REPORT

POTENTIAL IMPACTS TO THE DOLORES RIVER FROM THE PIÑON RIDGE PROJECT, MONTROSE COUNTY, COLORADO

Submitted to:
Energy Fuels Resources Corporation
44 Union Blvd., Suite 600
Lakewood, Colorado 80228

Submitted by:
Golder Associates Inc.
44 Union Blvd., Suite 300
Lakewood, Colorado 80228

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1.0 INTRODUCTION

This report summarizes and quantifies potential impacts of the Piñon Ridge Project (Project) on the Dolores River, which is located approximately seven miles northwest of the Project site. The Project consists of licensing, constructing, and operating a conventional acid-leach uranium and vanadium mill at the Project site, which is in the Paradox Valley, western Montrose County, Colorado. Figure 1 presents a map showing the location of the Project site. Water usage projections (CH2M Hill 2009) indicate that 141 gallons per minute (gpm) of non-potable water and 3 gpm of potable water will be needed to operate the mill at a processing rate of 500 tons of ore per day. The 141 gpm (0.31 cubic feet per second [cfs]) of non-potable water, to the extent possible, will be withdrawn from production wells located within the Project site and adjacent property. The potable water and remainder of non-potable water, if needed, will be purchased from the nearby town of Naturita. In addition to groundwater withdrawal from production wells, the Project will also retain and use direct precipitation from approximately 240 acres of the facility.

Impacts from the Project's groundwater withdrawal and precipitation retention on the Dolores River will be evaluated and quantified in this report to address concerns expressed by the Colorado Water Conservation Board (CWCB) and the Bureau of Land Management (BLM) in Statements of Opposition to Energy Fuels Resources Corporation's (EFRC's) Application for Underground Water Rights and Surface Water Rights (EFRC 2009). The water right application was filed on November 3, 2009 with the Colorado District Court, Water Division No. 4. The Dolores River receives groundwater and surface water flows from Paradox Valley; therefore, the concern of the CWCB is that the mill's operation will reduce the quantity of groundwater and surface water flows received by the river. The BLM is concerned that groundwater extraction could impact their wells, springs, and associated water rights within east Paradox Valley.

Section 2.0 provides relevant background information, Section 3.0 summarizes potential impacts from the retention of precipitation, and Section 4.0 summarizes potential impacts from groundwater withdrawal.

2.0 BACKGROUND

Energy Fuels Resources Corporation (EFRC) proposes to license, construct, and operate a conventional acid leach uranium and vanadium mill at the Piñon Ridge Project site. The Project site, shown on Figure 1, covers approximately 880 acres in eastern Paradox Valley, with site elevations ranging from 6,020 feet above mean sea level (amsl) on the lower flank of Davis Mesa to the south, to 5,417 feet amsl at the north end of the site, near the center of Paradox Valley. The valley is bisected into east and west sections by the Dolores River, which flows perpendicular to the valley axis. The Dolores River originates from the San Juan Mountains to the southeast and flows approximately 183 miles (Weir et al. 1983) west and north before joining the Colorado River near the town of Cisco, Utah. The drainage area upstream of Cisco is approximately 4,580 square miles (Colorado's Decision Support Systems 2005).

Paradox Valley gets its name from the fact that the Dolores River runs perpendicular to the valley axis rather than parallel with the valley, as is the case with river valleys. This is because the Paradox Valley was created by the collapse of a salt anticline rather than fluvial processes. The central portion of the valley floor consists of the salt-bearing Paradox member of the Hermosa Formation, both as outcrops and as subcrops beneath the alluvium. The Dolores River is relatively fresh as it enters Paradox Valley and saline as it leaves, especially during periods of low flow. The change in salinity is due to the dissolution of halite and other evaporite minerals from the Paradox member by groundwater flowing into the river. In 1996, the U.S. Bureau of Reclamation began operation of the Paradox Valley Unit (PVU) to decrease flow of brine to the river. Details of the PVU are presented in Section 2.1. Information regarding the hydrogeologic setting of the Project site and eastern Paradox Valley is presented in Section 2.2.

