±) | 1.6 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Gross Beta MDC | 1.6 | pCi/L | | | | E900.0 | 06/17/11 09:13 / ep |
| Radium 226 | 0.08 | pCi/L | U | | 5 | E903.0 | 06/27/11 11:38 / trs |
| Radium 226 precision (±) | 0.1 | pCi/L | | | | E903.0 | 06/27/11 11:38 / trs |
| Radium 226 MDC | 0.1 | pCi/L | | | | E903.0 | 06/27/11 11:38 / trs |
| Radium 228 | 1.9 | pCi/L | | | 5 | RA-05 | 06/20/11 13:53 / plj |
| Radium 228 precision (±) | 0.8 | pCi/L | | | | RA-05 | 06/20/11 13:53 / plj |
| Radium 228 MDC | 0.7 | pCi/L | | | | RA-05 | 06/20/11 13:53 / plj |
| Radium 226 + Radium 228 | 2.0 | pCi/L | | | 5 | A7500-RA | 06/28/11 15:34 / res |
| Radium 226 + Radium 228 precision (±) | 0.8 | pCi/L | | | | A7500-RA | 06/28/11 15:34 / res |
| Radium 226 + Radium 228 MDC | 0.7 | pCi/L | | | | A7500-RA | 06/28/11 15:34 / res |
| DATA QUALITY | | | | | | | |
| A/C Balance (± 5) | -1.49 | % | | | | Calculation | 06/17/11 08:50 / kbh |
| Anions | 2.53 | meq/L | | | | Calculation | 06/17/11 08:50 / kbh |
| Cations | 2.45 | meq/L | | | | Calculation | 06/17/11 08:50 / kbh |
| Solids, Total Dissolved Calculated | 144 | mg/L | | | | Calculation | 06/17/11 08:50 / kbh |
| TDS Balance (0.80 - 1.20) | 0.990 | | | | | Calculation | 06/17/11 08:50 / kbh |
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,1,1-Trichloroethane | ND | ug/L | | 0.50 | 200 | E524.2 | 06/08/11 17:18 / jlr |
| 1,1,2,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,1,2-Trichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| 1,1-Dichloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |

Report RL - Analyte reporting limit.

Definitions: QCL - Quality control limit.

MDC - Minimum detectable concentration

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1-Dichloroethene | ND | ug/L | | 0.50 | 7 | E524.2 | 06/08/11 17:18 / jlr |
| 1,1-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2,3-Trichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2,4-Trichlorobenzene | ND | ug/L | | 0.50 | 70 | E524.2 | 06/08/11 17:18 / jlr |
| 1,2,4-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,2-Dichlorobenzene | ND | ug/L | | 0.50 | 600 | E524.2 | 06/08/11 17:18 / jlr |
| 1,2-Dichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| 1,2-Dichloropropane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| 1,3,5-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,3-Dichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,3-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 1,4-Dichlorobenzene | ND | ug/L | | 0.50 | 75 | E524.2 | 06/08/11 17:18 / jlr |
| 2,2-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 2-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| 4-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Benzene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| Bromobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Bromochloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Bromodichloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Bromoform | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Bromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Carbon tetrachloride | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| Chlorobenzene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:18 / jlr |
| Chlorodibromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Chloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Chloroform | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Chloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| cis-1,2-Dichloroethene | ND | ug/L | | 0.50 | 70 | E524.2 | 06/08/11 17:18 / jlr |
| cis-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Dibromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Dichlorodifluoromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Ethylbenzene | ND | ug/L | | 0.50 | 700 | E524.2 | 06/08/11 17:18 / jlr |
| Hexachlorobutadiene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Isopropylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| m+p-Xylenes | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Methyl tert-butyl ether (MTBE) | ND | ug/L | | 2.0 | | E524.2 | 06/08/11 17:18 / jlr |
| Methylene chloride | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| Naphthalene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| n-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| n-Propylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|-----------|--------|-------------|--------|------------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| o-Xylene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| p-Isopropyltoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| sec-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Styrene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:18 / jlr |
| tert-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Tetrachloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| Toluene | ND | ug/L | | 0.50 | 1000 | E524.2 | 06/08/11 17:18 / jlr |
| trans-1,2-Dichloroethene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:18 / jlr |
| trans-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Trichloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:18 / jlr |
| Trichlorofluoromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:18 / jlr |
| Vinyl chloride | ND | ug/L | | 0.50 | 2 | E524.2 | 06/08/11 17:18 / jlr |
| Xylenes, Total | ND | ug/L | | 0.50 | 10000 | E524.2 | 06/08/11 17:18 / jlr |
| Trihalomethanes, Total | ND | ug/L | | 0.50 | 80 | E524.2 | 06/08/11 17:18 / jlr |
| Surr: Dibromofluoromethane | 100 | %REC | | 70-130 | | E524.2 | 06/08/11 17:18 / jlr |
| Surr: p-Bromofluorobenzene | 95.0 | %REC | | 70-130 | | E524.2 | 06/08/11 17:18 / jlr |
| Surr: Toluene-d8 | 103 | %REC | | 70-130 | | E524.2 | 06/08/11 17:18 / jlr |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES | | | | | | | |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.020 | 0.2 | E504.1 | 06/09/11 18:44 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.010 | 0.05 | E504.1 | 06/09/11 18:44 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.050 | | E504.1 | 06/09/11 18:44 / jlr |
| Surr: 1,1,1,2-Tetrachloroethane | 100 | %REC | | 70-130 | | E504.1 | 06/09/11 18:44 / jlr |
| SYNTHETIC ORGANIC COMPOUNDS - HERBICIDES | | | | | | | |
| 2,4-D | ND | ug/L | | 1.0 | 70 | E515.1 | 06/09/11 16:31 / eli-b |
| 2,4-DB | ND | ug/L | | 2.5 | | E515.1 | 06/09/11 17:02 / eli-b |
| Dalapon | ND | ug/L | | 2.5 | 200 | E515.1 | 06/09/11 16:31 / eli-b |
| Dicamba | ND | ug/L | | 0.25 | | E515.1 | 06/09/11 16:31 / eli-b |
| Dichlorprop | ND | ug/L | | 1.0 | | E515.1 | 06/09/11 16:31 / eli-b |
| Dinoseb | ND | ug/L | | 1.0 | 7 | E515.1 | 06/09/11 16:31 / eli-b |
| Pentachlorophenol | ND | ug/L | | 0.040 | 1 | E515.1 | 06/09/11 16:31 / eli-b |
| Picloram | ND | ug/L | | 0.50 | 500 | E515.1 | 06/09/11 16:31 / eli-b |
| 2,4,5-TP (Silvex) | ND | ug/L | | 0.20 | 50 | E515.1 | 06/09/11 16:31 / eli-b |
| Surr: DCAA | 77.0 | %REC | | 70-130 | | E515.1 | 06/09/11 16:31 / eli-b |
| SEMI-VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Alachlor | ND | ug/L | | 0.10 | 2 | E525.2 | 06/10/11 10:58 / eli-b |
| Aldrin | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1016 | ND | ug/L | | 0.080 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1221 | ND | ug/L | | 2.0 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1232 | ND | ug/L | | 0.50 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1242 | ND | ug/L | | 0.30 | | E525.2 | 06/10/11 10:58 / eli-b |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-001
Client Sample ID: Lone Tree Fault 1-5

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|---|--------|-------|-----------|--------|-------------|--------|------------------------|
| SEMI-VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Aroclor 1248 | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1254 | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Aroclor 1260 | ND | ug/L | | 0.20 | | E525.2 | 06/10/11 10:58 / eli-b |
| Atrazine | ND | ug/L | | 0.10 | 3 | E525.2 | 06/10/11 10:58 / eli-b |
| Benzo(a)pyrene | ND | ug/L | | 0.10 | 0.2 | E525.2 | 06/10/11 10:58 / eli-b |
| bis(2-ethylhexyl)Adipate | ND | ug/L | | 0.50 | 400 | E525.2 | 06/10/11 10:58 / eli-b |
| bis(2-ethylhexyl)Phthalate | ND | ug/L | | 2.0 | 6 | E525.2 | 06/10/11 10:58 / eli-b |
| Butachlor | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Chlordane | ND | ug/L | | 1.0 | 2 | E525.2 | 06/10/11 10:58 / eli-b |
| Dieldrin | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Endrin | ND | ug/L | | 0.10 | 2 | E525.2 | 06/10/11 10:58 / eli-b |
| gamma-BHC (Lindane) | ND | ug/L | | 0.10 | 0.2 | E525.2 | 06/10/11 10:58 / eli-b |
| Heptachlor | ND | ug/L | | 0.10 | 0.4 | E525.2 | 06/10/11 10:58 / eli-b |
| Heptachlor epoxide | ND | ug/L | | 0.10 | 0.2 | E525.2 | 06/10/11 10:58 / eli-b |
| Hexachlorobenzene | ND | ug/L | | 0.10 | 1 | E525.2 | 06/10/11 10:58 / eli-b |
| Hexachlorocyclopentadiene | ND | ug/L | | 0.10 | 50 | E525.2 | 06/10/11 10:58 / eli-b |
| Methoxychlor | ND | ug/L | | 0.10 | 40 | E525.2 | 06/10/11 10:58 / eli-b |
| Metolachlor | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Metribuzin | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Propachlor | ND | ug/L | | 0.10 | | E525.2 | 06/10/11 10:58 / eli-b |
| Simazine | ND | ug/L | | 0.10 | 4 | E525.2 | 06/10/11 10:58 / eli-b |
| Toxaphene | ND | ug/L | | 2.0 | 3 | E525.2 | 06/10/11 10:58 / eli-b |
| Surr: 1,3-Dimethyl-2-nitrobenzene | 94.0 | %REC | | 70-130 | | E525.2 | 06/10/11 10:58 / eli-b |
| Surr: Perylene-d12 | 85.0 | %REC | | 70-130 | | E525.2 | 06/10/11 10:58 / eli-b |
| Surr: Pyrene-d10 | 101 | %REC | | 70-130 | | E525.2 | 06/10/11 10:58 / eli-b |
| Surr: Triphenylphosphate | 112 | %REC | | 70-130 | | E525.2 | 06/10/11 10:58 / eli-b |
| Note: The federal MCL for total PCB's is 0.5 ug/L as Decachlorobiphenyl (DCB). PCB screening at the reporting limits given for the individual Aroclors meets or exceeds federal and state requirements for "Total PCB" monitoring if Aroclors are not detected. | | | | | | | |
| SYNTHETIC ORGANIC COMPOUNDS - PESTICIDES, CARBAMATES | | | | | | | |
| Aldicarb | ND | ug/L | | 0.50 | 3 | E531.1 | 06/08/11 22:01 / swc |
| Aldicarb sulfone | ND | ug/L | | 0.50 | 2 | E531.1 | 06/08/11 22:01 / swc |
| Aldicarb sulfoxide | ND | ug/L | | 0.50 | 4 | E531.1 | 06/08/11 22:01 / swc |
| Carbaryl | ND | ug/L | | 0.50 | | E531.1 | 06/08/11 22:01 / swc |
| Carbofuran | ND | ug/L | | 0.50 | 40 | E531.1 | 06/08/11 22:01 / swc |
| 3-Hydroxycarbofuran | ND | ug/L | | 0.50 | | E531.1 | 06/08/11 22:01 / swc |
| Methiocarb | ND | ug/L | | 0.50 | | E531.1 | 06/08/11 22:01 / swc |
| Methomyl | ND | ug/L | | 0.50 | | E531.1 | 06/08/11 22:01 / swc |
| Oxamyl | ND | ug/L | | 0.50 | 200 | E531.1 | 06/08/11 22:01 / swc |
| Baygon | ND | ug/L | | 0.50 | | E531.1 | 06/08/11 22:01 / swc |
| Surr: BDMC | 95.0 | %REC | | 70-130 | | E531.1 | 06/08/11 22:01 / swc |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-002
Client Sample ID: Trip Blank 6292

Report Date: 06/29/11
Collection Date: 06/02/11
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| 1,1,1,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,1,1-Trichloroethane | ND | ug/L | | 0.50 | 200 | E524.2 | 06/08/11 17:54 / jlr |
| 1,1,2,2-Tetrachloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,1,2-Trichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| 1,1-Dichloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,1-Dichloroethene | ND | ug/L | | 0.50 | 7 | E524.2 | 06/08/11 17:54 / jlr |
| 1,1-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2,3-Trichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2,3-Trichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2,4-Trichlorobenzene | ND | ug/L | | 0.50 | 70 | E524.2 | 06/08/11 17:54 / jlr |
| 1,2,4-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2-Dibromo-3-chloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2-Dibromoethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,2-Dichlorobenzene | ND | ug/L | | 0.50 | 600 | E524.2 | 06/08/11 17:54 / jlr |
| 1,2-Dichloroethane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| 1,2-Dichloropropane | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| 1,3,5-Trimethylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,3-Dichlorobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,3-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 1,4-Dichlorobenzene | ND | ug/L | | 0.50 | 75 | E524.2 | 06/08/11 17:54 / jlr |
| 2,2-Dichloropropane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 2-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| 4-Chlorotoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Benzene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| Bromobenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Bromochloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Bromodichloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Bromoform | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Bromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Carbon tetrachloride | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| Chlorobenzene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:54 / jlr |
| Chlorodibromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Chloroethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Chloroform | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Chloromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| cis-1,2-Dichloroethene | ND | ug/L | | 0.50 | 70 | E524.2 | 06/08/11 17:54 / jlr |
| cis-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Dibromomethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Dichlorodifluoromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Ethylbenzene | ND | ug/L | | 0.50 | 700 | E524.2 | 06/08/11 17:54 / jlr |
| Hexachlorobutadiene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Isopropylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| m+p-Xylenes | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |

Report RL - Analyte reporting limit.
Definitions: QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Lab ID: C11060146-002
Client Sample ID: Trip Blank 6292

Report Date: 06/29/11
Collection Date: 06/02/11
Date Received: 06/03/11
Matrix: Aqueous

| Analyses | Result | Units | Qualifier | RL | MCL/ QCL | Method | Analysis Date / By |
|-----------------------------------|--------|-------|-----------|--------|-------------|--------|----------------------|
| VOLATILE ORGANIC COMPOUNDS | | | | | | | |
| Methyl tert-butyl ether (MTBE) | ND | ug/L | | 2.0 | | E524.2 | 06/08/11 17:54 / jlr |
| Methylene chloride | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| Naphthalene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| n-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| n-Propylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| o-Xylene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| p-Isopropyltoluene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| sec-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Styrene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:54 / jlr |
| tert-Butylbenzene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Tetrachloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| Toluene | ND | ug/L | | 0.50 | 1000 | E524.2 | 06/08/11 17:54 / jlr |
| trans-1,2-Dichloroethene | ND | ug/L | | 0.50 | 100 | E524.2 | 06/08/11 17:54 / jlr |
| trans-1,3-Dichloropropene | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Trichloroethene | ND | ug/L | | 0.50 | 5 | E524.2 | 06/08/11 17:54 / jlr |
| Trichlorofluoromethane | ND | ug/L | | 0.50 | | E524.2 | 06/08/11 17:54 / jlr |
| Vinyl chloride | ND | ug/L | | 0.50 | 2 | E524.2 | 06/08/11 17:54 / jlr |
| Xylenes, Total | ND | ug/L | | 0.50 | 10000 | E524.2 | 06/08/11 17:54 / jlr |
| Trihalomethanes, Total | ND | ug/L | | 0.50 | 80 | E524.2 | 06/08/11 17:54 / jlr |
| Surr: Dibromofluoromethane | 109 | %REC | | 70-130 | | E524.2 | 06/08/11 17:54 / jlr |
| Surr: p-Bromofluorobenzene | 98.0 | %REC | | 70-130 | | E524.2 | 06/08/11 17:54 / jlr |
| Surr: Toluene-d8 | 106 | %REC | | 70-130 | | E524.2 | 06/08/11 17:54 / jlr |

Report Definitions: RL - Analyte reporting limit.
QCL - Quality control limit.

MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Lidstone and Associates
Project: Belvoir Aquifer Level II
Client Sample ID: Lone Tree Fault 1-5
Sampled By: Mark Stacy
Lab ID: C11060146-001B

Report Date: 06/29/11
Collection Date: 06/02/11 12:50
Received Date: 06/03/11 09:00
Matrix: Aqueous

| Analyses | Result | Units | Safe/Unsafe | Qualifier | Method | Analysis Date / By |
|---------------------------|--------|-------|-------------|-----------|---------|----------------------|
| MICROBIOLOGICAL | | | | | | |
| Bacteria, Total Coliform | Absent | | SAFE | | A9223 B | 06/03/11 15:10 / rlo |
| Bacteria, E-Coli Coliform | Absent | | | | A9223 B | 06/03/11 15:10 / rlo |

Comments: The notation "SAFE" indicates that the water was bacteriologically SAFE when sampled.

The notation "UNSAFE" indicates that the water was bacteriologically UNSAFE when sampled.

Method Reference: E - EPA / MCAWW Methodology A - Standard Methods 19th Ed.



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|------------------|-------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2120 B | | | | | | | | | | Batch: R146546 |
| Sample ID: MB-R146546 | | Method Blank | | | | | Run: ANALYST_110603B | | | 06/03/11 00:00 |
| Color | | ND | c.u. | 1 | | | | | | |
| - Color measured at pH 5.90 | | | | | | | | | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | | Run: ANALYST_110603B | | | 06/03/11 00:00 |
| Color | | 5.00 | c.u. | 5.0 | | | | | | |
| - Color measured at pH 7.85 | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---------------------------------|-------|--|-------|---------------------|------|-----------|------------|----------------|----------|----------------|
| Method: A2130 B | | Analytical Run: TURB-1_110603A | | | | | | | | |
| Sample ID: ICV-1_110603 | | Initial Calibration Verification Standard | | | | | | | | 06/03/11 12:58 |
| Turbidity | | 0.946 | NTU | 0.10 | 95 | 90 | 110 | | | |
| Sample ID: CCV-1_110603 | | Continuing Calibration Verification Standard | | | | | | | | 06/03/11 12:59 |
| Turbidity | | 9.83 | NTU | 0.10 | 98 | 90 | 110 | | | |
| Method: A2130 B | | Batch: 110603_1_TURB-W | | | | | | | | |
| Sample ID: MBLK-1_110603 | | Method Blank | | Run: TURB-1_110603A | | | | 06/03/11 12:59 | | |
| Turbidity | | ND | NTU | 0.1 | | | | | | |
| Sample ID: LCS-1_110603 | | Laboratory Control Sample | | Run: TURB-1_110603A | | | | 06/03/11 13:00 | | |
| Turbidity | | 9.69 | NTU | 0.10 | 97 | 90 | 110 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|------------------|--------|-----|------|-----------|----------------------|-----|----------|----------------|
| Method: A2150 B | | | | | | | | | | Batch: R146545 |
| Sample ID: MB-R146545 | | Method Blank | | | | | Run: ANALYST_110603A | | | 06/03/11 00:00 |
| Odor | | ND | T.O.N. | 1 | | | | | | |
| - NOO = No odor observed. | | | | | | | | | | |
| Sample ID: C11060146-001DDUP | | Sample Duplicate | | | | | Run: ANALYST_110603A | | | 06/03/11 00:00 |
| Odor | | NOO | T.O.N. | 1.0 | | | | | | |
| - NOO = No odor observed. | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|-----|------|----------------------|------------|------------------------|----------|------|
| Method: A2310 B | | | | | | | | Batch: 110607_1_ACID-W | | |
| Sample ID: MBLK-1_110607 | | Method Blank | | | | Run: ACIDITY_110607A | | 06/07/11 09:06 | | |
| Acidity, Total as CaCO ₃ | 2 | | mg/L | 1 | | | | | | |
| Sample ID: LCS-1_110607 | | Laboratory Control Sample | | | | Run: ACIDITY_110607A | | 06/07/11 09:11 | | |
| Acidity, Total as CaCO ₃ | 1050 | | mg/L | 5.0 | 105 | 80 | 120 | | | |
| Sample ID: C11060175-007ADUP | | Sample Duplicate | | | | Run: ACIDITY_110607A | | 06/07/11 09:38 | | |
| Acidity, Total as CaCO ₃ | 130 | | mg/L | 5.0 | | | | 0.0 | 20 | |

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QA/QC Summary Report

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Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|---------------------------|-------|-----|------|----------------------|------------|-----|----------|----------------|
| Method: A2320 B | | | | | | | | | | Batch: R146580 |
| Sample ID: MBLK | 3 | Method Blank | | | | Run: MANTECH_110603A | | | | 06/03/11 12:11 |
| Alkalinity, Total as CaCO ₃ | | 2 | mg/L | 1 | | | | | | |
| Carbonate as CO ₃ | | ND | mg/L | 1 | | | | | | |
| Bicarbonate as HCO ₃ | | 3 | mg/L | 1 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | Run: MANTECH_110603A | | | | 06/03/11 12:26 |
| Alkalinity, Total as CaCO ₃ | | 212 | mg/L | 5.0 | 105 | 90 | 110 | | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | Run: MANTECH_110603A | | | | 06/03/11 13:26 |
| Alkalinity, Total as CaCO ₃ | | 110 | mg/L | 5.0 | | | | 0.8 | 10 | |
| Sample ID: C11060146-001CMS | | Sample Matrix Spike | | | | Run: MANTECH_110603A | | | | 06/03/11 13:35 |
| Alkalinity, Total as CaCO ₃ | | 239 | mg/L | 5.0 | 102 | 80 | 120 | | | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Project: Belvoir Aquifer Level II

Report Date: 06/29/11

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|----------|-----|------|-----------|------------|-------------------------------------|----------|----------------|
| Method: A2510 B | | | | | | | | Analytical Run: ORION555A-2_110603B | | |
| Sample ID: ICV2_110603_2 | | Initial Calibration Verification Standard | | | | | | | | 06/03/11 14:32 |
| Conductivity @ 25 C | | 1380 | umhos/cm | 1.0 | 98 | 90 | 110 | | | |
| Method: A2510 B | | | | | | | | Batch: 110603_2_PH-W_555A-2 | | |
| Sample ID: MBLK1_110603_2 | | Method Blank | | | | | | | | 06/03/11 14:29 |
| Conductivity @ 25 C | | 0.6 | umhos/cm | 0.2 | | | | | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | | | | | 06/03/11 14:54 |
| Conductivity @ 25 C | | 223 | umhos/cm | 1.0 | | | | 0.1 | 10 | |

Qualifiers:

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Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|----|------|-----------|--------------------|-----|----------|----------------|
| Method: A2540 C | | | | | | | | | | Batch: R146649 |
| Sample ID: MBLK1_ | | Method Blank | | | | | Run: BAL-1_110603B | | | 06/03/11 13:49 |
| Solids, Total Dissolved TDS @ 180 C | | ND | mg/L | 4 | | | | | | |
| Sample ID: LCS1_ | | Laboratory Control Sample | | | | | Run: BAL-1_110603B | | | 06/03/11 13:50 |
| Solids, Total Dissolved TDS @ 180 C | | 1000 | mg/L | 10 | 100 | 90 | 110 | | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | | Run: BAL-1_110603B | | | 06/03/11 13:51 |
| Solids, Total Dissolved TDS @ 180 C | | 138 | mg/L | 10 | | | | 3.5 | 10 | |
| Sample ID: C11060151-005AMS | | Sample Matrix Spike | | | | | Run: BAL-1_110603B | | | 06/03/11 13:54 |
| Solids, Total Dissolved TDS @ 180 C | | 2510 | mg/L | 10 | 99 | 90 | 110 | | | |

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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|--------|-------|----|------|-----------|------------|-----|----------|----------------|
| Method: A2540 D | | | | | | | | | | Batch: R146698 |
| Sample ID: MBLK1_ Method Blank Run: BAL-1_110607A 06/07/11 15:28 | | | | | | | | | | |
| Solids, Total Suspended TSS @ 105 C | | ND | mg/L | 2 | | | | | | |
| Sample ID: LCS1_ Laboratory Control Sample Run: BAL-1_110607A 06/07/11 15:28 | | | | | | | | | | |
| Solids, Total Suspended TSS @ 105 C | | 168 | mg/L | 12 | 84 | 60 | 110 | | | |
| Sample ID: C11060282-001BDUP Sample Duplicate Run: BAL-1_110607A 06/07/11 15:29 | | | | | | | | | | |
| Solids, Total Suspended TSS @ 105 C | | 340 | mg/L | 12 | | | | 1.7 | 10 | |

