APPENDIX D6:

HYDROLOGY

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APPENDIX D6 HYDROLOGY

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D6.1 SURFACE WATER

The Appendix D6 Hydrology pages, table, figure and exhibits are sequentially numbered in this section, such as D6-1. The addendums are numbered by the sub-section, such as Figure D6B.1-1.

D6.1.1 DRAINAGE BASIN DESCRIPTION

The Nichols Ranch ISR Project areas exist in the Cottonwood and Willow Creek drainage areas. The Nichols Ranch Unit is located in the Cottonwood Creek drainage while the Hank Unit is located in the Willow Creek drainage.

The Nichols Ranch Unit is located near the confluence of the Cottonwood Creek drainage with the Dry Fork of the Powder River. Figure D6-1 shows the Cottonwood drainage area. The majority of the Nichols Ranch Unit drains directly to Cottonwood Creek while a portion of the northern part of the area drains to Tex Draw which is a tributary to the Dry Fork of the Powder River. Cottonwood Creek is a tributary to the Dry Fork of the Powder River and its confluence is located approximately ½ mile downstream of the project area. Tex Draw also enters the Dry Fork of the Powder River approximately 2 miles downstream of the project area.

Area of the Cottonwood Creek drainage basin is 80.2 square miles. Dry Fork of the Powder River is a tributary to Powder River which is a tributary to the Yellowstone River, which is a part of the Missouri River drainage basin. Land surface elevation in Cottonwood Creek drainage varies from 5,974 to 4,590 ft-msl at the mouth. The channel elevation varies from 4,622 to 4,660 ft-msl in the project area. Cottonwood Creek channel is flat at a gradient of approximately 0.003 ft/ft.

The Tex Draw drainage area is 5.2 square miles and its elevation varies from a peak of 5,085 to an elevation of 4,540 ft-msl at its confluence with the Dry Fork of the Powder River. None of the Tex Draw channel exists within the Nichols Ranch Unit area but the northwestern portion of the project area drains to Tex Draw. Tex Draw has a much steeper gradient due to being a smaller ephemeral channel and has an approximate gradient of 0.01 ft/ft just north of the project area.

The local drainages in Cottonwood Creek in the Nichols Ranch Unit have been divided into 6 small drainage basins. These drainage basins are presented on Figure D6-1 and have been named in NDA-1 through NDA-6. Table D6-1 presents the areas of these drainage basins. The slopes of these drainages vary from 1.5 to 2.9%.

The Hank Unit is located in the Dry Willow and Willow Creek drainages. Dry Willow is a tributary to Willow Creek which is a tributary of the Powder River. Dry Willow and a portion of Willow Creek drainage upstream of the Dry Willow confluence are shown in Figure D6-1. The Hank Unit is roughly 16 miles upstream of the confluence of Willow Creek and the Powder River. Willow Creek is oriented in a westerly direction through the northern end of the unit.

The area of the Willow Creek drainage basin above the Dry Willow Creek confluence is approximately 13.2 square miles. Elevation in the Willow Creek drainage varies from 6,052 to 4,795 ft-msl at the confluence of Dry Willow Creek. The short reach of the Willow Creek channel within the unit boundary ranges in elevation from 5,015 to 5,040 ft-msl.

The gradient of the stream channel within the Hank Unit is about 0.008 ft/ft, and the active stream channel width varies from a few feet to several tens of feet.

The drainage area of Dry Willow Creek is 12.2 square miles. The maximum elevation in this drainage basin is 6,018 ft and the elevation at the confluence is 4,795 ft. The elevation of the channel in the Hank Unit area of Dry Willow Creek varies from 4,995 ft to 5,085 ft-msl. The stream channel in this area has a gradient slightly greater than 0.01ft/ft.

The local drainages in Dry Willow Creek at the Hank site have been divided into 8 sub-basins. These small sub-basins have been labeled HDA-1 through HDA-8 on Figure D6-1. Table D6-1 shows that the channel bottoms for these drainages vary from 2.8 to 4%.

D6.1.2 SURFACE-WATER FLOW

Dry Willow, Willow and Cottonwood Creeks and Tex Draw are classified as ephemeral streams in the project area. Stream flows only occur in response to heavy snow melt and to large rainstorms. Runoff flows are typically intermittent in the spring and early summer and the stream channels are dry the remainder of the year except during major thunderstorms in the area.

The estimated peak flows for various recurrence intervals for Cottonwood, Tex, Dry Willow and Willow Creek drainages are presented in Table D6-1. The technique that was used to estimate the peak flows is presented in Lowham (1976).

The predicted peak flows in Table D6-1 vary from 454 cubic feet per second (csf) for a two-year recurrence interval to 7,500 csf for a hundred year recurrence interval for Cottonwood Creek drainage. The peak flows for Tex Draw vary from 170 to 2,720 csf for the 2 and 100 year recurrence intervals.

The predicted peak flows for the Dry Willow Creek and Willow Creek above Dry Willow Creek vary from a low of 231 csf for the 2 year recurrence interval for Dry Willow up to a peak of 3,840 for the 100 year recurrence interval. The estimates for Dry Willow and Willow Creek are very similar due to similarity in drainage area.

The smaller drainages at the Nichols Ranch Unit were divided into drainages NDA1-NDA6. The Craig-Rankl method (1978) for small drainage basins in Wyoming was used to estimate the peak discharges for the small sub-basins. Each of these drainages drain to the north side of Cottonwood Creek. The 25-year peak flows from these drainages vary from a low of 172 to a high of 950 csf. Eight sub basins were divided for the Hank Unit. These sub basins are labeled HDA1-HDA8 and are shown on Figure D6-1. Table D6-1 presents the peak flows for these sub basins with a ten-year flood varying from 109 to 384 csf using the Craig-Rankl method (1978).

The flow velocities for the 25-year peak discharges are calculated to present an estimate of the channel velocities during a significant runoff event. The bottom half of Table D6-1 presents the calculation of the flow velocities based on typical channel slope and the 25-year peak discharge. The 25-year peak discharge was selected as representing a reasonable design

period for the life of this operation. These 25-year peaks are calculated for the confluence of the drainages and therefore are a very conservative representation of the peak at the project location. The peak velocities for Cottonwood Creek are smaller due to the wide flood plane and the milder channel slope. Cottonwood Creek does have an incised pilot channel which has been dammed and, therefore, runoff flow during any significant event will be spread over a very significant width of the flood plane. The velocities in Tex Draw, Dry Willow and Willow Creek will be much greater due to the steeper channel slope and are near 10 ft/sec.

The flow velocity over the 25-year peak discharge for the smaller sub basins is also presented in Table D6-1. The velocities for the Nichols Ranch Unit vary from a low of 8.2 to a high of 12.1 ft/sec. Flow velocities were also calculated for the 8 sub basins for the Hank Unit and those flood velocities vary from 9.8 to 13.8 ft/sec.

The 25-year peaks and conveyance from Table D6-1 were used to define the flood inundated areas for the Nichols Ranch permit areas. Figure D6-1a shows the Nichols Ranch Unit inundated areas. A pattern in shown over the Cottonwood Creek inundated area. This entire area should be flooded during the 25-year peak runoff event. The 25-year peak runoffs for the incised small tributaries within the Nichols Ranch Unit will be confined to these channels and are the approximate flooded area is shown by the narrow channel lines presented on Figure D6-1a.

Figure D6-1b presents the 25-year flood inundated areas for the Hank Unit. This figure shows the areas where a 25-year flood will cause the inundation of the incised channels at the Hank Unit.

The upgradient side of each plant at Nichols Ranch and Hank will contain a ditch and berm which will have the conveyance to drain the 25-year flood around the plant facility.

D6.1.3 SURFACE-WATER QUALITY

The surface water quality from the Cottonwood, Tex, Dry Willow and Willow Creek drainages is generally very good in the upper channel reaches of these areas. A typical TDS is 200 mg/l. Water quality generally deteriorates as the surface water flows further down stream and is in contact with the streambed for longer periods of time.

The U. S. Geological Survey has monitored the Dead Horse Creek drainage which is approximately 30 miles north of the confluence of the Dry Fork with the Powder River and roughly 20 miles north of the confluence of Willow Creek with the Powder River. Dead Horse Creek drainage area is 151 square miles, which is significantly greater than the local drainages of the mining area. Limited water quality data from this gauging station shows that ion concentrations are significant with conductivity greater than 2,000 mhos/cm.

Table D6A.1-1 in Addendum D6A presents water quality data available from surface water samples within the drainages in the project. Figure D6-1 shows the location of surface water quality samples. These surface water results should be representative of conditions in 2007 because CBM discharges in this area have not started. Discharges to Tex Draw are expected to start in 2008 but a large portion of this area will not have CBM discharges because one of the major CBM producers is piping water to a deep injection well. The three surface water samples in early 2008 also should be representative of pre-CBM discharges because no CBM surface discharges have occurred in these drainages. The Dry Willow Reservoir which is upstream of the Hank Unit had a TDS of 174 mg/l. The Brown Water Pond also had a very low TDS due to the pond proximity to the drainage divide. This pond captures water after it has moved only a relatively short distance. The Dry Willow Reservoir and Brown Water Pond were dry in September of 2007 and early 2008. Additional samples on Dry Willow Creek and Cottonwood Creek show that the TDS can exceed 2,000 mg/l in the surface runoff. The spring of 2008 TDS from Dry Willow Creek and Cottonwood Creek downstream (D) of Nichols Ranch Unit are much lower while the TDS from the Cottonwood Creek upstream (U) of Nichols Ranch, which is similar to the late 1970 higher values. This data shows that the surface water quality can naturally vary greatly. Surface runoff water quality is generally dominated by bicarbonate concentrates but increase concentrations of calcium and sulfate are observed with increasing exposure time in channels.

D6.2 GROUND-WATER HYDROLOGY

The regional ground-water setting has been defined by Hodson and others, 1973, and Whitehead, 1996. The Nichols Ranch permit area is located in the south-central Powder River Basin, to the west of the Middle Pumpkin Butte. The regional Quarternary aquifers are alluvial aquifer adjacent to the major drainages in the area. The North Platte, Powder River, Belle Fourche, and Cheyenne are the major streams in this region. Hodson and others, 1973, indicates a large range in transmissivity and well yields in these alluvial aquifers with the poorest water quality in the Powder River alluvium. Geologic structure in the permit area is relatively flat with a gentle dip to the southwest toward the basin axis. The Wasatch Formation is the uppermost geologic unit in the area of the Nichols Ranch permit. The sands within the Wasatch Formation create regional aquifers in this area. Whitehead, 1996 also presents information relative to the regional groundwater setting in this area. Ground water in the Wasatch aquifers generally flows to the north and northwest in this area. The

transmissivity and yield from the Wasatch Formation is also highly variable with the yield up to a few hundred gallons per minute when a large thickness of saturated sands are completed in a well. The water quality in these aquifers would also generally be good, with a TDS concentration typically from <1000 mg/l to <2,000 mg/l. The aquifers of interest in this area are sands within the Wasatch Formation. The confining units between the aquifers are also within the Wasatch Formation.

The sandstones and the coal seams form aquifers in the Fort Union Formation. The aquifers will be deeper than the Wasatch aquifers but the general flow in the aquifer would be expected to be in the similar direction as the flow in the Wasatch aquifers. Whitehead, 1996 indicates that some of the flow between the aquifers is upwards in this region. Ground-water quality of the Fort Union aquifers would also be expected to be relatively good with TDS generally less than 2,000 mg/l.

The Lance Formation consists mainly of very fine to fine grain sandstone shale and coal beds. The ground-water flow direction in the Lance Formation in this area is expected to be to the north. Water quality data is very limited on the Lance Formation in this area but the TDS would be expected to be >2000 mg/l based on the limited data. The TDS is less toward the outcrop area to the southwest. TDS concentrations near the outcrops have been reported to be <1000 mg/l.

The Foxhills Sandstone exists below the base of the Lance Formation. Foxhills is mainly a fine to medium grain sandstone. The ground-water flow direction in the Foxhills would be expected to be to the north in this area based on a map presented in Whitehead, 1996. The TDS of the Foxhills is likely to be >2000 mg/l in this area based on the limited data available for this aquifer. The TDS in the outcrop area to the southwest has been measured to be from 1000 to >2000 mg/l.

The Lewis Shale underlies the Foxhill aquifer and is mainly an aquitard. This shale contains some lenses of fine grained sandstone but is generally not a very significant producer of water. The water quality in the Lewis Shale would be expected to be very poor. TDS in the Lewis Shale is likely to exceed 5000 mg/l in this area.

D6.2.1 HYDROLOGIC SETTING AND WELL CONSTRUCTION

The Nichols Ranch ISR Project is located in the outcrop of the Wasatch Formation. The stratigraphy of the Wasatch at this site consists of alternating layers of sand and shale with lignite marker beds. The mineable ore exists in two sand members, designated as the A Sand at the Nichols Ranch Unit and F Sand at the Hank Unit. These two sand members are typically separated by the B and C Sands and adjacent aquitards.

The aquifer and aquitard sequence at the project area is shown in Figure D6-2. This shows labeled sands from the 1, A, B, C, F, G, and H Sands. This figure also shows the aquitards that exist between the different sands and those aquitards are labeled as by the combination of labels for the two adjacent sands. These sands are the same names that are used at Power Resources North Butte permit which exists just north of the Hank Unit site.

