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October 24, 2019

Mr. Larry Sandoval
Field Manager
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Bureau of Land Management
Interior Region 7
By email only: lsandoval@blm.gov

RE: Comments and concerns re. RMR proposed hydrologic baseline study and drilling program

Dear Mr. Sandoval:

This letter presents a summary of our comments on the Rocky Mountain Resources (RMR) planned hydrologic baseline study and drilling program related to its quarry expansion project located north of Glenwood Springs, Colorado, and our concerns regarding potential impacts to the geothermal aquifer resulting from the baseline study and drilling program and the effectiveness of the study to accomplish its objective. BBA Water Consultants, Inc. and West Sage Water Consultants have prepared this letter on behalf of the Glenwood Hot Springs Lodge and Pool (Glenwood Hot Springs), the Iron Mountain Hot Springs and the Glenwood Caverns Adventure Park. However, our concerns are not limited to these facilities and entities. We believe our comments incorporate the most comprehensive background on the hydrogeology of the area in that BBA has been studying and advising private and governmental entities in the Glenwood Springs area for many decades.

The proposed quarry operation is an extensive expansion of an existing quarry. The quarry will be a surface pit excavation and based on information provided by BLM in RMR's proposed Plan of Operations, they request to expand the BLM permit boundary for the quarry from 15.7 acres to 447 acres. The quarry will mine limestone, dolomite and other materials. The source of the mined product is the Leadville Limestone, the same geologic formation which sources and recharges both the hot springs aquifer that the nearby hot springs amenities rely upon and the same formation containing the cave attractions. The proposed baseline study and drilling program is reportedly intended to characterize the hydrogeology of the ground water system at the location of the proposed quarry operation and to determine the potential for impacts to the local aquifer system potentially resulting from the quarry expansion. It appears that the boreholes will also function as

exploratory holes for mining purposes based on the proposed coring program. The results of the exploratory mineralogical information will be proprietary.
As summarized below, we are concerned that:

1. To the extent the boreholes penetrate ground water flow paths, there is a high likelihood that the boreholes will intercept and redirect that ground water to a flow path that did not previously exist. This change in ground water flow may disrupt the recharge pattern to the hydrothermal aquifer, which could result in changes in pressure, temperature and chemistry in the hydrothermal aquifer.
2. The proposed wells may not intercept water because local ground water likely flows primarily through caves and karst features, and the proposed wells were specifically located to avoid cave and karst resources.
3. The baseline study is not adequate to characterize the ground water system.
4. Adequate protections for the hydrothermal ground water resource and public safety are not in place for the drilling program.
5. Additional boreholes would be necessary to adequately characterize the ground water system, but that necessity increases the significant risks and dangers associated with drilling wells into the fragile ground water system. The risk associated with any borehole and especially the number of boreholes required to characterize the system is not acceptable. We have provided recommendations at the end of this letter regarding alternative methods that can be considered to help collect technical information yet minimize impacts to the local ground water system.
6. Due to the importance of the hydrologic baseline study and the drilling program, there should be additional public notice and engagement than has occurred to date. The project should involve an Environmental Assessment (EA) and should not be authorized by BLM through a Categorical Exclusion.

We cannot emphasize enough the importance of protecting the hydrothermal aquifer that exists beneath the City of Glenwood Springs. The hydrothermal aquifer supplies hot springs attractions in Glenwood Springs, which attract tens of thousands of visitors to Glenwood Springs, and are an irreplaceable part of the identity and culture of Glenwood Springs. If these features were to be impacted, there could be devastating and unrepairable loss of the hot springs attractions and to the Glenwood Springs economy as a whole. As explained below, the hydrothermal asset is fragile and cannot be replaced or repaired if it should be impacted.

Even though the proposed hydrology baseline study is a preliminary and partial review of the larger mining application, it is nevertheless critically important to the users of the hydrothermal aquifer system and to the community as a whole. We obtained additional important information from the BLM after identifying and requesting such information, but the public as a whole has not seen this information. For example, the November 13, 2018 Collier Report, which contains very important information about the presence of caves and karst features within the study area, was not specifically disclosed. That report provides a very important finding regarding the presence of caves and karst features that should be emphasized in the proposal for the hydrology baseline study. In order to provide informed comments and feedback regarding the proposed baseline study, the public needs access to these documents and time to provide comments regarding these

important technical findings. Unfortunately, if BLM treats the RMR application under a Categorical Exclusion format, the public will not be given the opportunity to review and comment upon these and other pieces of information.