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QA/QC Summary Report

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Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|-----------|----------------------|-----|----------|----------------|
| Method: A4500-F C | | | | | | | | | | Batch: R146759 |
| Sample ID: MBLK | | Method Blank | | | | | Run: MANTECH_110609A | | | 06/09/11 08:57 |
| Fluoride | | ND | mg/L | 0.05 | | | | | | |
| Sample ID: LCS | | Laboratory Control Sample | | | | | Run: MANTECH_110609A | | | 06/09/11 09:04 |
| Fluoride | | 2.08 | mg/L | 0.10 | 102 | 90 | 110 | | | |
| Sample ID: C11060128-001AMS | | Sample Matrix Spike | | | | | Run: MANTECH_110609A | | | 06/09/11 09:16 |
| Fluoride | | 6.95 | mg/L | 0.10 | 97 | 80 | 120 | | | |
| Sample ID: C11060128-001AMSD | | Sample Matrix Spike Duplicate | | | | | Run: MANTECH_110609A | | | 06/09/11 09:20 |
| Fluoride | | 6.95 | mg/L | 0.10 | 97 | 80 | 120 | 0.0 | 10 | |

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Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|-------|------|--------------------------|------------|-------------------------------------|----------|----------------|
| Method: A4500-H B | | | | | | | | Analytical Run: ORION555A-2_110603B | | |
| Sample ID: ICV1_110603_2 | | Initial Calibration Verification Standard | | | | | | | | 06/03/11 14:30 |
| pH | | 6.89 | s.u. | 0.010 | 100 | 98 | 102 | | | |
| Method: A4500-H B | | | | | | | | Batch: 110603_2_PH-W_555A-2 | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | | | | | |
| pH | | 8.01 | s.u. | 0.010 | | | | 0.1 | 3 | |
| | | | | | | Run: ORION555A-2_110603B | | 06/03/11 14:54 | | |

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Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------------------------------|--------|-------|-------|------|----------------------------|-----------------------------|----------------|----------|------|
| Method: A4500-NO2 B | | | | | | | Batch: A2011-06-03_6_NO2_01 | | | |
| Sample ID: MBLK-1 | Method Blank | | | | | Run: HACH DR3000-2_110603B | | 06/03/11 14:00 | | |
| Nitrogen, Nitrite as N | | ND | mg/L | 0.003 | | | | | | |
| Sample ID: LCS-2 | Laboratory Control Sample | | | | | Run: HACH DR3000-2_110603B | | 06/03/11 14:00 | | |
| Nitrogen, Nitrite as N | | 1.00 | mg/L | 0.20 | 100 | 90 | 110 | | | |
| Sample ID: C11060146-001CMS | Sample Matrix Spike | | | | | Run: HACH DR3000-2_110603B | | 06/03/11 14:00 | | |
| Nitrogen, Nitrite as N | | 0.0478 | mg/L | 0.10 | 100 | 90 | 110 | | | |
| Sample ID: C11060146-001CMSD | Sample Matrix Spike Duplicate | | | | | Run: HACH DR3000-2_110603B | | 06/03/11 14:00 | | |
| Nitrogen, Nitrite as N | | 0.0478 | mg/L | 0.10 | 100 | 90 | 110 | | 10 | |

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QA/QC Summary Report

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Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---------------------------|-------|------|------|-----------|--------------------|-----|----------|----------------|
| Method: A5540 C | | | | | | | | | | Batch: R146537 |
| Sample ID: MB-R146537 | | Method Blank | | | | | Run: DS1-C_110603A | | | 06/03/11 10:16 |
| Surfactants, MBAS | | ND | mg/L | 0.02 | | | | | | |
| Sample ID: LCS-R146537 | | Laboratory Control Sample | | | | | Run: DS1-C_110603A | | | 06/03/11 10:16 |
| Surfactants, MBAS | | 1.00 | mg/L | 1.0 | 100 | 75 | 125 | | | |
| Sample ID: C11060146-001CDUP | | Sample Duplicate | | | | | Run: DS1-C_110603A | | | 06/03/11 10:16 |
| Surfactants, MBAS | | < 1.00 | mg/L | 1.0 | | | | | | 20 |

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Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|---------------------|------------|-----|----------|----------------|
| Method: E200.7 | | | | | | | | | | Batch: R146611 |
| Sample ID: MB-110606A | 9 | Method Blank | | | | Run: ICP2-C_110606A | | | | 06/06/11 13:13 |
| Aluminum | | ND | mg/L | 0.10 | | | | | | |
| Boron | | ND | mg/L | 0.10 | | | | | | |
| Calcium | | ND | mg/L | 1.0 | | | | | | |
| Iron | | ND | mg/L | 0.030 | | | | | | |
| Magnesium | | ND | mg/L | 1.0 | | | | | | |
| Manganese | | ND | mg/L | 0.010 | | | | | | |
| Potassium | | ND | mg/L | 1.0 | | | | | | |
| Silicon | | ND | mg/L | 0.10 | | | | | | |
| Sodium | | ND | mg/L | 1.0 | | | | | | |
| Sample ID: LFB-110606A | 9 | Laboratory Fortified Blank | | | | Run: ICP2-C_110606A | | | | 06/06/11 13:17 |
| Aluminum | | 0.972 | mg/L | 0.10 | 97 | 85 | 115 | | | |
| Boron | | 0.969 | mg/L | 0.10 | 97 | 85 | 115 | | | |
| Calcium | | 48.6 | mg/L | 0.50 | 97 | 85 | 115 | | | |
| Iron | | 0.978 | mg/L | 0.030 | 98 | 85 | 115 | | | |
| Magnesium | | 47.7 | mg/L | 0.50 | 95 | 85 | 115 | | | |
| Manganese | | 1.02 | mg/L | 0.010 | 102 | 85 | 115 | | | |
| Potassium | | 45.0 | mg/L | 0.50 | 90 | 85 | 115 | | | |
| Silicon | | 0.407 | mg/L | 0.10 | 90 | 85 | 115 | | | |
| Sodium | | 48.8 | mg/L | 0.50 | 98 | 85 | 115 | | | |
| Sample ID: C11060022-003BMS2 | 9 | Sample Matrix Spike | | | | Run: ICP2-C_110606A | | | | 06/06/11 17:17 |
| Aluminum | | 2.0 | mg/L | 0.10 | 98 | 70 | 130 | | | |
| Boron | | 2.1 | mg/L | 0.10 | 97 | 70 | 130 | | | |
| Calcium | | 120 | mg/L | 0.50 | 94 | 70 | 130 | | | |
| Iron | | 1.9 | mg/L | 0.030 | 95 | 70 | 130 | | | |
| Magnesium | | 100 | mg/L | 0.50 | 94 | 70 | 130 | | | |
| Manganese | | 2.0 | mg/L | 0.010 | 97 | 70 | 130 | | | |
| Potassium | | 94 | mg/L | 0.50 | 90 | 70 | 130 | | | |
| Silicon | | 7.3 | mg/L | 0.10 | | 70 | 130 | | | A |
| Sodium | | 110 | mg/L | 0.50 | 96 | 70 | 130 | | | |
| Sample ID: C11060022-003BMSD | 9 | Sample Matrix Spike Duplicate | | | | Run: ICP2-C_110606A | | | | 06/06/11 17:21 |
| Aluminum | | 2.0 | mg/L | 0.10 | 100 | 70 | 130 | 1.9 | 20 | |
| Boron | | 2.1 | mg/L | 0.10 | 100 | 70 | 130 | 3.0 | 20 | |
| Calcium | | 120 | mg/L | 0.50 | 96 | 70 | 130 | 1.9 | 20 | |
| Iron | | 2.0 | mg/L | 0.030 | 98 | 70 | 130 | 3.1 | 20 | |
| Magnesium | | 100 | mg/L | 0.50 | 95 | 70 | 130 | 1.8 | 20 | |
| Manganese | | 2.1 | mg/L | 0.010 | 101 | 70 | 130 | 3.9 | 20 | |
| Potassium | | 94 | mg/L | 0.50 | 90 | 70 | 130 | 0.1 | 20 | |
| Silicon | | 7.5 | mg/L | 0.10 | | 70 | 130 | 3.2 | 20 | A |
| Sodium | | 110 | mg/L | 0.50 | 98 | 70 | 130 | 1.9 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|----------------------------|-------|---------|------|-----------|-----------------------|-----|----------|----------------|
| Method: E200.8 | | | | | | | | | | Batch: R146795 |
| Sample ID: LRB | 13 | Method Blank | | | | | Run: ICPMS2-C_110609A | | | 06/09/11 11:30 |
| Antimony | | ND | mg/L | 7E-05 | | | | | | |
| Arsenic | | ND | mg/L | 6E-05 | | | | | | |
| Barium | | ND | mg/L | 3E-05 | | | | | | |
| Beryllium | | ND | mg/L | 3E-05 | | | | | | |
| Cadmium | | ND | mg/L | 1E-05 | | | | | | |
| Chromium | | ND | mg/L | 4E-05 | | | | | | |
| Copper | | ND | mg/L | 7E-05 | | | | | | |
| Lead | | ND | mg/L | 3E-05 | | | | | | |
| Nickel | | ND | mg/L | 0.0007 | | | | | | |
| Selenium | | ND | mg/L | 0.0002 | | | | | | |
| Thallium | | ND | mg/L | 1E-05 | | | | | | |
| Uranium | | ND | mg/L | 1E-05 | | | | | | |
| Zinc | | ND | mg/L | 0.0003 | | | | | | |
| Sample ID: LFB | 13 | Laboratory Fortified Blank | | | | | Run: ICPMS2-C_110609A | | | 06/09/11 11:36 |
| Antimony | | 0.0548 | mg/L | 0.0010 | 110 | 85 | 115 | | | |
| Arsenic | | 0.0510 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Barium | | 0.0519 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Beryllium | | 0.0486 | mg/L | 0.0010 | 97 | 85 | 115 | | | |
| Cadmium | | 0.0506 | mg/L | 0.0010 | 101 | 85 | 115 | | | |
| Chromium | | 0.0493 | mg/L | 0.0010 | 99 | 85 | 115 | | | |
| Copper | | 0.0516 | mg/L | 0.0010 | 103 | 85 | 115 | | | |
| Lead | | 0.0509 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Nickel | | 0.0515 | mg/L | 0.0010 | 103 | 85 | 115 | | | |
| Selenium | | 0.0520 | mg/L | 0.0010 | 104 | 85 | 115 | | | |
| Thallium | | 0.0498 | mg/L | 0.0010 | 100 | 85 | 115 | | | |
| Uranium | | 0.0490 | mg/L | 0.00030 | 98 | 85 | 115 | | | |
| Zinc | | 0.0524 | mg/L | 0.0010 | 105 | 85 | 115 | | | |
| Sample ID: C11060158-001DMS4 | 13 | Sample Matrix Spike | | | | | Run: ICPMS2-C_110609A | | | 06/09/11 17:14 |
| Antimony | | 0.0554 | mg/L | 0.050 | 111 | 70 | 130 | | | |
| Arsenic | | 0.0512 | mg/L | 0.0010 | 102 | 70 | 130 | | | |
| Barium | | 0.0990 | mg/L | 0.0010 | 96 | 70 | 130 | | | |
| Beryllium | | 0.0460 | mg/L | 0.010 | 92 | 70 | 130 | | | |
| Cadmium | | 0.0481 | mg/L | 0.010 | 96 | 70 | 130 | | | |
| Chromium | | 0.0456 | mg/L | 0.0010 | 91 | 70 | 130 | | | |
| Copper | | 0.0488 | mg/L | 0.010 | 93 | 70 | 130 | | | |
| Lead | | 0.0492 | mg/L | 0.0010 | 98 | 70 | 130 | | | |
| Nickel | | 0.0499 | mg/L | 0.0010 | 94 | 70 | 130 | | | |
| Selenium | | 0.0521 | mg/L | 0.0010 | 104 | 70 | 130 | | | |
| Thallium | | 0.0484 | mg/L | 0.0010 | 97 | 70 | 130 | | | |
| Uranium | | 0.0490 | mg/L | 0.00030 | 98 | 70 | 130 | | | |
| Zinc | | 0.0724 | mg/L | 0.010 | 91 | 70 | 130 | | | |

Qualifiers:

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MDC - Minimum detectable concentration



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|--------|-------|---------|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E200.8 | | | | | | | | | | Batch: R146795 |
| Sample ID: C11060158-001DMSD 13 Sample Matrix Spike Duplicate | | | | | | | | | | Run: ICPMS2-C_110609A 06/09/11 17:17 |
| Antimony | | 0.0561 | mg/L | 0.050 | 112 | 70 | 130 | 1.3 | 20 | |
| Arsenic | | 0.0523 | mg/L | 0.0010 | 105 | 70 | 130 | 2.0 | 20 | |
| Barium | | 0.100 | mg/L | 0.0010 | 99 | 70 | 130 | 1.5 | 20 | |
| Beryllium | | 0.0473 | mg/L | 0.010 | 95 | 70 | 130 | 2.9 | 20 | |
| Cadmium | | 0.0492 | mg/L | 0.010 | 98 | 70 | 130 | 2.1 | 20 | |
| Chromium | | 0.0460 | mg/L | 0.0010 | 92 | 70 | 130 | 0.9 | 20 | |
| Copper | | 0.0504 | mg/L | 0.010 | 97 | 70 | 130 | 3.4 | 20 | |
| Lead | | 0.0502 | mg/L | 0.0010 | 100 | 70 | 130 | 2.0 | 20 | |
| Nickel | | 0.0517 | mg/L | 0.0010 | 98 | 70 | 130 | 3.5 | 20 | |
| Selenium | | 0.0535 | mg/L | 0.0010 | 107 | 70 | 130 | 2.6 | 20 | |
| Thallium | | 0.0492 | mg/L | 0.0010 | 98 | 70 | 130 | 1.7 | 20 | |
| Uranium | | 0.0506 | mg/L | 0.00030 | 101 | 70 | 130 | 3.2 | 20 | |
| Zinc | | 0.0741 | mg/L | 0.010 | 95 | 70 | 130 | 2.3 | 20 | |
| Method: E200.8 | | | | | | | | | | Batch: R146982 |
| Sample ID: LRB Method Blank | | | | | | | | | | Run: ICPMS2-C_110615A 06/15/11 11:11 |
| Silver | | 6E-05 | mg/L | 3E-05 | | | | | | |
| Sample ID: LFB Laboratory Fortified Blank | | | | | | | | | | Run: ICPMS2-C_110615A 06/15/11 11:14 |
| Silver | | 0.0205 | mg/L | 0.0010 | 102 | 85 | 115 | | | |
| Sample ID: C11060153-012BMS4 Sample Matrix Spike | | | | | | | | | | Run: ICPMS2-C_110615A 06/15/11 15:06 |
| Silver | | 0.0139 | mg/L | 0.010 | 70 | 70 | 130 | | | |
| Sample ID: C11060153-012BMSD Sample Matrix Spike Duplicate | | | | | | | | | | Run: ICPMS2-C_110615A 06/15/11 15:09 |
| Silver | | 0.0106 | mg/L | 0.010 | 53 | 70 | 130 | 27 | 20 | SR |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

ND - Not detected at the reporting limit.

R - RPD exceeds advisory limit.



QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------------------------------|---------|-------|---------|------|------------------------|------------|-----|----------------|--------------|
| Method: E245.1 | | | | | | | | | | Batch: 30059 |
| Sample ID: MB-30059 | Method Blank | | | | | Run: CVAA_C203_110607A | | | 06/07/11 11:21 | |
| Mercury | | 0.0001 | mg/L | 1E-06 | | | | | | |
| Sample ID: LCS-30059 | Laboratory Control Sample | | | | | Run: CVAA_C203_110607A | | | 06/07/11 11:24 | |
| Mercury | | 0.00502 | mg/L | 0.00010 | 98 | 90 | 110 | | | |
| Sample ID: C11060146-001FMS | Sample Matrix Spike | | | | | Run: CVAA_C203_110607A | | | 06/07/11 11:39 | |
| Mercury | | 0.00528 | mg/L | 0.00020 | 103 | 85 | 115 | | | |
| Sample ID: C11060146-001FMSD | Sample Matrix Spike Duplicate | | | | | Run: CVAA_C203_110607A | | | 06/07/11 11:40 | |
| Mercury | | 0.00510 | mg/L | 0.00020 | 100 | 85 | 115 | 3.6 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|---|-------|------|------|-----------|------------|-------------------------------|----------|----------------|
| Method: E300.0 | | | | | | | | Analytical Run: IC2-C_110606A | | |
| Sample ID: ICV-110606 | 2 | Initial Calibration Verification Standard | | | | | | | | 06/06/11 16:41 |
| Chloride | | 9.89 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sulfate | | 39.4 | mg/L | 1.0 | 98 | 90 | 110 | | | |
| Method: E300.0 | | | | | | | | Batch: R146687 | | |
| Sample ID: ICB-110606 | 2 | Method Blank | | | | | | | | 06/06/11 16:57 |
| Chloride | | ND | mg/L | 0.04 | | | | | | |
| Sulfate | | 0.2 | mg/L | 0.1 | | | | | | |
| Sample ID: LFB-110606 | 2 | Laboratory Fortified Blank | | | | | | | | 06/06/11 17:12 |
| Chloride | | 9.88 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sulfate | | 39.6 | mg/L | 1.0 | 99 | 90 | 110 | | | |
| Sample ID: C11050625-005APDS | 2 | Post Digestion/Distillation Spike | | | | | | | | 06/06/11 19:31 |
| Chloride | | 91.1 | mg/kg | 1.0 | 98 | 80 | 120 | | | |
| Sulfate | | 297 | mg/kg | 1.0 | 98 | 80 | 120 | | | |
| Sample ID: C11050625-005APDS | 2 | Post Digestion Spike Duplicate | | | | | | | | 06/06/11 19:46 |
| Chloride | | 92.2 | mg/kg | 1.0 | 100 | 80 | 120 | | | |
| Sulfate | | 300 | mg/kg | 1.0 | 100 | 80 | 120 | | | |

Qualifiers:

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MDC - Minimum detectable concentration



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|------|------|-----------|------------------------|-----|----------|----------------|
| Method: E353.2 | | | | | | | | | | Batch: R146818 |
| Sample ID: MBLK-1 | | Method Blank | | | | | Run: TECHNICON_110610A | | | 06/10/11 13:23 |
| Nitrogen, Nitrate+Nitrite as N | | ND | mg/L | 0.06 | | | | | | |
| Sample ID: LCS-2 | | Laboratory Control Sample | | | | | Run: TECHNICON_110610A | | | 06/10/11 13:26 |
| Nitrogen, Nitrate+Nitrite as N | | 2.56 | mg/L | 0.10 | 102 | 90 | 110 | | | |
| Sample ID: LFB-3 | | Laboratory Fortified Blank | | | | | Run: TECHNICON_110610A | | | 06/10/11 13:28 |
| Nitrogen, Nitrate+Nitrite as N | | 1.97 | mg/L | 0.10 | 101 | 90 | 110 | | | |
| Sample ID: C11060106-006DMS | | Sample Matrix Spike | | | | | Run: TECHNICON_110610A | | | 06/10/11 13:43 |
| Nitrogen, Nitrate+Nitrite as N | | 3.33 | mg/L | 0.10 | 97 | 90 | 110 | | | |
| Sample ID: C11060106-006DMSD | | Sample Matrix Spike Duplicate | | | | | Run: TECHNICON_110610A | | | 06/10/11 13:46 |
| Nitrogen, Nitrate+Nitrite as N | | 3.35 | mg/L | 0.10 | 98 | 90 | 110 | 0.6 | 10 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|-------------------------------------|-------|-------|------|---------------------|------------|-----|----------|----------------|
| Method: E504.1 | | | | | | | | | | Batch: 30084 |
| Sample ID: LCS-30084 | 4 | Laboratory Control Sample | | | | Run: ECD1-C_110609A | | | | 06/09/11 16:48 |
| 1,2-Dibromo-3-chloropropane | | 0.216 | ug/L | 0.020 | 86 | 70 | 130 | | | |
| 1,2-Dibromoethane | | 0.267 | ug/L | 0.010 | 107 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 0.237 | ug/L | 0.050 | 95 | 70 | 130 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 99 | 70 | 130 | | | |
| Sample ID: LCSD-30084 | 4 | Laboratory Control Sample Duplicate | | | | Run: ECD1-C_110609A | | | | 06/09/11 17:26 |
| 1,2-Dibromo-3-chloropropane | | 0.217 | ug/L | 0.020 | 87 | 70 | 130 | 0.5 | 20 | |
| 1,2-Dibromoethane | | 0.273 | ug/L | 0.010 | 109 | 70 | 130 | 2.2 | 20 | |
| 1,2,3-Trichloropropane | | 0.245 | ug/L | 0.050 | 98 | 70 | 130 | 3.3 | 20 | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 100 | 70 | 130 | 0.0 | 10 | |
| Sample ID: MB-30084 | 4 | Method Blank | | | | Run: ECD1-C_110609A | | | | 06/09/11 18:05 |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.020 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.010 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.050 | | | | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 91 | 70 | 130 | | | |
| Sample ID: C11060311-005CMS | 4 | Sample Matrix Spike | | | | Run: ECD1-C_110609A | | | | 06/10/11 04:20 |
| 1,2-Dibromo-3-chloropropane | | 0.191 | ug/L | 0.020 | 78 | 65 | 135 | | | |
| 1,2-Dibromoethane | | 0.242 | ug/L | 0.010 | 99 | 65 | 135 | | | |
| 1,2,3-Trichloropropane | | 0.217 | ug/L | 0.050 | 88 | 65 | 135 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 91 | 70 | 130 | | | |
| Sample ID: C11060146-001KMS | 4 | Sample Matrix Spike | | | | Run: ECD1-C_110609A | | | | 06/09/11 19:24 |
| 1,2-Dibromo-3-chloropropane | | 0.223 | ug/L | 0.020 | 88 | 65 | 135 | | | |
| 1,2-Dibromoethane | | 0.270 | ug/L | 0.010 | 107 | 65 | 135 | | | |
| 1,2,3-Trichloropropane | | 0.248 | ug/L | 0.050 | 98 | 65 | 135 | | | |
| Surr: 1,1,1,2-Tetrachloroethane | | | | 0.020 | 99 | 70 | 130 | | | |

Qualifiers:

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ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|-------------------------------|-------|-------|------------------|-----------|------------|-----|----------------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_54502 |
| Sample ID: B11060785-001MSD | 9 | Sample Matrix Spike Duplicate | | | Run: SUB-B166970 | | | | 06/09/11 17:32 | |
| 2,4-D | | 4.83 | ug/L | 1.0 | 97 | 65 | 135 | 7.3 | 40 | |
| Dalapon | | 3.56 | ug/L | 2.5 | 71 | 65 | 135 | 22 | 40 | |
| Dicamba | | 6.58 | ug/L | 0.25 | 132 | 65 | 135 | 0.3 | 40 | |
| Dichlorprop | | 5.51 | ug/L | 1.0 | 110 | 65 | 135 | 6.2 | 40 | |
| Dinoseb | | 2.79 | ug/L | 1.0 | 56 | 65 | 135 | 0.4 | 40 | S |
| Pentachlorophenol | | 4.36 | ug/L | 0.040 | 87 | 65 | 135 | 4.9 | 40 | |
| Picloram | | 4.72 | ug/L | 0.50 | 94 | 65 | 135 | 4.3 | 40 | |
| 2,4,5-TP (Silvex) | | 4.96 | ug/L | 0.20 | 99 | 65 | 135 | 3.3 | 40 | |
| Surr: DCAA | | | | 0.10 | 91 | 70 | 130 | | | |
| Sample ID: MB-54502 | 9 | Method Blank | | | Run: SUB-B166970 | | | | 06/09/11 13:01 | |
| 2,4-D | | ND | ug/L | 1.0 | | | | | | |
| Dalapon | | ND | ug/L | 2.5 | | | | | | |
| Dicamba | | ND | ug/L | 0.25 | | | | | | |
| Dichlorprop | | ND | ug/L | 1.0 | | | | | | |
| Dinoseb | | ND | ug/L | 1.0 | | | | | | |
| Pentachlorophenol | | ND | ug/L | 0.040 | | | | | | |
| Picloram | | ND | ug/L | 0.50 | | | | | | |
| 2,4,5-TP (Silvex) | | ND | ug/L | 0.20 | | | | | | |
| Surr: DCAA | | | | 0.10 | 83 | 70 | 130 | | | |
| Sample ID: LCS-54502 | 9 | Laboratory Control Sample | | | Run: SUB-B166970 | | | | 06/09/11 13:31 | |
| 2,4-D | | 4.52 | ug/L | 1.0 | 90 | 70 | 130 | | | |
| Dalapon | | 3.85 | ug/L | 2.5 | 77 | 70 | 130 | | | |
| Dicamba | | 4.86 | ug/L | 0.25 | 97 | 70 | 130 | | | |
| Dichlorprop | | 5.14 | ug/L | 1.0 | 103 | 70 | 130 | | | |
| Dinoseb | | 4.09 | ug/L | 1.0 | 82 | 70 | 130 | | | |
| Pentachlorophenol | | 4.10 | ug/L | 0.040 | 82 | 70 | 130 | | | |
| Picloram | | 3.64 | ug/L | 0.50 | 73 | 70 | 130 | | | |
| 2,4,5-TP (Silvex) | | 4.51 | ug/L | 0.20 | 90 | 70 | 130 | | | |
| Surr: DCAA | | | | 0.10 | 85 | 70 | 130 | | | |
| Sample ID: C11060146-001I | 9 | Sample Matrix Spike | | | Run: SUB-B166970 | | | | 06/09/11 17:02 | |
| 2,4-D | | 4.49 | ug/L | 1.0 | 90 | 65 | 135 | | | |
| Dalapon | | 4.43 | ug/L | 2.5 | 89 | 65 | 135 | | | |
| Dicamba | | 6.60 | ug/L | 0.25 | 132 | 65 | 135 | | | |
| Dichlorprop | | 5.18 | ug/L | 1.0 | 104 | 65 | 135 | | | |
| Dinoseb | | 2.80 | ug/L | 1.0 | 56 | 65 | 135 | | | S |
| Pentachlorophenol | | 4.15 | ug/L | 0.040 | 83 | 65 | 135 | | | |
| Picloram | | 4.52 | ug/L | 0.50 | 90 | 65 | 135 | | | |
| 2,4,5-TP (Silvex) | | 4.80 | ug/L | 0.20 | 96 | 65 | 135 | | | |
| Surr: DCAA | | | | 0.10 | 88 | 70 | 130 | | | |
| Sample ID: LCS-54502 | | Laboratory Control Sample | | | Run: SUB-B166972 | | | | 06/09/11 14:01 | |
| 2,4-DB | | 3.56 | ug/L | 2.5 | 71 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.