The majority of the wells completed in the Nichols Ranch Unit are completed in the A Sand because this is the ore bearing sand in this area. Figure D6-3 shows the locations of the Nichols Ranch Unit wells and Exhibit D6-1 shows the locations of wells within three miles of the Nichols Ranch Unit. Table D6-2 presents the tabulation of the well data for the Nichols Ranch Unit wells. The wells used to define baseline water level (L) and water quality (Q) are indicated in the last column of the Tables D6-2 and D6-3. Table D6-2 shows that eight of the wells have been completed in the A Sand for definition of baseline water level and water quality with one well completed in the C Sand, B Sand, 1 Sand and the Cottonwood alluvium. Two wells are completed in the F and G Sands for baseline measurements. Additional ranch wells are presented in the table but not used for baselining. Wells MN-1, MN-2, URZNB-1 and URZN1-2 are completed as open-hole completions, while the remaining Nichols Ranch wells have well screens in their completion interval. Addendum D6L gives the Uranium Data Submission Spreadsheets which contain additional information on the wells.

Table D6-3 presents the basic well data for the Hank Unit wells while Figure D6-4 shows the location of the Hank Unit wells. Exhibit D6-2 shows the locations of wells within three miles of the Hank Unit. Ten of these wells are completed in the F Sand for baselining of this aquifer because this is the ore bearing sand in this area. Four of the wells are completed in the overlying G Sand and two of the wells are completed in the underlying C Sand for baseline monitoring of these aquifers. In areas where the C Sand does not exist, the B Sand is the underlying aquifer and seven of the baseline wells in this area are completed in the B Sand. Three dry alluvial wells and five surficial aquifer H Sand wells are listed in Table D6-3. Hank wells C #1, Dry Willow #1, Hank 1, NBHW-13, URZHB-6, URZHC-2, URZNF-1, URZHF-5, URZHG-3, URZHG-4 and WC-MN1 are completed as open-hole completions while the remaining Hank wells have screens. Additionally, seven existing stock wells are listed in Table D6-3 but not used for baseline purposes.

Three new Nichols Ranch Unit wells were added in late 2009 and six new Hank Unit wells were drilled. Tables D6-2 and D6-3 have been updated with this new information.

D6.2.2 SUMMARY OF AQUIFER AND AQUITARD PROPERTIES

Numerous single-well pump tests and multi-well pump tests were conducted at the Nichols Ranch and Hank Units to define the aquifer properties. The detailed hydrologic analyses and supporting data are contained in Addendums D6B and D6C for Nichols Ranch Unit and Hank Unit respectively. Three multi-well pump tests were conducted at the Nichols Ranch Unit site and are referred to in this report as the MN-1, MN-2 and MN-6 tests. Three multi-well tests were performed at the Hank Unit site. These tests are referred to as the URZHF-1, URZHF-5 and SS1F tests. Tables D6-2 and D6-3 present the basic well data for wells used to define the aquifer properties for the Nichols Ranch and Hank Units respectively. Addendum D6J presents the aquifer test theory used to analyze the pump tests.

Additional multi-well pump tests were conducted in early 2010. The aquifer properties obtained from tests have been added to Tables D6-4 and D6-5, respectively, for the Nichols Ranch and Hank Units.

D6.2.2.1 AQUIFER PROPERTIES

In addition to determining the aquifer properties from the multi-well test, numerous single-well tests were conducted to define the aquifer properties. Several pump tests were previously conducted by Cleveland-Cliffs and Uranerz and the results of these tests were analyzed and included in the general hydrologic analysis.

The aquifer property tables and discussion present the ore sand first, then the overlying and underlying aquifers and finally shallowest to deeper aquifer for the remaining aquifers.

Nichols Ranch Unit

Table D6-4 presents a summary of the aquifer properties for the Nichols Ranch Unit. This table shows a summary of the aquifer properties for the A, B and 1 Sands and then the Cottonwood Alluvium, F and C Sands for the Nichols Ranch Unit. For the A Sand, the single-well pump tests are presented first and then the results for the three multi-well pump tests are presented. Transmissivities for the A Sand aquifer vary from a low of 101 to a high of 460 gal/day/ft. A value of 350 gal/day/ft is thought to best represent the A Sand in the Nichols Ranch Unit area. The hydraulic conductivity (horizontal permeability) varies from 0.18 to slightly greater than 0.7 ft/day (0.08 to 0.36 Darcy), and a value of 0.5 ft/day is thought to best represent the A Sand. Average storage coefficient for the A Sand was 1.8E-4.

The one single-well pump test in the B Sand produced a transmissivity of 174 gal/day/ft and a horizontal permeability of 0.37 ft/day. The single-well pump tests for the 1 Sand produced a transmissivity of 88 and 101 gal/day/ft for the 1 Sand for the Cottonwood Alluvium. A significantly higher transmissivity was obtained from the single-well test for the F Sand well at 1,410 gal/day/ft and a hydraulic conductivity of 3.6 ft/day. A small transmissivity of 45 gal/day/ft and hydraulic conductivity of 0.099 ft/day were determined for the C Sand.

Hank Unit

Table D6-5 presents the summary of aquifer properties for the Hank Unit. This table presents results of aquifer properties testing for the F ore sand, G overlying aquifer, C and B underlying aquifers and finally the H and A Sands in the Hank Unit area.

The properties in the F Sand vary greatly in the Hank Unit area. The transmissivities vary from a low of 19 to a high of 6,670 gal/day/ft. Hydraulic conductivity varies from a low of 0.14 ft/day to a high of 9.4 ft/day (0.07 to 4.5 Darcy). A transmissivity of 400 gal/day/ft is thought to best represent the majority of the F Sand in the Hank Unit and the hydraulic conductivity of 0.6 ft/day is also thought to best represent the F Sand. A storage coefficient of 6.8E-5 was determined for the F Sand at the SS1-F site. The water level in the ore zone of the Hank Unit is near the top of the sand and therefore the F Sand is not fully saturated and is therefore an unconfined aquifer at the Hank Unit. The primary storage property for an unconfined aquifer is specific yield and a specific yield of 0.14 is thought to best represent the F Sand in this area.

Similar tests were conducted on two G Sand wells. The transmissivities of this G Sand varied from 0.4 to 2.9 gal/day/ft with hydraulic conductivities varying from 0.005 to 0.022 ft/day.

The aquifer properties for the underlying sands were determined for the C and B underlying aquifer. The aquifer properties for the C Sand were a low transmissivity of 1.9 gal/day/ft and a hydraulic conductivity of 0.025 ft/day. The transmissivities for the B Sand varied over a

much larger range from 264 to 742 gal/day/ft. Hydraulic conductivities for the B Sand varied from 0.38 to 2.2 ft/day.

Table D6-5 shows the hydraulic properties for the Hank Unit URZHH-7 well. This H Sand well has a best value transmissivity of 1.1 gallons/day showing that it contains a very low hydraulic conductivity of 0.006 ft/day.

The A Sand was tested at one site and the two tests for the A Sand produced transmissivities of 843 and 1,030 gallons/day/ft and yield hydraulic conductivities of 0.89 and 1.1 ft/day for the A Sand.

D6.2.2.2 AQUITARD PROPERTIES

The multi-well pump tests were used to define the confinement of the aquitards between the ore aquifer and the overlying and underlying aquifers. The MN-1 multi-well pump test had no indication of connection between the A Sand and the overlying B Sand and the underlying 1 Sand during this multi-well pump test. The MN-2 multi-well pump test showed that no indication of connection existed between the A Sand and the overlying B Sand and the underlying 1 Sand.

The multi-well pump test in the Hank Unit also did not show any indication of connection between the F Sand and the overlying and underlying aquifers. The multi-well pump test URZHF-5 did not show any indication of connection between the overlying and underlying observation wells indicating that the aquitards in this area adequately separate the ore sand from the overlying and underlying aquifers. The URZHF-1 multi-well pump test also did not show connections with the overlying and underlying aquifers during this pump test. This shows that the aquitards in this area adequately separate the overlying and underlying aquifers from the ore sand.

The most important parameter for confinement of the ore sand from the adjacent aquifers is the thickness of the aquitard. Experience has shown that the continuity of only a few feet of Powder River shale is needed to form an adequate confinement between the ore sand and adjacent aquifers. Exhibit D5-14 presents the aquitard thickness for the A-B Shale. This isopach map shows that the thinnest location observed is 13 feet with the majority of Mine Unit 1 consisting of an aquitard thickness of greater than 20 feet. Exhibit D5-16 presents the aquitard thickness between the 1-A Sand in the Nichols Ranch Unit area. These figures show that this aquitard has adequate thickness to function as a confinement between the A ore sand and B and 1 Sands. Exhibit D5-19 presents the aquitard thickness for the shale between the F-G Sands. This aquitard thickness is less than 30 feet in a small portion of the Hank Mine Unit 1 and generally much thicker than this amount. The overlying aquitard therefore should be adequate in the Hank mine area. Exhibit D5-21 presents the thickness of the shale between the F ore sand and the next underlying aquifer, which is the B Sand in some cases and C Sand in the northern portion of the mine area. This aquitard thickness also is slightly less than 30

feet in a portion of Mine Unit 1 with values significantly greater than this in the remainder of the mine unit. The underlying aquitard at the Hank Unit therefore should be adequate for confinement between the F Sand and the underlying aquifer.

The vertical hydraulic conductivities of the aquitard in the Powder River Basin have been defined at numerous locations. These hydraulic conductivities have been measured in multi-well pump tests with the Neuman-Witherspoon (1972) method, determined from the results from the leaky aquifer pump test analysis with the modified Hantush (1960) method, and from laboratory measurements. This data has shown that the vertical hydraulic conductivity of these aquitards is low enough that site specific measurements of the aquitard hydraulic conductivity are not necessary. Aquitard hydraulic conductivity was measured in the area just north of the Hank Unit in Power Resources North Butte permit. This permit presents aquitards evaluated with the Neuman-Witherspoon field test for the C-F aquitard between the F and C Sands. Table D6-5a presents the North Butte aquitard properties. The vertical hydraulic conductivity of this material was 3.4E-8 cm/sec (3.5E-2 ft/yr). A second multi-well test at the North Butte site defined the 1-A aquitard hydraulic conductivity between the A Sand and the 1 Sand. The results of this test were 4.1E-8 cm/sec (4.2E-2 ft/yr). Additional field tests were evaluated using the modified Hantush method to define the vertical hydraulic conductivity of the aquitard. These calculated hydraulic conductivities varied from a low of 6.7E-9 to a high of 6.9E-8 cm/sec (6.9E-3 to 7.1E-2 ft/yr). Laboratory hydraulic conductivities were also measured on two samples of the aquitards at the North Butte permit and these hydraulic conductivities varied from 6.4E-9 to 1.3E-8 cm/sec (6.6E-3 to 1.3E-2 ft/yr).

Additional test of aquitard properties have been made in this area at the Ruth and Ruby projects. The Ruth project located approximately 6 miles southwest of the Nichols Ranch project while the Ruby project is approximately 6 miles east of the Hank project. Table D6-5a presents additional field and laboratory aquitard properties for the Ruby and Ruth projects. The aquitards between the A-B Sands and 1-A Sands were measured at the Ruth project. The aquitards between the B-C Sands and A-B Sands were measured at the Ruby project. These aquitard properties show that the aquitards at both the Ruth and Ruby sites are similar to those that were measured at the North Butte site. This data shows that the aquitards in this area have sufficiently small vertical hydraulic conductivities to restrict the movement of ground water from one aquifer to the next. Aquifer confinement will be further defined for each of the wellfields during the wellfield multi-well pump test.

D6.2.3 GROUND-WATER FLOW

Water levels have been measured in the wells in the Nichols Ranch ISR Project area to define the direction and gradient of the ground water movement and define water-level changes in the aquifers in this area. Addendum D6D presents the water-level plots and tabulation of ground-water levels. Addendum D6L also presents a tabulation of the water levels in the Uranium Data Submission Spreadsheets.

The historical and current water-level elevation maps for the aquifers in this area are essentially the same. Water-level plots show that historically only small changes have occurred in these water levels since the late 1970s. Also, the coal bed methane production in the immediate area has not started and therefore the 2007 piezometric surface maps can be used as historical water-level elevations. The CBM production has caused large drawdown in the coal aquifer but these drawdowns have not been observed in the aquifer adjacent to the production zones. The drawdowns in the sands above the CBM production aquifers have generally been observed in some of the sands closer to the coal aquifer. These drawdowns should generally be relatively small and decrease in sands with greater distances from the coal aquifer.

Nichols Ranch Unit

The water-level elevation for the A Sand, which is the production sand at the Nichols Ranch Unit, is presented in Figure D6-5. This water-level elevation map shows that the ground water in the A Sand is flowing to the northwest with an average gradient of 0.0033 ft/ft. This gradient, an effective porosity of 0.05 and an average hydraulic conductivity of 0.5 ft/day indicates that the ground water in the A Sand is flowing at an average rate of 0.033 ft/day (12 ft/yr).

The regional piezometric surface of the A Sand aquifer is developed from the Nichols Ranch Unit A Sand wells and from three additional A Sand wells in this region. Figure D6-5a presents the regional water-level elevation map for the A Sand. This map shows that the regional ground water flow direction is the same as that in the Nichols Ranch Unit area. The regional ground-water velocity would be expected to be similar to the local ground-water velocity in the Nichols Ranch Unit area.

An F Sand well was added at the Nichols Ranch Unit to define the shallow ground water at this site. Figure D6-6 shows the water-level elevation for F Sand well URZNF-3. The water-level elevation of this shallow sand is roughly 25 feet higher than the water-level elevation than the A Sand at this location. An additional shallow monitoring well was installed at the Nichols Ranch Unit in the Cottonwood alluvium. This monitoring well is located on the downstream edge of the Nichols Ranch Unit area (see Figure D6-3 for location). Completion information for this well is presented in Table D6-3 and the well has a water-level elevation of 4,629 ft-msl. This water-level elevation is approximately 35 feet below the water-level elevation of the A Sand in this area.