Description of Iron Mountain and Glenwood Hot Springs Resort Geothermal Features

The source springs for the Iron Mountain Springs and Glenwood Hot Springs discharge from the geothermal aquifer system present beneath the Town of Glenwood Springs. The aquifer system is primarily contained within the Mississippian aged Leadville Limestone, the same formation that will be mined by the proposed quarry expansion and penetrated by the proposed drilling program. Water from both deep and shallow sources recharges the aquifer system through local rock formations and through local geologic faults. The water is heated in the earth, and then migrates upward through Limestone fractures and void spaces as well as through geologic faults and fractures. The aquifer system is shallow beneath Glenwood Springs and is highly transmissive and highly interconnected. As a result, changes in aquifer conditions propagate quickly with little resistance. For example, past pumping tests of the Redstone Well, located at the Iron Mountain Hot Springs have shown that water level changes spread quickly across the aquifer, resulting in changes in aquifer discharge at the Glenwood Hot Springs Pool spring source approximately 4,000 feet away. Geologic faults, including the Glenwood Fault, create a structural separation between the Leadville Limestone at the location of the proposed quarry and the hydrothermal aquifer system present beneath Glenwood Springs. It is our opinion that the faults function as a conduit to ground water flow, enabling ground water north of the fault to flow along the faults and fractures and ultimately recharge the aquifer beneath Glenwood Springs.

It is our opinion that the aquifer is recharged from various sources, including ground water flowing from north to south from the Flat Tops through karst features, caves and fractures in the Leadville Limestone. The proposed quarry and the proposed test drilling program will intercept and redirect this recharge source to travel paths that did not previously exist. This change could result in different aquifer recharge conditions than exist today. The change in recharge to the aquifer has potential to disrupt water levels, chemistry and temperatures in the aquifer. Obviously, if the proposed large-scale quarry were constructed, it would have a devastating effect by disrupting recharge to the aquifer below.

The Fulford Cave in Eagle County is a similar karst cave system in the Leadville Limestone and presents a proxy for the formation present at the proposed mine site. Fulford Cave contains a stream flowing through the cave network through a steep rubbly confined channel. If a borehole were to intersect the subsurface stream and proceed into a lower karst feature, there is potential that all or a portion of that stream could be diverted to a different location.

We offer another more local example. In the Glenwood Caverns, owned by Mr. Steve Beckley, a borehole was drilled into one of the main cave rooms. The borehole first penetrated a sandy karst void (vug) and then penetrated into the cave room. Not long after the borehole was constructed, during precipitation events, sandy and muddy water would flow from shallower portions of the rock formation into the cave room through the borehole, resulting in water cascading into the cave room. This was a threat to the cave attractions and environment, including aesthetics, biology and

geology, and therefore the hole was sealed using an inflatable packer. This situation illustrates an example of the redirection of ground water that can occur as a result of boreholes in this particular karst environment. In this particular situation, the problem was known because it was visible in the cave and the problem could be fixed. If a similar situation were to occur with one of the proposed boreholes as part of the proposed test drilling program, RMR and others would probably never know about it, and the problem would go uncorrected.

These two examples also illustrate that monitoring wells will likely not function as intended, because they are unlikely to encounter a subsurface stream system and because water at the location of the wells may flow only at times of runoff and precipitation events, in which case the driller and on-site geologist may not know if they have encountered a water bearing zone and the well may not be constructed with the perforated interval being in a water bearing zone.

Past Efforts to Protect the Hydrothermal Aquifer

The Glenwood Hot Springs has a long history of active protection of the hydrothermal aquifer system. Past efforts to protect the aquifer include the following:

1. Redstone Well testing and acquisition - The Glenwood Hot Springs has a senior water right for the main geothermal spring. Because of the complexity and various unknowns regarding the hydrothermal aquifer and springs, Glenwood Hot Springs continually makes efforts and expresses concern to outside sources, including government and the private sector. These concerns include aquifer impacts resulting from well pumping and flow from the well and aquifer under artesian conditions, because of the potential of external aquifer stresses to impact flows at the Glenwood Hot Springs source springs. Extensive testing on the well was completed, which confirmed hydraulic connection between the Redstone Well and the Glenwood Hot Springs source springs. The Glenwood Hot Springs ultimately acquired 90% of the Redstone Well and water rights as a measure to protect the hot springs resource.
2. CDOT Bridge Construction - Glenwood Hot Springs participated in the planning and engineering efforts associated with the construction of the new highway bridge abutments to ensure that the structures did not penetrate the aquifer in a detrimental way. During the Environmental Assessment process, CDOT planners were educated and subsequently cooperated to work with the Glenwood Hot Springs to select appropriate locations for the abutments.
3. Kayak Course Location and Construction - The City of Glenwood Springs planned the construction of a kayak course on the Colorado River through Glenwood Springs immediately south of the resort and within the boundary of the geothermal aquifer. The course entailed the installation of rock features in the streambed of the river, and related excavation as part of the construction. The Glenwood Hot Springs educated City Council and Council agreed that excavations in the streambed of the river posed an unacceptable risk to the cap material of the aquifer. The Glenwood Hot Springs worked with the City to find a suitable location downstream where the aquifer would not be threatened. These protective efforts resulted in the kayak course being located where it is today.