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QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|--------|------------------|-----|------|----------------|------------|-----|----------|----------------|
| Method: E515.1 | | | | | | | | | | Batch: B_54502 |
| Sample ID: C11060146-001I | | | | | | | | | | |
| Sample Matrix Spike | | | Run: SUB-B166972 | | | 06/09/11 17:32 | | | | |
| 2,4-DB | | 4.80 | ug/L | 2.5 | 96 | 65 | 135 | | | |
| Sample ID: B11060785-001MSD | | | | | | | | | | |
| Sample Matrix Spike Duplicate | | | Run: SUB-B166972 | | | 06/09/11 18:02 | | | | |
| 2,4-DB | | 4.62 | ug/L | 2.5 | 92 | 65 | 135 | 3.8 | 40 | |
| Sample ID: MB-54502 | | | | | | | | | | |
| Method Blank | | | Run: SUB-B166972 | | | 06/09/11 13:31 | | | | |
| 2,4-DB | | ND | ug/L | 2.5 | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------------|-------|--------|---------------------|-----|-----------------------|-----------|------------|-----|----------------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: C11060330-001AMS | | 65 | Sample Matrix Spike | | Run: SATURNCA_110608A | | | | 06/08/11 21:29 | |
| 1,1,1,2-Tetrachloroethane | 151 | ug/L | 5.0 | 151 | 70 | 130 | | | | S |
| 1,1,1-Trichloroethane | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | | |
| 1,1,2,2-Tetrachloroethane | 116 | ug/L | 5.0 | 116 | 70 | 130 | | | | |
| 1,1,2-Trichloroethane | 136 | ug/L | 5.0 | 136 | 70 | 130 | | | | S |
| 1,1-Dichloroethane | 99.6 | ug/L | 5.0 | 100 | 70 | 130 | | | | |
| 1,1-Dichloroethene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| 1,1-Dichloropropene | 122 | ug/L | 5.0 | 122 | 70 | 130 | | | | |
| 1,2,3-Trichlorobenzene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| 1,2,3-Trichloropropane | 119 | ug/L | 5.0 | 119 | 70 | 130 | | | | |
| 1,2,4-Trichlorobenzene | 109 | ug/L | 5.0 | 109 | 70 | 130 | | | | |
| 1,2,4-Trimethylbenzene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| 1,2-Dibromo-3-chloropropane | 128 | ug/L | 5.0 | 128 | 70 | 130 | | | | |
| 1,2-Dibromoethane | 129 | ug/L | 5.0 | 129 | 70 | 130 | | | | |
| 1,2-Dichlorobenzene | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | | |
| 1,2-Dichloroethane | 126 | ug/L | 5.0 | 126 | 70 | 130 | | | | |
| 1,2-Dichloropropane | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | | |
| 1,3,5-Trimethylbenzene | 111 | ug/L | 5.0 | 111 | 70 | 130 | | | | |
| 1,3-Dichlorobenzene | 114 | ug/L | 5.0 | 114 | 70 | 130 | | | | |
| 1,3-Dichloropropane | 125 | ug/L | 5.0 | 125 | 70 | 130 | | | | |
| 1,4-Dichlorobenzene | 134 | ug/L | 5.0 | 134 | 70 | 130 | | | | S |
| 2,2-Dichloropropane | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | | |
| 2-Chlorotoluene | 119 | ug/L | 5.0 | 119 | 70 | 130 | | | | |
| 4-Chlorotoluene | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | | |
| Benzene | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | | |
| Bromobenzene | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | | |
| Bromochloromethane | 143 | ug/L | 5.0 | 143 | 70 | 130 | | | | S |
| Bromodichloromethane | 72.4 | ug/L | 5.0 | 67 | 70 | 130 | | | | S |
| Bromoform | 21.9 | ug/L | 5.0 | 22 | 70 | 130 | | | | S |
| Bromomethane | 160 | ug/L | 5.0 | 160 | 70 | 130 | | | | S |
| Carbon tetrachloride | 91.6 | ug/L | 5.0 | 92 | 70 | 130 | | | | |
| Chlorobenzene | 148 | ug/L | 5.0 | 148 | 70 | 130 | | | | S |
| Chlorodibromomethane | 45.6 | ug/L | 5.0 | 46 | 70 | 130 | | | | S |
| Chloroethane | 128 | ug/L | 5.0 | 128 | 70 | 130 | | | | |
| Chloroform | 203 | ug/L | 5.0 | 122 | 70 | 130 | | | | |
| Chloromethane | 120 | ug/L | 5.0 | 120 | 70 | 130 | | | | |
| cis-1,2-Dichloroethene | 121 | ug/L | 5.0 | 121 | 70 | 130 | | | | |
| cis-1,3-Dichloropropene | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | | |
| Dibromomethane | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | | |
| Dichlorodifluoromethane | 118 | ug/L | 5.0 | 118 | 70 | 130 | | | | |
| Ethylbenzene | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | | |
| Hexachlorobutadiene | 116 | ug/L | 5.0 | 116 | 70 | 130 | | | | |
| Isopropylbenzene | 130 | ug/L | 5.0 | 130 | 70 | 130 | | | | |
| m+p-Xylenes | 245 | ug/L | 5.0 | 122 | 70 | 130 | | | | |
| Methyl tert-butyl ether (MTBE) | 121 | ug/L | 20 | 121 | 70 | 130 | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--|-------|--------|-------|-----|------|-----------|------------|-----|----------|--------------------------------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: C11060330-001AMS 65 Sample Matrix Spike | | | | | | | | | | Run: SATURNCA_110608A 06/08/11 21:29 |
| Methylene chloride | 105 | ug/L | 5.0 | 104 | 70 | 130 | | | | |
| Naphthalene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| n-Butylbenzene | 111 | ug/L | 5.0 | 111 | 70 | 130 | | | | |
| n-Propylbenzene | 114 | ug/L | 5.0 | 114 | 70 | 130 | | | | |
| o-Xylene | 115 | ug/L | 5.0 | 115 | 70 | 130 | | | | |
| p-Isopropyltoluene | 110 | ug/L | 5.0 | 110 | 70 | 130 | | | | |
| sec-Butylbenzene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| Styrene | 112 | ug/L | 5.0 | 112 | 70 | 130 | | | | |
| tert-Butylbenzene | 113 | ug/L | 5.0 | 113 | 70 | 130 | | | | |
| Tetrachloroethene | 123 | ug/L | 5.0 | 123 | 70 | 130 | | | | |
| Toluene | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | | |
| trans-1,2-Dichloroethene | 117 | ug/L | 5.0 | 117 | 70 | 130 | | | | |
| trans-1,3-Dichloropropene | 126 | ug/L | 5.0 | 126 | 70 | 130 | | | | |
| Trichloroethene | 116 | ug/L | 5.0 | 116 | 70 | 130 | | | | |
| Trichlorofluoromethane | 108 | ug/L | 5.0 | 108 | 70 | 130 | | | | |
| Vinyl chloride | 111 | ug/L | 5.0 | 111 | 70 | 130 | | | | |
| Xylenes, Total | 360 | ug/L | 5.0 | 120 | 70 | 130 | | | | |
| Trihalomethanes, Total | 343 | ug/L | 5.0 | 64 | 70 | 130 | | | | S |
| Surr: Dibromofluoromethane | | | 0.50 | 104 | 80 | 120 | | | | |
| Surr: p-Bromofluorobenzene | | | 0.50 | 108 | 80 | 120 | | | | |
| Surr: Toluene-d8 | | | 0.50 | 108 | 80 | 120 | | | | |
| Sample ID: C11060330-001AMSD 65 Sample Matrix Spike Duplicate | | | | | | | | | | Run: SATURNCA_110608A 06/08/11 22:05 |
| 1,1,1,2-Tetrachloroethane | 153 | ug/L | 5.0 | 153 | 70 | 130 | 1.1 | 20 | | S |
| 1,1,1-Trichloroethane | 119 | ug/L | 5.0 | 119 | 70 | 130 | 0.7 | 20 | | |
| 1,1,2,2-Tetrachloroethane | 114 | ug/L | 5.0 | 114 | 70 | 130 | 2.1 | 20 | | |
| 1,1,2-Trichloroethane | 130 | ug/L | 5.0 | 130 | 70 | 130 | 4.8 | 20 | | |
| 1,1-Dichloroethane | 106 | ug/L | 5.0 | 106 | 70 | 130 | 5.8 | 20 | | |
| 1,1-Dichloroethene | 112 | ug/L | 5.0 | 112 | 70 | 130 | 0.4 | 20 | | |
| 1,1-Dichloropropene | 119 | ug/L | 5.0 | 119 | 70 | 130 | 2.0 | 20 | | |
| 1,2,3-Trichlorobenzene | 115 | ug/L | 5.0 | 115 | 70 | 130 | 2.8 | 20 | | |
| 1,2,3-Trichloropropane | 122 | ug/L | 5.0 | 122 | 70 | 130 | 2.3 | 20 | | |
| 1,2,4-Trichlorobenzene | 109 | ug/L | 5.0 | 109 | 70 | 130 | 0.0 | 20 | | |
| 1,2,4-Trimethylbenzene | 105 | ug/L | 5.0 | 105 | 70 | 130 | 6.3 | 20 | | |
| 1,2-Dibromo-3-chloropropane | 121 | ug/L | 5.0 | 121 | 70 | 130 | 5.8 | 20 | | |
| 1,2-Dibromoethane | 126 | ug/L | 5.0 | 126 | 70 | 130 | 1.9 | 20 | | |
| 1,2-Dichlorobenzene | 118 | ug/L | 5.0 | 118 | 70 | 130 | 0.3 | 20 | | |
| 1,2-Dichloroethane | 132 | ug/L | 5.0 | 132 | 70 | 130 | 4.3 | 20 | | S |
| 1,2-Dichloropropane | 116 | ug/L | 5.0 | 116 | 70 | 130 | 1.4 | 20 | | |
| 1,3,5-Trimethylbenzene | 106 | ug/L | 5.0 | 106 | 70 | 130 | 4.8 | 20 | | |
| 1,3-Dichlorobenzene | 115 | ug/L | 5.0 | 115 | 70 | 130 | 0.7 | 20 | | |
| 1,3-Dichloropropane | 118 | ug/L | 5.0 | 118 | 70 | 130 | 5.6 | 20 | | |
| 1,4-Dichlorobenzene | 137 | ug/L | 5.0 | 137 | 70 | 130 | 2.1 | 20 | | S |
| 2,2-Dichloropropane | 115 | ug/L | 5.0 | 115 | 70 | 130 | 2.1 | 20 | | |
| 2-Chlorotoluene | 117 | ug/L | 5.0 | 117 | 70 | 130 | 2.0 | 20 | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|--------|-------------------------------|-----|-----------------------|-----------|------------|-----|----------------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: C11060330-001AMSD | | 65 | Sample Matrix Spike Duplicate | | Run: SATURNCA_110608A | | | | 06/08/11 22:05 | |
| 4-Chlorotoluene | 114 | ug/L | 5.0 | 114 | 70 | 130 | 1.4 | 20 | | |
| Benzene | 117 | ug/L | 5.0 | 117 | 70 | 130 | 0.3 | 20 | | |
| Bromobenzene | 113 | ug/L | 5.0 | 113 | 70 | 130 | 0.4 | 20 | | |
| Bromochloromethane | 143 | ug/L | 5.0 | 143 | 70 | 130 | 0.0 | 20 | | S |
| Bromodichloromethane | 80.4 | ug/L | 5.0 | 75 | 70 | 130 | 10 | 20 | | |
| Bromoform | 37.9 | ug/L | 5.0 | 38 | 70 | 130 | 54 | 20 | | SR |
| Bromomethane | 152 | ug/L | 5.0 | 152 | 70 | 130 | 4.6 | 20 | | S |
| Carbon tetrachloride | 96.8 | ug/L | 5.0 | 97 | 70 | 130 | 5.5 | 20 | | |
| Chlorobenzene | 141 | ug/L | 5.0 | 141 | 70 | 130 | 4.4 | 20 | | S |
| Chlorodibromomethane | 52.0 | ug/L | 5.0 | 52 | 70 | 130 | 13 | 20 | | S |
| Chloroethane | 126 | ug/L | 5.0 | 126 | 70 | 130 | 1.6 | 20 | | |
| Chloroform | 204 | ug/L | 5.0 | 123 | 70 | 130 | 0.6 | 20 | | |
| Chloromethane | 126 | ug/L | 5.0 | 126 | 70 | 130 | 4.9 | 20 | | |
| cis-1,2-Dichloroethene | 122 | ug/L | 5.0 | 122 | 70 | 130 | 1.0 | 20 | | |
| cis-1,3-Dichloropropene | 114 | ug/L | 5.0 | 114 | 70 | 130 | 2.1 | 20 | | |
| Dibromomethane | 114 | ug/L | 5.0 | 114 | 70 | 130 | 3.4 | 20 | | |
| Dichlorodifluoromethane | 114 | ug/L | 5.0 | 114 | 70 | 130 | 3.8 | 20 | | |
| Ethylbenzene | 107 | ug/L | 5.0 | 107 | 70 | 130 | 5.1 | 20 | | |
| Hexachlorobutadiene | 111 | ug/L | 5.0 | 111 | 70 | 130 | 4.6 | 20 | | |
| Isopropylbenzene | 124 | ug/L | 5.0 | 124 | 70 | 130 | 4.1 | 20 | | |
| m+p-Xylenes | 231 | ug/L | 5.0 | 115 | 70 | 130 | 5.9 | 20 | | |
| Methyl tert-butyl ether (MTBE) | 125 | ug/L | 20 | 125 | 70 | 130 | 2.9 | 20 | | |
| Methylene chloride | 111 | ug/L | 5.0 | 110 | 70 | 130 | 5.5 | 20 | | |
| Naphthalene | 116 | ug/L | 5.0 | 116 | 70 | 130 | 3.9 | 20 | | |
| n-Butylbenzene | 104 | ug/L | 5.0 | 104 | 70 | 130 | 7.1 | 20 | | |
| n-Propylbenzene | 110 | ug/L | 5.0 | 110 | 70 | 130 | 3.6 | 20 | | |
| o-Xylene | 112 | ug/L | 5.0 | 112 | 70 | 130 | 2.8 | 20 | | |
| p-Isopropyltoluene | 102 | ug/L | 5.0 | 102 | 70 | 130 | 7.2 | 20 | | |
| sec-Butylbenzene | 104 | ug/L | 5.0 | 104 | 70 | 130 | 7.0 | 20 | | |
| Styrene | 112 | ug/L | 5.0 | 112 | 70 | 130 | 0.7 | 20 | | |
| tert-Butylbenzene | 109 | ug/L | 5.0 | 109 | 70 | 130 | 3.2 | 20 | | |
| Tetrachloroethene | 118 | ug/L | 5.0 | 118 | 70 | 130 | 4.3 | 20 | | |
| Toluene | 108 | ug/L | 5.0 | 108 | 70 | 130 | 0.4 | 20 | | |
| trans-1,2-Dichloroethene | 117 | ug/L | 5.0 | 117 | 70 | 130 | 0.3 | 20 | | |
| trans-1,3-Dichloropropene | 120 | ug/L | 5.0 | 120 | 70 | 130 | 5.2 | 20 | | |
| Trichloroethene | 114 | ug/L | 5.0 | 114 | 70 | 130 | 1.7 | 20 | | |
| Trichlorofluoromethane | 108 | ug/L | 5.0 | 108 | 70 | 130 | 0.0 | 20 | | |
| Vinyl chloride | 113 | ug/L | 5.0 | 113 | 70 | 130 | 1.4 | 20 | | |
| Xylenes, Total | 343 | ug/L | 5.0 | 114 | 70 | 130 | 4.9 | 20 | | |
| Trihalomethanes, Total | 374 | ug/L | 5.0 | 72 | 70 | 130 | 8.8 | 20 | | |
| Surr: Dibromofluoromethane | | | 0.50 | 111 | 80 | 120 | 0.0 | 10 | | |
| Surr: p-Bromofluorobenzene | | | 0.50 | 103 | 80 | 120 | 0.0 | 10 | | |
| Surr: Toluene-d8 | | | 0.50 | 103 | 80 | 120 | 0.0 | 10 | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

ND - Not detected at the reporting limit.

R - RPD exceeds advisory limit.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------|-------|--------|-------|------|------|-----------|------------|-----|----------|-----------------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: 060811_LCS_4 | | | | | | | | | | 06/08/11 12:55 |
| 65 Laboratory Control Sample | | | | | | | | | | Run: SATURNCA_110608A |
| 1,1,1,2-Tetrachloroethane | | 14.1 | ug/L | 0.50 | 141 | 70 | 130 | | | S |
| 1,1,1-Trichloroethane | | 10.7 | ug/L | 0.50 | 107 | 70 | 130 | | | |
| 1,1,2,2-Tetrachloroethane | | 11.1 | ug/L | 0.50 | 111 | 70 | 130 | | | |
| 1,1,2-Trichloroethane | | 12.6 | ug/L | 0.50 | 126 | 70 | 130 | | | |
| 1,1-Dichloroethane | | 9.76 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| 1,1-Dichloroethene | | 10.9 | ug/L | 0.50 | 109 | 70 | 130 | | | |
| 1,1-Dichloropropene | | 11.4 | ug/L | 0.50 | 114 | 70 | 130 | | | |
| 1,2,3-Trichlorobenzene | | 11.7 | ug/L | 0.50 | 117 | 70 | 130 | | | |
| 1,2,3-Trichloropropane | | 12.7 | ug/L | 0.50 | 127 | 70 | 130 | | | |
| 1,2,4-Trichlorobenzene | | 11.6 | ug/L | 0.50 | 116 | 70 | 130 | | | |
| 1,2,4-Trimethylbenzene | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| 1,2-Dibromo-3-chloropropane | | 13.2 | ug/L | 0.50 | 132 | 70 | 130 | | | S |
| 1,2-Dibromoethane | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| 1,2-Dichlorobenzene | | 11.6 | ug/L | 0.50 | 116 | 70 | 130 | | | |
| 1,2-Dichloroethane | | 12.0 | ug/L | 0.50 | 120 | 70 | 130 | | | |
| 1,2-Dichloropropane | | 11.2 | ug/L | 0.50 | 112 | 70 | 130 | | | |
| 1,3,5-Trimethylbenzene | | 9.96 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| 1,3-Dichlorobenzene | | 11.6 | ug/L | 0.50 | 116 | 70 | 130 | | | |
| 1,3-Dichloropropane | | 11.6 | ug/L | 0.50 | 116 | 70 | 130 | | | |
| 1,4-Dichlorobenzene | | 11.0 | ug/L | 0.50 | 110 | 70 | 130 | | | |
| 2,2-Dichloropropane | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| 2-Chlorotoluene | | 11.0 | ug/L | 0.50 | 110 | 70 | 130 | | | |
| 4-Chlorotoluene | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| Benzene | | 10.4 | ug/L | 0.50 | 104 | 70 | 130 | | | |
| Bromobenzene | | 11.2 | ug/L | 0.50 | 112 | 70 | 130 | | | |
| Bromochloromethane | | 12.4 | ug/L | 0.50 | 124 | 70 | 130 | | | |
| Bromodichloromethane | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| Bromoform | | 12.6 | ug/L | 0.50 | 126 | 70 | 130 | | | |
| Bromomethane | | 13.5 | ug/L | 0.50 | 135 | 70 | 130 | | | S |
| Carbon tetrachloride | | 11.1 | ug/L | 0.50 | 111 | 70 | 130 | | | |
| Chlorobenzene | | 12.9 | ug/L | 0.50 | 129 | 70 | 130 | | | |
| Chlorodibromomethane | | 12.3 | ug/L | 0.50 | 123 | 70 | 130 | | | |
| Chloroethane | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| Chloroform | | 11.6 | ug/L | 0.50 | 116 | 70 | 130 | | | |
| Chloromethane | | 11.3 | ug/L | 0.50 | 113 | 70 | 130 | | | |
| cis-1,2-Dichloroethene | | 11.9 | ug/L | 0.50 | 119 | 70 | 130 | | | |
| cis-1,3-Dichloropropene | | 11.7 | ug/L | 0.50 | 117 | 70 | 130 | | | |
| Dibromomethane | | 11.0 | ug/L | 0.50 | 110 | 70 | 130 | | | |
| Dichlorodifluoromethane | | 11.5 | ug/L | 0.50 | 115 | 70 | 130 | | | |
| Ethylbenzene | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| Hexachlorobutadiene | | 11.2 | ug/L | 0.50 | 109 | 70 | 130 | | | |
| Isopropylbenzene | | 11.4 | ug/L | 0.50 | 114 | 70 | 130 | | | |
| m+p-Xylenes | | 21.1 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| Methyl tert-butyl ether (MTBE) | | 13.7 | ug/L | 2.0 | 137 | 70 | 130 | | | S |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---------------------------------|-------|---------------------------|-------|------|------|-----------------------|------------|-----|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: 060811_LCS_4 | 65 | Laboratory Control Sample | | | | Run: SATURNCA_110608A | | | | 06/08/11 12:55 |
| Methylene chloride | | 10.4 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| Naphthalene | | 12.3 | ug/L | 0.50 | 123 | 70 | 130 | | | |
| n-Butylbenzene | | 10.2 | ug/L | 0.50 | 102 | 70 | 130 | | | |
| n-Propylbenzene | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| o-Xylene | | 10.5 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| p-Isopropyltoluene | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| sec-Butylbenzene | | 9.64 | ug/L | 0.50 | 96 | 70 | 130 | | | |
| Styrene | | 11.4 | ug/L | 0.50 | 114 | 70 | 130 | | | |
| tert-Butylbenzene | | 9.84 | ug/L | 0.50 | 98 | 70 | 130 | | | |
| Tetrachloroethene | | 10.3 | ug/L | 0.50 | 103 | 70 | 130 | | | |
| Toluene | | 10.0 | ug/L | 0.50 | 100 | 70 | 130 | | | |
| trans-1,2-Dichloroethene | | 11.2 | ug/L | 0.50 | 112 | 70 | 130 | | | |
| trans-1,3-Dichloropropene | | 13.2 | ug/L | 0.50 | 132 | 70 | 130 | | | S |
| Trichloroethene | | 10.8 | ug/L | 0.50 | 108 | 70 | 130 | | | |
| Trichlorofluoromethane | | 10.1 | ug/L | 0.50 | 101 | 70 | 130 | | | |
| Vinyl chloride | | 11.2 | ug/L | 0.50 | 112 | 70 | 130 | | | |
| Xylenes, Total | | 31.6 | ug/L | 0.50 | 105 | 70 | 130 | | | |
| Trihalomethanes, Total | | 46.6 | ug/L | 0.50 | 117 | 70 | 130 | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 114 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 99 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 97 | 70 | 130 | | | |
| Sample ID: 060811_MBLK_7 | 65 | Method Blank | | | | Run: SATURNCA_110608A | | | | 06/08/11 14:55 |
| 1,1,1,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,1-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2,2-Tetrachloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1,2-Trichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| 1,1-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,3-Trichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2,4-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromo-3-chloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dibromoethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloroethane | | ND | ug/L | 0.50 | | | | | | |
| 1,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,3,5-Trimethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 1,3-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 1,4-Dichlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| 2,2-Dichloropropane | | ND | ug/L | 0.50 | | | | | | |
| 2-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|--------------------------------|-------|--------------|-------|-----------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E524.2 | | | | | | | | | | Batch: R146739 |
| Sample ID: 060811_MBLK_7 | 65 | Method Blank | | Run: SATURNCA_110608A | | | | 06/08/11 14:55 | | |
| 4-Chlorotoluene | | ND | ug/L | 0.50 | | | | | | |
| Benzene | | ND | ug/L | 0.50 | | | | | | |
| Bromobenzene | | ND | ug/L | 0.50 | | | | | | |
| Bromochloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromodichloromethane | | ND | ug/L | 0.50 | | | | | | |
| Bromoform | | ND | ug/L | 0.50 | | | | | | |
| Bromomethane | | ND | ug/L | 0.50 | | | | | | |
| Carbon tetrachloride | | ND | ug/L | 0.50 | | | | | | |
| Chlorobenzene | | ND | ug/L | 0.50 | | | | | | |
| Chlorodibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroethane | | ND | ug/L | 0.50 | | | | | | |
| Chloroform | | ND | ug/L | 0.50 | | | | | | |
| Chloromethane | | ND | ug/L | 0.50 | | | | | | |
| cis-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| cis-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Dibromomethane | | ND | ug/L | 0.50 | | | | | | |
| Dichlorodifluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Ethylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Hexachlorobutadiene | | ND | ug/L | 0.50 | | | | | | |
| Isopropylbenzene | | ND | ug/L | 0.50 | | | | | | |
| m+p-Xylenes | | ND | ug/L | 0.50 | | | | | | |
| Methyl tert-butyl ether (MTBE) | | ND | ug/L | 2.0 | | | | | | |
| Methylene chloride | | ND | ug/L | 0.50 | | | | | | |
| Naphthalene | | ND | ug/L | 0.50 | | | | | | |
| n-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| n-Propylbenzene | | ND | ug/L | 0.50 | | | | | | |
| o-Xylene | | ND | ug/L | 0.50 | | | | | | |
| p-Isopropyltoluene | | ND | ug/L | 0.50 | | | | | | |
| sec-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Styrene | | ND | ug/L | 0.50 | | | | | | |
| tert-Butylbenzene | | ND | ug/L | 0.50 | | | | | | |
| Tetrachloroethene | | ND | ug/L | 0.50 | | | | | | |
| Toluene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,2-Dichloroethene | | ND | ug/L | 0.50 | | | | | | |
| trans-1,3-Dichloropropene | | ND | ug/L | 0.50 | | | | | | |
| Trichloroethene | | ND | ug/L | 0.50 | | | | | | |
| Trichlorofluoromethane | | ND | ug/L | 0.50 | | | | | | |
| Vinyl chloride | | ND | ug/L | 0.50 | | | | | | |
| Xylenes, Total | | ND | ug/L | 0.50 | | | | | | |
| Trihalomethanes, Total | | ND | ug/L | 0.50 | | | | | | |
| Surr: Dibromofluoromethane | | | | 0.50 | 101 | 70 | 130 | | | |
| Surr: p-Bromofluorobenzene | | | | 0.50 | 98 | 70 | 130 | | | |
| Surr: Toluene-d8 | | | | 0.50 | 107 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Project: Belvoir Aquifer Level II