Figure D6-6 shows the water-level elevation for the F Sand for the Nichols Ranch ISR Project area. This map includes wells in both the Nichols Ranch and Hank Units. The ground-water elevation shows that the water in the F Sand is flowing west with an average gradient of 0.005 ft/ft. This gradient, along with an average hydraulic conductivity of 0.6 ft/day and an effective porosity of 0.14, indicates that the ground water velocity is moving at 0.02 ft/day (8 ft/yr). Ground water in the F Sand flows into the Cottonwood alluvium in the area of the Nichols Ranch Unit.

A water-level elevation for the 1 Sand, the underlying aquifer to the Nichols Ranch Unit A Sand production, is presented in Figure D6-6a. This water-level elevation map shows that the ground-water flow in the 1 Sand is mainly to the northwest. The gradient of the 1 Sand

piezometric surface is 0.006 ft/ft and this gradient, and a hydraulic conductivity of 0.26 ft/day and an effective porosity of 0.05 indicates ground water in the 1 Sand is moving at 0.03 ft/day (11 ft/yr).

Figure D6-7 presents the water-level elevations for wells that are completed in the B and C Sands. The water-level elevations in these sands indicate that the gradient is to the west in the Nichols Ranch ISR Project area for both the Nichols Ranch and Hank Units (see Figure D6-7). The piezometric gradient in the ground-water systems has a north-northwest gradient further to the north of the Hank Unit. Similar gradients are observed in the B and C Sand aquifers as in the A and F Sand aquifers.

The depth to water in the surficial aquifer for the Nichols Ranch Unit is presented in Figure D6-7a. This figure shows a pattern the cottonwood alluvial area where the depth to water is less than 10 feet. The green contours present the depth to water in the F Sand. The F Sand is the surficial aquifer in the southern portion of the wellfields. This figure shows that the depth to water gets to greater than 100 feet in the F Sand in the central portion of the Nichols Ranch wellfields. The F Sand is the surficial aquifer in the southern third of the Nichols Ranch Unit while the G Sand is the surficial in the remainder of the unit. Estimated depths to water in the G Sand are presented with the red contours based on depths to water in the two G Sand wells. The G Sand is the surficial aquifer north of the 50 foot contour for the G Sand in areas where the sand is adequately developed. The G Sand may not be the surficial aquifer in some of this area due to the sand pinching out. Two G Sand wells were added to define the G Sand in the northern portion of the Nichols Ranch. The G Sand wells are shown on Figure D6-7a.

Hank Unit

The water-level elevation for the F Sand in the area of the Hank Unit is presented in more detail in Figure D6-6b. The gradient of the F Sand in the Hank wellfield area is generally 0.005 ft/ft. This gradient steepens to the east of the wellfield to a gradient of 0.01 ft/ft.

The H Sand is the surficial aquifer in the area of the Hank Unit. The BLM has monitored the Dry Willow alluvial wells which have recently been dry. The one alluvial well in Willow Creek is also dry, therefore, the alluvial aquifer is not considered the surficial aquifer in any of the Hank Unit. Figure D6-7b presents the depth to water for the H Sand. This shows that the H Sand depth to water is typically 100 feet in the wellfield area. The depths get less than 50 feet in the southwestern portion of the Hank Unit and greater than 200 feet in the eastern portion of the Hank Unit. Two additional H Sand wells were installed at the Hank Unit to further define the H Sand as the surficial aquifer in this area.

The shallow sands in the Hank Unit area are more likely to be affected by local topography changes than the deeper sands. Figure D6-7c presents a water-level elevation map for the G Sand which is the overlying sands for the F Sand in the Hank Unit. These piezometric contours are for the G Sand and show a much steeper gradient of 0.014 ft/ft to the west. This gradient, an average hydraulic conductivity of 0.005 ft/day and an effective porosity of 0.05 indicate that the ground water in these sands is moving at an average rate of 0.0014 ft/day (0.5 ft/year).

The head in the H Sand wells URZHH-7, URZHH-9 and URZHH-10 are shown on Figure D6-8 with water-level elevations of 5032 to 5127 ft-msl. H Sand well URZHH-7 was installed to define the shallow groundwater at the Hank Site. These wells are completed in the H Sand which is above the G Sand. The H Sand has a water-level elevation approximately 150 feet higher than the G Sand in the northern area of the Hank Unit.

Nichols Ranch Unit Aquitard Flow

Table D6-5b presents the gradient calculations through the aquitards based on the heads in the adjacent aquifers and the thickness of the aquitard. The head in the A Sand is 14 feet higher than the head in the B Sand at the Nichols Ranch Unit at well MN-1. These head differences indicate a gradient of 0.2 ft/ft across the 70 feet of aquitard at this location. The actual gradient in the aquitard is expected to be mainly controlled by the higher head in the A Sand and therefore, based on observation of head measurements in aquitards in the Powder River Basin the actual gradient in the overlying aquitard at the Nichols Ranch Unit is likely to be roughly 0.1 ft/ft. The head in the underlying aquifer 1 Sand in this location is approximately 15 feet less than the head in the A Sand therefore, a downward gradient exists between the A Sand and the underlying 1 Sand. This indicates a gradient across the aquitard that is greater than 0.3 ft/ft. The higher head in the A Sand is expected to mainly control the head in the aquitard until within a very few feet adjacent to the 1 Sand. Therefore, the gradient in the underlying aquitard is expected to be near 0.1 ft/ft at the Nichols Ranch Unit.

Hank Unit Aquitard Flow

The head in the overlying G Sand at the Hank Unit is greater than 50 feet higher than the head in the F Sand at URZHF-1. This head difference indicates a gradient of greater than 1 ft/ft in the overlying aquitard. The actual head in the overlying aquitard will be mainly governed by the higher head in the G sand and therefore the actual gradient in the overlying aquitard is expected to be near 0.1 ft/ft. A downward gradient exists in the lower aquitard at the Hank Unit where the head at URZHF-1 is 11 ft higher than the head in the underlying C Sand. These head differences indicate a downward gradient of greater than 0.3 ft/ft in the underlying aquitard. The actual gradient in the underlying aquitard is expected to be controlled by the head in the F Sand at the Hank Unit and therefore the actual gradient in the aquitard is expected to be near 0.1 ft/ft.

D6.2.3.1 NICHOLS RANCH UNIT WATER LEVEL CHANGES

The water-level elevations have been measured on the Nichols Ranch ISR Project wells and are presented in Addendum D6D. Table D6D.1-1 in Addendum D6D presents the water-level data tabulation for the Nichols Ranch Unit wells while Table D6D.2-1 presents the water-level data collected for the Hank Unit wells. Figures D6D.1-1 through D6D.1-3 in Addendum D6D present the water-level elevations; versus time for the Nichols Ranch Unit wells. Water levels for the A Sand wells for 2007 were fairly steady with a gradual rise observed in 2008. The limited data in the late 1970s and early 1980s indicate the water levels in the A Sands were roughly 20 feet higher than the recent levels. This change is thought to be due to the

drought in recent years or possibly some affect from the ISR operation to the north of Nichols Ranch. The recent data indicates that this previous decline is not due to CBM drawdowns.

Water-level elevations for the B Sand well URZNB-1 and the 1 Sand well URZN1-2 are slightly less than the water level elevation in adjacent A Sand well MN-1. The vertical head difference between these two aquifers and the A Sand is approximately 10 feet. Water levels have varied similarly in the B Sand and 1 Sand in the Nichols Ranch Unit area to those in the A Sand.

Water-level changes in the DW-4 cluster of wells to the northeast of the Nichols Ranch Unit have also been fairly steady. These water levels were also measured in 1978 and 1979 and were slightly lower than the recent water levels. The comparison in head between the F Sand, C Sand and A Sand and a comparison of the historical 1978 and 1979 data to the recent data are presented for the DW-4 site. Water levels are about 55 feet higher in the F Sand than those observed in the C and A Sands.

Figure D6B.1-3 also presents water level plots for the Nichols Ranch new F Sand well URZNF-3 and the Cottonwood Alluvium monitoring well URZNQ-4. Their water levels show a gradual water-level rise in 2008.

D6.2.3.2 HANK UNIT WATER LEVEL CHANGES

The water-level changes for the Hank Unit wells are presented in Figures D6A.2-1 through D6D.2-5 in Addendum D6D, while Table D6D.2-1 in Addendum D6D lists the water levels. The water-level changes for the Hank 1, Dry Willow #1, URZHF-1, URZHC-2, and URZHG-3 and URZHF-8 wells are presented in Figure D6A.2-1 Addendum D6D. The recent water levels in the F Sand in Hank 1 and Dry Willow #1 wells have been fairly steady with a small increase in 2008. The recent water levels in the Hank 1 well are approximately 14 feet higher than the 1979 measurement. Water levels in the Dry Willow well are five to seven feet higher than they were in 1979.

Figure D6D.2-2 in Addendum D6D presents the water levels measured for the second new well cluster including, G Sand well URZHG-4, F Sand well URZHF-5 and B Sand well URZHB-6. The head in the G Sand in this area is approximately 35 feet higher than the head in the F Sand while the F Sand head is similarly higher than the B Sand head.

The BR wells are presented in Figure D6D.2-3 in Addendum D6D and these wells are located on the northern side of the Hank Unit. These wells were monitored in the early 1980s for a period of slightly more than two years. Recent water levels in F Sand wells BR-B and BR-G are similar to those that were measured in the early 1980s. Water-level plots for H Sand well URZHH-7 are also presented in Figure D6D.2-3. Water levels have gradual risen since monitoring began in mid-2007.

Figure D6D.2-4 in Addendum D6D presents the plot of water levels for F Sand well WC-MN1. This well is monitored continuously by the BLM in conjunction with to their coal bed methane monitoring program. A plot of data for this well shows that in 1999 through early 2000 the water level was rising in this well and then gradually declined for the next 6-7 years. During late 2006 the water levels in well WC-WN1 declined at a faster rate than the previous years. Monitoring in the last three quarters of 2007 and early 2008 shows a gradual water-level rise. This plot also shows two data points that were measured in 1979 and 1981 which are several feet lower than the present water level.

The BLM has also monitored three alluvial wells in the Dry Willow alluvial system. The water levels for these wells are shown in Figure D6D.2-5 in Addendum D6D with alluvial wells DRYMW1 showing saturation in portions of 2000 through 2001 and well DRYMW3 having some saturation in late 2003. Both of these wells were dry in August of 2007 and through the majority of the monitoring period.

D6.2.3.3 COAL BED PRODUCTION EFFECTS ON WATER LEVELS

This section presents the potential effects of the coal bed water production on the ore sands. Coal bed methane (CBM) production has been underway for more than 10 years in the Powder River Basin. The CBM production in this uranium in-situ recovery (ISR) project area is presently in the process of being developed. The CBM wells typically produce a few tens of gallons per minute (gpm) and then production rates significantly decrease with time. This

water production has typically resulted in several hundred feet of drawdown in the coal aquifer. The potential effect of the drawdowns on the ISR operation is discussed in this section.

Exhibit D6-5 shows the spacing from the base with the A Sand at the Nichols Ranch Unit to the top of the coal which is 765 feet. The base of the F Sand to the top of the coal of the Hank Unit is 1160 Feet (see Exhibit D6-5). The fluvial deposition of the sandstones creates areas where a sandstone has direct connection with other sandstones. The thickest layer of sandstone that has been observed from the logs in the Powder River Basin is approximately 150 feet. Therefore, the large zone between the ore sands and the first major coal seam should always contain some layers of shale where drawdowns from the coal should be greatly attenuated and unlikely to reach the sandstones in the interval of the coal.

Artificial connections through the shales above the first major CBM coal seam could be developed through deep exploration drill holes or deep wells which penetrate the coal seam. Typically, drill holes in the Nichols Ranch permit area are drilled only down into the 1 Sand. A few deeper exploration drill holes were drilled and a very few penetrated the coal seam. Figure D6-8a presents the location of the deep drill holes in this area that extend below 800 feet deep. This figure presents the ID name of the drill hole and the total depth for each of the holes. Drill hole CC-4-6 is the only exploration hole that extends down to the first major coal seam. The seal in drill hole CC-4-6 and drill holes CC-65 through CC-68, CC-74, CC-78 and CC-79 in the northeast portion of the wellfield will be evaluated to determine if these holes are adequately abandoned. The remainder of the other deep drill holes are far enough from the well field that they should not create a potential problem relative to ISR containment of solutions.

The State Engineer's records have been searched for permitted wells and all wells that exceed a total depth of 800 feet and not an oil and gas well are posted on Figure D6-8a. The majority of wells in this area that are greater than 800 feet depth are oil and gas wells. Figure D6-8a shows the location of eight deep permitted wells that are not oil and gas wells. The total depth of these deep wells is shown on Figure D6-8a adjacent to the well name. All of these wells are shallow enough that they would not penetrate the CBM coal seam but two of these wells may be within a couple hundred feet of the coal seam. If the CBM drawdowns propagate up into a deeper sand which is within the completion interval of one of these wells, there is a potential for further propagation of drawdown to shallower sands depending on the well completions. Some shales should be present between the Nichols Ranch ore sands and the completion top of the most of these wells. These shales should still retard drawdowns and prevent impacts on the ore sand aquifer water levels. However, the North Dry Willow #1 well will allow the drawdowns that reach the lower sands in this well to propagate up to the ore sand at Hank. This well will be abandoned or at a minimum, the ore zone sand of the well will be sealed off prior to ISR operation in this area.

This portion of this section presents water-level changes that have been observed relative to CBM drawdowns.