2.1 Paradox Valley Unit Salinity Project

As part of the Colorado River Basin Salinity Control Program, the U.S. Bureau of Reclamation began operating the PVU in July 1996 to decrease flow of brine to the Dolores River. Prior to operation of the PVU, data from two gauging stations, one upstream and one downstream of the valley, indicated that the average dissolved-solids load from brine inflow was approximately 313 tons per day (Chafin 2003). Studies have shown that natural brine inflow rates range from 0.2 to 2.1 cubic feet per second (cfs) (90 to 942 gallons per minute [gpm]) across the valley (Bureau of Reclamation 2010). The PVU consists of ten extraction wells (nine currently operate), a pipeline connecting the wells to a holding/pumping facility, and a deep injection well with injection zones at depths of 14,068 and 15,857 feet below ground surface (Chafin 2003). The location of the ten PVU extraction wells installed along the east side of the river are shown on Figure 1. These wells range in depth from 54 to 106 feet. At the PVU, approximately 100 or more feet of alluvial deposits are present, overlying several hundred feet of caprock (gypsum and anhydrite), which overlie as much as 14,000 feet of salt, primarily halite (Nicholas 2008). Originally, brine with a total dissolved solids (TDS) concentration of approximately 256,000 milligrams per liter (mg/L) was withdrawn at a rate of 0.67 cfs (300 gpm). However, the brine injection program has contributed to the occurrence of micro-earthquakes in the region, which prompted the flow rate being reduced to approximately 0.51 cfs (230 gpm) (Franson Civil Engineers 2008a), or approximately 371 acre-feet per year. Data through 2001 show that the PVU has reduced the valley's salt load contribution to the Dolores River by approximately 90 percent, from 313 tons per day to 29 tons per day; however, this decrease may be partially due to relatively dry conditions during the last few years of the assessment (Chafin 2003).

The PVU has recently evaluated additional methods to further reduce salt loading to the Dolores River (Franson Civil Engineers 2008a, 2008b). The majority of the methods would reduce salt loading by limiting flow and infiltration in the valley. The evaluated methods include:

- Increasing consumptive use of fresh water by pumping and planting deep-rooted phreatophytes such as salt cedar to consume additional water;
- Adding additional deep injection wells;
- Lining West Paradox Creek wetlands to prevent infiltration;
- Installing a diversion tunnel to physically separate brine inflow from the passing flow of the Dolores River;
- Diverting West Paradox Creek; and
- Agricultural Land Management, which would include evaluating and potentially reducing the component of recharge to the saline aquifer from irrigated agricultural land.

2.2 Hydrogeologic Setting of the Project Site and East Paradox Valley

Based on drilling conducted for the Project, four formations were identified which are important from a hydrogeologic perspective. These formations are:

- Alluvium – uppermost sediments, which contain a very limited volume of groundwater and transmit some fraction of meteoric water to underlying formations;
- Chinle Formation – strata which contains groundwater in its lower part;
- Moenkopi Formation – strata which underlies the Chinle Formation and also may contain groundwater in some locations; and
- Hermosa Formation – formation of primarily salt, which truncates the Chinle and Moenkopi Formations near the center line of the valley, thereby terminating the local aquifer; it also acts as a barrier to downward flow of groundwater.

Identified groundwater occurrences within the site and vicinity (where vicinity is defined as the surface drainage area shown in Figure 1) are close to the contact between the Chinle and Moenkopi Formations, and close to the contact between the Moenkopi and Hermosa Formations. Groundwater in the Chinle and Moenkopi Formations is present from Davis Mesa on the southwest side of the Site, to the approximate location of the proposed Tailings Cells, as shown in Figure 2. At locations farther north, the Chinle and Moenkopi Formations are truncated by the uplift of the salt anticline of the Hermosa Formation.

Groundwater was not encountered at the contact between the alluvium and the underlying geologic formations in any of the borings drilled on-site (Golder 2008a; Golder 2009a). Although a number of wells have historically been completed in the alluvium in the central portion of east Paradox Valley, none are currently in use. Where water was encountered in the alluvium, it was found to be of limited volume and poor quality (i.e., brackish). Analysis of a water sample collected in 1980 from one of the now abandoned alluvial wells (i.e., Prospector Well) located about two miles northwest of the Project site showed that the water had a conductivity of 3,350 microSiemens per centimeter and a dissolved sulfate concentration of 2,300 mg/L. By comparison, the drinking water standard for sulfate is 250 mg/L (Colorado Department of Public Health and Environment 2009). Although the alluvial groundwater system appears to be too small and of poor water quality to support consumptive uses, it does exist to a limited extent beneath the major surface drainages and East Paradox Creek, which is an ephemeral creek that drains east Paradox Valley (see Figure 1).

2.2.1 Groundwater Flow Paths

Groundwater flow in the Chinle-Moenkopi aquifer is influenced by the following factors:

- Proximity to Davis Mesa, which acts as a recharge area for the aquifer;
- Northwest-trending faults that may affect groundwater flow; and
- Uplifted sediment and evaporites of the Hermosa Formation, which act as a barrier to flow of groundwater.

Based on the above factors, groundwater in the Chinle-Moenkopi aquifer near the Project site generally flows away from the mesa in a northeast direction. Regionally, groundwater flows to the northwest, discharging to the Dolores River (Weir et al. 1983). This groundwater flow direction towards the Dolores River is supported by water level data collected as part of the Project site's hydrogeologic characterization. Depths to groundwater in the Chinle-Moekopi aquifer near the Project site range from approximately 250 to 410 feet below ground surface. Additional information on water level data is provided in the Hydrogeologic Report (Golder 2009a).