Report Date: 06/29/11

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|--------|-------|------|------|-----------|------------|-----|----------|------------------|
| Method: E525.2 | | | | | | | | | | Batch: B_54500 |
| Sample ID: B11060301-001FMS | | | | | | | | | | 06/09/11 22:05 |
| 23 Sample Matrix Spike | | | | | | | | | | Run: SUB-B167000 |
| Alachlor | | 1.96 | ug/L | 0.10 | 98 | 70 | 130 | | | |
| Aldrin | | 1.85 | ug/L | 0.10 | 93 | 70 | 130 | | | |
| Atrazine | | 2.01 | ug/L | 0.10 | 100 | 70 | 130 | | | |
| Benzo(a)pyrene | | 2.23 | ug/L | 0.10 | 112 | 70 | 130 | | | |
| bis(2-ethylhexyl)Adipate | | 2.25 | ug/L | 0.50 | 113 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 2.35 | ug/L | 0.60 | 118 | 70 | 130 | | | |
| Butachlor | | 2.33 | ug/L | 0.10 | 117 | 70 | 130 | | | |
| Dieldrin | | 2.37 | ug/L | 0.10 | 119 | 70 | 130 | | | |
| Endrin | | 2.54 | ug/L | 0.10 | 127 | 70 | 130 | | | |
| gamma-BHC (Lindane) | | 2.19 | ug/L | 0.10 | 109 | 70 | 130 | | | |
| Heptachlor | | 2.07 | ug/L | 0.10 | 103 | 70 | 130 | | | |
| Heptachlor epoxide | | 2.06 | ug/L | 0.10 | 103 | 70 | 130 | | | |
| Hexachlorobenzene | | 1.96 | ug/L | 0.10 | 98 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 1.72 | ug/L | 0.10 | 86 | 70 | 130 | | | |
| Methoxychlor | | 2.26 | ug/L | 0.10 | 113 | 70 | 130 | | | |
| Metolachlor | | 2.38 | ug/L | 0.10 | 119 | 70 | 130 | | | |
| Metribuzin | | 2.00 | ug/L | 0.10 | 100 | 70 | 130 | | | |
| Propachlor | | 2.50 | ug/L | 0.10 | 125 | 70 | 130 | | | |
| Simazine | | 2.23 | ug/L | 0.10 | 112 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 86 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 91 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 113 | 70 | 130 | | | |
| Sample ID: B11060301-001FMSD | | | | | | | | | | 06/09/11 22:44 |
| 23 Sample Matrix Spike Duplicate | | | | | | | | | | Run: SUB-B167000 |
| Alachlor | | 1.88 | ug/L | 0.10 | 94 | 70 | 130 | 4.2 | 40 | |
| Aldrin | | 1.83 | ug/L | 0.10 | 92 | 70 | 130 | 1.1 | 40 | |
| Atrazine | | 1.91 | ug/L | 0.10 | 96 | 70 | 130 | 5.1 | 40 | |
| Benzo(a)pyrene | | 1.93 | ug/L | 0.10 | 97 | 70 | 130 | 14 | 40 | |
| bis(2-ethylhexyl)Adipate | | 1.91 | ug/L | 0.50 | 96 | 70 | 130 | 16 | 40 | |
| bis(2-ethylhexyl)Phthalate | | 1.87 | ug/L | 0.60 | 94 | 70 | 130 | 23 | 40 | |
| Butachlor | | 2.17 | ug/L | 0.10 | 108 | 70 | 130 | 7.1 | 40 | |
| Dieldrin | | 1.84 | ug/L | 0.10 | 92 | 70 | 130 | 25 | 40 | |
| Endrin | | 1.95 | ug/L | 0.10 | 98 | 70 | 130 | 26 | 40 | |
| gamma-BHC (Lindane) | | 2.01 | ug/L | 0.10 | 100 | 70 | 130 | 8.6 | 40 | |
| Heptachlor | | 1.96 | ug/L | 0.10 | 98 | 70 | 130 | 5.5 | 40 | |
| Heptachlor epoxide | | 1.86 | ug/L | 0.10 | 93 | 70 | 130 | 10 | 40 | |
| Hexachlorobenzene | | 1.98 | ug/L | 0.10 | 99 | 70 | 130 | 1.0 | 40 | |
| Hexachlorocyclopentadiene | | 1.70 | ug/L | 0.10 | 85 | 70 | 130 | 1.2 | 40 | |
| Methoxychlor | | 1.86 | ug/L | 0.10 | 93 | 70 | 130 | 19 | 40 | |
| Metolachlor | | 2.15 | ug/L | 0.10 | 107 | 70 | 130 | 10 | 40 | |
| Metribuzin | | 1.66 | ug/L | 0.10 | 83 | 70 | 130 | 19 | 40 | |
| Propachlor | | 2.29 | ug/L | 0.10 | 115 | 70 | 130 | 8.8 | 40 | |
| Simazine | | 2.14 | ug/L | 0.10 | 107 | 70 | 130 | 4.1 | 40 | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 95 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-------|------|-----------|------------------|-----|----------|----------------|
| Method: E525.2 | | | | | | | | | | Batch: B_54500 |
| Sample ID: B11060301-001FMSD | 23 | Sample Matrix Spike Duplicate | | | | | Run: SUB-B167000 | | | 06/09/11 22:44 |
| Surr: Perylene-d12 | | | | 0.10 | 85 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 91 | 70 | 130 | | | |
| Sample ID: MB-54500 | 11 | Method Blank | | | | | Run: SUB-B167000 | | | 06/09/11 19:30 |
| Aroclor 1016 | | ND | ug/L | 0.080 | | | | | | |
| Aroclor 1221 | | ND | ug/L | 2.0 | | | | | | |
| Aroclor 1232 | | ND | ug/L | 0.50 | | | | | | |
| Aroclor 1242 | | ND | ug/L | 0.30 | | | | | | |
| Aroclor 1248 | | ND | ug/L | 0.10 | | | | | | |
| Aroclor 1254 | | ND | ug/L | 0.10 | | | | | | |
| Aroclor 1260 | | ND | ug/L | 0.20 | | | | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 101 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 91 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 94 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 122 | 70 | 130 | | | |
| Sample ID: LCS-54500 | 23 | Laboratory Control Sample | | | | | Run: SUB-B167000 | | | 06/10/11 15:26 |
| Alachlor | | 2.26 | ug/L | 0.10 | 113 | 70 | 130 | | | |
| Aldrin | | 2.08 | ug/L | 0.10 | 104 | 70 | 130 | | | |
| Atrazine | | 2.02 | ug/L | 0.10 | 101 | 70 | 130 | | | |
| Benzo(a)pyrene | | 1.81 | ug/L | 0.10 | 91 | 70 | 130 | | | |
| bis(2-ethylhexyl)Adipate | | 1.74 | ug/L | 0.50 | 87 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 1.81 | ug/L | 0.60 | 91 | 70 | 130 | | | |
| Butachlor | | 2.59 | ug/L | 0.10 | 129 | 70 | 130 | | | |
| Dieldrin | | 1.89 | ug/L | 0.10 | 94 | 70 | 130 | | | |
| Endrin | | 1.91 | ug/L | 0.10 | 96 | 70 | 130 | | | |
| gamma-BHC (Lindane) | | 2.23 | ug/L | 0.10 | 112 | 70 | 130 | | | |
| Heptachlor | | 2.05 | ug/L | 0.10 | 102 | 70 | 130 | | | |
| Heptachlor epoxide | | 2.09 | ug/L | 0.10 | 104 | 70 | 130 | | | |
| Hexachlorobenzene | | 1.96 | ug/L | 0.10 | 98 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 1.42 | ug/L | 0.10 | 71 | 70 | 130 | | | |
| Methoxychlor | | 1.84 | ug/L | 0.10 | 92 | 70 | 130 | | | |
| Metolachlor | | 2.46 | ug/L | 0.10 | 123 | 70 | 130 | | | |
| Metribuzin | | 1.92 | ug/L | 0.10 | 96 | 70 | 130 | | | |
| Propachlor | | 2.06 | ug/L | 0.10 | 103 | 70 | 130 | | | |
| Simazine | | 2.02 | ug/L | 0.10 | 101 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 83 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 110 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 94 | 70 | 130 | | | |
| Sample ID: AR1660-54500 | 6 | Laboratory Control Sample | | | | | Run: SUB-B167000 | | | 06/09/11 20:48 |
| Aroclor 1016 | | 2.15 | ug/L | 0.080 | 107 | 70 | 130 | | | |
| Aroclor 1260 | | 1.92 | ug/L | 0.20 | 96 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|---------------------------|-------|------------------|------|-----------|------------|----------------|----------|----------------|
| Method: E525.2 | | | | | | | | | | Batch: B_54500 |
| Sample ID: AR1660-54500 | 6 | Laboratory Control Sample | | Run: SUB-B167000 | | | | 06/09/11 20:48 | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 103 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 92 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 101 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 135 | 70 | 130 | | | S |
| Sample ID: TOX-54500 | 5 | Laboratory Control Sample | | Run: SUB-B167000 | | | | 06/09/11 20:09 | | |
| Toxaphene | | 48.8 | ug/L | 2.0 | 122 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 91 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 105 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 108 | 70 | 130 | | | |
| Sample ID: MB-54500 | 25 | Method Blank | | Run: SUB-B167000 | | | | 06/09/11 19:30 | | |
| Alachlor | | ND | ug/L | 0.10 | | | | | | |
| Aldrin | | ND | ug/L | 0.10 | | | | | | |
| Atrazine | | ND | ug/L | 0.10 | | | | | | |
| Benzo(a)pyrene | | ND | ug/L | 0.10 | | | | | | |
| bis(2-ethylhexyl)Adipate | | ND | ug/L | 0.50 | | | | | | |
| bis(2-ethylhexyl)Phthalate | | ND | ug/L | 0.60 | | | | | | |
| Butachlor | | ND | ug/L | 0.10 | | | | | | |
| Chlordane | | ND | ug/L | 1.0 | | | | | | |
| Dieldrin | | ND | ug/L | 0.10 | | | | | | |
| Endrin | | ND | ug/L | 0.10 | | | | | | |
| gamma-BHC (Lindane) | | ND | ug/L | 0.10 | | | | | | |
| Heptachlor | | ND | ug/L | 0.10 | | | | | | |
| Heptachlor epoxide | | ND | ug/L | 0.10 | | | | | | |
| Hexachlorobenzene | | ND | ug/L | 0.10 | | | | | | |
| Hexachlorocyclopentadiene | | ND | ug/L | 0.10 | | | | | | |
| Methoxychlor | | ND | ug/L | 0.10 | | | | | | |
| Metolachlor | | ND | ug/L | 0.10 | | | | | | |
| Metribuzin | | ND | ug/L | 0.10 | | | | | | |
| Propachlor | | ND | ug/L | 0.10 | | | | | | |
| Simazine | | ND | ug/L | 0.10 | | | | | | |
| Toxaphene | | ND | ug/L | 2.0 | | | | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 101 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 84 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 93 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 106 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-----------------------------------|-------|--|-------|-------|------|-----------|------------|---------------------------|----------|----------------|
| Method: E525.2 | | | | | | | | Analytical Run: B_R167000 | | |
| Sample ID: Ar1660_CCV_5 | 6 | Continuing Calibration Verification Standard | | | | | | | | 06/10/11 07:05 |
| Aroclor 1016 | | 1.94 | ug/L | 0.080 | 121 | 70 | 130 | | | |
| Aroclor 1260 | | 4.72 | ug/L | 0.20 | 118 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 106 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 103 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 105 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 117 | 70 | 130 | | | |
| Sample ID: CLD_CCV_5 | 5 | Continuing Calibration Verification Standard | | | | | | | | 06/10/11 05:48 |
| Chlordane | | 22.2 | ug/L | 1.0 | 111 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 102 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 98 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 100 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 107 | 70 | 130 | | | |
| Sample ID: TOX_CCV_5 | 5 | Continuing Calibration Verification Standard | | | | | | | | 06/10/11 06:26 |
| Toxaphene | | 50.1 | ug/L | 2.0 | 125 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 104 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 91 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 95 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 97 | 70 | 130 | | | |
| Sample ID: 525_CCV_5 | 23 | Continuing Calibration Verification Standard | | | | | | | | 06/10/11 05:09 |
| Alachlor | | 1.76 | ug/L | 0.10 | 88 | 70 | 130 | | | |
| Aldrin | | 1.82 | ug/L | 0.10 | 91 | 70 | 130 | | | |
| Atrazine | | 2.05 | ug/L | 0.10 | 102 | 70 | 130 | | | |
| Benzo(a)pyrene | | 1.86 | ug/L | 0.10 | 93 | 70 | 130 | | | |
| bis(2-ethylhexyl)Adipate | | 1.84 | ug/L | 0.50 | 92 | 70 | 130 | | | |
| bis(2-ethylhexyl)Phthalate | | 1.86 | ug/L | 0.60 | 93 | 70 | 130 | | | |
| Butachlor | | 1.78 | ug/L | 0.10 | 89 | 70 | 130 | | | |
| Dieldrin | | 1.83 | ug/L | 0.10 | 92 | 70 | 130 | | | |
| Endrin | | 1.91 | ug/L | 0.10 | 96 | 70 | 130 | | | |
| gamma-BHC (Lindane) | | 1.86 | ug/L | 0.10 | 93 | 70 | 130 | | | |
| Heptachlor | | 1.96 | ug/L | 0.10 | 98 | 70 | 130 | | | |
| Heptachlor epoxide | | 1.72 | ug/L | 0.10 | 86 | 70 | 130 | | | |
| Hexachlorobenzene | | 1.70 | ug/L | 0.10 | 85 | 70 | 130 | | | |
| Hexachlorocyclopentadiene | | 1.80 | ug/L | 0.10 | 90 | 70 | 130 | | | |
| Methoxychlor | | 1.88 | ug/L | 0.10 | 94 | 70 | 130 | | | |
| Metolachlor | | 1.73 | ug/L | 0.10 | 87 | 70 | 130 | | | |
| Metribuzin | | 1.69 | ug/L | 0.10 | 85 | 70 | 130 | | | |
| Propachlor | | 1.91 | ug/L | 0.10 | 96 | 70 | 130 | | | |
| Simazine | | 2.08 | ug/L | 0.10 | 104 | 70 | 130 | | | |
| Surr: 1,3-Dimethyl-2-nitrobenzene | | | | 0.10 | 100 | 70 | 130 | | | |
| Surr: Perylene-d12 | | | | 0.10 | 99 | 70 | 130 | | | |
| Surr: Pyrene-d10 | | | | 0.10 | 104 | 70 | 130 | | | |
| Surr: Triphenylphosphate | | | | 0.10 | 100 | 70 | 130 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|----------------------------|-------|---|-------|------|------|-----------|------------|-----|----------|---------------------------------------|
| Method: E531.1 | | | | | | | | | | Analytical Run: R146784 |
| Sample ID: ICV_09r | 11 | Initial Calibration Verification Standard | | | | | | | | 06/08/11 12:35 |
| Aldicarb | | 10 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Aldicarb sulfone | | 10 | ug/L | 0.40 | 102 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 9.4 | ug/L | 0.41 | 94 | 80 | 120 | | | |
| Carbaryl | | 9.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Carbofuran | | 10 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 9.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Methiocarb | | 9.7 | ug/L | 0.50 | 97 | 80 | 120 | | | |
| Methomyl | | 9.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Oxamyl | | 9.6 | ug/L | 0.40 | 96 | 80 | 120 | | | |
| Baygon | | 9.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 96 | 70 | 130 | | | |
| Method: E531.1 | | | | | | | | | | Batch: R146784 |
| Sample ID: MBLK_10r | 11 | Method Blank | | | | | | | | Run: HPLC202-C_110608A 06/08/11 13:19 |
| Aldicarb | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfone | | ND | ug/L | 0.40 | | | | | | |
| Aldicarb sulfoxide | | ND | ug/L | 0.41 | | | | | | |
| Carbaryl | | ND | ug/L | 0.40 | | | | | | |
| Carbofuran | | ND | ug/L | 0.40 | | | | | | |
| 3-Hydroxycarbofuran | | ND | ug/L | 0.40 | | | | | | |
| Methiocarb | | ND | ug/L | 0.50 | | | | | | |
| Methomyl | | ND | ug/L | 0.40 | | | | | | |
| Oxamyl | | ND | ug/L | 0.40 | | | | | | |
| Baygon | | ND | ug/L | 0.40 | | | | | | |
| Surr: BDMC | | | | 0.40 | 97 | 70 | 130 | | | |
| Sample ID: LFB_11r | 11 | Laboratory Fortified Blank | | | | | | | | Run: HPLC202-C_110608A 06/08/11 14:02 |
| Aldicarb | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Aldicarb sulfone | | 7.8 | ug/L | 0.40 | 97 | 80 | 120 | | | |
| Aldicarb sulfoxide | | 7.5 | ug/L | 0.41 | 94 | 80 | 120 | | | |
| Carbaryl | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Methiocarb | | 8.0 | ug/L | 0.50 | 100 | 80 | 120 | | | |
| Methomyl | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Oxamyl | | 7.5 | ug/L | 0.40 | 94 | 80 | 120 | | | |
| Baygon | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 101 | 70 | 130 | | | |
| Sample ID: LFB_12r | 11 | Laboratory Fortified Blank Duplicate | | | | | | | | Run: HPLC202-C_110608A 06/08/11 14:46 |
| Aldicarb | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | 0.1 | 20 | |
| Aldicarb sulfone | | 7.6 | ug/L | 0.40 | 96 | 80 | 120 | 1.8 | 20 | |
| Aldicarb sulfoxide | | 7.7 | ug/L | 0.41 | 96 | 80 | 120 | 2.6 | 20 | |
| Carbaryl | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 1.0 | 20 | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 98 | 80 | 120 | 0.6 | 20 | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|-------|--------------------------------------|-------|------|------|------------------------|------------|-----|----------------|----------------|
| Method: E531.1 | | | | | | | | | | Batch: R146784 |
| Sample ID: LFB_D_12r | 11 | Laboratory Fortified Blank Duplicate | | | | Run: HPLC202-C_110608A | | | 06/08/11 14:46 | |
| 3-Hydroxycarbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 0.0 | 20 | |
| Methiocarb | | 7.9 | ug/L | 0.50 | 99 | 80 | 120 | 1.4 | 20 | |
| Methomyl | | 7.6 | ug/L | 0.40 | 95 | 80 | 120 | 3.1 | 20 | |
| Oxamyl | | 7.6 | ug/L | 0.40 | 96 | 80 | 120 | 1.7 | 20 | |
| Baygon | | 7.9 | ug/L | 0.40 | 98 | 80 | 120 | 0.1 | 20 | |
| Surr: BDMC | | | | 0.40 | 98 | 70 | 130 | 0.0 | 20 | |
| Sample ID: C11060045-001A MS | 11 | Sample Matrix Spike | | | | Run: HPLC202-C_110608A | | | 06/08/11 16:13 | |
| Aldicarb | | 7.8 | ug/L | 0.40 | 98 | 80 | 120 | | | |
| Aldicarb sulfone | | 9.8 | ug/L | 0.40 | 122 | 80 | 120 | | | S |
| Aldicarb sulfoxide | | 8.0 | ug/L | 0.41 | 100 | 80 | 120 | | | |
| Carbaryl | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Carbofuran | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| 3-Hydroxycarbofuran | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | | | |
| Methiocarb | | 8.0 | ug/L | 0.50 | 100 | 80 | 120 | | | |
| Methomyl | | 8.0 | ug/L | 0.40 | 101 | 80 | 120 | | | |
| Oxamyl | | 8.6 | ug/L | 0.40 | 108 | 80 | 120 | | | |
| Baygon | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | | | |
| Surr: BDMC | | | | 0.40 | 96 | 70 | 130 | | | |
| - Analyte is out of range; however, the LCS LCSD and the RPD for the MS MSD pair are acceptable. Sample Matrix effects are suspected. This batch is approved. | | | | | | | | | | |
| Sample ID: C11060045-001A MSD | 11 | Sample Matrix Spike Duplicate | | | | Run: HPLC202-C_110608A | | | 06/08/11 16:56 | |
| Aldicarb | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 1.1 | 20 | |
| Aldicarb sulfone | | 9.9 | ug/L | 0.40 | 124 | 80 | 120 | 1.7 | 20 | S |
| Aldicarb sulfoxide | | 7.6 | ug/L | 0.41 | 95 | 80 | 120 | 4.6 | 20 | |
| Carbaryl | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 0.8 | 20 | |
| Carbofuran | | 7.9 | ug/L | 0.40 | 99 | 80 | 120 | 1.0 | 20 | |
| 3-Hydroxycarbofuran | | 8.1 | ug/L | 0.40 | 101 | 80 | 120 | 1.0 | 20 | |
| Methiocarb | | 7.9 | ug/L | 0.50 | 98 | 80 | 120 | 1.9 | 20 | |
| Methomyl | | 7.7 | ug/L | 0.40 | 96 | 80 | 120 | 4.2 | 20 | |
| Oxamyl | | 8.1 | ug/L | 0.40 | 102 | 80 | 120 | 5.9 | 20 | |
| Baygon | | 8.0 | ug/L | 0.40 | 100 | 80 | 120 | 1.8 | 20 | |
| Surr: BDMC | | | | 0.40 | 96 | 70 | 130 | 0.0 | 20 | |
| - Analyte is out of range; however, the LCS LCSD and the RPD for the MS MSD pair are acceptable. Sample Matrix effects are suspected. This batch is approved. | | | | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

S - Spike recovery outside of advisory limits.