The BLM has monitored water levels in the coal aquifers and sand aquifers above the coal for the last several years. The network of monitoring wells is used to define the effects of water extraction from the coal bed production zone on water levels in the coal and overlying aquifer. The monitoring well locations, drawdown and footage between the bottom of the sand completion and the top of the CBM completion is presented on Figure D6-8b. The nearest monitoring site to the Hank Unit is a Wasatch Sand well which is called the Dry Willow Well. Water-level data for this well is presented in Section D6.2 with the Hank water levels. This sand well is completed 100 feet above the major coal seam. The next closest well is the Fourmile monitoring well which is approximately 4 miles to the east of Hank. Water levels for this monitoring well are discussed later in this section. The Pistol coal well is located approximately 5 miles due north of the northern boundary of the Hank Unit. Figure D6D.3-1 of Addendum D6D presents the water-level elevations of the Pistol Coal Well. Water levels in this coal aquifer well started to greatly decline in 2007 and had only varied over a range of slightly greater than 10 feet for the previous ten years. This well did not show a significant effect from the production of water from the coal aquifer until 2007. The drawdown in early 2009 in the Pistol coal well was 710 feet.

The Bullwacker Sand and Coal wells, which are located approximately 6 miles southwest of the Nichols Ranch Unit, have been monitored since 2002. Figure D6D.3-2 in Addendum D6D presents the water level changes for the 2 Bullwacker wells. The sand well, which is completed 100 feet above the coal, has had approximately 195 feet of water level decline through early 2009. The coal well, which has also been monitored over this same period of time, shows a decline in water level starting in 2002 with a drop of approximately 600 feet by early 2008. This indicates that, at the Bullwacker site, the coal has had a large amount of drawdown and the sand water level appears to be declining steadily with the coal. This sand unit must be hydraulically connected with the coal or some well completion is allowing connection between the coal and this sand.

The coal and sand are monitored by the BLM at a location 10 miles west of Nichols Ranch Unit at the Streeter site. Figure D6D.3-3 in Addendum D6D presents the water-level elevation for the Streeter Sand and Coal wells. This figure shows that the water level in the Streeter Sand well has been steady in the last three years. This sand is 621 feet above the top of the coal. The water levels from the Streeter Coal well were fairly steady from late 2004 through mid 2005 when water levels started to gradually decline. Water levels from this well have declined approximately 111 feet from mid 2005 through early 2009. The early change in the water level from the Streeter Sand well is unusual because the water level initially declined and then became steady. The recent steady water levels in the sand well indicate that the sand aquifer has not been affected by the CBM production.

The sand well in the All Night Creek area is completed 124 feet above the coal. These two wells (completed in the sand and coal) are approximately 10 miles to the southwest of the Hank Unit. Figure D6D.3-4 in Addendum D6D presents the water level changes for the All Night Creek wells. The water level changes in the coal are greater than 600 feet while the

water levels have very gradually declined approximately 5 feet over the last few years. This small decline could be natural change.

The Beaver Federal Sand and Coal wells are located approximately 19 miles north-northeast of the Hank Unit. Figure D6D.3-5 of Addendum D6D presents the water levels for the Beaver Federal Sand and Coal wells. The water level has not changed appreciably in the Beaver Federal Sand well, while the coal's water level has declined greater than 450 feet. This sand is 561 feet above the coal, similar to the A Sand completion above the coal. The response of the ore sand water levels in the Nichols Ranch project to coal bed production should be similar to the response in this well.

The sixth cluster of CBM monitoring wells is located to the northwest of the Nichols Ranch ISR project. The Juniper well group water-level changes are presented on Figure D6D.3-6 in Addendum D6D. The water-level elevations do not show a significant change in the sand well which is completed 418 feet above the top of the coal. The coal water-level declines are greater than 600 feet in this area.

An additional CBM monitoring location was started in late 2007 approximately 4 miles east of the Hank site which is called the Fourmile monitoring site. Figure D6D.3-7 presents the water-level data for the Fourmile Coal and Fourmile Wasatch Sand well. The Wasatch Sand well is located approximately 534 feet above the top of the coal seam. Figure D6D.3-7 shows that no water-level declines have been observed in the sand well and shows fairly steady water levels for the Fourmile Coal well during this monitoring period. The water-level drawdowns are estimated to be approximately 100 feet in the coal sand based on pre-CBM coal water-level elevations.

An additional CBM monitoring site was also added in late 2007 approximately less than 6 miles south of the Nichols Ranch Unit. This monitoring site is called the West Pine Tree site. Figure D6D.3-8 shows that the water levels in the Wasatch Sand, which is 782 feet above the coal, have been fairly steady after the initial variable measurements. Therefore, no drawdown in the Wasatch Sand, 782 feet above the coal have occurred at this location. This sand is located at a similar footage above the coal as the A Sand. The coal drawdown at this location is greater than 436 feet because some drawdown very likely occurred at this location prior to the start of monitoring.

The CBM water-level monitoring shows that sand wells completed a few hundred feet above the coal in this area have not exhibited drawdowns. The exception to this is the drawdowns observed in the Bullwhacker Sand well which is completed only 100 feet above the top of the coal. It is likely that the drawdown in this sand well is caused by some artificial connection between the sand and the coal in this area.

The drawdown in the coal seam(s) for CBM production has the potential to cause hydrologic impacts in adjacent stratigraphic layers. The magnitude of drawdown in the coal for CBM production can be large, and thus the propagation of this drawdown into and through adjacent layers is of concern for other water or mineral extraction operations within these potentially affected strata. For uranium ISR operations in the vicinity of CBM activities, both the well

field operation and lixiviant control could potentially be affected by significant water level changes due to external stresses.

In the Powder River Basin (PRB), the uranium production sand/sandstones are within the Wasatch Formation and are separated from the CBM production coal seams by a substantial thickness of sand/sandstone and silt/shale sequences. The fine-grained silt or shale layers act as aquitards and greatly restrict or preclude the vertical movement of ground water. This in turn limits the vertical propagation of drawdown. In order to evaluate the potential hydrologic impacts of CBM production on the uranium ore-bearing sands in the PRB, a multi-layer MODFLOW model was constructed to represent a typical stratigraphic column at the Nichols Ranch project area. The modeled 13 layer stratigraphic column extends from the coal seam up through a sandstone representing a likely uranium production sand in order to evaluate the hydrologic impacts on the sequence of layers from the coal to the uranium production sand. The horizontal modeled area was set as a rectangle 15,000 feet by 5,000 feet. This quasi-strip configuration facilitated the placement of a separate constant head boundary for each layer at one end of the strip to represent the regional supporting aquifer system. The boundary condition at the other end of the strip was set as a variable head boundary. Well extraction stresses were placed in the coal seam layer approximately one-third of the total strip dimension from the variable head boundary end of the strip. In order to evaluate drawdown impacts, the resulting drawdown in the coal and overlying layers was analyzed for a location directly over the area where the well stresses were applied.

All layers in the model were established as confined aquifers with a uniform storage coefficient of 1.0 E-05. The top layer was a 40 foot thick sand layer with a transmissivity of 424 gal/day/ft which corresponds to a hydraulic conductivity of 5.0 E-04 cm/sec. Shale/silt intervals were broken into two layers for modeling purposes to further refine estimates of drawdown within the finer grained material where large gradients could potentially develop. Layers 2 and 3 were 50 foot thick shale layers with a transmissivity of 0.5 gal/day/foot. Layers 4, 5, and 6 repeated the thickness and properties sequence of layers 1 through 3. Layers 7, 8, and 9 also repeated this sequence. Layer 10 was modeled as a 40 foot thick sand with a modest transmissivity of 21 gal/day/foot. Layers 11 and 12 were 20 foot thick shale intervals with a transmissivity of 0.5 gal/day/foot. Layer 13 was a 40 foot thick coal seam with a transmissivity of 21 gal/day/foot. The total sequence thickness is 500 feet and can generally be described as the uranium production ore sand (top) and CBM production coal seam (bottom) separated by an alternating sequence comprised of four shale layers and three intermediate sand layers.

The initial water level elevation (hereafter termed head) for each layer was scaled in a generally linear manner from an arbitrary value of 500 feet for the coal seam (layer 13) to 560 feet for the upper sand aquifer (layer 1). The difference between the head in the upper and lower layers represents the likely condition of progressively higher head in overlying aquifers. A simulation was also conducted with a much larger differential in initial head between upper and lower aquifers and the results were generally similar to those presented in the following discussion.

The model simulation period was 20 years in 15 stress periods. The stress period intervals were selected to provide complete definition of the transient drawdown response for the coal and adjacent layers. The magnitude of the wells stresses in the coal seam was varied to

produce a large drawdown in the coal at the end of the simulation. The vertical conveyance between layers (termed Vcont in MODFLOW) was set as a uniform value for the interface between all layers and was then varied to produce total drawdown in layers 12 and 11 that was similar in magnitude to that predicted by the Neuman-Witherspoon (1972) method. This method allows calculation of drawdown in an adjacent aquitard based on the predicted drawdown in an aquifer.

The results of the MODFLOW simulation are presented for a selected model cell in Figure D6-8c. Only the results for layers 7 through 13 are presented because there were no significant changes in head for layers 1 through 6. A large degree of drawdown (493 feet) was produced in the coal seam (layer 13). Layers 12 and 11 are shale layers directly above the coal and the magnitude of predicted drawdown in these layers is still large at 291 feet and 154 feet, respectively. These drawdowns compare favorably with those predicted by the Neuman-Witherspoon (1972) method and were used in evaluating the Vcont. The predicted drawdown in the sand layer nearest to the coal seam (layer 10) was greatly muted at 32 feet. The progressively diminishing drawdown the shale/sand sequences in general reflects the very small quantities of ground water that are actually conveyed vertically in the very low permeability shales. This tiny vertical conveyance produces only a very small stress on the sand aquifer (layer 10), and thus the magnitude of drawdown rapidly decreases with increasing distance from the coal seam.

The predicted drawdown in layers 9 and 8 (shale layers overlying the deepest sand in the sequence) is 19 feet and 9.1 feet respectively, which continues the trend of rapidly diminishing drawdown while moving upward through the strata sequence. The predicted drawdown in the next sand aquifer (layer 7) is an insignificant 0.1 feet. As mentioned previously, there were no significant predicted changes in head for layers above layer 7.

A summary of the model results is that a large drawdown in the coal seam resulting from CBM production may cause significant drawdown in the adjacent aquitard(s). This drawdown may also propagate into and through aquifers located in close vertical proximity to the coal seam, but will be greatly muted by even modestly transmissive layers within the sequence. For multiple shale/sand sequences above the coal, the drawdown is progressively attenuated and will not propagate beyond one or two alternating sequences above the coal seam. The attenuation of drawdown within a shale layer is very large, so the presence of even thin continuous aquitards above the coal will greatly dampen the propagation of drawdown to overlying layers. However, any strata that have a permeability similar to or greater than that in the coal, and are in direct contact with the coal, will exhibit a drawdown response that is similar to that of the coal. With the typical lithology present in the Nichols Ranch project area, the CBM induced drawdown will not have a measurable impact on ore sand water levels unless there is an artificial connection through an improperly completed well or improperly abandoned bore hole.

The CBM drawdowns in the coal aquifer should not increase the potential for vertical excursions. The numerous aquitards between the coal and the ore sands should prevent the occurrence of significant drawdowns in the ore sands from CBM production. An artificial connection between the ore sand and the coal aquifer through a deep drill hole or deep well is the most likely pathway for a vertical excursion and thus the potential for such a connection should be evaluated.

CBM drawdowns could potentially cause drawdown in an ore sand if there are artificial connections with the production coal. In most cases, this CBM induced drawdown is not expected to appreciably affect gradients within a mine unit and therefore will not significantly increase the potential for horizontal excursions. Unless the artificial connection is directly within a mine unit, the changes in the piezometric surface should affect the mining in a relatively uniform manner. If drawdown occurs within a mine unit it is due to an artificial connection, this actually reduces the potential for horizontal excursion while, as previously noted, raising concerns for vertical excursion.

The modeling of the vertical propagation of CBM drawdown through the shale and sand layers shows that the first continuous shale will greatly dampen the drawdowns in the aquifers above the shale. Some drawdown is likely to occur in the first aquifer above the coal aquifer but drawdowns should be very small beyond the first sand. Some of the sands near the coal aquifer may have direct connection with the coal at some locations and, therefore, significant drawdown may develop in these connected aquifers. Ore sands, which are several hundred feet above the top of the coal, should not exhibit drawdown from the coal bed production unless artificial connections between the sand and the coal aquifer. It will be very important to determine if artificial connections exist within an ISR well field area and to correct any potential connections. Artificial connections that exist at some distance from the well field should not affect the potential for vertical or horizontal excursions.

D6.2.4 GROUND-WATER QUALITY

The ground-water quality at the Nichols Ranch ISR Project areas has been defined by sampling numerous wells in several aquifers in this area. Addendum D6E contains a tabulation of all ground-water quality. Addendum D6L also presents the water quality data in the Uranium Data Submission Spreadsheets. Some of the older water quality results were deemed not representative of the aquifer and are not used in the summary calculations of water quality. A criterium was established whereby the largest measured constituent concentration was deemed an outlier if it was greater than five times the next highest value in the data set. These outlier water quality results are highlighted in the water quality table in Addendum D6E. Addendum D6E also presents Stiff and Piper plots and a discussion of the water quality for each aquifer.