As groundwater in the Chinle-Moenkopi aquifer flows northwest from the Project site toward the Dolores River, it likely flows into the alluvium prior to discharging to the Dolores River. Figure 3 presents a map of the surface geology of East Paradox Valley and Figure 4 presents a typical geologic cross section of the valley. As shown on Figure 3, the Chinle and Moenkopi Formations are not continuous at the surface on the southwest side of the valley. Therefore, these formations alone are unlikely to provide a continuous flow path from the Project site to the Dolores River, and groundwater likely flows into the alluvium at locations near the river.

As shown on Figures 3 and 4, alluvium is present as a continuous veneer within East Paradox Valley, except in the center of the valley where the Hermosa Formation outcrops. However, lack of saturation in the alluvium of East Paradox Valley, as documented at the Project site, suggests that alluvium is not a continuous pathway for groundwater flow between the Project site and Dolores River.

2.2.2 Groundwater Velocity

To estimate the travel time for groundwater from the Project site to reach the Dolores River, the following estimates and assumptions were made:

- A hydraulic conductivity of 3 x 10^{-3} cm/s is representative of the formations in which groundwater flow occurs, based on the average estimated value from pumping tests (Golder 2009a);
- A porosity of 30%, based on a representative value for poorly consolidated sandstone (Driscoll 1986);
- A hydraulic gradient for groundwater flow in the northwest direction is approximately 0.01, based on water level elevations from exploratory boreholes advanced for the Project (Golder 2009a). Similarly, the hydraulic gradient could be estimated based on ground surface elevations, assuming that the water table mimics the surface topography. Assuming this, the hydraulic gradient is 0.015, based on an elevation of 5,482 feet in the center of the Project site and an elevation of 4,964 feet near the Dolores River at the center of Section 21, Township 47 North, Range 18 West, and located 6.5 miles northwest of the Project site; and
- The distance of the groundwater flow path from the Project site to the Dolores River is approximately 7 miles.

Based on these assumptions, the average linear velocity is approximately 100 feet per year and groundwater from the Project site will take over 300 years to reach the Dolores River. This estimate assumes porous-type flow to the river. Groundwater flow could be faster in some areas due to localized fracture-type flow. Additionally, this estimate does not account for a different flow rate that may occur in the alluvium near the Dolores River; however, the distance of groundwater flow in the alluvium is likely a small portion of the entire flow path from the Project site to the Dolores River.

2.2.3 Groundwater Quality

Groundwater within the on-site Chinle-Moenkopi aquifer has a total dissolved solids (TDS) concentration ranging from 590 to 1,030 mg/L. As the groundwater flows farther from the recharge area of the Davis Mesa, the groundwater comes in contact with evaporites of the Hermosa Formation and the TDS concentration increases from dissolution of evaporites. At the two groundwater sampling locations where the groundwater is affected by contact with the Hermosa Formation (monitoring wells MW-6 and MW-8B), TDS concentrations range from 1,140 to 3,040 mg/L. Figure 5 shows the TDS concentrations compared to the distance of the groundwater sampling location from Davis Mesa.

As groundwater flows toward the Dolores River, it is reasonable to assume that TDS would continue to increase from contact with the Hermosa Formation, especially given the long estimated travel times for the groundwater to reach the Dolores River (over 300 years). Therefore, water from the on-site Chinle-Moenkopi aquifer would ultimately contribute to salt loading of the Dolores River as the river crosses Paradox Valley. A reduction in groundwater flow toward the Dolores River would therefore produce a reduction in salt loading to the river. Reducing salt loading to the Dolores River is the goal of the PVU, as described in Section 2.1. Accordingly, it is fair to assume that some groundwater and surface water that ultimately flows from the Project site toward the Dolores River would be intercepted and captured by the PVU.

3.0 POTENTIAL IMPACTS FROM RETENTION OF PRECIPITATION

The processing and waste disposal areas of the mill site have been designed to be Zero-Discharge Facilities so that process solutions containing elevated levels of metals and radioactivity are isolated from the surrounding environment. These Zero-Discharge Facilities will also capture, transport, retain, use and recycle precipitation falling on portions of the Project site. Currently, the facilities will include the following:

- East and west stormwater ponds;
- Tailings cells (initial construction of Cell A, with expansion to Cells B and C);
- Evaporation ponds (initial construction of half of the pond network, with later expansion);
- Mill site; and
- Ore stockpile pads.

The locations of the proposed Zero-Discharge Facilities are shown on Figures 1 and 2. EFRC applied for water rights for retention of precipitation in these areas, totaling capture of 428 acre-feet per year. This volume was based on the maximum recorded annual rainfall in the vicinity of the Project site (21.4 inches) and a zero-discharge area of 240 acres. Based on the average annual precipitation of 12.6 inches, the Project would capture and use an average of 252 acre-feet per year of precipitation at ultimate build-out of the facility. As described in the application for water rights (EFRC 2009), EFRC may capture rainwater and place it into stormwater ponds, evaporation ponds, or other temporary storage structures to allow it to evaporate so that it will not run off from the Zero-Discharge Facilities, or otherwise be discharged back to the local surface drainage system. The rainwater will also be used in connection with the construction, operation, maintenance, and reclamation of the facility. These industrial uses include mineral processing, dust suppression, truck and equipment washing, fire protection, and general maintenance.