4. The City of Glenwood Springs cooperated with Glenwood Hot Springs to install a raw water carriage pipe across the Colorado River above grade to avoid penetration of the streambed of the Colorado River, which would have occurred if the pipeline were installed subgrade.
5. In 2006 Glenwood Hot Springs proposed and submitted a draft to the State of Colorado Assistant State Engineer for a Geothermal Management District. The primary emphasis of the ordinance would be the local ability to halt non-permitted and threatening geothermal ground water disturbances. The proposed geothermal district included the proposed quarry area.
6. In the late 1800's the Town of Defiance (now Glenwood Springs) organizers patented a 400 acre town site protecting Glenwood Hot Springs water rights so that others would be restricted from utilizing or carrying said waters, above or underground, by trough, ditches, pipes or conduits, etc. Local protection of the springs dates back more than 120 years.
7. Although it did not involve the hydrothermal aquifer, in the Glenwood Caverns, measures have been taken to control the environment in the cave for the protection of the biology and integrity of the cave features.

As evidenced by these past activities, active protection by users of the hot springs and cave resources is nothing new. RMR is not being singled out. The Glenwood Hot Springs and the Iron Mountain Hot Springs are maintaining an important and necessary approach in their protection of the hydrothermal resource, consistent with past efforts to protect the resource. BBA Water Consultants has been actively involved in these protective efforts on behalf of the Glenwood Hot Springs and now the Iron Mountain Springs.

Past protections of the hydrothermal resource have occurred because the resource is unique, fragile and an immeasurable asset to the Glenwood Springs community. This situation is unique in that it involves a proposed rock quarry, and initially a drilling program, in close proximity to a sensitive hydrothermal feature. Protections of the hydrothermal system are necessary and appropriate, similar to other sensitive hydrothermal features such as those that exist in Yellowstone National Park, a location at which there are restrictions on boreholes near hydrothermal features (National Research Council. 1987. Objectives for Deep Scientific Drilling in Yellowstone National Park: A Report. Washington, DC: The National Academies Press. https://doi.org/10.17226/18786, Chapter 5). Those restrictions are appropriate at a location such as Yellowstone and they are appropriate in Glenwood Springs and at the location of the proposed RMR quarry expansion.

Description of Proposed Mine Expansion and Planned Well Drilling Program

The proposed quarry operation is an expansion of an existing quarry located as shown in Figure 1, a map duplicated from the RMR Baseline Study Action Plan. The mined product is limestone derived from the Leadville Limestone formation, which is present at the surface and beneath the proposed quarry location. The quarry is proposed to be a surface excavation and is estimated to achieve depths of 200 or more feet. The surface size of the mine excavation is estimated to be on the order of 447 acres, and based on the mine footprint, the mine may include excavation in three local drainage basins, including Tumble Creek, Cascade Creek, and possibly Oasis Creek drainages, as shown in Figure 2, a geology map showing topography, well locations and the

locations of the hot springs facilities. All of these drainages are tributary to the Colorado River and discharge to the river at various points in and around the City of Glenwood Springs.

The mine is expected to alter the existing surface water drainage, and those impacts may include changes to the historical hydrological balance, expedited drainage of surface water, reductions in ground water recharge, and water quality impacts resulting from both suspended solids and chemical changes in surface and ground water. The surface water impacts referenced above have potential to be problematic to water rights and water users, but of greater concern is the potential for alterations to the fragile hydrothermal aquifer system supplying the hot springs within Glenwood Springs. We understand that the hydrologic baseline study and proposed drilling program are seeking to quantify potential ground water impacts, but there is no mention of the determination of impacts to surface water or the impacts to ground water-surface water interactions in and around the proposed quarry area.