Table D6-6 presents the summary of the ground-water quality. These summaries are grouped for the A Sand, F Sand, B and C Sands together, then the G and H Sands and finally the I Sand. The values in Addendum D6E that are highlighted are not included in Table D6-6 calculations. Only wells listed in Table D6-2 and D6-3 for baseline water quality are included in the summary water quality. Three sets of parameters are listed in the upper half of the first page in Table D6-6. The A Sand wells MN-1, MN-2, MN-3, MN-4, MN-5, MN-6 and DW-4L were used to calculate the average concentrations for the A Sand. The first row presents the number of samples followed by the average of those samples for that particular constituent. The maximum, mean and standard deviation are also given in the summary

tabulations. The number of samples that have a concentration above the DEQ Class I standard is presented in the last row. The A Sand water typically has very low TDS, (less than 500 mg/l), with its major components being sodium, sulfate and bicarbonate. For the thirty samples, the TDS varies from a minimum of 289 to 370 mg/l with a standard deviation of 23 mg/l. The sulfate concentrations for the thirty samples vary from 85 to 183 mg/l while the chloride concentrations vary from 4 to 16 mg/l. Variations are 84 to 130 mg/l for sodium and 5.3 to 11 mg/l for calcium. The variation of uranium concentrations are over a small range from less than detection values to a maximum 0.027 mg/l. These A Sand wells are fully penetrating wells and therefore the uranium and radium concentrations will be significantly less for the average of the aquifer than within the ore zone. Radium-226+228 concentrations from the A Sand vary from less than detection to 38.2 pCi/l. The radium-226 concentrations would likely be in a few hundred pCi/l for a partially penetrating well completed only in the ore zone. Five of the radium-226+228 values exceed the Class I standard.

The second group of three sets of summary parameters is for the F Sand wells DW-4U, Hank 1, Dry Willow #1, WC-MN1, BR-B, C #1, SS1F, URZHF-1, URZHF-5 and URZNF-3. F Sand wells BR-G and OW43756 were not included in summary calculations because their water level elevations indicate that they are receiving water from an aquifer with a higher head. Forty-five samples have been collected from the F Sand wells, with the average TDS concentration greater than 1,000 mg/l. The range in TDS concentration is from 710 to 1,860 mg/l. Sodium, calcium, bicarbonate and sulfate are the major dissolved constituents in this water. The number of times the F Sand aquifer water exceeds the Class I standard for sulfate, iron, TDS, manganese, lead and radium-226+228 are 51, 17, 50, 34, 9 and 22 times respectively.

The sulfate concentrations varied over a large range from 418 to 981 mg/l while the chloride concentrations are low in the F Sand water with a variation of less than detection to 33 mg/l. The cations with the largest concentrations are sodium with a variation from 94 to 261 mg/l and calcium which varies from 44 to 293 mg/l. Uranium concentrations varied from less than detection to a high of 5.25 mg/l in this ore bearing sand. Radium concentrations have varied from less than detection to 566 pCi/l.

The two sands that are typically between the A and F production sands are the B and C Sands. The water quality data for these two sands were tabulated on the second page of Table D6-6 with the water quality for the B Sand on the top of the page and the C Sand on the bottom. The B Sand analysis includes wells BR-Q, BR-T, F. Brown #1, Brown #5, NBHW-13, SS1-M, URZNB-1 and URZHB-6. TDS concentrations for this aquifer are typically above 600 mg/l with the larger major constituent concentrations being those of sodium, bicarbonate and sulfate.

The TDS of this water ranges from 278 to 958 mg/l. Sodium is the major cation in this water with concentration variations of 85 to 250 mg/l. Sulfate is a major anion with concentrated variation from 121 to 620 mg/l. These sands do show low concentrations of uranium in some areas that is attributed to limited mineralization. The radium-226+228 concentrations in the B aquifer vary from less than detection to a maximum of 128 pCi/l. Sulfate, TDS and radium

are the main parameters that exceed the Class I use standards in the B Sand. The water quality for the C Sand is summarized on the bottom half of the second page of Table D6-6. Wells DW-4M, SS1-U and URZHC-2 were used to develop a summary of the C Sand water quality. TDS concentrations in the C Sand vary from a minimum of 387 to 920 mg/L. The major cation in this water is sodium and the major anions are sulfate and bicarbonate. Sulfate concentrations vary from a maximum of 514 to a minimum of 219 mg/L. Fifteen of the sulfate concentrations exceed the Class I standard while thirteen of the TDS samples exceed the Class I TDS standard. Radium-226+228 exceeds the Class I standard in six of the C Sand samples.

The group of parameters on the third page of Table D6-6 is for the G and H Sands which are the overlying and surficial sands for the F Sand in the Hank Unit area. The G Sand summary was made from water quality from BR-F and BR-H wells. This tabulation shows that, on average, the TDS is near 500 mg/l with a range of 236 to 696 mg/l. The major constituents with the highest concentrations are sodium, sulfate and bicarbonate.

The uranium and radium concentrations in these two G Sand wells were small. This data indicates that the wells completed in the G Sand are not near mineralized areas.

The summary of the water quality for the H Sand was developed using data from H Sand wells BR-I and URZHH-7. The H Sand water quality varies significantly with the major anion being sulfate in one of the wells and bicarbonate in the other. The major cation is sodium in one well and calcium in the other well. The TDS varies from a maximum of 1,010 to a minimum of 225 mg/L. Table D6-6 shows that three of the sulfate and TDS values exceed the Class I standard for the H Sand. Three of the lead concentrations also exceed the Class I use standard. Uranium concentration in the H Sand samples varied from very low values up to 0.046 mg/L.

The fourth page of Table D6-6 presents the summary of water quality for the 1 Sand well URZN1-2 in the Nichols Ranch Unit area. This data shows that the TDS is slightly greater than 200 mg/l with sodium and bicarbonate being the major components of this water quality. The sulfate and chloride concentrations for the 1 Sand vary over a very small range. Sodium concentrations vary from 92 to 104 mg/l. Bicarbonate is the major anion in this water with very low levels of uranium and radium indicating no mineralization near this 1 Sand well. No other constituent concentrations are significant in the water from the 1 Sand.

A summary of the Cottonwood Alluvial water quality is developed from the data collected from well URZNQ-4. The TDS from the Cottonwood Alluvial ground-water is high with all values greatly exceeding the Class I use standard. The average value is 3,902 mg/L. Sulfate concentrations are also high with the maximum value being 2,500 mg/L. The high TDS and sulfate concentrations in the Cottonwood Alluvium are natural and are due to the effects of this aquifer being a very shallow aquifer and a discharge point for other aquifers. Transpiration of ground water is significant relative to increasing the TDS in this shallow

ground-water system. All four of the samples from the Cottonwood Alluvial well significantly exceed the iron and manganese concentrations. These two constituents naturally exist at significant levels in ground water. The gross alpha concentrations all significantly exceed the Class I standard for gross alpha.

D6.3 WATER RIGHTS

Surface and ground-water rights on, adjacent to, and within 3 miles of the Nichols Ranch ISR Project are listed in Table D6F.1-1 in Addendum F and Table D6F.2-1 for the surface water and Tables D6G.1-1, D6G.1-2, D6G.2-1 and D6G.2-2 for the Nichols Ranch Unit and Hank Unit permitted water wells. Table D6G.1-1 lists the wells within the Nichols Ranch Unit while Table D6G.1-2 in Addendum D6G list wells in and within three miles of the Nichols Ranch Unit. Table D6F.1-2 in Addendum D6F lists the abbreviations used by the State Engineers Office for both the surface and ground-water

rights. Figures D6-9 and D6-10 present the locations of the Nichols Ranch Unit and Hank Unit surface rights respectively. Exhibits D6-1 and D6-2 show the locations of the permitted wells within three miles of the Nichols Ranch Unit and Hank Unit respectively. No adjudicated surface water rights are located in or adjacent to (within ½ mile of the project unit) the Nichols Ranch ISR Project. The surface water rights that do exist within the proposed mining project area are limited to stock/storage ponds and ephemeral creeks. Ground-water rights in the Nichols Ranch ISR Project area are mainly associated with the old monitoring wells and stock wells. No other adjudicated water rights are in the project area and lands adjacent to the project area according to the Wyoming State Engineers Office. Uranerz Energy Corporation also does not hold any adjudicated water rights in the project area. Most wells that are located within the Nichols Ranch ISR Project area were previously installed by uranium exploration companies, the T-Chair Livestock Company, or coal bed methane companies. Several additional wells have been completed in the project areas by Uranerz Energy Corporation for use in collecting base line ground water quality data.

The current regional ground water use in this area is mainly wells for wildlife and livestock. A few domestic wells exist at the ranch houses. The production of water from coal bed methane has been occurring in the region for slightly greater than 10 years but is expected to start in the permit area in the near future.

Wells in the area of the proposed project area are uniformly distributed over the area excluding monitoring/sampling wells that are permitted by Uranerz Energy Corporation. Most of the wells are used for livestock watering through the use of windmills or electric well pumps. Well depths vary from 180 feet to 1,000 feet in depth, and most wells are completed in sands other than the ore bearing sands. Those wells that are completed in the ore bearing sand will be abandoned using acceptable WDEQ methods or will be used as monitoring wells if not completed in multiple sands. No wells in or adjacent to the project area are used for domestic water consumption. A domestic water supply well is found on the Pfister Ranch (BR-T), located approximately 0.6 miles north of the northern boundary of the Hank Unit. This well is completed at a depth that is stratigraphically below the zones planned for the ISR mining at the Hank Unit. Additionally, the well is located at a large distance from any Hank planned wellfield areas and in the B Sand. It is unlikely that any mining activities that take place in the Hank area will affect this well because of the physical separation of the well from the ore zone. The extensive ground-water monitoring program utilized during the mining project will detect any problems prior to this well being adversely affected by mining activity.

Six permitted wells exist within ½ mile of the Hank Unit area. These wells consist of the Connie #2 well which is nearly ½ mile east of the project area. This well is used to supply water for stock and has a depth of 350 ft. This well is thought to be in the top portion of the F Sand. The Paden #1 and North Dry Willow #1 wells are very near the mineralized areas near the Hank Unit. The North Dry Willow #1 well is completed in the F Sand through sands down below the 1 Sand and will have to be abandoned before a wellfield pump test in this area. The Paden #1 well is also very near the ore zone in this area and is completed in the C, B and A Sands. This well will have to be monitored

during pump testing to determine if it has any connection with the F Sand. If the Paden #1 well has connection with the F Sand it will also need to be replaced. The Brown-WS well is completed in the C, B and A Sands. It is located greater than 1,000 feet west of the mineralized area in Hank Unit. The Brown #5 stock well is located just north of the northern edge of the Hank Unit area. This well has a depth of 540 feet and is completed in the B Sand. The distance of the ISR operation from this well makes it unlikely that mining operations will affect its water level or water quality. The sixth permitted well at the Hank Unit is the Means #1 well, which is used for stock watering and is 700 feet deep and also likely extends down to the A Sand.

Six permitted wells that are not related to the mining operations also exist within ½ mile of Nichols Ranch Unit. The Red Spring Artesian #1 well is located just north of the northwest corner of the project area. This well is completed to 740 feet deep and was a flowing well. The well was not flowing in August of 2007. This well likely extends to sands below the A Sand.

The other five wells are in the southern portion of the project area. The Brown 20-9 well is within the Nichols Ranch Unit and flows at approximately one gpm. This well is thought to be completed in the A Sand and has a total depth of 740 feet with perforations from 495 to 695 feet.

The Dry Fork #3 well is completed to a depth of 360 feet and was not flowing in October of 2007. With this depth, the well completion interval should be significantly shallower than the A Sand.

The Nichols #1 well, which is located in Section 19, is completed down to a depth of 310 feet. This well is likely completed in the C Sand and flows at approximately one gpm.

Based on a conversation with the current owner of the property where the Nichols Ranch once stood, the source of water was a well which was located approximately 200 yards from the old ranch house towards Cottonwood Creek and was thought to be artesian in nature. The depth of the well was not known but it was likely hand dug and fed off the waters of Cottonwood Creek.

The water source for the Pumpkin Buttes Ranch, located approximately 1.1 miles east of the Hank Unit permit area, is currently being supplied by a new well that was drilled sometime in 2008/2009 according to the landowner. This well is approximately 500 feet deep and completed between 400 and 480 feet placing it in the G Sand. The landowner also stated that there is another well present at the ranch near the current well that can be used as a backup well. The landowner did not know the depth of the well, it is not listed in the SEO database, and the landowner did not remember when it was drilled, but did state that the well had been there for sometime.

D6.4 COAL BED METHANE WELLS AND OIL/GAS WELLS

Wells permitted for coal bed methane production are presented on Exhibits D6-3 and D6-4 for the Nichols Ranch Unit and Hank Unit respectively. The tabulation of the coal bed methane

wells is presented in Addendum D6H. Exhibit D6-5 shows the footage between the base of the ore sand for each of the two sites and the top of the coal bed methane coal.

The coal bed methane wells in the area of the Nichols Ranch are expected to start water production in 2008. Presently no coal bed methane water is being discharged to the stream channels but it is expected to start in 2008 into Tex Draw. The majority of the coal bed methane wells in this area are planned to be pumped to a deep injection well.

Oil/Gas wells are shown on Exhibit D6-6 for the combined Nichols Ranch Project. Tabulation of the oil/gas wells is presented in Addendum D6H.