A water balance evaluation was performed to estimate the volumes of precipitation retained within the various mill facilities. This water balance is provided in Appendix C and summarized in Section 3.1 below. Section 3.2 presents an updated water balance for Tailings Cell A (also refer to Appendix B), with the primary purpose of estimating available excess water for use in the mill. Potential impacts from retention of precipitation (up to approximately 252 acre-feet) may consist of the following:

- Reducing groundwater recharge; and
- Reducing runoff to surface water.

Evaluations of these potential impacts are discussed in Sections 3.3 and 3.4, respectively.

3.1 Retained Precipitation Water Balance

EFRC developed a water balance to estimate the volumes of water contributing to the Zero-Discharge Facilities via precipitation, and of that volume, what volumes would infiltrate the ground, be used in the process, or would evaporate. The retained precipitation water balance is provided in Appendix C.

The mill facility was divided into three major categories, which included building roofs, secondary containment, and ground, where ground included lined stormwater ponds, ore pads (concrete and gravel-surfaced), and bare ground. Run-off from building roofs will be collected in gutters and transferred to the process water tank to maximize use, minimize evaporation, and prevent infiltration. Secondary containment areas will be pumped to the process water tank after major precipitation or snow melt events. Precipitation falling on the remaining mill areas will run-off to the stormwater ponds and either evaporate or be used at the truck wash or for dust suppression.

Precipitation falling over lined tailings cell areas will be used for dust suppression within the tailings cell or pumped back to the mill for use in the tailings disposal circuit. All precipitation falling over the lined evaporation ponds will evaporate.

Based on the assumptions presented in the retained precipitation water balance (refer to Appendix C), 24 percent of the precipitation within the zero-discharge areas is expected to infiltrate into the surface soil, 35 percent is used for processing and dust suppression, and 41 percent evaporates.

3.2 Tailings Cell Water Balance

Golder performed an update to the Tailings Cell water balance to reflect revised conditions for the facility, largely as a result of operating changes made to comply with current regulations. For instance, the water balance was updated to include maintaining a wet beach (assumed as 100 percent of the Tailings Cell area) to limit dust from the facility (Two Lines 2009), but also incorporated the use of bird balls (assumed 50 percent coverage of the Tailings Cell) to deter waterfowl from coming into contact with the tailings supernatant. The revised Tailings Cell water balance is included in Appendix B.

Flow components (i.e., inflows and outflows) considered in the water balance:

- Amount of water entering the Tailings Cell from the mill via the tailings slurry (252 gpm);
- Volume of water entering the system through meteoric precipitation;
- Amount of water released to the atmosphere through evaporation;
- Volume of water retained in the tailings voids;
- Volume of water returning to the mill from the Tailings Cell (i.e., recycle volume) (187 gpm); and
- Excess water (make-up) available to be pumped from the Tailings Cell.

In the model, precipitation was treated as a stochastic input (i.e., probabilistic) as it is likely to exhibit the largest variations, while other parameters were treated as deterministic variables.

As demonstrated by the water balance results presented in Appendix B, the volume of excess water available as make-up water (in excess of the design return flow volume to the mill) is essentially negligible after approximately 4 years of operating Tailings Cell A, though the cell has an estimated life of approximately 14 years at 500 tons per day of ore production. This demonstrates that the facility is recycling and reusing as much of the available water in the process cycle as possible. Figure B-2 in Appendix B illustrates the flow rates proposed for the mill, showing an approximate balance between the flow rate of tailings and water to the tailings cell (i.e., 252 gpm), the water retained in the tailings, and the water being returned to the plant for process (i.e., 187 gpm). Approximately 59% of the water used in the process is recycled back to the plant (refer to Figure B-2 in Appendix B).

The site is located in an arid environment, with the annual evaporation (i.e., 38 inches) significantly exceeding the annual precipitation (i.e., 12.6 inches). As a result, evaporation is an effective method for disposal of any excess solutions, and hence used to dispose of excess waste water or "raffinate" from processing.

3.3 Potential Reduction of Groundwater Recharge

In the Project area, recharge to the Chinle/Moenkopi aquifer locally occurs through two means: as diffuse infiltration of rain and snowmelt over the valley area overlying the aquifer and as localized infiltration from runoff on the slopes of Davis Mesa. As shown in Figure 2, a portion of the Zero-Discharge facilities are in the valley area overlying the aquifer. These areas include Tailings Cell A, the Mill Facility, and the Ore Pads. The remaining Zero-Discharge facilities (Tailings Cells B and C and the Evaporation Ponds) are located in the valley area where the Chinle/Moenkopi aquifer does not exist. As described in Section 2.2, the Hermosa Formation truncates the Chinle and Moenkopi Formations near the centerline of the valley, thereby terminating the local aquifer. Because Tailings Cells B and C and the Evaporation Ponds do not overlie the Chinle/Moenkopi aquifer, retention of precipitation falling on these areas will not impact recharge to the Chinle/Moenkopi aquifer, but will impact recharge to the limited alluvial system.