The test drilling program will consist of five wells drilled to estimated depths of 125 to 250 feet and will fully penetrate the Leadville Limestone. The wells will be used for water level measurements and water quality sampling. The proposed well locations are geographically spread around part of the perimeter of the proposed quarry area with one located in the middle of the proposed quarry. RMR stated that these locations were selected to avoid caves and karst features. The boreholes will also serve an exploratory mining purpose for the benefit of the operator. It is unclear the extent to which the exploratory function of the boreholes has influenced the proposed well locations. We are told that mineralogical findings of the borehole core data will be proprietary.

As described in the RMR Request for Authorization for Hydrology Baseline Study document, dated August 16, 2019, at least some of the proposed boreholes will be constructed with 3¾ - inch core bits and will be constructed with 2-inch inside diameter (ID) PVC casing. This type of well construction will not be compliant with the Colorado Well Construction Rules 2 CCR 402-2 (Well Construction Rules) because inadequate annular space will exist in the boreholes, making it near impossible to install a proper grout seal and gravel pack.

Potential Impacts to Hot Springs Geothermal System

The proposed quarry expansion and the proposed test drilling program have potential to alter the ground water recharge to the hydrothermal aquifer system, which is very fragile and exists in a state of equilibrium in terms of hydraulic pressure, temperature and chemistry. Beyond the test drilling effort, the actual mining program would have a far greater impact on this delicate system. The system may not be able to tolerate changes to ground water inflows that may result from the test drilling program. The aquifer may be impacted if the proposed boreholes cause recharge water from the north to be different than has historically occurred. For example, ground water intercepted by the boreholes may result in reductions in aquifer recharge. This could occur as a result of a borehole causing water to flow from a shallow karst feature to a deeper karst feature, or perhaps from one fracture zone to another fracture zone. The flow direction through the borehole would most likely be downward, but it could also be upward if localized pressure exists in the formation. Changes in flow patterns will likely result in a different flow pattern to the hydrothermal aquifer system than has previously occurred. If the recharge to the system is altered, those changes will

spread quickly and regionally throughout the aquifer, because of the high transmissivity and interconnectedness of the aquifer.

Discharge from the hydrothermal aquifer, including discharge to both the Hot Springs Pool and the Iron Mountain Springs hot springs and wells is based on the naturally occurring pressure head in the aquifer. Changes in ground water recharge has potential to result in changes to the pressure head in the aquifer, discharge rates, temperature and chemistry of the hot springs. For example, the main spring at the Hot Springs Pool is plumbed to deliver water to the pools and amenities based on the artesian head pressure and pool temperature as they exist today. The same is true for the springs at the Iron Mountain Springs. It may effectively be infeasible to deliver hot water to the respective spring amenities if the pressure head or temperature is changed.

Geothermal springs are much more sensitive to aquifer water level impacts than water supply wells. It is typical that hydrological concerns associated with surface mines and rock quarries focus on impacts to water supply wells. These hot springs and the hydrothermal resource are different than water supply wells. The springs are much more sensitive to changes, and unlike water supply wells, the system cannot tolerate changes in water levels, pressures or temperatures. Changes in pressure or temperature can also result in chemical changes. We note that the plumbing and water treatment systems at the Iron Mountain Springs and the Glenwood Hot Springs are configured to handle water of specific chemistry. Changes in chemistry can result in very costly operational and infrastructure changes for those amenities.

There is significant uncertainty and unacceptable risk regarding what impacts the test drilling program will have on the geothermal system. We have pointed out above that the proposed well construction is not compliant with the Well Construction Rules because the borehole and casing sizes will not result in adequate annular space to achieve an effective grout seal. It is imperative that the wells at a minimum are constructed in accordance with the Rules. However, the Well Construction Rules do not require grouting between individual water bearing zones, including karst zones or fractures, in the same formation. Therefore in fact, the proposed well construction needs to go beyond the requirements of the Well Construction Rules to maintain historical ground water flow paths and to prevent ground water from flowing between karst zones and separate fracture systems if there is evidence that more than one karst zone or separate fracture systems is penetrated during the drilling of the boreholes, which has the potential to alter ground water flow paths in the formation.

In addition to potential risks associated with changes in ground water recharge, there is risk to the drilling contractor and the public. Highly pressurized zones in the formation may exist as a result of caves or other karst features being filled with water in the steeply dipping limestone formation. The elevation change across the site is on the order of 2,000 feet. If a cavern or karst feature filled with water exists over a portion of the project site comprising a difference in elevation of say 850 feet, which is possible based on the structural dip and karst nature of the formation, then it is possible that a borehole at the lower portion of such a karst feature could encounter pressures on the order of 360 psi, and given the high transmissivity of the formation, it could be catastrophic if a drill rig encountered such pressures without protections in place. Appropriate protections may include blowout preventers, such as those used in the oil and gas industry. Encountering such

pressures with an improperly prepared drill rig could result in high flow rates out of the borehole at high pressure, which would be very hazardous to the drill crew and to the City located down-gradient of the borehole.