D6.5 EXPLORATION DRILL HOLES

The areas surrounding the Nichols Ranch ISR Project have been historically drilled by several different companies over the past 50 years. Companies such as Cleveland-Cliff Iron Company, American Nuclear Company, Texas Eastern Nuclear, Everest Minerals Corporation, Rio Algom Mining, and Silver King Mines have historically drilled in the Pumpkin Buttes Mining District. A search of the drill hole database maintained by Uranerz Energy Corporation and drill holes provided by the WDEQ-LQD resulted in a total of 841 abandoned exploration drill holes located within the Nichols Ranch ISR Project boundaries that were drilled by Cleveland Cliff Iron Company (CC), Rio Algom (RAM), Texas Eastern Nuclear (TE), and Uranerz Energy Corporation (U). Holes drilled from 1997 through year to date 2009 have been plugged in accordance with current State of Wyoming regulations. A reasonable inspection of the project area showed that these abandoned holes were marked with a stake or pin flag after plugging was completed. To the best of Uranerz Energy Corporations knowledge all holes drilled prior to 1997 were sealed and surface plugged in compliance with the State of Wyoming regulations in effect at the time of drilling. Additionally, visual inspection conducted during current drilling and reclamation operations from 2006 through 2009 in the two permit areas have found no historic drill holes that were not abandoned properly. Also there has not been any evidence of historic drill holes causing cross contamination between aquifers when conducting pump tests or when reviewing historic versus current water levels and water quality in monitor wells that are present in the permit areas. Furthermore, since the historic drill holes have been released by the WDEQ, an assumption can be made that the holes were properly abandoned according to the rules and regulations in place at the time the drill holes were abandoned. No problems are anticipated with past abandoned drill holes.

All known abandoned drill holes are listed in Tables D6I.1-1, D6I.1-2, D6I.2-1 and D6I.2-2. The first letters of the drill holes (historic and current) denote the company that drilled the hole as seen after the company name in the previous paragraph. The location and density of all drill holes is shown on Exhibits D6-7 and D6-8.

Abandonment methods used for exploration holes drilled prior to 1997 were sealed and surface plugged in compliance with the State of Wyoming regulations in effect at the time of drilling. The methods utilized prior to 1997 mostly consisted of drilling and abandoning drill holes with drill and natural mud. No additional materials were added to increase the solids or

viscosity. After 1977 bentonite was added if needed in abandoning drill holes. Drill holes abandoned by this method are denoted by a "1" in Tables D6I.1-2 and D6I.2-2. Drill holes that have a "2" are denoted for abandonment method in Tables D6I.1-1, D6I.1-2, D6I.2-1, and D6I.2-2 have been abandoned in accordance to current Wyoming Statue §35-11-404 and Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) Noncoal Rules and Regulations, Chapter 8. These drill holes are abandoned by sealing the drill hole with additional high solids (fortified) bentonite circulated at total depth or abandonment muds as specified in Wyoming Statue §35-11-404 and Chapter 8 of the WDEQ LQD Noncoal Rules and Regulations. All drill holes were surface sealed and marked for identification.

D6.6 REFERENCES

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TABLE D6-1. SURFACE DRAINAGE PROPERTIES, ESTIMATED PEAK FLOWS AND VELOCITIES

SITE	DRAINAGE AREA (sq. mi)	ESTIMATED PEAK FLOWS (CFS) RECURRENCE INTERVAL (YRS)					
		2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
Cottonwood Creek	80.2	454	1220	2150	3760	5420	7500
Tex Draw	5.2	170	456	782	1370	1970	2720
Dry Willow Creek	12.2	231	620	1070	1870	2700	3730
Willow Creek	13.2	231	638	1100	1930	2780	3840
NDA1	0.25	43	85	122	177	224	277
NDA2	0.33	50	101	145	212	271	337
NDA3	0.24	42	83	119	172	218	270
NDA4	0.3	48	96	137	199	254	315
NDA5	0.65	75	153	223	332	429	541
NDA6	3.2	189	407	611	950	1268	1648
HDA1	0.12	28	55	77	109	136	166
HDA2	0.4	56	114	164	241	309	385
HDA3	0.25	43	85	122	177	224	277
HDA4	0.48	63	127	184	272	350	438
HDA5	0.34	51	103	148	216	277	344
HDA6	0.81	85	175	256	384	499	631
HDA7	0.49	64	129	187	275	354	444
HDA8	0.2	38	75	106	152	193	237

25-YEAR VELOCITIES

Channel Station (ft)	Base Width (ft)	Side Slope (?H:1V)	Bottom Slope (ft/ft)	Discharge (cfs)	Normal Flow Depth (ft)	Flow Area (ft^2)
CTW CRK	100	2	0.0030	3760	4.768	522.3
Tex DRW	10	2	0.0100	1370	5.681	121.3
DRY WIL	20	2	0.0100	1870	5.211	158.5
WIL CRK	20	2	0.0080	1930	5.621	175.6
NDA1	5	2	0.0250	177	2.056	18.7
NDA2	5	2	0.0150	212	2.552	25.8
NDA3	5	2	0.0290	172	1.952	17.4
NDA4	5	2	0.0290	199	2.101	19.3
NDA5	5	2	0.0170	332	3.075	34.3
NDA6	5	2	0.0150	950	5.139	78.5
HDA1	5	2	0.0400	109	1.419	11.1
HDA2	5	2	0.0400	241	2.133	19.8
HDA3	5	2	0.0400	177	1.825	15.8
HDA4	5	2	0.0400	272	2.266	21.6
HDA5	5	2	0.0400	216	2.019	18.2
HDA6	5	2	0.0400	384	2.684	27.8

TABLE D6-1. SURFACE DRAINAGE PROPERTIES, ESTIMATED PEAK FLOWS AND VELOCITIES

Channel Station (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Flow Velocity (fps)	Top Width (ft)	Froude Number	Unit Discharge (cfs/ft)
CTW CRK	121.32	4.30	7.20	119.07	0.61	34.33
Tex DRW	35.40	3.43	11.29	32.72	1.03	64.14
DRY WIL	43.30	3.66	11.80	40.84	1.06	61.47
WIL CRK	45.14	3.89	10.99	42.49	0.95	61.77
NDA1	14.19	1.32	9.45	13.22	1.40	19.43
NDA2	16.41	1.57	8.22	15.21	1.11	20.98
NDA3	13.73	1.27	9.90	12.81	1.50	19.32
NDA4	14.39	1.34	10.29	13.40	1.51	21.63
NDA5	18.75	1.83	9.68	17.30	1.21	29.78
NDA6	27.98	2.81	12.10	25.56	1.22	62.18
HDA1	11.35	0.98	9.80	10.68	1.69	13.91
HDA2	14.54	1.36	12.19	13.53	1.78	26.01
HDA3	13.16	1.20	11.21	12.30	1.74	20.46
HDA4	15.13	1.43	12.59	14.06	1.79	28.53
HDA5	14.03	1.30	11.84	13.08	1.77	23.90
HDA6	17.00	1.64	13.80	15.74	1.83	37.03

TABLE D6-2. BASIC WELL DATA FOR NICHOLS RANCH UNIT WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	MP ELEV. (ft-msl)	CASING DIA. (in)	STICK-UP ABOVE LSD	WELL DEPTH (ft-mp)	WATER LEVEL DATE	WATER LEVEL DEPTH (ft-mp)	WATER LEVEL ELEVATION (ft-msl)		SCREEN INTERVAL (ft-lsd)	AQUIFER
20-9	1102911	275410	4664.08	5.0	0.9	740	---	---	---		495 - 615	A
	1102911	275410	4664.08	5.0	0.9	740	---	---	---		635 - 655	A
CALVING #1	1100015	289109	4824.00	5.0	1.6	560	---	---	---		390 - 420	A
	1100015	289109	4824.00	5.0	1.6	560	---	---	---		440 - 500	A
Dry Fork #3	1100675	273123	4720.00		---	360	---	---	---		-	C
DW-4L	1112331	276856	4969.73	5.0	0.4	795	1/18/2010	307.67	4662.06		726 - 795	A
DW-4M	1112331	276769	4970.17	5.0	0.3	441	1/18/2010	285.20	4684.97		389 - 441	C
DW-4U	1111406	276812	4966.75	5.0	0.3	310	1/18/2010	230.60	4736.15		256 - 309	F
GARDEN	---	---	---		---	---	---	---	---		-	A
MN-1	1105710	273118	4715.14	4.5	1.3	556	2/3/2010	46.03	4669.11	#	479 - 556	A
MN-2	1108147	273844	4840.00	4.5	0.7	670	1/29/2010	176.40	4663.60	#	560 - 670	A
MN-3	1106960	275167	4764.64	4.5	0.7	585	1/18/2010	93.46	4671.18		479 - 585	A
MN-4	1109835	272220	4800.36	4.5	2.2	623	1/29/2010	142.73	4657.63		520 - 623	A
MN-5	1108755	272120	4883.28	4.5	2.3	727	1/29/2010	222.83	4660.45		628 - 727	A
MN-6	1107478	272220	4761.18	4.5	2.2	593	1/18/2010	98.30	4662.88		485 - 593	A
Nichols #1	1102532	269925	4622.33	2.0	0.0	310	---	---	---		191 - 310	F
NR#1	1107430	272265	4758.88	5.0	1.2	620	1/18/2010	94.75	4664.13		550 - 565	A
Pats #1	1102872	279812	4690.00		---	405	---	---	---		375 - 405	A
Pug #1	1102383	275338	4685.00		---	370	---	---	---		340 - 370	B
URZN1-2	1105691	273081	4714.31	4.5	1.1	645	2/3/2010	60.40	4653.91	#	600 - 645	1
URZNA-7	1106069	275761	4711.00	5.0	1.5	510	1/18/2010	42.67	4668.33	#	489 - 498	A
URZNA-8	1109220	272539	4962.12	5.0	1.1	645	4/13/2010	195.16	4766.96	#	628 - 636	A
URZNA-9	1109282	272604	4852.54	5.0	1.2	685	4/13/2010	186.57	4665.97	#	669 - 679	A
URZNB-1	1105725	273149	4716.36	4.5	1.3	375	2/3/2010	58.90	4657.46	#	330 - 375	B
URZNB-10	1109279	272522	4855.98	5.0	1.1	501	4/13/2010	193.63	4662.35	#	396 - 496	1
URZNF-3	1105992	273707	4728.87	4.0	2.3	173	1/26/2010	85.50	4643.37		153 - 173	F
URZNG-5	1109316	271149	4790.62	4.0	2.0	60	8/17/2009	49.78	4740.84		30 - 60	G
URZNG-6	1107845	277024	4785.15	4.0	2.0	105	1/18/2010	73.30	4711.85		70 - 100	G
URZNQ-4	1103219	272397	4638.44	4.0	1.5	35	2/3/2010	5.40	4633.04		15 - 35	ALL
W. of WW1	1116674	286130	5080.00	6.0	2.3	720	4/22/2009	358.16	4721.84		340 - 370	C
	1116674	286130	5080.00	6.0	2.3	720	4/22/2009	358.16	4721.84		540 - 720	A

NOTE: * = Abandoned
# = Open Hole Completion
ALL = Alluvial
W. of WW1 = West of Widow Women
MP = Measuring Point (at top of casing)
MSL = Mean Sea Level
LSD = Land Surface Datum
L = Baseline Water Level
Q = Baseline Water Quality

TABLE D6-3. BASIC WELL DATA FOR HANK UNIT WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	MP ELEV. (ft-msl)	CASING DIA. (in)	STICK-UP ABOVE LSD	WELL DEPTH (ft-mp)	WATER LEVEL DATE	WATER LEVEL DEPTH (ft-mp)	WATER LEVEL ELEVATION (ft-msl)		SCREEN INTERVAL (ft-lsd)	AQUIFER
BR-B	1129884	299194	5029.70	5.0	1.5	300	12/10/2009	139.04	4890.66		200 - 280	F
BR-F	1128473	302583	5082.25	5.0	1.6	160	12/10/2009	67.10	5015.15		60 - 100	G
BR-G	1125397	305568	5157.27	5.0	1.6	320	7/17/2009	147.89	5009.38		240 - 320	F
BR-H	1127077	293768	4957.56	5.0	1.6	200	12/14/2009	92.85	4864.71		140 - 180	G
BR-I	1128729	303971	5130.88	4.0	1.7	80	11/11/2008	59.16	5071.72		40 - 80	H
BR-K	1129697	306515	5193.00	4.0	1.7	124	11/3/2008	124.00	5069.00		84 - 124	H
Brown #5	1128252	301915	5061.76	5.0	1.3	540	9/26/2007	215.60	4846.16		460 - 540	B
Brown-WS	1125026	299713	5146.00	6.0	1.2	702	12/14/2009	264.00	4882.00		340 - 380	C
	1125026	299713	5146.00	6.0	1.2	702	12/14/2009	264.00	4882.00		425 - 465	B
	1125026	299713	5146.00	6.0	1.2	702	12/14/2009	264.00	4882.00		540 - 620	A
BR-Q	1125878	305553	5154.22	5.0	1.1	600	12/17/2007	291.61	4862.61		500 - 600	B
BR-T	1131333	300699	5033.00	5.0	---	496	3/11/1981	196.50	4836.50		390 - 470	B
BR-U	1128876	300158	4983.18	4.0	1.7	23	4/13/1982	11.86	4971.32		5 - 23	ALL
C #1	1100216	304090	5137.00	5.0	1.1	232	12/14/2009	191.20	4945.80	#	146 - 232	F
Connie #2	---	---	5310.00	6.0	---	350	---	---	---		-	F
DRYMW1	1121212	293031	4930.00	3.0	0.3	19	10/4/2007	> 19.20	< 4910.80		-	ALL
DRYMW3	1121635	292581	4920.00	3.0	0.5	19	10/4/2007	> 18.60	< 4901.40		-	ALL
DW#1	1112155	304041	5154.19	6.0	1.3	320	10/26/2009	220.88	4933.31	#	220 - 320	F
F. Brown #1	1108650	288324	4890.00	7.0	2.3	520	10/29/2009	191.43	4698.57		423 - 483	B
Hank 1	1122566	302568	5251.01	6.0	1.8	440	1/18/2010	355.08	4895.93	#	354 - 440	F
Means #1	1108983	301384	5259.86	6.0	1.1	700	10/26/2009	341.60	4918.26		320 - 330	F
	1108983	301384	5259.86	6.0	1.1	700	10/26/2009	341.60	4918.26		640 - 650	B
NBHW-13	1128356	295943	4969.86	4.5	1.7	470	12/14/2009	126.33	4843.53	#	424 - 446	B
North Dry Willo	1116100	303879	5205.00	6.0	0.3	1132	---	---	---		250 - 280	F
	1116100	303879	5205.00	6.0	0.3	1132	---	---	---		380 - 410	C
	1116100	303879	5205.00	6.0	0.3	1132	---	---	---		540 - 570	B
	1116100	303879	5205.00	6.0	0.3	1132	---	---	---		700 - 770	A
	1116100	303879	5205.00	6.0	0.3	1132	---	---	---		990 - 1100	1
Old Maid #1	1115480	292878	5080.00	6.0	2.3	300	7/17/2009	197.69	4882.31		250 - 300	F
OW43756	1115602	298221	5052.00	6.0	2.0	251	12/18/2009	142.30	4909.70		-	G
	1115602	298221	5052.00	6.0	2.0	251	12/18/2009	142.30	4909.70		-	F
Paden #1	1115635	304361	5195.85	5.0	1.8	650	12/18/2009	306.38	4889.47		400 - 440	C
	1115635	304361	5195.85	5.0	1.8	650	12/18/2009	306.38	4889.47		570 - 630	A
	1115635	304361	5195.85	5.0	1.8	650	12/18/2009	306.38	4889.47		570 - 630	B
RED WINDMILL	---	---	---	6.0	---	300	---	---	---		-	A

TABLE D6-3. BASIC WELL DATA FOR HANK UNIT WELLS.