To quantify the reduction in groundwater recharge for Zero-Discharge facilities overlying the Chinle/Moenkopi aquifer and alluvial groundwater system, it is estimated that approximately 5% of the precipitation will recharge the aquifer, with the remaining 95% consumed by evapotranspiration processes. This rate of recharge is representative of recharge to the upper aquifers of the Paradox Basin (Weir et al. 1983) and was also used in the Water Supply Evaluation for the Piñon Ridge Project (Golder 2008b). The 5% recharge rate assumed for this study is similar to recharge rates used for other studies in the region. For example, a study of the Blanding-Durango area, Southern Paradox Basin, assumes a 2% recharge rate (Whitfield et al. 1983) and a study of the four corners area of Utah, Colorado, Arizona, and New Mexico assumes a 1 to 3% recharge rate for plateau areas and 5 to 15% for mountain areas

(Thomas 1989). Estimating an average annual precipitation of 12.6 inches for the valley area and approximately 65 acres of Zero-Discharge Facilities overlying the Chinle/Moenkopi aquifer, the annual amount of recharge reduction from retention of precipitation is approximately 3.4 acre-feet. Similarly, for the approximately 175 acres of Zero-Discharge Facilities overlying the alluvium/Hermosa Formation, the reduction in recharge is approximately 9.2 acre-feet. The total reduction for both areas of 12.6 acre-feet is equivalent to 0.017 cfs, if the recharge were distributed evenly throughout the year. For comparison, the average flow rate in the Dolores River within Paradox Valley is approximately 269 cfs (USGS 2010).

3.4 Potential Reduction of Runoff to Surface Water

Within the Project site, five distinct drainage basins (Basins 1 to 5) are present. Runoff in the drainages flows north, as both sheet-flow and as flow in discontinuous arroyos, as shown on Figure 1. Runoff flows north towards East Paradox Creek, an ephemeral stream (see Figure 6). The East Paradox Creek bed trends northwest down the valley to the Dolores River. No perennial streams are present within East Paradox Valley. Runoff upgradient (south) of the mill facilities will be diverted around the facilities. Therefore, the only potential reduction in surface runoff will be from the retention of direct precipitation at the Zero-Discharge Facilities.

A surface water monitoring program has been in place at the Project site since February 2008 and includes sampling at four locations, as shown on Figure 6. These locations monitor the drainages with the largest predicted peak discharges based on the Baseline Hydrology Modeling Report (Kleinfelder 2009). In the two-year period from February 2008 to March 2010, 14 surface water events generated sufficient runoff (either precipitation or snowmelt driven) to collect a sample from at least one of the samplers (Golder 2009b). Of the four samplers onsite (S-1 through S-4), S-1, S-2 and S-3 monitor discharges exiting the site, while S-4 monitors surface water runoff entering the site from the south. Additionally, it should be noted that while some runoff collected at Sampler S-2 during snowmelt events, no runoff collected at Sampler S-2 during documented rainfall events, such as the 1.2-inch recorded precipitation event on May 27, 2009. Table 1 provides a summary of precipitation and snowmelt events that have been large enough to provide runoff for sample collection. Additional details of the results of the surface water monitoring program are contained in the 2008-2009 Surface Water Monitoring Summary Report (Golder 2009b).

Based on available topographic information and verified by field investigation, runoff downstream of Samplers S-1 and S-2 is collected by two separate impoundments (i.e., clay-lined stock ponds), as shown on Figure 6. Runoff downstream of S-1 exits the northwest corner of the site and collects in an existing impoundment approximately 0.8-mile downstream on private property designated as grazing land (Edge 2009). Runoff downstream of the S-2 sampler exits the northeast corner of the property, crosses SH 90 approximately 200 feet northeast of the sampler, and collects in an impoundment on Bureau of Land Management (BLM) property just downstream of SH 90. A photo of the BLM impoundment after a large snowmelt event is provided as Figure 7.

Of the five delineated basins, the runoff passing samplers S-1 and S-2 represent Basins 1 and 4, respectively. From a site-wide perspective, runoff from Basins 1, 2 and 4 (1,356 of 1,566 acres or 87% of the total basin area) will report to either the BLM impoundment or the private impoundment, while runoff from Basins 3 and 5 (210 of 1,566 acres or 13% of the total basin area) will report to East Paradox Creek. Therefore, the only source of runoff from the site with the potential to reach Dolores River via East Paradox Creek is from Basins 3 and 5.