There are inadequate protections in place to mitigate a problem with the drilling program should it occur. Should the drilling program proceed, the drill rig should be equipped with a blowout preventer and tooling appropriate to seal off portions of the borehole if the boreholes create conduits to ground water flow that did not previously exist. All drilling activities should be closely monitored by a qualified scientist during each step of well drilling and construction, including documentation of water, lithology and void spaces. Special care should be taken to note any drops of the drill bit indicative of void spaces. Bonding should be in place to cover damages that may occur to the hydrothermal aquifer; however, it may not be feasible to provide adequate bonding to protect against an incident in which the hydrothermal aquifer was damaged as a result of the drilling or mining program. The hydrothermal aquifer provides immeasurable benefit to the City of Glenwood Springs. The risk associated with the proposed drilling program and ultimately the quarry, is unjustifiable considering the potential impact to the hydrothermal system and the difficulty of repairing a problem in the aquifer, if a problem were to occur.

The Hydrologic Baseline Study is Inadequate to Characterize the Ground Water System

The hydrologic baseline study consists of only five wells drilled over the entire 447-acre study area and some of the wells are located outside of the study area. The well locations were specifically located to "avoid known known cave/karst resources" (RMR Action Plan document). We have various concerns related to this program as stated below.

1. Ground water most likely flows through cave and karst features, and to a lesser extent fractures in the formation. By avoiding cave and karst features, the proposed wells are unlikely to encounter water. Any wells that fail to hit water may be meaningless and may have simply missed the water bearing zones of the formation. Ground water may flow only through isolated preferential flow paths (most likely caves and karst features), and if this is the case, then the proposed boreholes are not likely to encounter the ground water flow paths. Ground water may also flow through fractures, but if the fractures are located near caves and karst features, then those fractures may not contain water because the water will drain out of the fractures to the caves and karst features. It appears that the proposed boreholes were located near but not in caves and karst features, which may result in dry holes. Recall the example stated earlier regarding the Fulford Cave. Fulford Cave contains a subsurface stream which flows through a channel only a few feet in width. It is highly unlikely that a monitoring hole would encounter such an underground stream channel.
2. The ground water flow through the formation may be "flashy", meaning that water flows only at times of runoff and precipitation events, and when it flows, it flows quickly. Cave and karst features have very high aquifer transmissivities, and if the water has the opportunity to drain at the bottom of the study area, perhaps to the structural fault or via a different path to the hydrothermal aquifer, then the presence of water may only be detectable through the use of a transducer installed at the bottom of the monitoring wells, if RMR is fortunate enough to encounter the water travel paths in the formation. Ground

water may not be detected at the time of well construction unless the wells are constructed at the time of one of the flashy flow events. The discharge of water through the borehole in the Glenwood Cavern referenced earlier is an example of flashy ground water flow occurring only at times of precipitation events.

3. In order to have any confidence in the results of the proposed hydrologic baseline study, it would be necessary to drill many more holes in the formation, preferably oriented in transects or lines across the formation. But of course, additional holes add exponential unacceptable risk of altering the ground water flow path in the formation.
4. The hydrologic baseline study will be completed under time pressure, and there is not opportunity to expand or alter the scope of the study based on the findings of the initial five boreholes. A more effective study would be structured such that a subset of holes can be drilled and then additional holes drilled based on the findings of the initial boreholes. It is not realistic to think that in a complicated karst system such as this, that the boreholes will provide the necessary information to characterize the system based on five points picked on a map at locations specifically intended to avoid cave and karst features.
5. The baseline study does not include surface water monitoring. Even though some of the local drainages are at times dry, there should be a requirement that surface drainages are sampled and measured when flowing.
6. We understand that mineralogical data from the borehole cord data will be proprietary and that information will not be disclosed. The baseline study will include water chemistry analyses, and therefore, the mineralogical data from the boreholes should be disclosed as it may inform the chemical interpretation of the water chemistry sampled from the wells.

In order to adequately characterize the ground water system, it may be necessary to consider additional testing methods that may collect more meaningful information about the local ground water system. This could include the following methods, but any such additional studies should be conducted in a way that does not impact and harm the karst aquifer system. Adequate time must be dedicated to this process in order to consider and execute alternative methods.