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------------|-------|-------------------------------|-------|-----|------|---------------------|------------|-----|----------|------------------|
| Method: E900.0 | | | | | | | | | | Batch: GrAB-1102 |
| Sample ID: MB-GrAB-1102 | 6 | Method Blank | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Alpha | | -0.7 | pCi/L | | | | | | | U |
| Gross Alpha precision (±) | | 0.8 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 0.9 | pCi/L | | | | | | | |
| Gross Beta | | 1 | pCi/L | | | | | | | U |
| Gross Beta precision (±) | | 2 | pCi/L | | | | | | | |
| Gross Beta MDC | | 2 | pCi/L | | | | | | | |
| Sample ID: Th230-GrAB-1102 | | Laboratory Control Sample | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Alpha | | 100 | pCi/L | 101 | | 80 | 120 | | | |
| Sample ID: Cs137-GrAB-1102 | | Laboratory Control Sample | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Beta | | 84 | pCi/L | 94 | | 80 | 120 | | | |
| Sample ID: C11050935-001AMS | | Sample Matrix Spike | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Alpha | | 120 | pCi/L | 117 | | 70 | 130 | | | |
| Sample ID: C11050935-001AMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Alpha | | 100 | pCi/L | 98 | | 70 | 130 | 18 | 20 | |
| Sample ID: C11050935-001AMS | | Sample Matrix Spike | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Beta | | 86 | pCi/L | 96 | | 70 | 130 | | | |
| Sample ID: C11050935-001AMSD | | Sample Matrix Spike Duplicate | | | | Run: G5000W_110614A | | | | 06/16/11 20:59 |
| Gross Beta | | 84 | pCi/L | 94 | | 70 | 130 | 2.1 | 16.2 | |
| Sample ID: C11060130-001ADUP | 6 | Sample Duplicate | | | | Run: G5000W_110614A | | | | 06/17/11 09:13 |
| Gross Alpha | | 60 | pCi/L | | | | | 9.6 | 27.2 | |
| Gross Alpha precision (±) | | 5.3 | pCi/L | | | | | | | |
| Gross Alpha MDC | | 2.7 | pCi/L | | | | | | | |
| Gross Beta | | 22 | pCi/L | | | | | 6.1 | 31.9 | |
| Gross Beta precision (±) | | 2.4 | pCi/L | | | | | | | |
| Gross Beta MDC | | 2.0 | pCi/L | | | | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------------------------------|--------------|-------|-----------------------------|-----------------------------|-----------|----------------|----------------|-------------------|------|
| Method: E903.0 | | | | | | | | | Batch: RA226-5421 | |
| Sample ID: C11060144-001DMS | Sample Matrix Spike | | | Run: BERTHOLD 770-2_110610B | | | 06/27/11 11:38 | | | |
| Radium 226 | 13 | pCi/L | | 100 | 80 | 120 | | | | |
| Sample ID: C11060144-001DMSD | Sample Matrix Spike Duplicate | | | Run: BERTHOLD 770-2_110610B | | | 06/27/11 11:38 | | | |
| Radium 226 | 12 | pCi/L | | 92 | 80 | 120 | 9.4 | 25.8 | | |
| Sample ID: MB-RA226-5421 | 3 | Method Blank | | | Run: BERTHOLD 770-2_110610B | | | 06/27/11 13:18 | | |
| Radium 226 | | -0.05 | pCi/L | | | | | | | U |
| Radium 226 precision (±) | | 0.08 | pCi/L | | | | | | | |
| Radium 226 MDC | | 0.1 | pCi/L | | | | | | | |
| Sample ID: LCS-RA226-5421 | Laboratory Control Sample | | | Run: BERTHOLD 770-2_110610B | | | 06/27/11 13:18 | | | |
| Radium 226 | 6.9 | pCi/L | | 109 | 90 | 110 | | | | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|------------------------------|-------|---|-------|--------|------|------------------|------------|-----------------------------|----------------|------|
| Method: Kelada mod | | | | | | | | Analytical Run: SUB-B166937 | | |
| Sample ID: ICV | | Initial Calibration Verification Standard | | | | | | | 06/09/11 08:46 | |
| Cyanide, Total | | 0.155 | mg/L | 0.0050 | 103 | 90 | 110 | | | |
| | | | | | | | | | | |
| Method: Kelada mod | | | | | | | | Batch: B_54472 | | |
| Sample ID: MBLK | | Method Blank | | | | Run: SUB-B166937 | | | 06/09/11 08:51 | |
| Cyanide, Total | | ND | mg/L | 0.002 | | | | | | |
| | | | | | | | | | | |
| Sample ID: LFB | | Laboratory Fortified Blank | | | | Run: SUB-B166937 | | | 06/09/11 08:49 | |
| Cyanide, Total | | 0.0965 | mg/L | 0.0050 | 97 | 90 | 110 | | | |
| | | | | | | | | | | |
| Sample ID: B11060841-001FMSD | | Sample Matrix Spike Duplicate | | | | Run: SUB-B166937 | | | 06/09/11 12:36 | |
| Cyanide, Total | | 0.103 | mg/L | 0.0050 | 103 | 90 | 110 | 3.9 | 10 | |
| | | | | | | | | | | |
| Sample ID: B11060841-001FMS | | Sample Matrix Spike | | | | Run: SUB-B166937 | | | 06/09/11 12:33 | |
| Cyanide, Total | | 0.0989 | mg/L | 0.0050 | 99 | 90 | 110 | | | |

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

MDC - Minimum detectable concentration

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Lidstone and Associates

Report Date: 06/29/11

Project: Belvoir Aquifer Level II

Work Order: C11060146

| Analyte | Count | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|-------------------------------|-------------------------------|--------------|-------|----|------|-------------------------|-------------------------|-----|-------------------|----------------|
| Method: RA-05 | | | | | | | | | Batch: RA228-3756 | |
| Sample ID: LCS-228-RA226-5421 | Laboratory Control Sample | | | | | Run: TENNELEC-3_110610A | | | 06/20/11 13:53 | |
| Radium 228 | | 6.5 | pCi/L | | 96 | 80 | 120 | | | |
| Sample ID: MB-RA226-5421 | 3 | Method Blank | | | | | Run: TENNELEC-3_110610A | | | 06/20/11 15:26 |
| Radium 228 | | 0.02 | pCi/L | | | | | | | U |
| Radium 228 precision (±) | | 0.9 | pCi/L | | | | | | | |
| Radium 228 MDC | | 0.9 | pCi/L | | | | | | | |
| Sample ID: C11060144-002DMS | Sample Matrix Spike | | | | | Run: TENNELEC-3_110610A | | | 06/20/11 13:53 | |
| Radium 228 | | 11 | pCi/L | | 86 | 70 | 130 | | | |
| Sample ID: C11060144-002DMSD | Sample Matrix Spike Duplicate | | | | | Run: TENNELEC-3_110610A | | | 06/20/11 13:53 | |
| Radium 228 | | 11 | pCi/L | | 87 | 70 | 130 | 1.8 | 41.8 | |

Qualifiers:

RL - Analyte reporting limit.

MDC - Minimum detectable concentration

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration

Workorder Receipt Checklist



C11060146

 Login completed by: Edith McPike
 Reviewed by: BL2000\cwagner
 Reviewed Date: 6/7/2011

Date Received: 6/3/2011

Received by: em

 Carrier FedEx
 name:

| | | | |
|---|---|-----------------------------|--|
| Shipping container/cooler in good condition? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on shipping container/cooler? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Present <input type="checkbox"/> |
| Custody seals intact on sample bottles? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | Not Present <input checked="" type="checkbox"/> |
| Chain of custody present? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody signed when relinquished and received? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Chain of custody agrees with sample labels? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Samples in proper container/bottle? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sample containers intact? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Sufficient sample volume for indicated test? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| All samples received within holding time? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | |
| Container/Temp Blank temperature: | 3.2°C On Ice | | |
| Water - VOA vials have zero headspace? | Yes <input type="checkbox"/> | No <input type="checkbox"/> | No VOA vials submitted <input checked="" type="checkbox"/> |
| Water - pH acceptable upon receipt? | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/> | Not Applicable <input type="checkbox"/> |

Contact and Corrective Action Comments:

Samples for dissolved metals were subsampled, filtered and preserved with 2 mL HNO₃ in lab upon receipt to pH <2.



Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT (Provide as much information as possible.)

| | | | |
|--|--|--|--|
| Company Name: <i>Lidstone and Associates,</i> | Project Name, PWS, Permit, Etc. <i>Bellevue Canyon Aquifer Level II</i> | Sample Origin State: <i>WY</i> | EPA/State Compliance: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Report Mail Address: <i>4625 Automation Way, Bldg. E. Ft. Collins, CO 80525</i> | Contact Name: <i>Mark Stary</i> | Phone/Fax: <i>970-223-4765 / 970-223-4706</i> | Email: <i>ME@LIDSTONE.COM</i> |
| Invoice Address: <i>SAME</i> | Invoice Contact & Phone: <i>Melinda Culver 970-223-4705</i> | Purchase Order: <i>WYWDC109</i> | Quote/Bottle Order: <i>33232</i> |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--|--|---|--|--|--|------|--|--|--|------|--|--|--|---|--|-----------|--|---------------------|--|--|--|---------------------|--|--|--|
| Special Report/Formats: | | | | ANALYSIS REQUESTED | | | | | | | | | | | | R U S H Standard Turnaround (TAT) | Contact ELI prior to RUSH sample submittal for charges and scheduling - See Instruction Page | Comments: | Shipped by: <i>FedEx</i> Cooler ID(s): <i>C3680</i> Receipt Temp: <i>3.2 °C</i> On Ice: <input checked="" type="radio"/> Y <input type="radio"/> N Custody Seal: On Bottle <input checked="" type="radio"/> Y <input type="radio"/> N On Cooler <input checked="" type="radio"/> Y <input type="radio"/> N Intact <input checked="" type="radio"/> Y <input type="radio"/> N Signature Match <input checked="" type="radio"/> Y <input type="radio"/> N | | | | | | | | |
| <input type="checkbox"/> DW <input type="checkbox"/> POTW/WWTP <input type="checkbox"/> State: _____ <input type="checkbox"/> Other: _____ <input checked="" type="checkbox"/> EDD/EDT (Electronic Data) Format: <i>PDF</i> <input type="checkbox"/> LEVEL IV <input type="checkbox"/> NELAC | | | | Number of Containers: _____ Sample Type: <input type="checkbox"/> A <input type="checkbox"/> W <input type="checkbox"/> S <input type="checkbox"/> V <input type="checkbox"/> B <input type="checkbox"/> O <input type="checkbox"/> DW <input type="checkbox"/> Air <input type="checkbox"/> Water <input type="checkbox"/> Soils/Solids <input type="checkbox"/> Vegetation <input type="checkbox"/> Bioassay <input type="checkbox"/> Other <input type="checkbox"/> DW - Drinking Water <i>WWDC FINAL</i> | | | | | | | | | | | | | | | | | | | | | | | |
| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) Collection Date Collection Time MATRIX | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 <i>Lone Tree Fault 1-5</i> | | | | 6/2/11 | | | | 1250 | | | | 25 W | | | | X | | | | X | | | | <i>see attached</i> | | | |
| 2 <i>(LTF 1-5)</i> | | | | | | | | | | | | | | | | | | | | <i>Bottle order</i> | | | | | | | |
| 3 <i>TRX BLANK C292</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | | | |
|-------------------------------|---|----------------------------------|---------------------------------|---|----------------------------------|------------|
| Custody Record MUST be Signed | Relinquished by (print): <i>MARK STARY</i> | Date/Time: <i>6/2/11 1455</i> | Signature: <i>Mark Stary</i> | Received by (print): <i>FEDEx</i> | Date/Time: <i>6/2/11 1455</i> | Signature: |
| | Relinquished by (print): | Date/Time: | Signature: | Received by (print): | Date/Time: | Signature: |
| | Sample Disposal: | Return to Client: | Lab Disposal: <i>X</i> | Received by Laboratory: <i>WYWDC</i> | Date/Time: <i>6/3/11 900</i> | Signature: |

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly noted on your analytical report. Visit our web site at www.energylab.com for additional information, downloadable fee schedule, forms, and links.



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Gibbs, WY 888-888-7175 • Rapid City, SD 888-872-1229 • College Station, TX 888-898-2218

BOTTLE ORDER 33232



SHIPPED TO: Lldstone and Associates

Contact: Mark Stacy
4025 Automation Way Unit E
Fort Collins CO 80525
Phone: (970) 223-4705
Project:

Order Created by: Tessa Parke
Shipped From: Casper, WY
Ship Date: 5/10/2011
VIA: Ground

| Bottle Size/Type | Bottles Per Samp | Method | Tests | Critical Hold Time | Preservative | Notes | Num of Samp |
|------------------|------------------------|--------|-------|--------------------------|--------------|-------|-------------------|
|------------------|------------------------|--------|-------|--------------------------|--------------|-------|-------------------|

Supplies

| | | | | | | | |
|----------------------------------|---|----------|----------|--|--|--|---|
| Trip Blank 3) 40ML-CG-VOA-HCL | 1 | SUPPLIES | Supplies | | | | 1 |
|----------------------------------|---|----------|----------|--|--|--|---|

| | | | | | | | |
|-----------------|---|---------|-------------------------|--|--|--|---|
| 1 Liter Plastic | 1 | A2540 D | Solids, Total Suspended | | | | 1 |
|-----------------|---|---------|-------------------------|--|--|--|---|

WWDC Final

| | | | | | | | |
|----------------------------------|---|-------------|---|--------|---------|----------------------------------|---|
| 1 Liter Plastic | 3 | E300.0 | E300.0 Anions | | | | 1 |
| | | - | Sample Filtering | 48 hrs | | | |
| | | A2340 B | Hardness | | | | |
| | | E200.7_8 | Metals by ICP/ICPMS, Dissolved | | | | |
| | | A2310 B | Acidity, Total as CaCO3 | | | | |
| | | A2320 B | Alkalinity | | | | |
| | | A2510 B | Conductivity | | | | |
| | | Calculation | Corrosivity, Calculated | | | | |
| | | A4500-F C | Fluoride | | | | |
| | | A4500-NO2 B | Nitrogen, Nitrite | 48 hrs | | | |
| | | A4500-H B | pH | | | | |
| | | A2540 C | Solids, Total Dissolved | | | | |
| | | A2130 B | Turbidity | 48 hrs | | | |
| | | A5540 C | Foaming Agents | 48 hrs | | | |
| | | A2120 B | Color | 48 hrs | | | |
| 500ML-AG-NM-UP | 1 | A2150 B | Odor | 48 hrs | | | 1 |
| 250 mL Plastic | 1 | E200.7_8 | Metals by ICP/ICPMS, Drinking Water | | ■ HNO3 | | 1 |
| | | E245.1 | Mercury, Drinking Water | | | | |
| 2 Liter Plastic | 2 | E900.0 | Gross Alpha, Gross Beta | | ■ HNO3 | | 1 |
| | | A7500-RA | Radium 226 + Radium 228 | | | | |
| | | E903.0 | Radium 226, Total | | | | |
| | | RA-05 | Radium 228, Total | | | | |
| 500 mL Plastic | 1 | E353.2 | Nitrogen, Nitrate + Nitrite | | ■ H2SO4 | | 1 |
| 500 mL Plastic | 1 | Kelada mod | Cyanide, SDWA | | ■ NaOH | | 1 |
| 1L-AG-NM-AA | 2 | E515.1 | E515.1 Chlorinated Herbicides | | | | 1 |
| 1 Liter Amber Glass Narrow Mouth | 2 | E525.2 | 525-Semi-Volatile Organic Compounds, SDWA | | ■ HCL | Do Not Rinse - Contains Additive | 1 |
| 40ML-CG-VOA-NATHIO | 3 | E504.1 | E504 Pesticides | | | | 1 |
| 40 mL Clear Glass VOA | 3 | E531.1 | Pesticides, Carbamates SDWA | | | Do Not Rinse - Contains Additive | 1 |

| | | | | | | | |
|------------------------|---|----------|------------------------|--------|--|--|---|
| 40ML-CG-VOA-HCL-AA | 3 | E524.2 | E524.2 SDWA VOCs | | | | 1 |
| 100 mL Plastic Sterile | 2 | IRB-BART | Bacteria, Iron Related | | | | 1 |
| | | A9223 B | Bacteria, SDWA | 30 hrs | | | |

☒ HNO₃ - Nitric Acid
 ☒ H₂SO₄ - Sulfuric Acid
 ☒ NaOH - Sodium Hydroxide
☒ ZnAc - Zinc Acetate
 ☒ HCl - Hydrochloric Acid
☐ H₃PO₄ - Phosphoric Acid

We strongly suggest that the samples are shipped the same day as they are collected.

Material Safety Data Sheets(MSDS) Available @ EnergyLab.com ->Services -> MSDS Sheets

Corrosive Chemicals: Nitric, Sulfuric, Phosphoric, Hydrochloric Acids and Sodium Hydroxide. Zinc Acetate is a skin irritant.

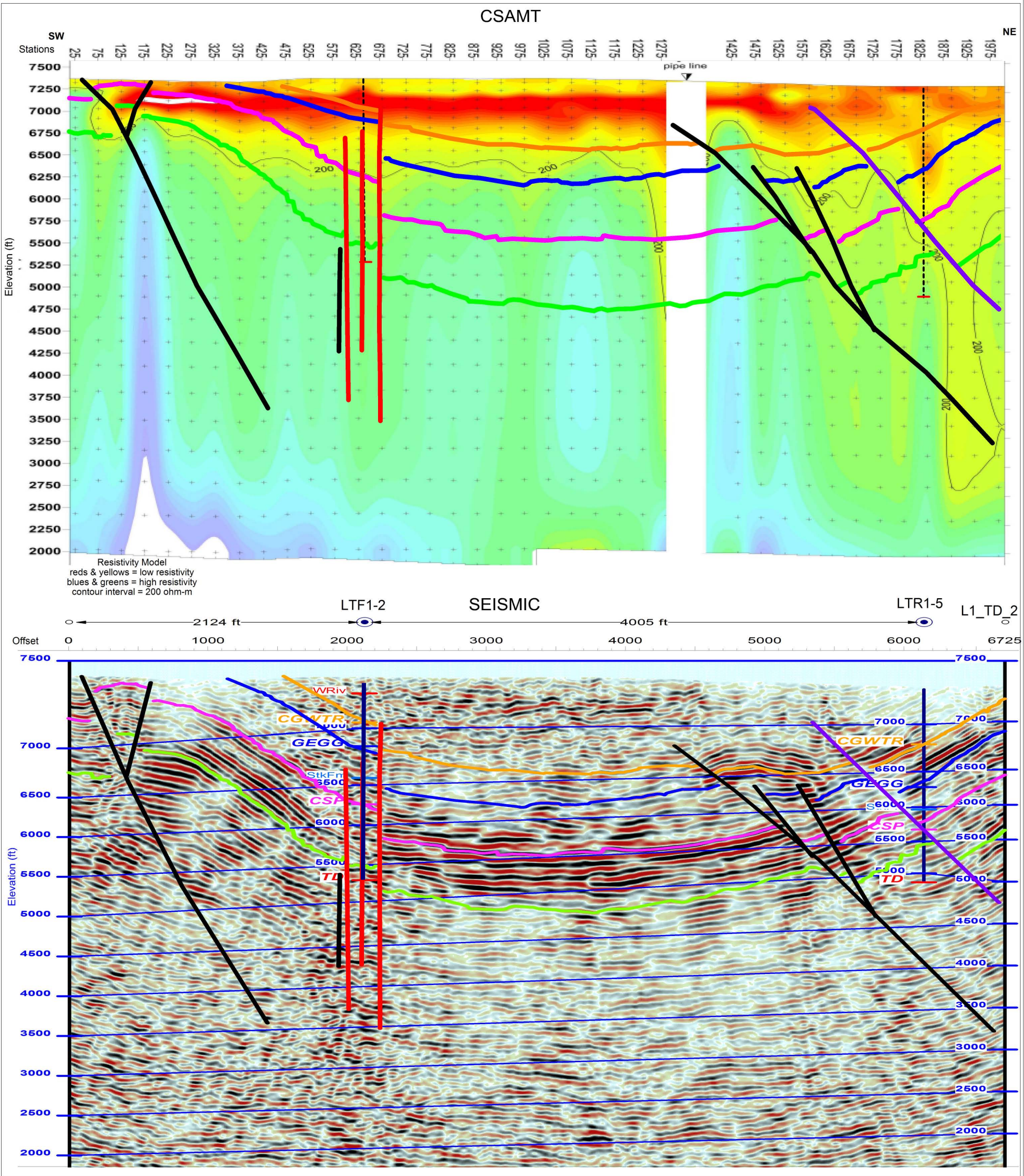
Subcontracting of sample analyses to an outside laboratory may be required. If so, Energy Laboratories will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories will be indicated within the Laboratory Analytical Report.