Drainage across the site has previously been characterized as having discontinuous ephemeral streams or arroyos that discharge into areas of unconsolidated sheet-flow (Kleinfelder 2008). Figure 1 highlights this discontinuity, with additional diagrams provided in Appendix A1. This observed trend of rainfall producing minimal runoff and flows dissipating and disappearing downstream can be explained by the high infiltration rates of the native soils. Natural Resources Conservation Service (NRCS) soil survey information for the site indicates that except for two small areas in the southwest and southeast corners of the site, the majority of the site soils have moderately high to high saturated hydraulic conductivities, ranging from 0.6 to 6.0 inches/hour (see Appendix A2), (Edge 2009). Soil types and characteristics were verified through the excavation of 11 test pits on site (see Appendix A3). Due to the relatively short length of the surface water monitoring program and the lack of high precipitation events during this period, the statement cannot be made that no runoff will exit the site. However, it is anticipated that significant runoff from this site only occurs during early spring snowmelt and infrequent, high depth precipitation events.

The Zero-Discharge areas will remove 240 acres from the total drainage of 1,566 acres contributing to runoff exiting the site. For higher precipitation, lower frequency design storms such as the 100-year event (precipitation depth of 3.0 inches), the runoff volume that would be generated under pre-development conditions is 61.3 ac-ft, based on the 1,566-acre drainage area. The runoff that would be generated after construction of the Zero-Discharge Facilities is 60.8 ac-ft, based on a 1,326-acre drainage area. Although the acreage removed is approximately 15% of the total area, the reduction in generated runoff is 0.8% because mill construction will include low-permeable and non-permeable features with high runoff coefficients such as the administration building, parking lots, and the access road. Additional documentation regarding this determination is provided in Appendix A4.

Construction of the Zero Discharge Facilities will also result in a portion of the current drainage area within Basin 4 being diverted into Basin 5. This will actually increase surface water runoff into East Paradox Creek during operations and more than negate the removal from planned Zero Discharge Facilities from the watershed. Table 2 provides a comparison of the current basin drainage areas and the net change to these areas during operations due to incorporation of the Zero-Discharge Facilities. As a result of the diversion of a portion of the Basin 4 area to Basin 5, the total surface area contributing runoff to East Paradox Creek actually increases by 60% during operating conditions (see Table 2).

In summary, it is expected that development of the site will not result in surface water reductions to the Dolores River. Under current conditions, 13% of the total basin area (Basins 3 and 5) reports to East Paradox Creek, and subsequently the Dolores River. Due to incorporation of the Zero-Discharge Facilities and basin diversions around these facilities during operations, the area reporting to East Paradox Creek increases to 21% of the total basin area. Due to the high infiltrative soils in the area, runoff generated by the site rarely exits the site during ordinary rainfall events. When runoff does exit the site, surface flows do not travel far off site before infiltrating. Significant runoff is expected to exit the site only during early spring snowmelt and low frequency, high precipitation storms such as the 100-year event.

4.0 POTENTIAL IMPACTS FROM GROUNDWATER WITHDRAWAL

EFRC has applied for Underground Water Rights for the production wellfield, with a maximum combined pumping rate of 175 gpm (282 acre-feet per year) from five or more production wells. Presently, three production wells have been installed in the Chinle/Moenkopi aquifer: PW-1, PW-2, and PW-3. Water usage projections (CH2M Hill 2009) indicate that an average of 141 gpm (227 acre-feet per year) of non-potable water will be needed to operate the mill at a processing rate of 500 tons of ore per day. This includes 130 gpm for mill processing and 11 gpm for non-processing uses such as dust suppression. Consumption rates are expected to be higher during the summer months when dust suppression usage is greater. In the event that the wellfield cannot provide the total volume of water needed for milling, an agreement has been reached with the town of Naturita to purchase untreated water from the town.

As discussed in Section 3.2 (and presented in Figure B-2 in Appendix B), the flow rates proposed for the mill show an approximate balance between the flow rate of tailings and water to the tailings cell (i.e., 252 gpm), the water retained in the tailings, and the water being returned to the plant for process (i.e., 187 gpm). Of the 317 gpm required for processing ore, only 40% (i.e., 130 gpm) is provided as non-potable make-up water. Over 70% of the waste water (or raffinate) produced in the process is recycled back to the plant. Excess raffinate that cannot be recycled is disposed of in the evaporation ponds.

The withdrawal and use of 141 gpm could potentially reduce the amount of groundwater seepage received by the Dolores River. To quantify the impact, the following items were evaluated:

- Calculation of potential depletion of the Dolores River compared to Dolores River flow; and
- Evaluation of the water quality of the groundwater being depleted.

These items are discussed in Sections 4.1 and 4.2.

4.1 Comparison of Groundwater Depletion Rates to Dolores River Flow

As discussed previously, the Project will withdraw approximately 0.31 cfs (141 gpm) of groundwater to operate the mill and for additional uses such as dust suppression, fire protection, truck washing, and general maintenance. Figure 8 presents a log-scale graph of how this rate of groundwater withdrawal compares to both the flow of the Dolores River and the rate of groundwater withdrawal from the PVU. Use of the log-scale allows for comparison of very large flows in the Dolores River to the much smaller withdrawal rates.