1. Additional geophysical analyses should be used to better identify potential cave and karst features. It may be feasible to use geophysical methods to identify likely water conduits based on low elevation caverns and karst features, which better inform the locations of potential boreholes. Geophysical methods are advantageous in that they are non-invasive. We note that in Section 5.3 of the November 13, 2018 Collier Report, they recommended additional geophysical line to further characterize the study area. Collier appears to agree with this recommendation.
2. Non-introduced tracer tests can be considered to identify potential ground water travel paths through the aquifer. Results of tracer tests would need to be considered as part of a conceptual model that considers ground water flow towards the aquifer system beneath Glenwood Springs through potentially complicated and indirect flow paths. Tracer tests should not be relied upon on their own. For example, if the tracer tests showed little to no chemical match between two points, it does not mean that there is no hydraulic connection between those points, it could just be that the molecules at the upgradient tracer point enter the aquifer at a down-gradient location where tracers are not monitored. Such a finding would not imply a hydraulic separation between two points because the inflow of the water

to the aquifer may still contribute to the hydraulic head in the aquifer. It may be feasible to use introduced tracers as well if it can be accomplished in a manner that is not impactful to the aquifer and hot springs attractions.

3. It may be necessary to drill into the caves to investigate flowing water. It may be feasible to accomplish this task with down-hole cameras and listening devices by drilling into only the top of one or more caverns. If only the top of a cavern is penetrated, then there should be less risk of water draining out of the cavern. If this type of investigation is considered or pursued, it should be done in a very careful way and only after consultation with cave experts regarding potential impacts to cave biology, temperature, chemistry and other considerations. Any constructed borehole should be permanently sealed after the investigation.
4. As stated above, additional boreholes may be needed to effectively characterize the system, but such boreholes carry an unacceptable risk of harming the hydrothermal aquifer system.

We recognize that some of these suggestions carry risks of their own, and would merit careful consideration and review prior to proceeding. Given the sensitivity and high risk of drilling into this unique ground water system, it is appropriate to consider methods other than borehole investigations or at least to be careful and as informed as possible before penetrating the formation. We are open to meeting with BLM and other stakeholders about appropriate investigations that accomplish the technical objectives of the study with minimal risk and disturbance to the aquifer system.

Summary of Opinions and Concerns

Summarized below are our opinions and concerns with the proposed drilling program and baseline study.

1. To the extent the boreholes penetrate ground water flow paths, it is likely that the boreholes will intercept and redirect that ground water to a flow path that did not previously exist. This change in ground water flow may alter the recharge pattern to the hydrothermal aquifer, which could result in changes in pressure, temperature and chemistry in the hydrothermal aquifer.
2. The boreholes create an unacceptable risk of altering the flow path of ground water recharging the hydrothermal aquifer system in Glenwood Springs. The hydrothermal springs are an immeasurable asset to the Glenwood Springs community and should be protected.
3. The proposed boreholes are not adequate to characterize the complex ground water system at the project site, nor are they adequate to characterize potential alterations to the surface water flow regime or alterations in the ground water / surface water interactions in the area.
4. An adequate baseline study would include many more boreholes in order to provide meaningful results, but the exponential added risk associated with additional wells, as stated above, is not acceptable. We have offered suggestions for alternative methods that BLM can consider as part of the baseline study.
5. There are inadequate protections in place to mitigate a problem with the drilling program should it occur. Protections should include drilling equipment capable of handling

blowouts and capable of grouting specific zones in karst formations, which may be difficult to accomplish. Bonding should be in place to mitigate damage to the hydrothermal aquifer, should it occur. The quantity of such a bond should be substantial given the potential impact to the Iron Mountain Hot Springs and Glenwood Hot Springs Lodge and Pool, and the City of Glenwood Springs as a whole, if the hydrothermal aquifer should be impacted.

6. The proposed hydrology baseline study is very important to the community in and near Glenwood Springs, yet not all of the detail regarding the study was shared with the public. There needs to be complete sharing of technical information with the public and the public needs to have the opportunity to provide comment on the study and potential impacts.

If you have questions or need additional information, please do not hesitate to contact me. We recognize that we have introduced an abundance of technical information and concepts that may merit additional technical discussion with BLM. We are more than open to meeting with you and BLM to further present and discuss this information.