Appendix E

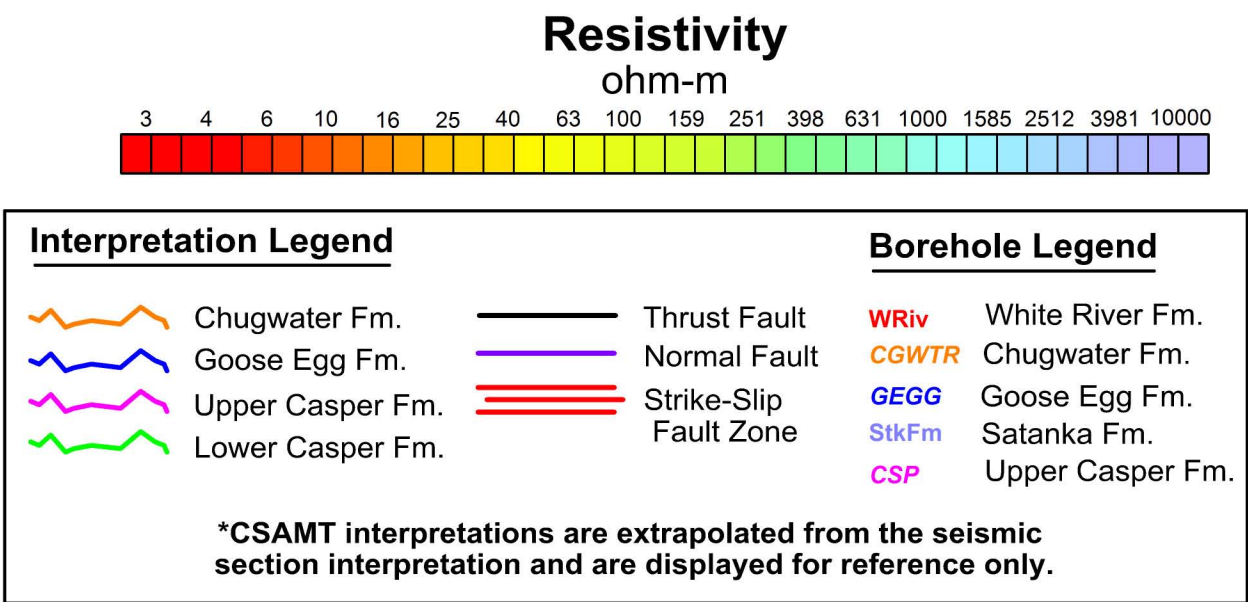
Post Lone Tree Fault 1-5 Geophysical Reinterpreted Sections, August 2011



Lone Tree Fault - Line 1

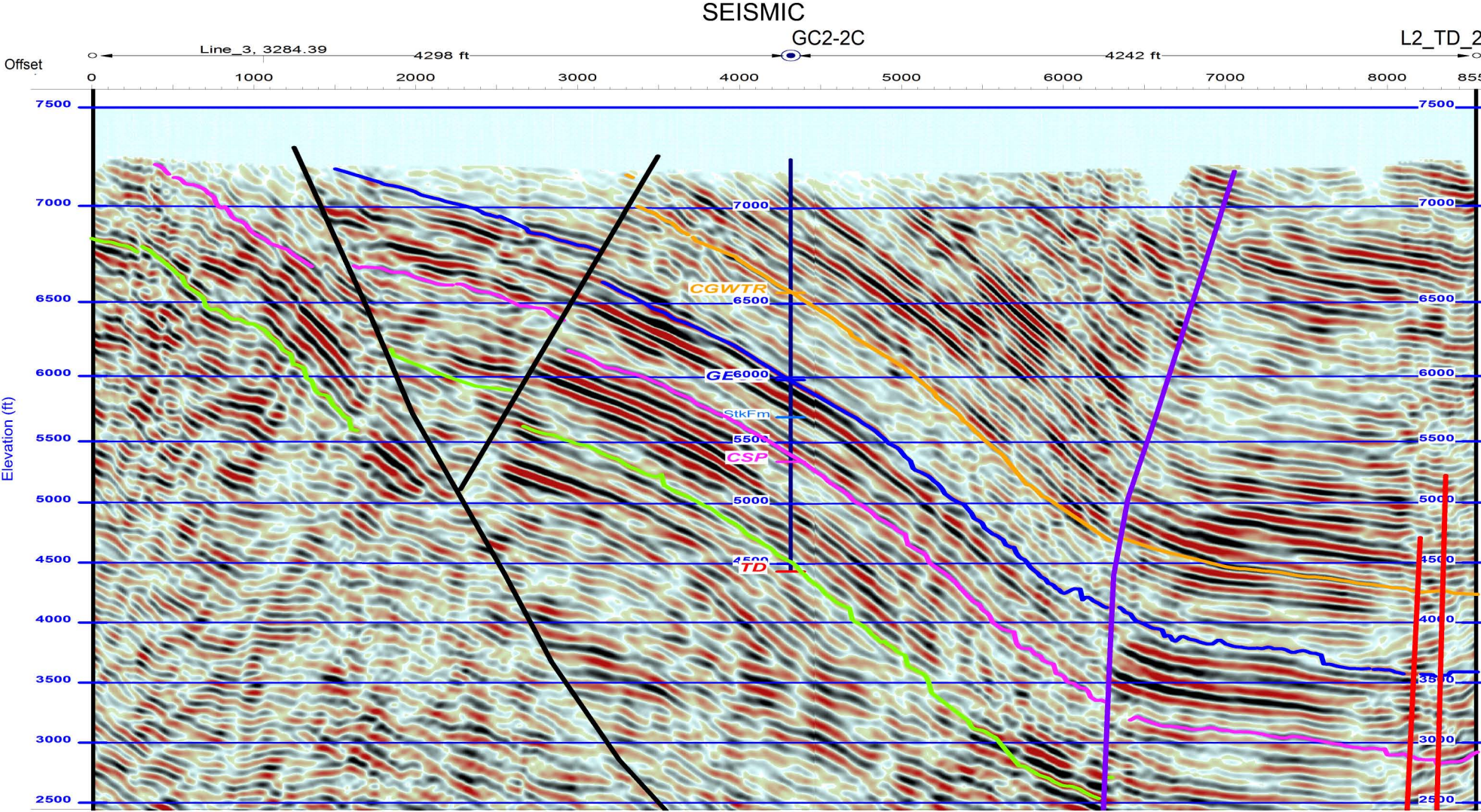
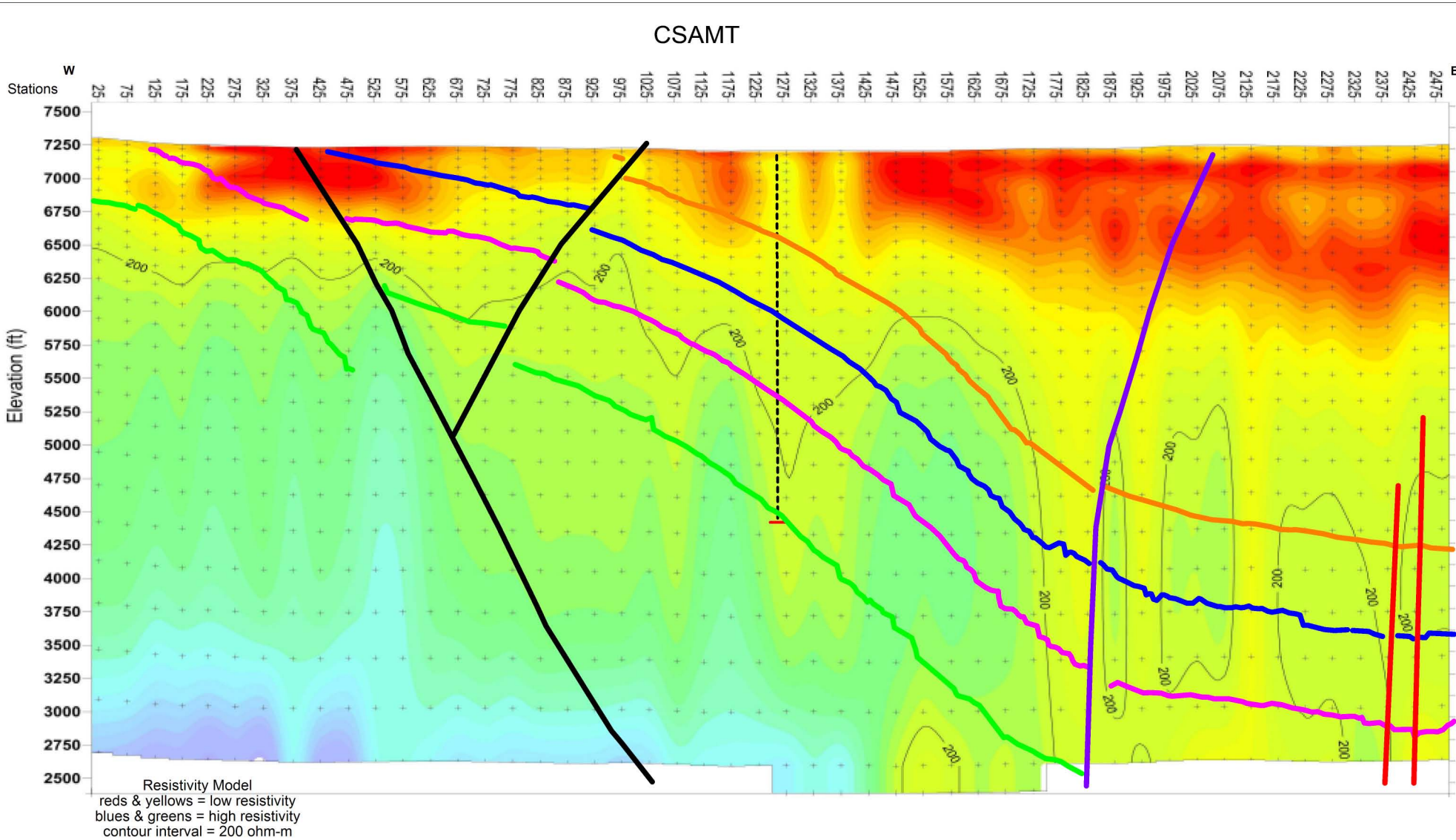


| | |
|---|-------------------------------|
| Safety + First | |
| Composite CSAMT & Seismic Sections | |
| Cheyenne Belvoir Ranch Ground Water Level II Study | |
| Lidstone and Associates, Inc. AMEC, Inc. Fort Collins, CO Denver, CO | |
| ZONGE International, Inc. GEOPHYSICS Lakewood, Colorado | TECHNICAL APPROVAL Phil Sites |
| DRAWN Nicole Pendrigh | SUBMITTED Nicole Pendrigh |
| CHECKED Phil Sites | APPROVED Norm Carlson |
| August, 2011 | |

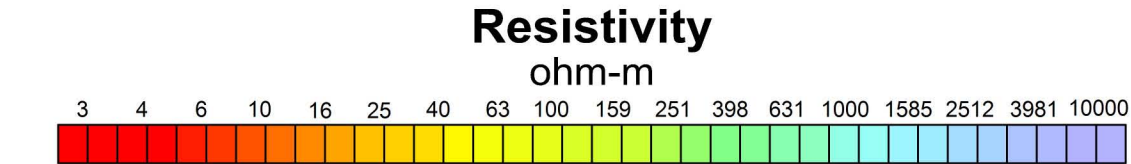




Goose Creek - Line 2



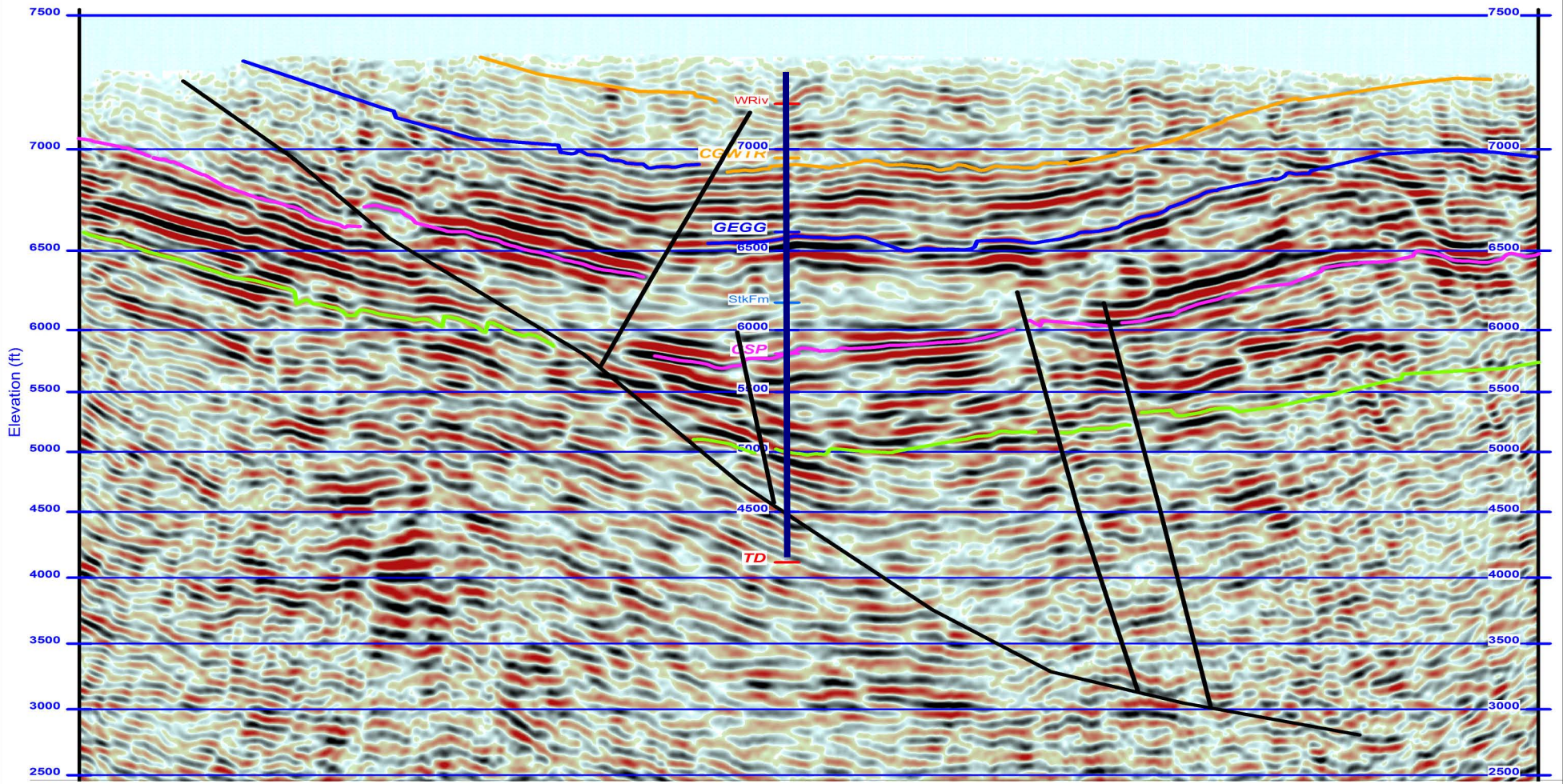
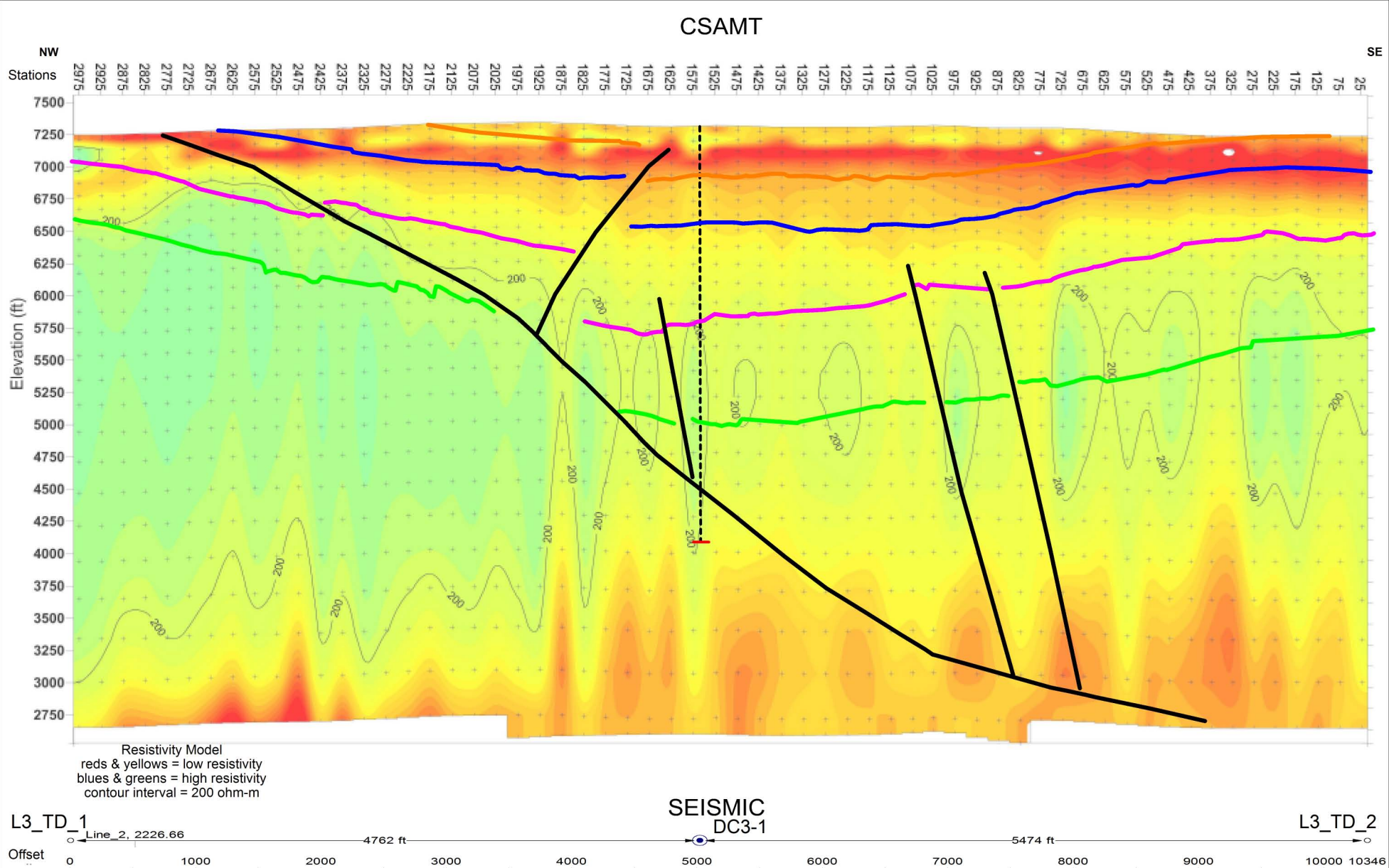
| | |
|---|--------------------------------|
| Safety + First | |
| Composite CSAMT & Seismic Sections | |
| Cheyenne Belvoir Ranch Ground Water Level II Study | |
| Lidstone and Associates, Inc. AMEC, Inc. Fort Collins, CO Denver, CO | |
| ZONGE International, Inc. GEOPHYSICS Lakewood, Colorado | TECHNICAL APPROVAL Phil Sifres |
| DRAWN Nicole Pendrigh | SUBMITTED Nicole Pendrigh |
| CHECKED Phil Sifres | APPROVED Norm Carlson |
| August, 2011 | |



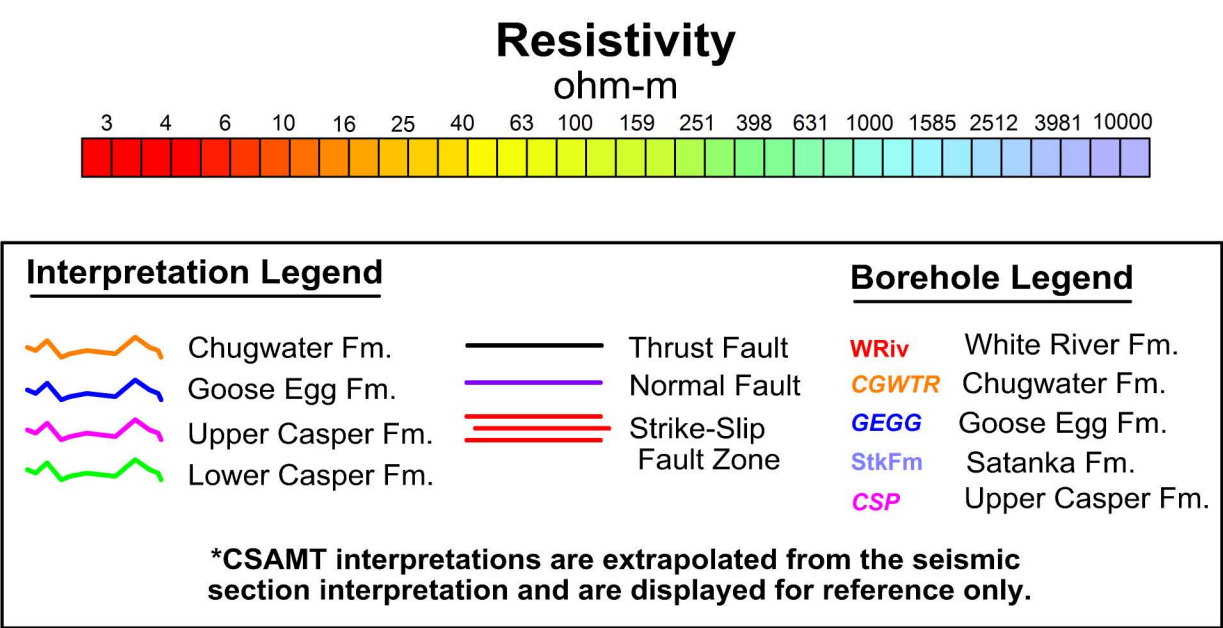
| Interpretation Legend | | Borehole Legend | |
|-----------------------|------------------|-----------------|------------------------|
| | Chugwater Fm. | | Thrust Fault |
| | Goose Egg Fm. | | Normal Fault |
| | Upper Casper Fm. | | Strike-Slip Fault Zone |
| | Lower Casper Fm. | | White River Fm. |
| | | | Chugwater Fm. |
| | | | Goose Egg Fm. |
| | | | Satanka Fm. |
| | | | Upper Casper Fm. |

*CSAMT interpretations are extrapolated from the seismic section interpretation and are displayed for reference only.

Duck Creek - Line 3

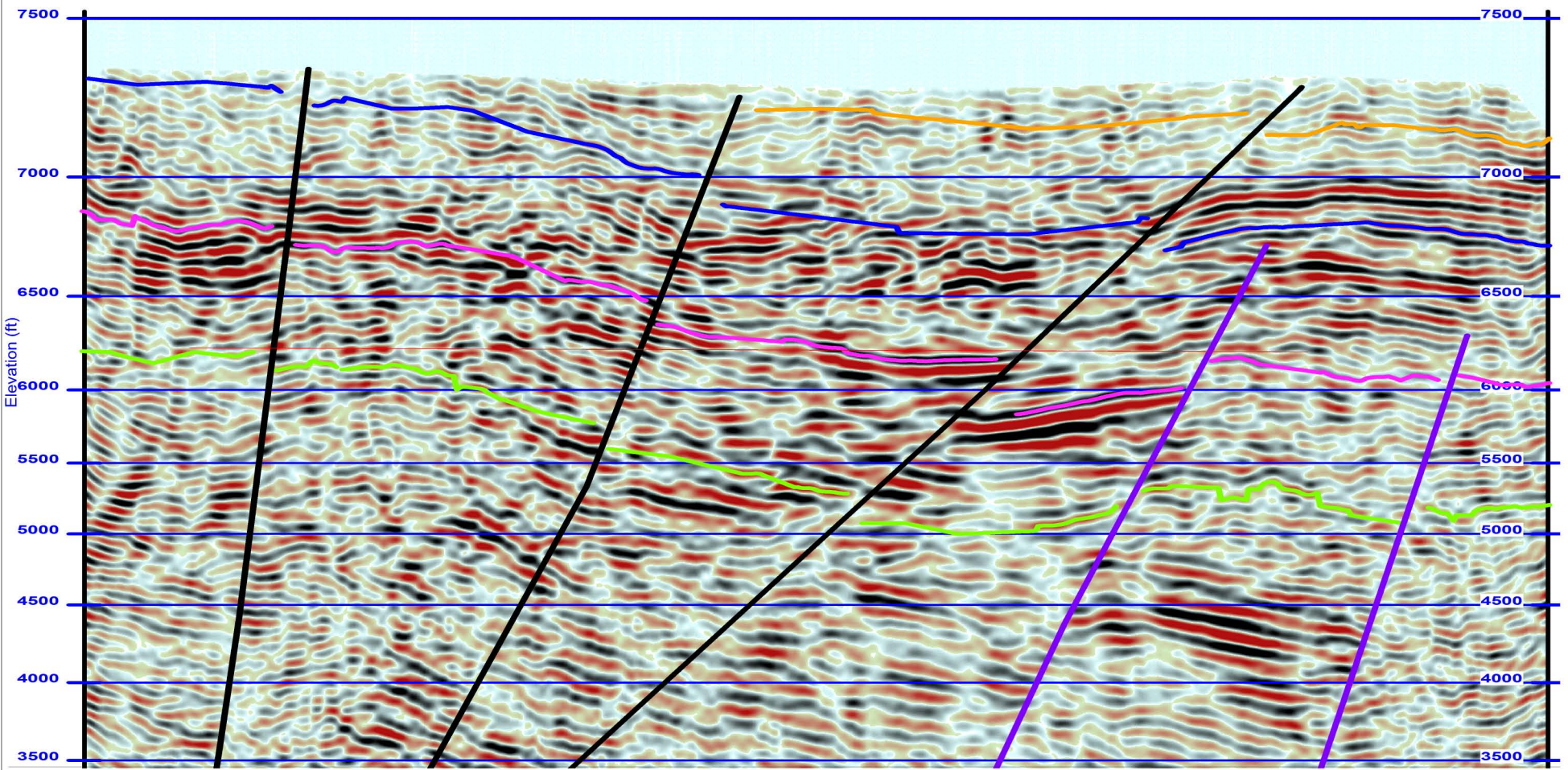
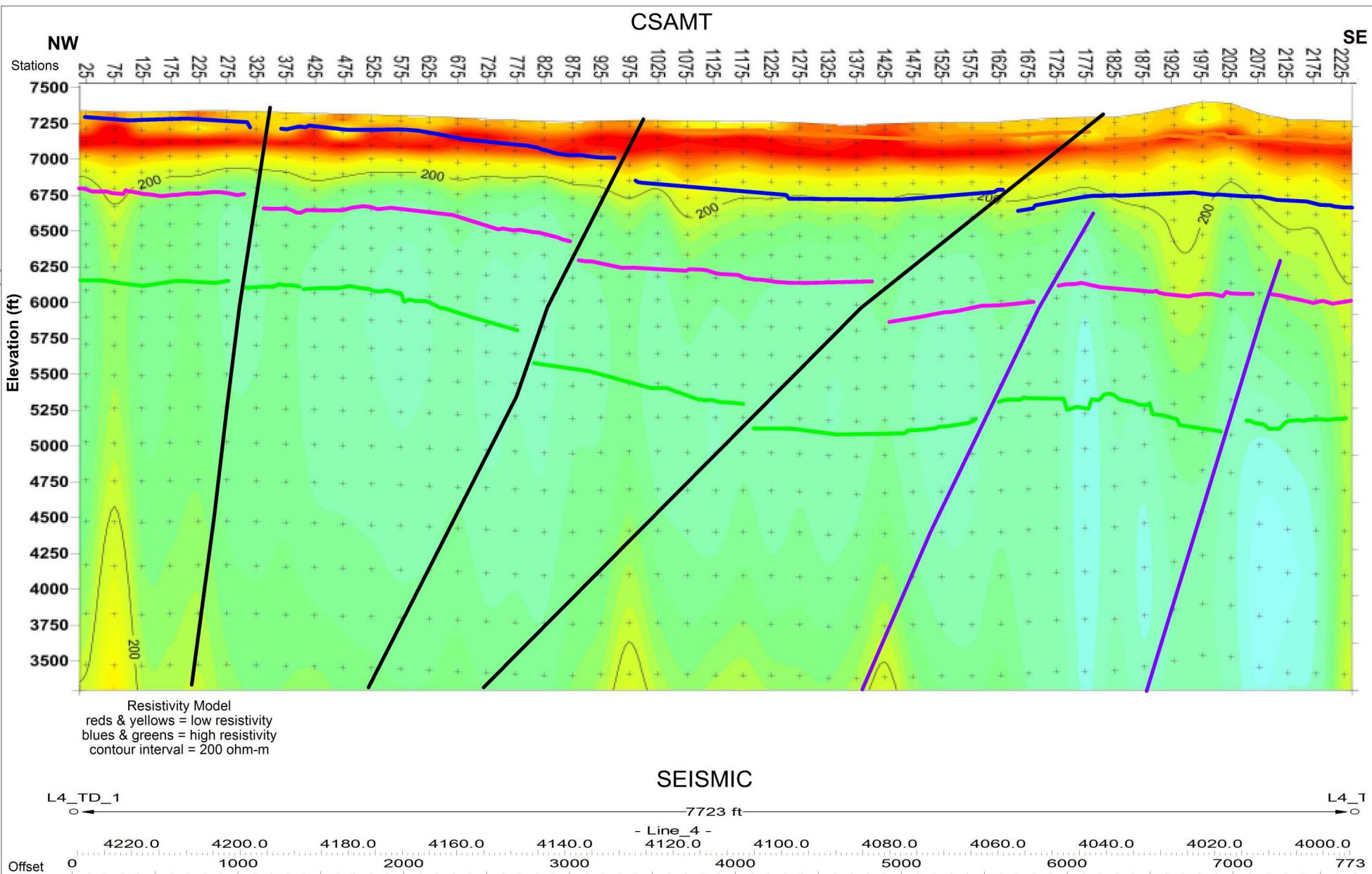


| | |
|--|---------------------------|
| Safety + First | |
| Composite CSAMT & Seismic Sections | |
| Cheyenne Belvoir Ranch Ground Water Level II Study | |
| Lidstone and Associates, Inc. Fort Collins, CO | |
| AMEC, Inc. Denver, CO | |
| ZONGE International, Inc. GEOPHYSICS Lakewood, Colorado | |
| TECHNICAL APPROVAL Phil Stries | |
| DRAWN Nicole Pendrigh | SUBMITTED Nicole Pendrigh |
| CHECKED Phil Stries | APPROVED Norm Carlson |
| August, 2011 | |