The average flow of the Dolores River from October 1984 to September 2009 is approximately 269 cfs (120,725 gpm) at the gauging station upstream from the valley, and 277 cfs (124,155 gpm) at the gauging station downstream of the valley (USGS 2010). Assuming that all 0.31 cfs (141 gpm) of the groundwater withdrawn for the Project would discharge to the River, the Dolores River would have a 0.1% reduction in flow at Paradox Valley. However, this is a conservative estimate because, in reality, not all of the groundwater withdrawn would ultimately discharge to the Dolores River. A study of the entire Dolores River basin estimated that groundwater outflows from the upper groundwater system consist of approximately 30% evapotranspiration, 2% springflow, 68% discharge to the Dolores River, 1% to wells, and negligible subsurface outflow. Inflows to the upper groundwater system consist mostly of recharge from precipitation and runoff, with no recharge from the Dolores River, and an unknown, likely minor, contribution from subsurface inflow (Weir et al. 1983). Assuming that 68% of groundwater outflow is discharged to the Dolores River, groundwater withdrawal of 0.31 cfs (141 gpm) will cause a 0.21 cfs (96 gpm) or 155 acre-feet per year reduction in groundwater discharge to the Dolores River. Hence, the total flow in the Dolores River would be reduced by only 0.08%, a hardly measurable amount. Additionally, the estimated reduction in groundwater discharge does not account for the PVU (see Section 2.1), which would likely consume a portion of the water that would naturally flow into the river. Accounting for the PVU, the reduction in groundwater discharge to the river would likely be less than the 0.21 cfs (96 gpm) rate calculated above.

4.2 Water Quality of Groundwater Discharge and the Dolores River

In Section 4.1, the reduction of groundwater discharge to the Dolores River was estimated at 0.21 cfs (96 gpm). Given that groundwater from the site has a TDS concentration of 3,040 mg/L at the farthest downgradient sampling location, as documented at monitoring well MW-8 (Golder 2009a), a 0.21 cfs (96 gpm) reduction in groundwater discharge would provide an estimated annual reduction in salt loading of 640 tons per year. This amount is less than 0.4% of the 147,000 tons per year (403 tons per day) of salt estimated to reach the Dolores River and PVU production wells combined between 2000 and 2006 (Franson Civil Engineers 2008b). Actual reduction in salt loading to the Dolores River from the Project's operation may exceed the calculated amount above, assuming that as groundwater flows towards the Dolores River, TDS concentrations continue to increase from contact with the Hermosa Formations. The Project would therefore provide an incidental benefit to the water quality of the Dolores River.

5.0 SUMMARY

This report summarizes and quantifies the impacts from the Project's retention of approximately 252 acre-feet per year of precipitation in Zero-Discharge areas and use of groundwater at a rate of approximately 141 gpm (0.31 cfs). The retention of precipitation is estimated to reduce recharge to groundwater by approximately 3 acre-feet per year, assuming that 5% of the precipitation in areas overlying the aquifer would provide recharge. If the areas overlying the alluvium and the Hermosa Formation are included, the estimated reduction increases to 12.6 acre-feet per year. Retention of precipitation is expected to cause no reduction in surface runoff to East Paradox Creek. Under both current and operational conditions, runoff from three of the main drainages (Basins 1, 2, and 4) flows to impoundments before reaching East Paradox Creek. Under current conditions, the two remaining basins (Basins 3 and 5) comprise 13% of the total basin area, with runoff reporting to East Paradox Creek and subsequently the Dolores River. Due to incorporation of the Zero-Discharge Facilities and basin diversions around these facilities during operations, the area reporting to East Paradox Creek (Basins 3 and 5) increases to 21% of the total basin area. Therefore, the project will not reduce runoff to East Paradox Creek and the Dolores River.

The Project's pumping and use of groundwater at an approximate average rate of 141 gpm (0.31 cfs) is estimated to reduce the groundwater discharge to the Dolores River by approximately 96 gpm (0.21 cfs). This rate is a small fraction (below 0.1%) of the Dolores River flow at gauging stations before and after the river crosses Paradox Valley. Given that groundwater from the site has a TDS concentration of 3,040 mg/L at the farthest downgradient location, the Project's removal of groundwater would provide an incidental benefit to water quality of the Dolores River, with a reduction in salt loading of approximately 640 tons per year. However, any depletion of groundwater inflow or benefit to water quality from the Project's operation will be delayed, given an estimated travel time of over 300 years for groundwater from the Project site to reach the Dolores River.

GOLDER ASSOCIATES INC.

Sarah Doyle
Project Environmental Scientist

Roman Popielak
Practice Leader/Hydrogeologist

Kimberly Finke Morrison, P.E., R.G.
Associate – Senior Project Manager

6.0 REFERENCES

Bureau of Reclamation, website < http://www.usbr.gov/projects/Project.jsp?proj_Name=CRBSCP+-+Paradox+Valley+Unit+-+Title+II > accessed February 24, 2010

Cater, F.W., Jr., 1954, Geology of the Bull Canyon Quadrangle, Colorado: U.S. Geological Survey, Geologic Quadrangle Map GQ-33.