Very truly yours,

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West Sage Water Consultants

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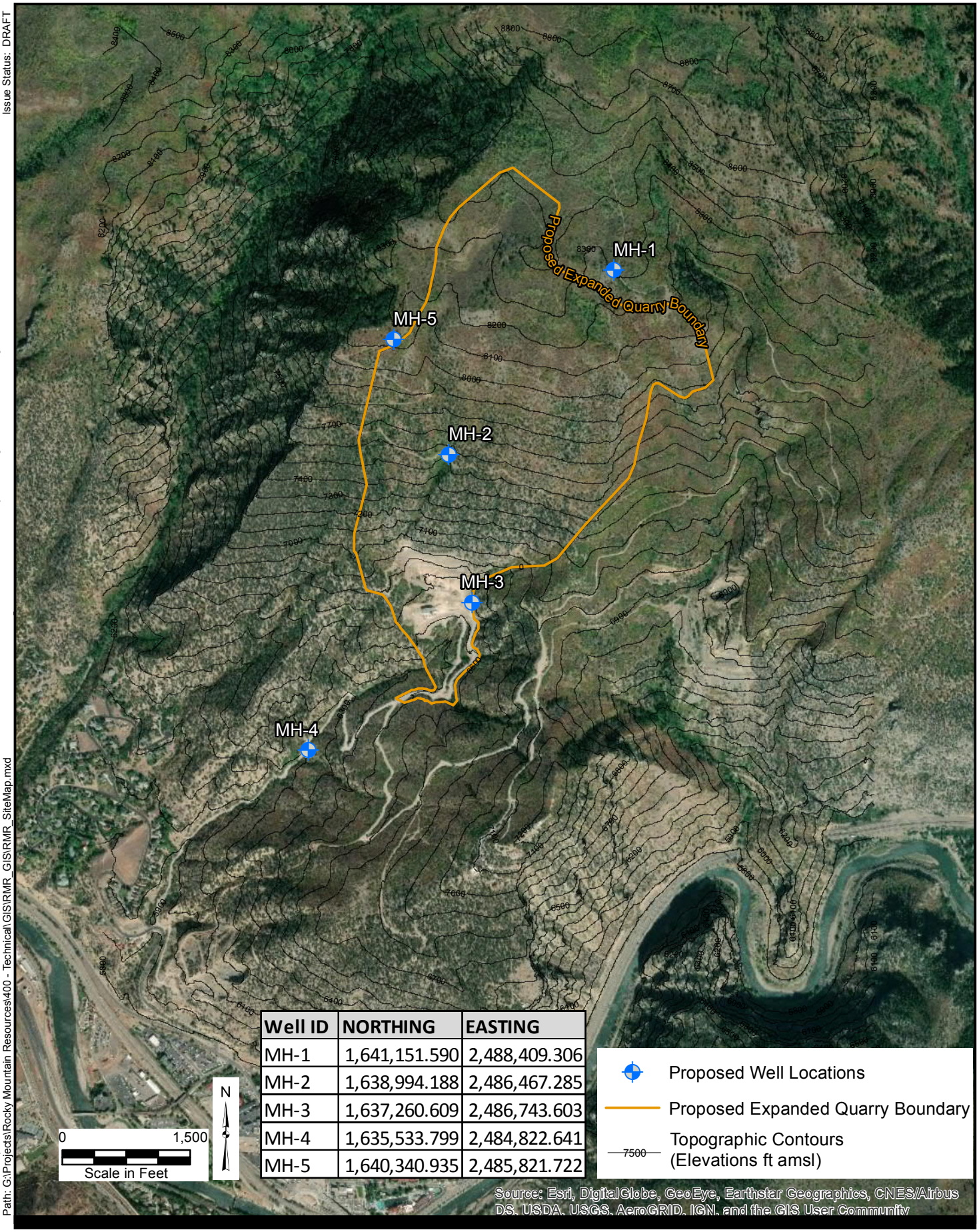
Principal

CJS/jeb
Enclosures
9318.09



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MH-4	1,635,533.799	2,484,822.641
MH-5	1,640,340.935	2,485,821.722

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Last saved by: JR 8/9/2019
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Rocky Mountain Resources
Location: Glenwood Springs, Colorado
Project No.: 60583176
Date: August, 2019
Scale: 1:18,000