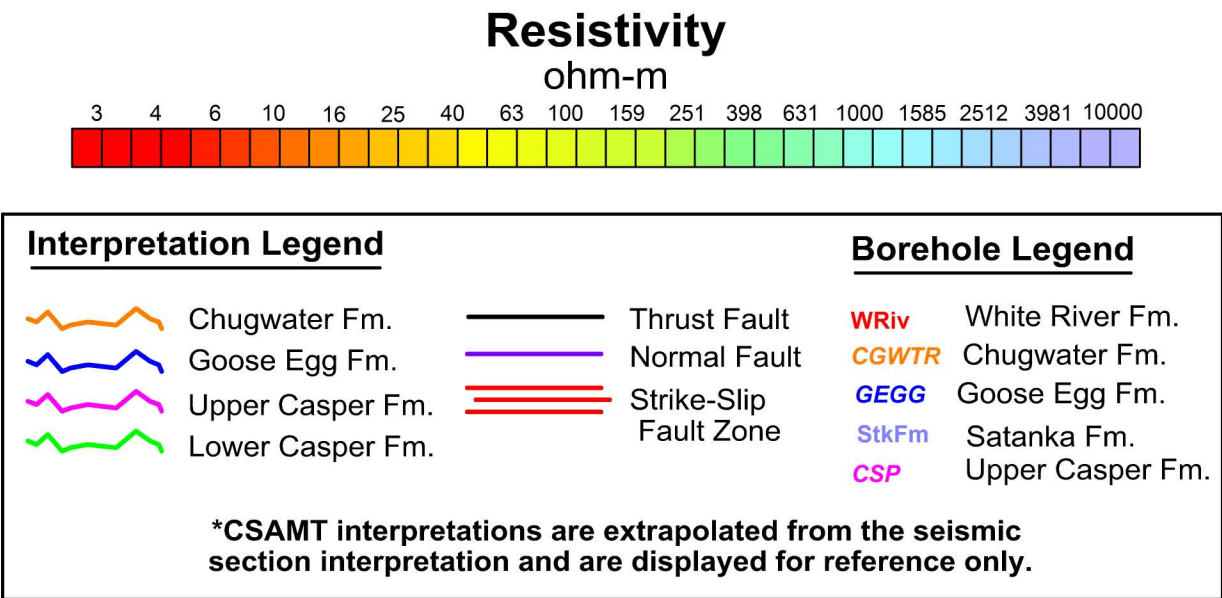




Spottlewood - Line 4

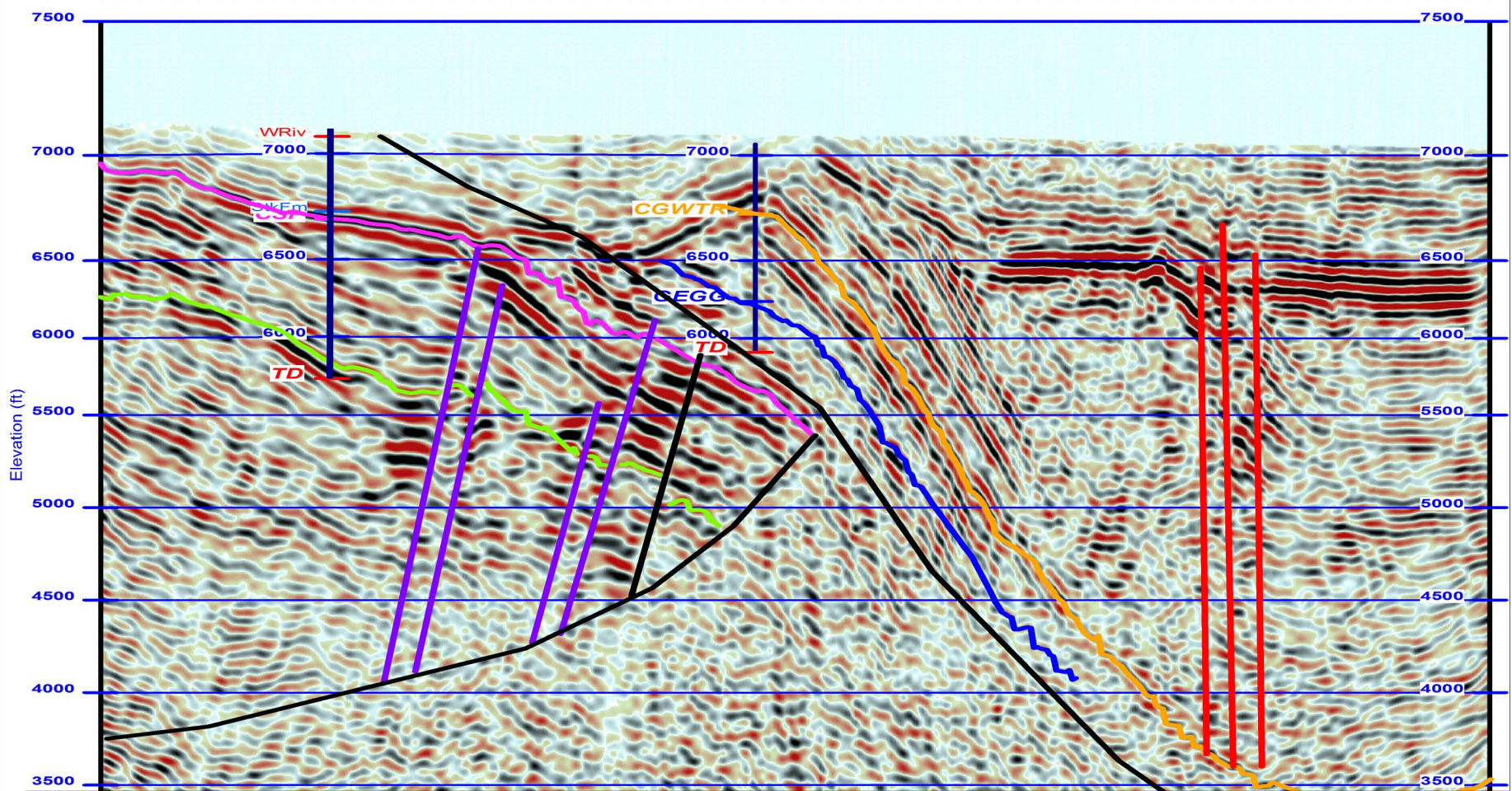
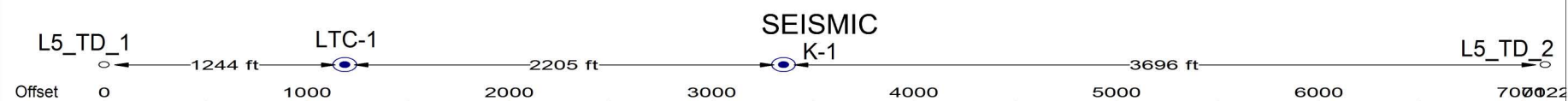
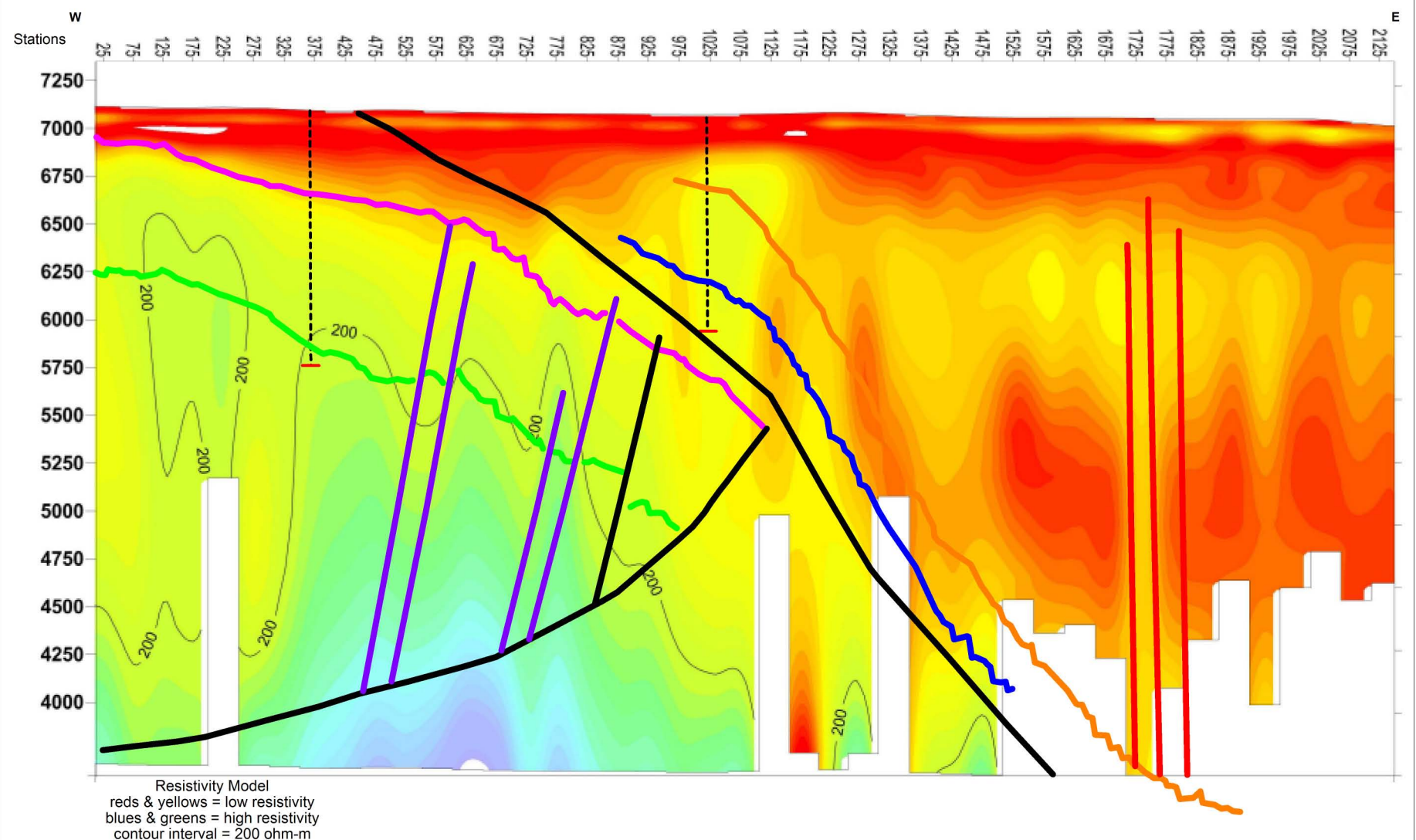


| | |
|--|--|
| Safety + First | |
| Composite CSAMT & Seismic Sections | |
| Cheyenne Belvoir Ranch Ground Water Level II Study | |
| Lidstone and Associates, Inc. AMEC, Inc. Fort Collins, CO Denver, CO | |
| ZONGE International, Inc. TECHNICAL APPROVAL Phil Sires GEOPHYSICS Lakewood, Colorado | |
| DRAWN Nicole Pendrigh SUBMITTED Nicole Pendrigh | |
| CHECKED Phil Sires APPROVED Norm Carlson | |
| August, 2011 | |

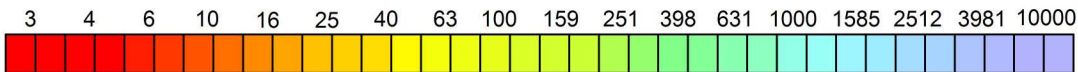


Lone Tree Creek - Line 5

CSAMT



Resistivity
ohm-m



Interpretation Legend

- Chugwater Fm.
- Goose Egg Fm.
- Upper Casper Fm.
- Lower Casper Fm.

- Thrust Fault
- Normal Fault
- Strike-Slip Fault Zone

Borehole Legend

- WRiv White River Fm.
- CGWTR Chugwater Fm.
- GEGG Goose Egg Fm.
- StkFm Satanka Fm.
- CSP Upper Casper Fm.

*CSAMT interpretations are extrapolated from the seismic section interpretation and are displayed for reference only.

August, 2011

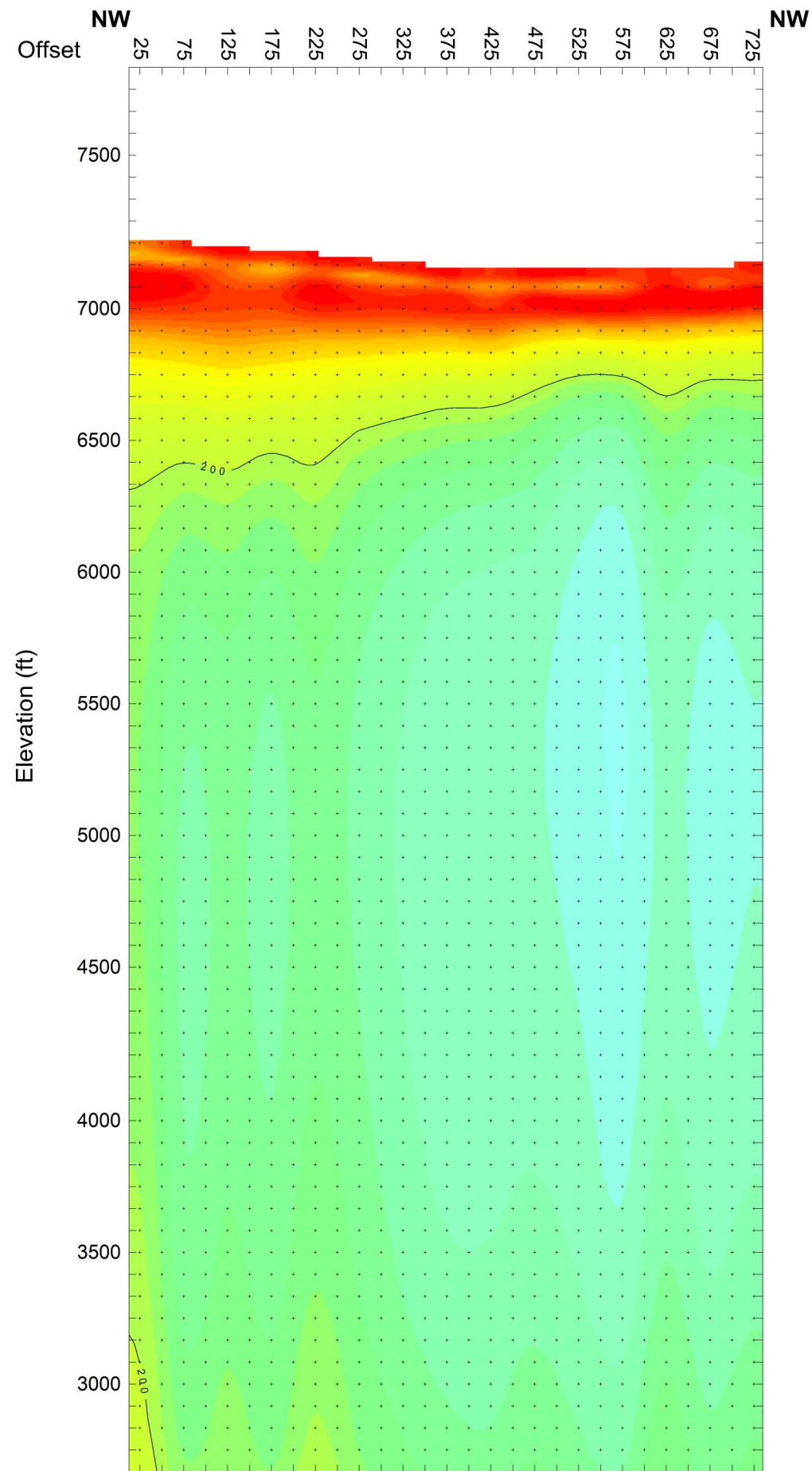
DRAWN
CHECKED
August, 2011

Lidstone and Associates, Inc.
Cheyenne Belvoir Ranch
Ground Water Level II Study
Fort Collins, CO
AMEC, Inc.
Denver, CO

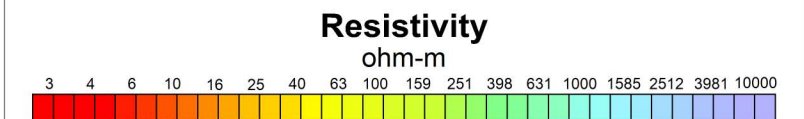
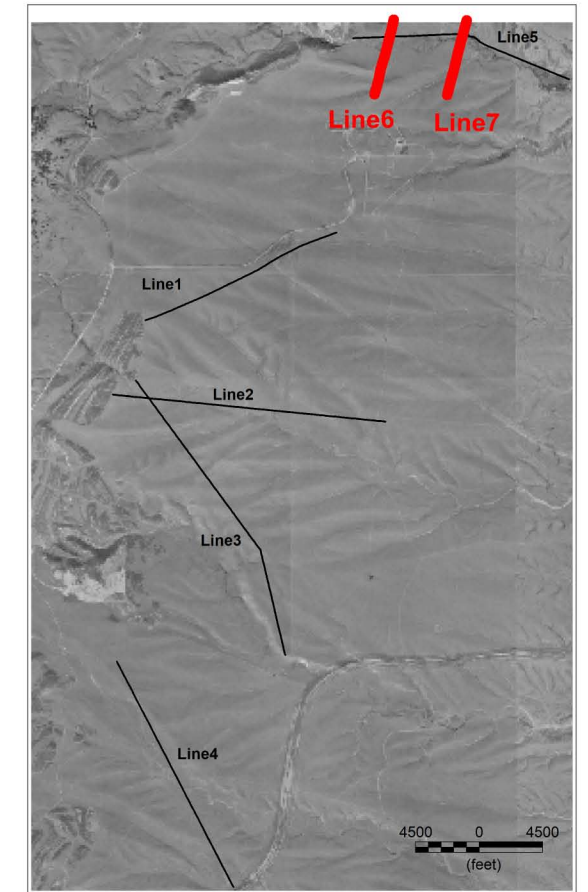
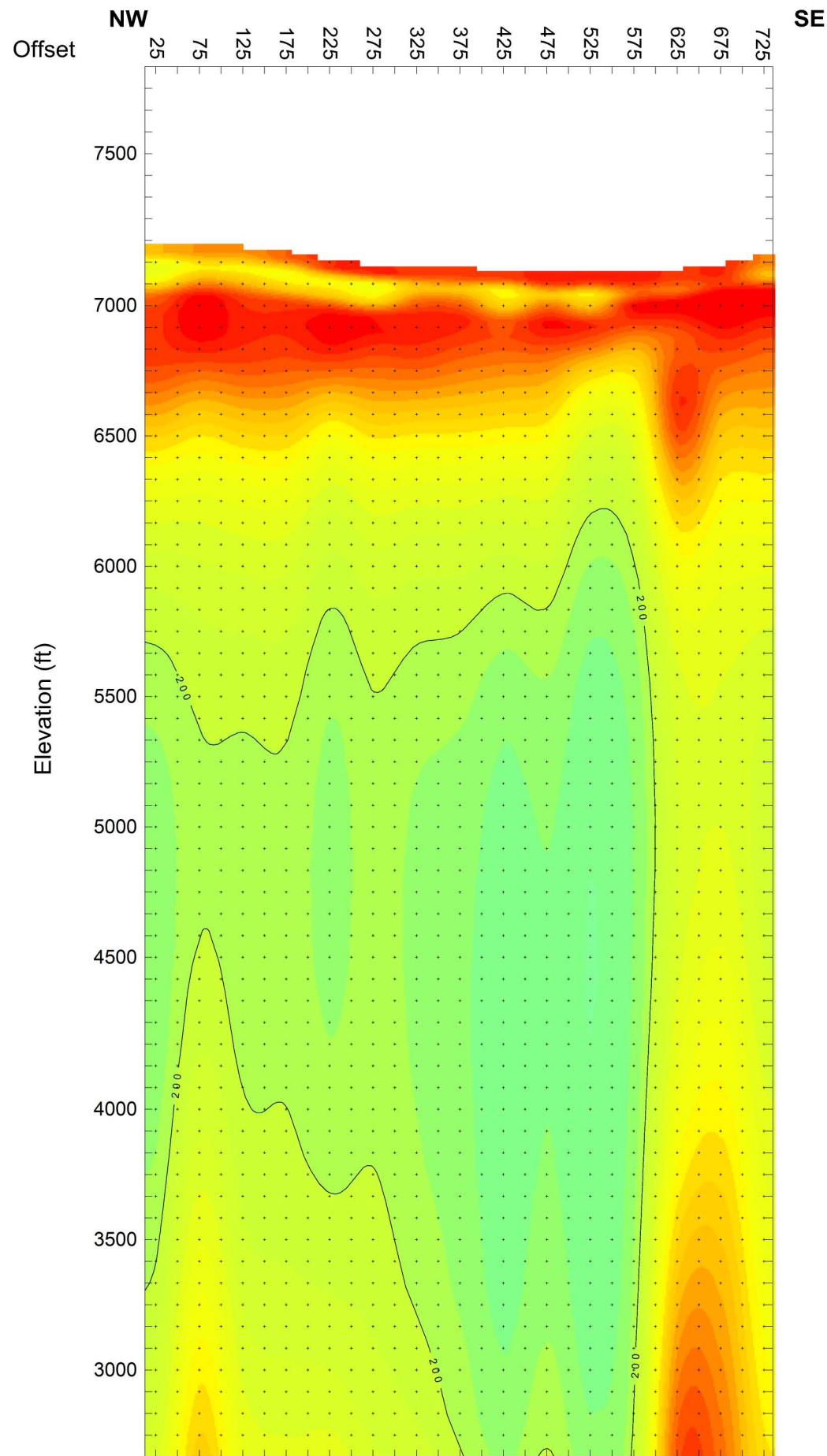
Safety + First

Line 6

CSAMT



Line 7



Resistivity Model
reds & yellows = low resistivity
blues & greens = high resistivity
contour interval = 200 ohm-m