WELL NAME	NORTH. COORD.	EAST. COORD.	MP ELEV. (ft-msl)	CASING DIA. (in)	STICK-UP ABOVE LSD	WELL DEPTH (ft-mp)	WATER LEVEL DATE	WATER LEVEL DEPTH (ft-mp)	WATER LEVEL ELEVATION (ft-msl)		SCREEN INTERVAL (ft-lsd)	AQUIFER
SS1-F	1129626	295559	4975.00	4.5	1.1	185	7/22/2009	113.71	4861.29		145 - 185	F
SS1-FPU	1129700	295428	4976.00	2.0	2.3	175	12/14/2009	199.30	4776.70		-	F
SS1-L	1129551	295690	4974.00	5.0	0.9	654	12/14/2009	136.95	4837.05		540 - 652	A
SS1-M	1129546	295602	4974.00	5.0	1.2	454	12/14/2009	136.00	4838.00		405 - 454	B
SS1-U	1129619	295647	4975.00	5.0	0.9	372	12/14/2009	134.45	4840.55		323 - 372	C
URZHB-6	1124299	302427	5213.78	4.5	1.1	650	12/18/2009	348.48	4865.30	#	536 - 650	B
URZHC-16	1122506	302466	5244.00	5.0	1.1	523	1/18/2010	364.00	4880.00	#	462 - 523	C
URZHC-2	1118511	302629	5234.76	4.5	1.3	485	12/14/2009	340.90	4893.86	#	440 - 450	C
URZHF-1	1118584	302588	5231.73	4.5	0.9	440	12/18/2009	328.00	4903.73	#	365 - 374	F
URZHF-11	1122685	301960	5232.00	5.0	1.0	420	1/18/2010	341.63	4890.37	#	330 - 420	F
URZHF-12	1122353	303021	5280.00	5.0	1.3	482	1/18/2010	381.28	4898.72	#	380 - 483	F
URZHF-13	1124729	301487	5179.00	5.0	1.0	330	2/1/2010	285.09	4893.91	#	317 - 325	F
URZHF-14	1124749	301408	5185.00	5.0	1.2	362	2/1/2010	291.61	4893.39	#	367 - 375	F
URZHF-5	1124265	302426	5217.67	4.5	1.7	410	2/1/2010	317.04	4900.63	#	369 - 386	F
URZHF-8	1122657	302570	5250.00	5.0	1.7	433	1/18/2010	354.77	4895.23		420 - 430	F
URZHG-15	1122559	302472	5244.00	5.0	1.3	314	1/18/2010	278.55	4965.45	#	255 - 314	G
URZHG-3	1118491	302556	5228.82	4.5	1.2	300	12/18/2009	273.88	4954.94	#	270 - 300	G
URZHG-4	1124257	302457	5215.78	4.5	1.1	290	12/17/2007	282.00	4933.78	#	270 - 290	G
URZHH-10	1122798	302044	5258.19	4.0	2.0	135	8/12/2009	131.18	5127.01		90 - 130	H
URZHH-7	1118639	301082	5169.37	4.0	2.2	135	12/18/2009	90.73	5078.64		115 - 135	H
	1118639	301082	5169.37	4.0	2.2	135	12/18/2009	90.73	5078.64		85 - 105	H
URZHH-9	1115596	302854	5157.68	4.0	2.0	155	8/13/2009	125.71	5031.97		135 - 150	H
WC-MN1	1121306	292653	4942.00	5.0	2.5	210	3/2/2009	92.93	4849.07	#	150 - 210	F

NOTE: * = Abandoned
# = Open Hole Completion
ALL = Alluvial
L = Baseline Water Level
Q = Baseline Water Quality

TABLE D6-4. SUMMARY OF AQUIFER PROPERTIES FOR NICHOLS RANCH UNIT

	TRANSMISSIVITY (GAL/DAY/FT)				HOR. HYDRAULIC CONDUCTIVITY		AQUIFER	STORAGE COEFFICIENT		
	RECOVERY	JACOB	THEIS OR WTAQ	BEST VALUE	(FT/DAY)	(DARCY)	THICKNESS (FT)	JACOB	THEIS OR WTAQ	BEST VALUE
SINGLE WELL TESTS						A ORE SAND				
MN-1	275	453	-	275	-	-	73	-	-	-
MN-1 (2nd test)	-	276	-	276	0.65	0.31	73	-	-	-
MN-3	454	465	-	460	0.57	0.27	107	-	-	-
MN-4	314	308	-	311	0.42	0.2	98	-	-	-
MN-5	284	747	-	-	-	-	104	-	-	-
MN-5 (2nd test)	322	357	-	322	0.41	0.20	104	-	-	-
DW-4L	53	101	-	101	0.18	0.084	77	-	-	-
MULTI WELL TESTS										
MN-1 TEST	303	355	-	329	0.6	0.29	73	-	-	-
MN-2 OBS	610	1034	180	180	0.33	0.16	73	1.5E-04	1.4E-04	1.4E-04
MN-3 OBS	471	1095	265	265	0.48	0.23	73	1.2E-04	1.2E-04	1.2E-04
NICHOLS 1 OBS	570	631	414	414	0.76	0.36	73	1.0E-04	1.7E-04	1.7E-04
MN-6 TEST	360	346	-	353	0.44	0.21	108	-	-	-
NICHOLS 1 OBS	369	384	359	371	0.46	0.22	108	2.8E-05	3.1E-05	-
MN-5 OBS	477	620	359	359	0.44	0.21	108	1.1E-04	1.5E-04	1.5E-04
MN-2 OBS	792	688	337	337	0.42	0.20	108	3.8E-05	3.8E-04	3.8E-04
MN-2 TEST	160	196	-	178	0.23	0.11	102			
MN-1 OBS	51	588	180	180	0.24	0.11	102	1.1E-04	1.0E-04	1.0E-04
URZNA-7 TEST	290	310	-	300	0.43	0.21	93	-	-	-
MN-1 OBS	-	-	260	260	0.37	0.18	93	-	1.1E-04	1.1E-04
MN-3 OBS	-	-	270	270	0.39	0.19	93	-	1.1E-04	1.1E-04
URZNA-9 TEST	310	350	-	310	0.41	0.2	100	-	-	-
URZNA-8 OBS	230	200	190	210	0.25	0.13	100	5.3E-04	1.3E-04	1.3E-04
MN-2 OBS	-	-	340	340	0.45	0.22	100	-	1.8E-04	1.8E-04
MN-4 OBS	-	-	320	320	0.43	0.2	100	-	1.1E-04	1.1E-04
MN-5 OBS	-	-	280	280	0.39	0.18	100	-	4.4E-05	4.4E-05

TABLE D6-4. SUMMARY OF AQUIFER ı ERTIES FOR NICHOLS RANCH UNIT (CONTINUED)

	TRANSMISSIVITY (GAL/DAY/FT)				HOR. HYDRAULIC CONDUCTIVITY		AQUIFER	STORAGE COEFFICIENT		
	RECOVERY	JACOB	THEIS OR WTAQ	BEST VALUE	(FT/DAY)	(DARCY)	THICKNESS (FT)	JACOB	THEIS OR WTAQ	BEST VALUE
SINGLE WELL TESTS					**B OVERLYING SAND**					
URZNB-1	-	306	-	-	-	-	63	-	-	-
URZNB-1 (2nd test)	127	174	-	174	0.37	0.18	63	-	-	-
SINGLE WELL TESTS					**1 UNDERLYING SAND**					
URZN1-2	93	105	-	-	-	-	45	-	-	-
URZN1-2 (2nd test)	83	73	-	88	0.26	0.12	45	-	-	-
SINGLE WELL TESTS					**COTTONWOOD ALLUVIUM**					
URZNQ-4	9520	8670	-	8,670	39	18	30	-	-	-
SINGLE WELL TESTS					**F SAND**					
DW-4U	1460	1360	-	1410	3.6	1.7	52	-	-	-
DW-4U (2nd test)	-	1470	-	-	-	-	-	-	-	-
URZNF-3	-	470	-	470	1.4	0.68	44	-	-	-
SINGLE WELL TESTS					**C SAND**					
DW-4M	-	45	-	45	0.099	0.047	61	-	-	-

TABLE D6-5. SUMMARY OF AQU[illegible] PROPERTIES FOR HANK UNIT

	TRANSMISSIVITY (GAL/DAY/FT)				HOR. HYDRAULIC CONDUCTIVITY		AQUIFER	STORAGE	SPECIFIC
	RECOVERY	JACOB	THEIS OR WTAQ	BEST VALUE	(FT/DAY)	(DARCY)	THICKNESS (FT)	COEFFICIENT	YIELD
SINGLE WELL TESTS					**F ORE SAND**				
HANK 1	2210	2210	-	2210	3.5	1.7	84	-	-
Dry Willow #1	7020	6670	-	6670	9.4	4.5	95	-	-
BR-B	2210	2530	-	-	-	-	88	-	-
BR-B (2nd Test)	-	1970	-	2240	3.4	1.6	88	-	-
BR-G	2.1	19	-	19	0.14	0.067	18	-	-
MULTI WELL TESTS									
HANK 1 TEST	2680	3510	-	-	-	-	84	-	-
URZHF-8 OBS	667	3740	-	667	1.06	0.5	84	1.10E-03	0.14
URZHF-5 TEST	-	470	-	470	0.69	0.33	91	-	-
HANK 1 OBS	-	-	-	-	-	-	91	-	-
BR-G OBS	-	-	-	-	-	-	91	-	-
URZHF-1	149	-	-	149	0.28	0.13	71	-	-
SS1-F TEST	-	1530	-	1530	6.4	3.1	32	-	-
SS1-FPU OBS	1380	1530	-	1450	6.1	2.9	32	6.80E-05	-
HANK 1, 2ND TEST	2300	-	-	-	-	-	84	-	-
URZHF-8 OBS	-	670	530	670	1.1	0.52	84	8.00E-04	0.13
URZHF-11 OBS	-	570	-	570	0.91	0.43	84	7.60E-04	0.11
URZHF-12 OBS	-	710	-	710	1.13	0.54	84	5.60E-04	0.11
URZHF-14 TEST	-	690	-	690	0.89	0.42	104	-	-
URZHF-13 OBS	-	770	-	770	0.99	0.47	104	4.80E-04	0.12

TABLE D6-5. SUMMARY OF AQU. . PROPERTIES FOR HANK UNIT (CONTINUED)

	TRANSMISSIVITY (GAL/DAY/FT)				HOR. HYDRAULIC CONDUCTIVITY		AQUIFER	STORAGE	SPECIFIC
	RECOVERY	JACOB	THEIS OR WTAQ	BEST VALUE	(FT/DAY)	(DARCY)	THICKNESS (FT)	COEFFICIENT	YIELD
SINGLE WELL TESTS					**G OVERLYING SAND**				
BR-F	-	0.62	-	-	-	-	10	-	-
BR-F (2nd Test)	0.4	2.3	-	0.4	0.005	0.003	10	-	-
BR-H	-	2.7	-	-	-	-	18	-	-
BR-H (2nd test)	2.9	2.9	-	2.9	0.022	0.01	18	-	-
SINGLE WELL TESTS					**C UNDERLYING SAND**				
URZHC-2	-	1.9	-	1.9	0.025	0.012	10	-	-
SINGLE WELL TESTS					**B UNDERLYING SAND**				
BR-Q	264	176	-	264	0.38	0.18	93	-	-
NBHW-13	742	1300	-	1300	2.2	1.1	78	-	-
SINGLE WELL TESTS					**H SAND**				
URZHH-7	2.1	8.1	-	-	-	-	25	-	-
URZHH-7(2nd test)	0.7	2.2	-	-	-	-	25	-	-
URZHH-7(3rd test)	1.1	1.8	-	1.1	0.006	0.003	25	-	-
SINGLE WELL TESTS					**A SAND**				
SS1-L	954	1100	-	1030	1.1	0.52	126	-	-
SS1-L (2nd test)	-	843	-	843	0.89	0.43	126	-	-