Cater, F.W., Jr., 1955, Geology of the Davis Mesa Quadrangle, Colorado: U.S. Geological Survey, Geologic Quadrangle Map GQ-71.

Chafin, D.T., 2003, Effect of the Paradox Valley Unit on the Dissolved-Solids Load of the Dolores River near Bedrock, Colorado, 1988-2001. U.S. Geological Survey WRIR 02-4275, January 2003.

CH2M Hill Engineers, Inc. (CH2M Hill), 2009, Basic Engineering Report and Cost Estimates, Piñon Ridge Project, Naturita, Colorado. February 4, 2009.

Colorado's Decision Support Systems, Colorado Water Conservation Board, San Juan and Dolores River Basin Information, November 2005.

Colorado Department of Public Health and Environment (CDPHE), 2009, Water Quality Control Commission, 5 CCR 1002-41, Regulation 41, *The Basic Standards for Ground Water*, Amended October 13, 2009, Effective November 30, 2009.

Driscoll, F.G., 1986, Groundwater and Wells, St. Paul, Minnesota, Johnson Division, second edition.

Edge Environmental, Inc. (EDGE), 2009. Piñon Ridge Project Environmental Report. November 2009.

Energy Fuels Resources Corporation (EFRC), 2009, Application for Underground Water Rights and Surface Water Rights, District County, Water Division No. 4, State of Colorado, October 21, 2009.

Franson Civil Engineers, 2008a, Draft Phase I Technical Memorandum, Identification of Potential Methods for Paradox Valley Salinity Control Unit, February 2008.

Franson Civil Engineers, 2008b, Phase 2 Technical Memorandum, Evaluation of Salinity Control Alternatives Technical Merit for Paradox Valley Salinity Control Unit, April 2008.

Golder Associates Inc. (Golder), 2008a, Phase 2 Geotechnical Field and Laboratory Test Program, Piñon Ridge Project, Montrose County, Colorado, Submitted to Energy Fuels Resources Corporation. September 2008.

Golder Associates Inc. (Golder), 2008b, Water Supply Evaluation, Piñon Ridge Project, Montrose County, Colorado, Submitted to Energy Fuels Resources Corporation. November 2008.

Golder Associates Inc. (Golder), 2009a, Hydrogeologic Report, Piñon Ridge Project, Montrose County, Colorado, Submitted to Energy Fuels Resources Corporation. July 2009.

Golder Associates Inc. (Golder), 2009b, Surface Water Monitoring Summary Report, Piñon Ridge Project, Montrose County, Colorado, Submitted to Energy Fuels Resources Corporation. October 2009.

Kleinfelder, 2008, Preliminary Delineation of Jurisdictional Waters of the United States, Energy Fuels Resource Corporation, Piñon Ridge Uranium Mill Licensing Support, Kleinfelder Project No. 83088, Rev. 1, June 4, 2008.

Kleinfelder, 2009, Baseline Hydrology Modeling Report, of the Environmental Report in Support of the Application for Source Material Milling, Piñon Ridge Uranium Mill, Montrose County, Colorado, Rev. 0, March 27, 2009.

Konikow, L.F. and M.S. Bedinger, 1978, Evaluation of Hydrgeologic Aspects of Proposed Salinity Control Program in Paradox Valley, Colorado, U.S. Geological Survey, Open File Report 78-27.

Nicholas, A., 2008, Pre-Proposal: Hydrogeologic characterization of the Paradox Valley and evaluation of alternative salinity control processes for the Paradox Valley Unit, Montrose County, Colorado 2009-2010, U.S. Geological Survey, Central Region, Colorado Water Science Center, October 24, 2008.

Thomas, B.E., 1989, Simulation Analysis of the Ground-water System in Mesozoic Rocks in the Four Corners Area, Utah, Colorado, Arizona, and New Mexico, U.S. Geological Survey, Water-Resources Report 88-4086.

Two Lines, Inc., 2009, Estimates of Radiation Doses to Members of the Public from the Piñon Ridge Mill, Prepared for Energy Fuels Resources Corporation, November 2009.

USGS gauging stations numbers 09169500 and 09171100, data downloaded from website on February 22, 2010.

Weir, J. E., Maxfield, E.B., and E.A. Zimmerman, 1983, Regional Hydrology of the Dolores River Basin, Eastern Paradox Basin, Colorado and Utah, U.S. Geological Survey, Water-Resources Investigations Report 83-4217.

Whitfield, M.S., Thordarson, W., Oatfield, W.J., Zimmerman, E.A., and B.F. Rueger, 1983, Regional Hydrology of the Blanding-Durango Area, Southern Paradox Basin, Utah and Colorado, U.S. Geological Survey, Water-Resources Investigations Report 83-4218.

Withington, C.F., 1955, Geology of the Paradox quadrangle, Colorado: U.S. Geological Survey, Geologic Quadrangle Map GQ-72.