AECOM

Figure 1: Hydrology Baseline Well Location Map

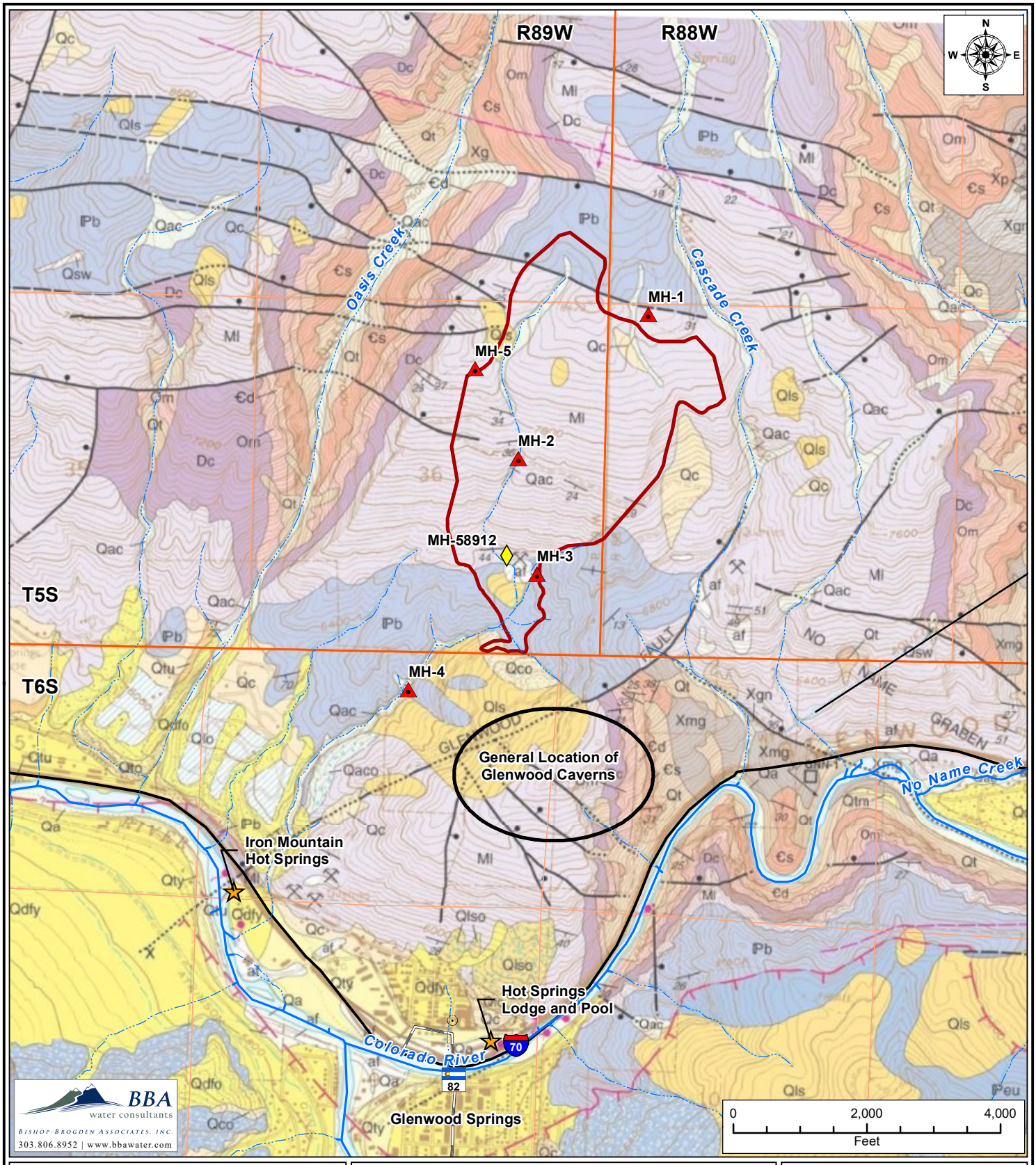

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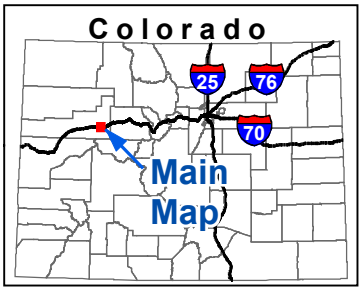
Figure 2
Rocky Mountain Resources Proposed Hydrologic Baseline Study

Date: 10/22/2019 | Job No. 9318.09

Legend

- Hot Spring
- Borehole Location
- Proposed Well Location
- General Location of Glenwood Caverns
- Proposed Quarry Expansion - Approx.

Data Source: RMR, CDSS, CDOT, USGS, BLM
Geologic Map of the Glenwood Springs Quadrangle, Colorado Geological Survey