TABLE D6-5. SUMMARY OF AQUIFER PROPERTIES FOR HANK UNIT

	TRANSMISSIVITY (GAL/DAY/FT)				HOR. PERMEABILITY		AQUIFER	STORAGE COEFFICIENT		
	RECOVERY	JACOB	THEIS	BEST VALUE	(FT/DAY)	(DARCY)	THICKNESS (FT)	JACOB	THEIS	BEST VALUE
SINGLE WELL TESTS						**F SAND**				
HANK 1	2210	2210	-	2210	3.5	1.7	84	-	-	-
Dry Willow #1	7020	6670	-	6670	9.4	4.5	95	-	-	-
BR-B	2210	2530	-	-	-	-	88	-	-	-
BR-B (2nd Test)	-	1970	-	2240	3.4	1.6	88	-	-	-
BR-G	2.1	19	-	19	0.14	0.067	18	-	-	-
OW43756	-	18	-	18	-	-	-	-	-	-
MULTI WELL TESTS										
URZHF-5	-	470	-	470	0.69	0.33	91	-	-	-
HANK 1	-	-	-	-	-	-	91	-	-	-
BR-G	-	-	-	-	-	-	91	-	-	-
URZHF-1	149	-	-	149	0.28	0.13	71	-	-	-
SS1-F	-	1530	-	1530	6.4	3.1	32	-	-	-
SS1-FPU	1380	1530	-	1450	6.1	2.9	32	6.80E-05	-	6.80E-05
SINGLE WELL TESTS						**G SAND**				
BR-F	-	0.62	-	-	-	-	10	-	-	-
BR-F (2nd Test)	0.4	2.3	-	0.4	0.005	0.003	10	-	-	-
BR-H	-	2.7	-	-	-	-	18	-	-	-
BR-H (2nd test)	2.9	2.9	-	2.9	0.022	0.01	18	-	-	-
SINGLE WELL TESTS						**C SAND**				
URZHC-2	-	1.9	-	1.9	0.025	0.012	10	-	-	-
SINGLE WELL TESTS						**B SAND**				
BR-Q	264	176	-	264	0.38	0.18	93	-	-	-
NBHW-13	742	1300	-	1300	2.2	1.1	78	-	-	-
SINGLE WELL TESTS						**A SAND**				
SS1-L	954	1100	-	1030	1.1	0.52	126	-	-	-
SS1-L (2nd test)	-	843	-	843	0.89	0.43	126	-	-	-

TABLE D6-6. SUMMARY OF THE GROUND-WATER QUALITY

A SAND WELLS: MN-1, MN-2, MN-3, MN-4, MN-5, MN-6 and DW-4L

	Ca	Cl	CO3	HCO3	K	Mg	Na	SO4	Temp	TDS	Cond	Cond(f)	pH	pH(f)
No. of Samples	29	29	29	29	29	29	29	29	25	29	24	26	24	28
Average	7.61	8.06	4.41	138.86	2.23	0.57	113.62	135.03	15.43	333.14	564.13	574.23	8.48	8.42
Maximum	11	16	24	156	5.7	1	130	183	20	370	643	720	8.74	9.5
Minimum	5.3	4	0.5	80	1.7	0.4	84	85	13.6	289	489	507	7.41	7.26
Standard Deviation	1.47	2.96	5.08	20.51	0.78	0.16	9.00	22.92	1.63	22.68	35.69	55.85	0.26	0.45

	Fe	Mn	NH3	NO3+NO2	F	Al	As	Ba	Cr	Cu	B	Cd	Hg	Mo
No. of Samples	29	28	29	24	29	28	28	28	28	28	28	28	29	28
Average	0.07	0.01	0.09	0.05	0.24	0.05	0.00	0.05	0.02	0.01	0.08	0.00	0.00	0.07
Maximum	0.65	0.03	0.57	0.05	0.3	0.05	0.009	0.05	0.025	0.005	0.5	0.005	0.0007	0.5
Minimum	0.005	0.005	0.02	0.05	0.1	0.05	0.0005	0.05	0.005	0.005	0.05	0.0025	0.00015	0.05
Standard Deviation	0.13	0.01	0.13	0.00	0.07	0.00	0.00	0.00	0.01	0.00	0.11	0.00	0.00	0.09

	Ni	Pb	Se	Unat	V	Zn	Ra226	Ra226(e)
No. of Samples	28	29	29	29	28	29	28	28
Average	0.02	0.01	0.00	0.01	0.05	0.01	5.02	0.66
Maximum	0.025	0.08	0.0015	0.027	0.05	0.04	36.3	3
Minimum	0.005	0.0005	0.0005	0.00015	0.05	0.005	0.1	0.2
Standard Deviation	0.01	0.02	0.00	0.01	0.00	0.01	9.35	0.64

F SAND WELLS: DW-4U, HANK 1, DRY WILLOW #1, WC-MN1, BR-B, C #1, SS1-F, URZHF-1, URZHF-5 and URZNF-3

	Ca	Cl	CO3	HCO3	K	Mg	Na	SO4	Temp	TDS	Cond	Cond(f)	pH	pH(f)
No. of Samples	36	36	26	36	36	35	36	36	30	35	24	33	25	34
Average	101.02	5.56	0.65	173.86	7.29	25.04	182.17	592.11	12.00	1019.09	1411.04	1530.24	7.80	7.74
Maximum	293	33	4.3	421	14	96	245	981	17.1	1860	1880	3370	8.5	10.4
Minimum	44	0.5	0.5	45	5	10	94	418	9	710	994	995	7.16	6.7
Standard Deviation	48.00	5.39	0.75	80.09	1.81	16.60	31.17	132.63	1.66	241.67	193.87	436.68	0.31	0.74

	Fe	Mn	NH3	NO3+NO2	F	Al	As	Ba	Cr	Cu	B	Cd	Hg	Mo
No. of Samples	36	36	35	19	36	33	33	31	33	33	36	33	33	32
Average	0.34	0.06	0.05	0.05	0.14	0.05	0.0017	0.05	0.02	0.01	0.08	0.0035	0.0005	0.05
Maximum	3.9	0.26	0.13	0.05	0.5	0.4	0.015	0.05	0.03	0.08	0.5	0.014	0.0013	0.05
Minimum	0.005	0.005	0.005	0.05	0.01	0.005	0.0005	0.015	0.005	0.005	0.005	0.001	0.00015	0.05
Standard Deviation	0.74	0.05	0.03	0	0.10	0.06	0.0027	0.01	0.01	0.02	0.09	0.0023	0.0002	0

	Ni	Pb	Se	Unat	V	Zn	Ra226	Ra226(e)
No. of Samples	33	33	33	36	33	35	34	29
Average	0.02	0.01	0.02	0.16	0.05	0.02	43.14	2.00
Maximum	0.025	0.05	0.574	5.25	0.05	0.32	562	7.2
Minimum	0.005	0.0005	0.0005	0.0005	0.025	0.005	0.1	0.2
Standard Deviation	0.01	0.01	0.10	0.87	0	0.05	100.38	1.71

TABLE D6-6. SUMMARY OF THE GROUND-WATER QUALITY, (cont.)

B and C SAND WELLS: BR-Q, BR-T, DW-4M, F. Brown #1, Brown #5, NBHW-13, SS1-M, SS1-U, URZNB-1, URZHC-2 and URZHB-6

	Ca	Cl	CO3	HCO3	K	Mg	Na	SO4	Temp	TDS	Cond	Cond(f)	pH	pH(f)
No. of Samples	58	58	39	58	57	58	47	61	46	60	35	52	44	44
Average	51.27	7.60	3.58	120.62	6.86	10.80	190.57	462.93	13.08	793.53	1155.11	1224.79	8.17	8.12
Maximum	103	80	26	242	41	22	250	620	18	966	1450	2100	9.63	10.07
Minimum	5	1	0.5	26	3	0.5	85	121	3	278	537	535	7.16	6.84
Standard Deviation	23.14	10.59	5.83	38.65	5.26	4.69	40.94	133.87	3.21	181.82	281.89	342.85	0.60	0.71

	Fe	Mn	NH3	NO3+NO2	F	Al	As	Ba	Cr	Cu	B	Cd	Hg	Mo
No. of Samples	57	57	57	22	54	58	57	57	57	57	56	57	56	46
Average	0.102	0.024	0.648	0.050	0.179	0.089	0.002	0.052	0.016	0.012	0.112	0.004	0.001	0.070
Maximum	1	0.09	26	0.05	0.88	0.7	0.007	0.15	0.025	0.2	0.7	0.02	0.00425	0.5
Minimum	0.005	0.005	0.02	0.05	0.01	0.025	0.0005	0.015	0.0025	0.005	0.005	0.0005	0.00005	0.05
Standard Deviation	0.186	0.022	3.558	0	0.169	0.105	0.002	0.032	0.009	0.028	0.162	0.003	0.001	0.083

	Ni	Pb	Se	Unat	V	Zn	Ra226	Ra226(e)
No. of Samples	57	57	57	55	57	56	50	38
Average	0.019	0.010	0.002	0.059	0.047	0.241	16.022	1.711
Maximum	0.07	0.13	0.025	2.16	0.2	3.19	128	9
Minimum	0.005	0.0005	0.0005	0.00015	0.0025	0.005	0.1	0.2
Standard Deviation	0.011	0.019	0.004	0.291	0.040	0.595	29.489	1.866

G and H SAND WELLS: BR-F, BR-H and BR-I

	Ca	Cl	CO3	HCO3	K	Mg	Na	SO4	Temp	TDS	Cond	Cond(f)	pH	pH(f)
No. of Samples	13	13	13	13	13	13	13	13	12	13	11	13	13	9
Average	40.5	8.2	10.1	157.0	5.7	7.2	101.6	187.5	11.6	427.8	691.3	726.2	8.5	8.6
Maximum	78	27	48	270	13	16	190	400	14.8	696	1080	1886	10.9	10.24
Minimum	8	3	0.5	13	2	0.5	8	9	7.9	225	400	380	7.1	7.06
Standard Deviation	23.37	7.27	16.15	81.01	3.32	5.22	67.15	159.89	1.89	214.14	296.48	446.48	1.24	1.08

	Fe	Mn	NH3	NO3+NO2	F	Al	As	Ba	Cr	Cu	B	Cd	Hg	Mo
No. of Samples	13	13	13	6	12	12	12	12	12	12	12	12	12	6
Average	0.57	0.06	0.11	0.05	0.26	0.49	0.003	0.06	0.02	0.01	0.28	0.003	0.0005	0.05
Maximum	2.16	0.22	0.66	0.05	0.4	1.6	0.007	0.25	0.025	0.01	1	0.005	0.0005	0.05
Minimum	0.015	0.005	0.025	0.05	0.1	0.05	0.0005	0.025	0.005	0.005	0.05	0.001	0.0001	0.05
Standard Deviation	0.77	0.07	0.17	0.00	0.10	0.54	0.002	0.06	0.01	0.003	0.31	0.001	0.0001	0

	Ni	Pb	Se	Unat	V	Zn	Ra226	Ra226(e)
No. of Samples	12	12	12	12	12	11	8	7
Average	0.02	0.03	0.003	0.004	0.03	0.02	0.44	0.29
Maximum	0.025	0.117	0.005	0.018	0.05	0.1	1.9	0.6
Minimum	0.02	0.0005	0.0005	0.00015	0.0025	0.005	0.1	0.2
Standard Deviation	0.003	0.04	0.002	0.01	0.02	0.03	0.67	0.16

TABLE D6-6. SUMMARY OF THE GROUND-WATER QUALITY, (cont.)

1 SAND WELL: URZN1-2

	Ca	Cl	CO3	HCO3	K	Mg	Na	SO4	Temp	TDS	Cond	Cond(f)	pH	pH(f)
No. of Samples	4	4	4	4	4	4	4	4	2	4	4	4	4	4
Average	3.75	5.00	15.75	233.75	2.25	0.50	99.50	1.50	15.20	232.00	411.50	416.00	8.63	8.94
Maximum	4	6	24	246	3	0.5	104	2	16.3	248	425	421	9.39	9.15
Minimum	3	4	12	209	2	0.5	92	1	14.1	204	393	409	7.07	8.78
Standard Deviation	0.50	0.82	5.56	16.82	0.50	0.00	5.26	0.58	1.56	20.33	13.38	5.03	1.05	0.17

	Fe	Mn	NH3	NO3+NO2	F	Al	As	Ba	Cr	Cu	B	Cd	Hg	Mo
No. of Samples	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Average	0.015	0.005	0.07	0.05	0.65	0.05	0.0005	0.05	0.025	0.005	0.05	0.0025	0.0005	0.05
Maximum	0.015	0.005	0.09	0.05	0.7	0.05	0.0005	0.05	0.025	0.005	0.05	0.0025	0.0005	0.05
Minimum	0.015	0.005	0.05	0.05	0.6	0.05	0.0005	0.05	0.025	0.005	0.05	0.0025	0.0005	0.05
Standard Deviation	0	0	0.02	0.00	0.06	0	0	0	0	0	0	0	0	0

	Ni	Pb	Se	Unat	V	Zn	Ra226	Ra226(e)
No. of Samples	4	4	4	4	4	4	4	4
Average	0.025	0.0005	0.0005	0.00015	0.05	0.005	0.1	0.2
Maximum	0.025	0.0005	0.0005	0.00015	0.05	0.005	0.1	0.2
Minimum	0.025	0.0005	0.0005	0.00015	0.05	0.005	0.1	0.2
Standard Deviation	0	0	0	0	0	0	0	0