Safety + First

CSAMT Plots Lines 6 & 7

Cheyenne Belvoir Ranch
Ground Water Level II Study

Lidstone and Associates, Inc.
Fort Collins, CO

AMEC, Inc.
Denver, CO

| | | | |
|------------|--|--------------------|-----------------|
| GEOPHYSICS | ZONGE International, Inc Lakewood, Colorado | TECHNICAL APPROVAL | Phil Sirles |
| DRAWN | Nicole Pendrigh | SUBMITTED | Nicole Pendrigh |
| CHECKED | Phil Sirles | APPROVED | Norm Carlson |

August, 2011

Appendix F

Analytically Modeled Theis Drawdowns for Proposed Well Fields



Appendix F
Contents

Lone Tree Creek Well Field
Duck Creek Well Field



Lidstone and Associates, Inc.
4025 Automation Way, Bldg. E
Fort Collins, CO 80525
www.lidstone.com

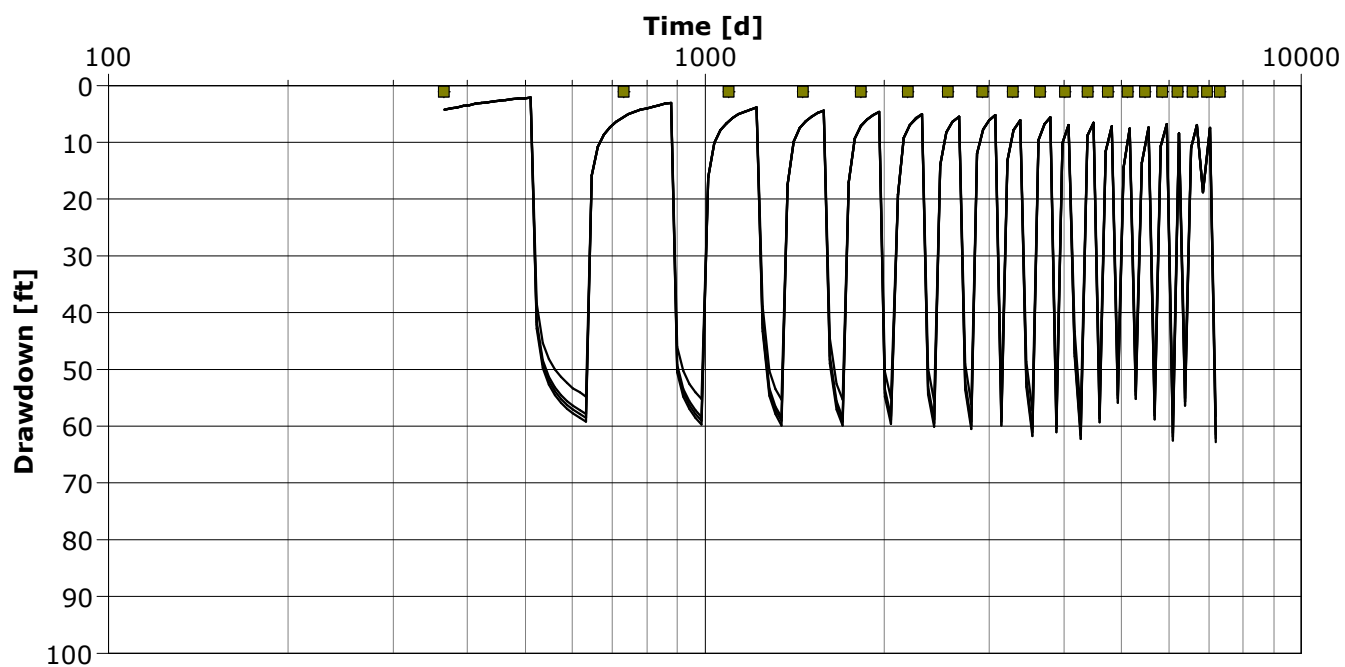
Pumping Test Analysis Report

Project: Lone Tree Creek Wellfield

Number: WYWDC109

Client: Wyoming Water Development Commission

| | | |
|---|--|--|
| Location: Western margin of Belvoir Ranch | Pumping Test: Projected DD 1, 5, 10 & 20 years | Pumping Well: LTC 1, LTC 3 (5-4), LTC 5, LTC 6 |
| Test Conducted by: M. Stacy | | Test Date: 4/12/2012 |
| Analysis Performed by: M. Stacy | Pumping Wells | Analysis Date: 4/12/2012 |
| Aquifer Thickness: 961.00 ft | | |



Calculation using Theis

| Observation Well | Transmissivity [U.S. gal/d-ft] | Hydraulic Conductivity [U.S. gal/d-ft ²] | Storage coefficient | |
|------------------|-----------------------------------|---|---------------------|--|
| LTC 1 | 4.39×10^4 | 4.57×10^1 | | |
| LTC 3 (5-4) | 4.39×10^4 | 4.57×10^1 | | |
| LTC 5 | 4.39×10^4 | 4.57×10^1 | | |
| LTC 6 | 4.39×10^4 | 4.57×10^1 | | |
| Average | 4.39×10^4 | 4.57×10^1 | | |



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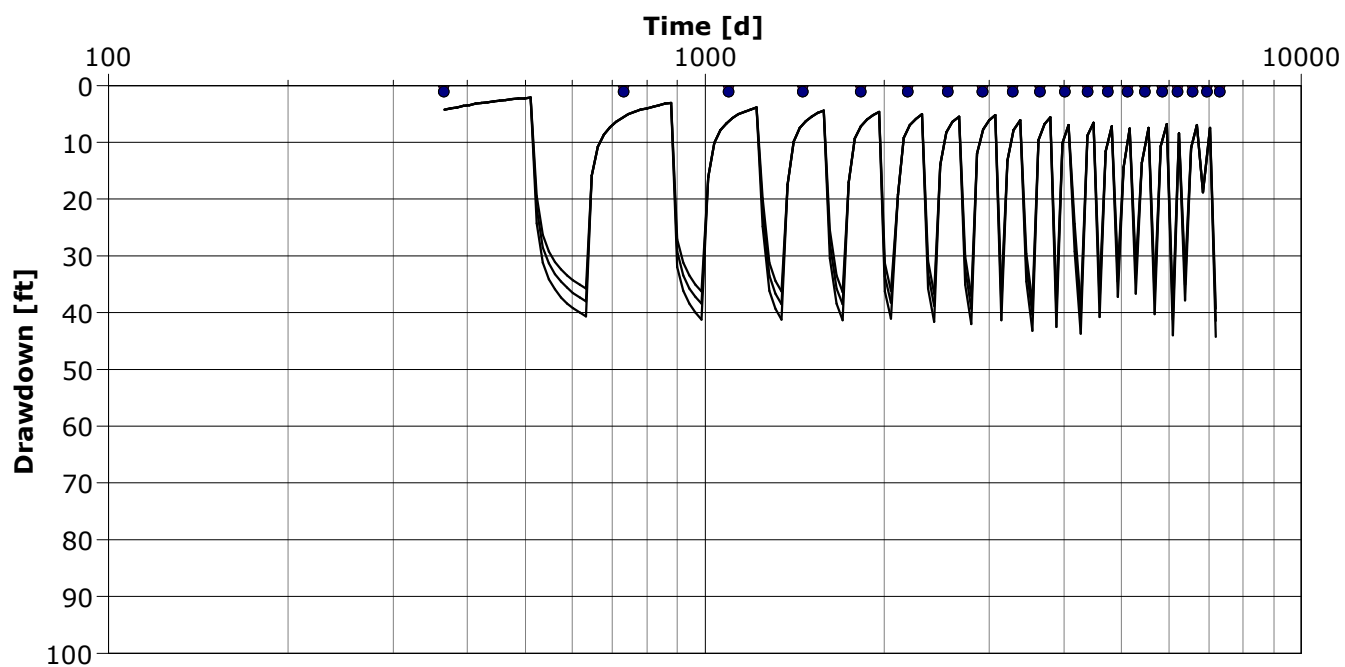
Pumping Test Analysis Report

Project: Lone Tree Creek Wellfield

Number: WYWDC109

Client: Wyoming Water Development Commission

| | | |
|---|--|--|
| Location: Western margin of Belvoir Ranch | Pumping Test: Projected DD 1, 5, 10 & 20 years | Pumping Well: LTC 1, LTC 3 (5-4), LTC 5, LTC 6 |
| Test Conducted by: M. Stacy | | Test Date: 4/12/2012 |
| Analysis Performed by: M. Stacy | Observation Wells | Analysis Date: 12/8/2011 |
| Aquifer Thickness: 961.00 ft | | |



Calculation using Theis

| Observation Well | Transmissivity [U.S. gal/d-ft] | Hydraulic Conductivity [U.S. gal/d-ft ²] | Storage coefficient | |
|------------------|-----------------------------------|---|-----------------------|--|
| LTC 2 (5-2) | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} | |
| LTC 4 | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} | |
| LTC 7 | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} | |
| Average | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} | |



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Pumping Test Analysis Report

Project: Lone Tree Creek Wellfield

Number: WYWDC109

Client: Wyoming Water Development Commission

Location: Western margin of Belvoir Ranch

Pumping Test: Projected DD 1, 5, 10 & 20 years

Pumping Well: LTC 1, LTC 3 (5-4), LTC 5, LTC 6

Test Conducted by: M. Stacy

Test Date: 4/12/2012

Aquifer Thickness: 961.00 ft

| | Analysis Name | Analysis Performed by | Analysis Date | Method name | Well | T [U.S. gal/d-ft] | K [U.S. gal/d-ft ²] | S |
|---------|-------------------|-----------------------|---------------|-------------|-------------|--------------------|---------------------------------|-----------------------|
| 1 | Observation Wells | M. Stacy | 12/8/2011 | Theis | LTC 2 (5-2) | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} |
| 2 | Observation Wells | M. Stacy | 12/8/2011 | Theis | LTC 4 | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} |
| 3 | Observation Wells | M. Stacy | 12/8/2011 | Theis | LTC 7 | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} |
| 4 | Pumping Wells | M. Stacy | 4/12/2012 | Theis | LTC 1 | 4.39×10^4 | 4.57×10^1 | |
| 5 | Pumping Wells | M. Stacy | 4/12/2012 | Theis | LTC 3 (5-4) | 4.39×10^4 | 4.57×10^1 | |
| 6 | Pumping Wells | M. Stacy | 4/12/2012 | Theis | LTC 5 | 4.39×10^4 | 4.57×10^1 | |
| 7 | Pumping Wells | M. Stacy | 4/12/2012 | Theis | LTC 6 | 4.39×10^4 | 4.57×10^1 | |
| Average | | | | | | 4.39×10^4 | 4.57×10^1 | 3.50×10^{-4} |



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Pumping Test Analysis Report

Project: Belvoir Ranch

Number: WYWDC109

Client: Wyoming Water Development Commission

Location: Belvoir Ranch

Pumping Test: Projected DD 1, 5, 10 & 20 years

Pumping Well: DC 1, DC 3, DC 6

Test Conducted by: M. Stacy

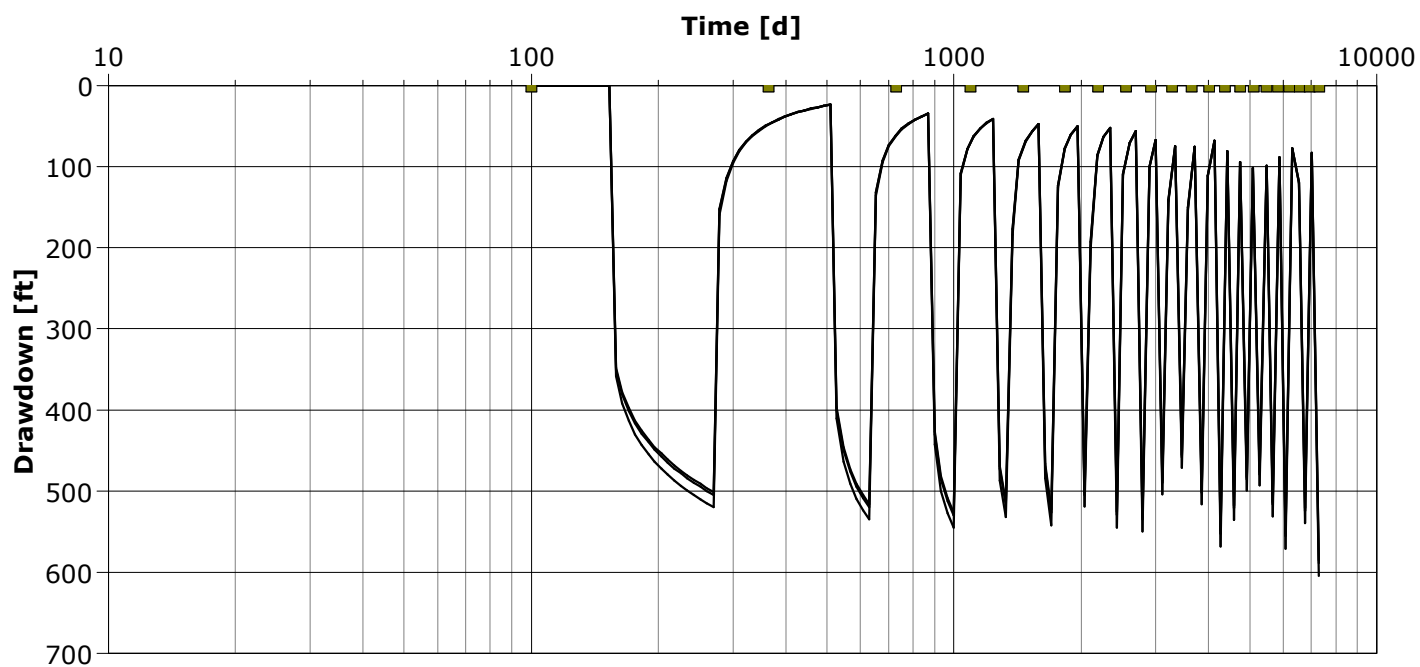
Test Date: 4/17/2012

Analysis Performed by: M. Stacy

Pumping Wells

Analysis Date: 4/17/2012

Aquifer Thickness: 1188.00 ft



Calculation using Theis

| Observation Well | Transmissivity [U.S. gal/d-ft] | Hydraulic Conductivity [U.S. gal/d-ft ²] | Storage coefficient | |
|------------------|-----------------------------------|---|---------------------|--|
| DC 1 | 1.19×10^3 | 1.00×10^0 | | |
| DC 3 | 1.19×10^3 | 1.00×10^0 | | |
| DC 6 | 1.19×10^3 | 1.00×10^0 | | |
| Average | 1.19×10^3 | 1.00×10^0 | | |



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Pumping Test Analysis Report

Project: Belvoir Ranch

Number: WYWDC109

Client: Wyoming Water Development Commission

Location: Belvoir Ranch

Pumping Test: Projected DD 1, 5, 10 & 20 years

Pumping Well: DC 1, DC 3, DC 6

Test Conducted by: M. Stacy

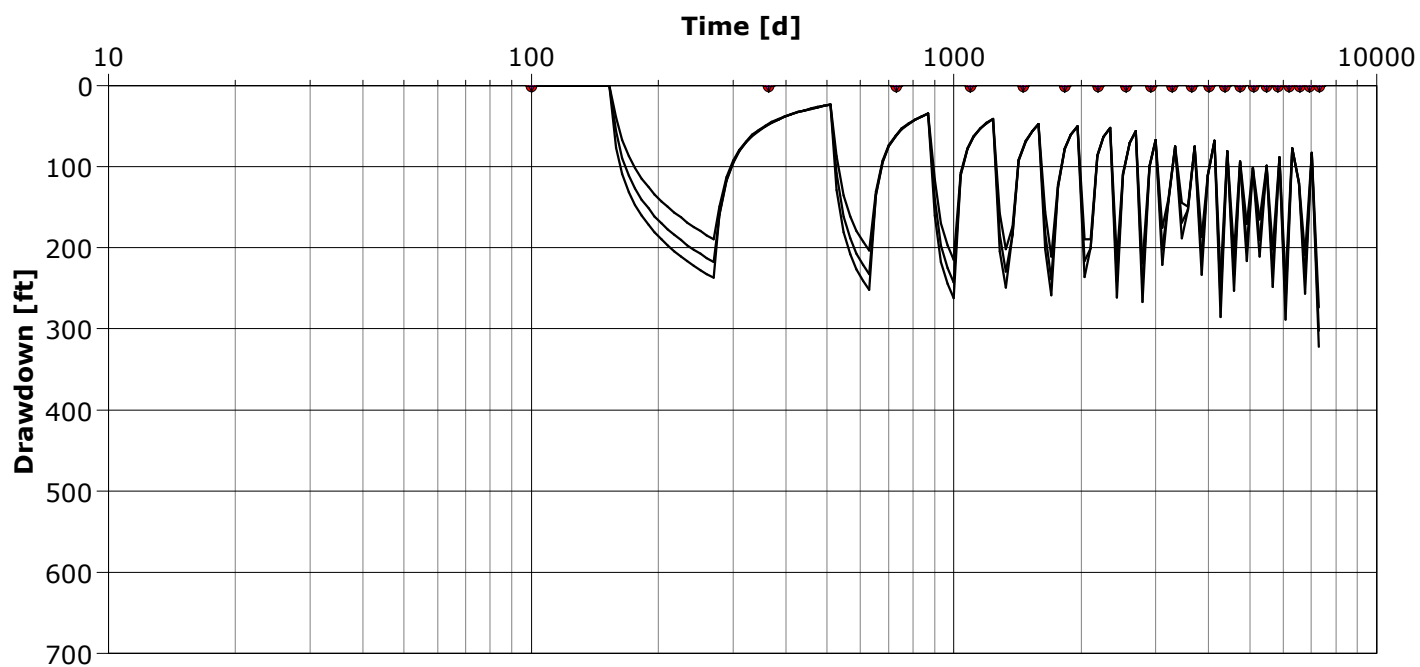
Test Date: 4/17/2012

Analysis Performed by: M. Stacy

Observation Wells

Analysis Date: 4/17/2012

Aquifer Thickness: 1188.00 ft



Calculation using Theis

| Observation Well | Transmissivity [U.S. gal/d-ft] | Hydraulic Conductivity [U.S. gal/d-ft ²] | Storage coefficient | |
|------------------|-----------------------------------|---|-----------------------|--|
| DC 2 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} | |
| DC 4 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} | |
| DC 5 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} | |
| Average | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} | |



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Pumping Test Analysis Report

Project: Belvoir Ranch

Number: WYWDC109

Client: Wyoming Water Development Commission

Location: Belvoir Ranch

Pumping Test: Projected DD 1, 5, 10 & 20 years

Pumping Well: DC 1, DC 3, DC 6

Test Conducted by: M. Stacy

Test Date: 4/17/2012

Aquifer Thickness: 1188.00 ft

| | Analysis Name | Analysis Performed by | Analysis Date | Method name | Well | T [U.S. gal/d-ft] | K [U.S. gal/d-ft ²] | S |
|---------|-------------------|-----------------------|---------------|-------------|------|--------------------|---------------------------------|-----------------------|
| 1 | Pumping Wells | M. Stacy | 4/17/2012 | Theis | DC 1 | 1.19×10^3 | 1.00×10^0 | |
| 2 | Pumping Wells | M. Stacy | 4/17/2012 | Theis | DC 3 | 1.19×10^3 | 1.00×10^0 | |
| 3 | Pumping Wells | M. Stacy | 4/17/2012 | Theis | DC 6 | 1.19×10^3 | 1.00×10^0 | |
| 4 | Observation Wells | M. Stacy | 4/17/2012 | Theis | DC 2 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} |
| 5 | Observation Wells | M. Stacy | 4/17/2012 | Theis | DC 4 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} |
| 6 | Observation Wells | M. Stacy | 4/17/2012 | Theis | DC 5 | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} |
| Average | | | | | | 1.19×10^3 | 1.00×10^0 | 3.50×10^{-4} |

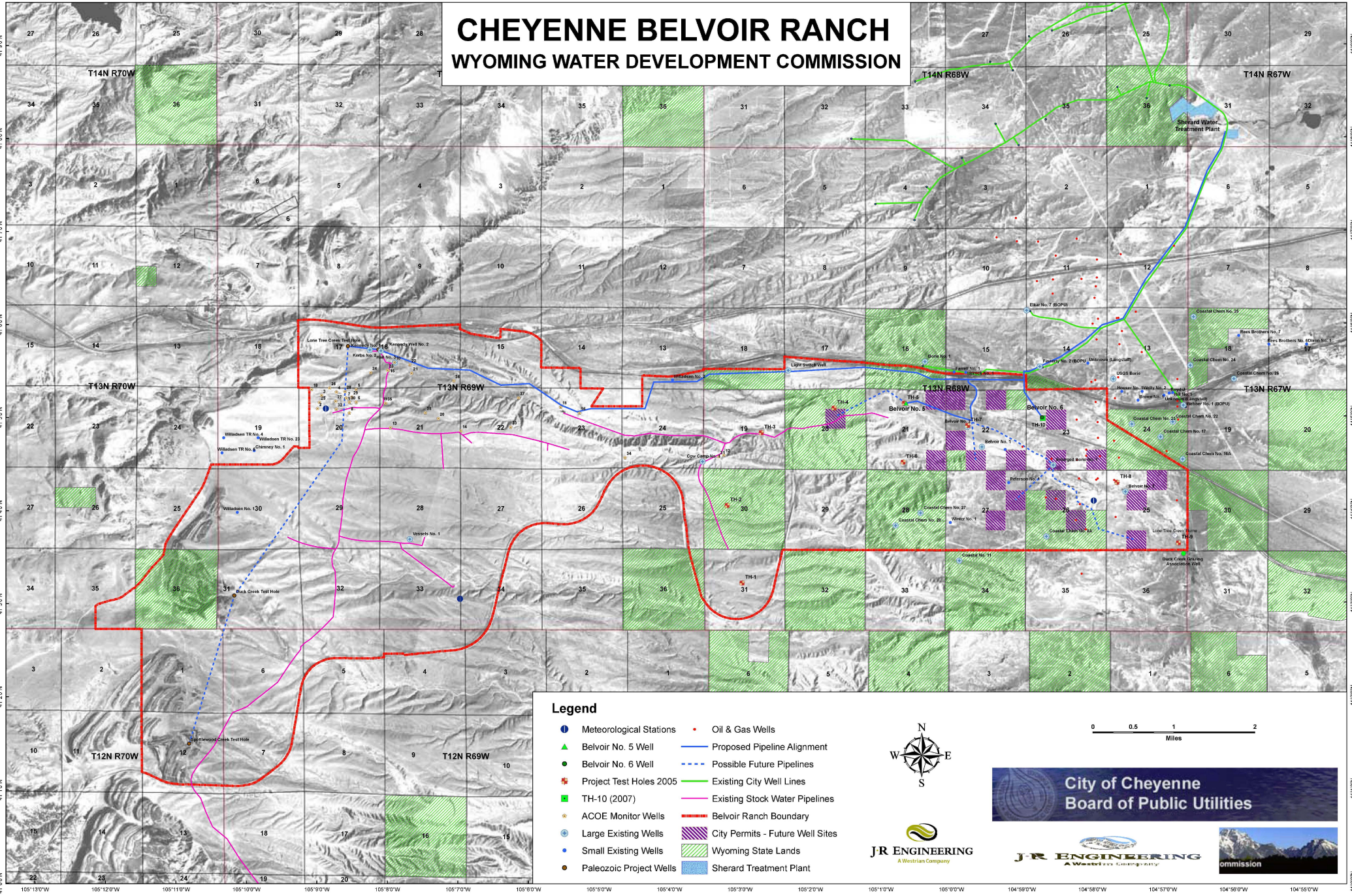
Appendix G

Western Belvoir Ranch Transmission Main



CHEYENNE BELVOIR RANCH

WYOMING WATER DEVELOPMENT COMMISSION



Legend

- Meteorological Stations
- ▲ Belvoir No. 5 Well
- ▲ Belvoir No. 6 Well
- ✦ Project Test Holes 2005
- TH-10 (2007)
- ACOE Monitor Wells
- Large Existing Wells
- Small Existing Wells
- Paleozoic Project Wells
- Oil & Gas Wells
- Proposed Pipeline Alignment
- Possible Future Pipelines
- Existing City Well Lines
- Existing Stock Water Pipelines
- Belvoir Ranch Boundary
- ▨ City Permits - Future Well Sites
- ▨ Wyoming State Lands
- ▨ Sheppard Treatment Plant



0 0.5 1 2
Miles

JR ENGINEERING
A Westcon Company

City of Cheyenne
Board of Public Utilities

JR ENGINEERING
A Westcon Company

