

GROUND WATER QUALITY DISCHARGE PERMIT UGW450013

STATEMENT OF BASIS

Magnum Solution Mining, LLC
Holladay, UT

March 2021

Introduction

The Division of Water Quality (DWQ) under the authority of the Utah Ground Water Quality Protection Rules ¹(Ground Water Rules) issues ground water discharge permits to facilities which have a potential to discharge contaminants to ground water². As defined by the Ground Water Rules, such facilities include mining operations. ³The Ground Water Rules are based on an anti-degradation strategy for ground water protection as opposed to non-degradation; therefore, discharge of contaminants to ground water may be allowed provided that current and future beneficial uses of the ground water are not impaired and the other requirements of Rule 317-6-6.4.A are met.⁴ Following this strategy, ground water is divided into classes based on its quality⁵; and higher-quality ground water is given greater protection⁶ due to the greater potential for beneficial uses. DWQ has developed permit conditions consistent with R317-6 and appropriate to the nature of the mined materials, facility operations, maintenance, best available technology⁷ (BAT) and the hydrogeologic and climatic conditions of the site, to ensure that the operation would not contaminate ground water.

Basis for Permit Issuance

Under Rule 317-6-6.4A, DWQ may issue a ground water discharge permit if:

- 1) The applicant demonstrates that the applicable class TDS limits, ground water quality standards protection levels and permit limits established under R317-6-6.4E will be met;
- 2) The monitoring plan, sampling and reporting requirements are adequate to determine compliance with applicable requirements;
- 3) The applicant is using best available technology to minimize the discharge of any pollutant; and
- 4) There is no impairment of present and future beneficial uses of ground water.

¹ Utah Admin. Code Rule 317-6

² https://deq.utah.gov/ProgramsServices/programs/water/groundwater/docs/2008/08Aug/GWQP_PermitInfo.pdf

³ Utah Admin Code Rule 317-6-6.1A

⁴ Preamble to the Ground Water Quality Protection Regulations of the State of Utah, sec. 2.1, August, 1989

⁵ Utah Admin. Code Rule 317-6-3

⁶ Utah Admin. Code Rule 317-6-4

⁷ Utah Admin. Code Rule 317-6-1(1.3)

Purpose

Magnum Solution Mining, LLC (Magnum) is constructing a hydrogen production and storage facility in Millard County, Utah approximately 10 miles north of Delta. The Project entails solution mining storage caverns in a subsurface salt deposit for the purpose of storing hydrogen. The resulting brine from the solution mining process is stored for evaporation in above ground earthen ponds. The Project lies within an approximately 321-acre site located on Utah School and Institutional Trust Lands Administration (SITLA) lands.

Ground Water Discharge Permit UGW450013 is issued to authorize the construction of one brine evaporation pond and the installation of additional unconfined water table aquifer compliance monitoring wells.

New Facilities

The following new facilities will be regulated under this Permit including the associated Best Available Technology (BAT), Protection Levels (Table 2) and requirements for monitoring Brine Evaporation Pond 4.

The pond footprint is approximately 168 acres with a storage area measured three feet below the crest of the berm of approximately 138 acres. The brine evaporation pond is constructed using a combination of excavation into the ground surface and the construction of elevated berms.

The brine evaporation pond is constructed with a composite liner system consisting of an 80-mil high density polyethylene (HDPE) primary liner and a 60-mil high density polyethylene secondary liner. The liners will be separated by either 130-mil raised drainage studs or a 250-mil geonet geomembrane layer drainage gap between the primary and secondary HDPE liners to route leakage to a sump.

The pond will have two leak detection recovery systems. The Leak Collection Recovery System (LCRS) sumps will collect any water between the primary and secondary liners and pump it to the pond surface. The Process Component Monitoring System (PCMS) – collection piping and a leak detection sump will be constructed in the soil under the secondary liner of the brine evaporation pond. The brine pond is designed as a zero-discharge system; both the LCRS and PCMS sumps and pumps are designed to capture and return the maximum calculated leakage flow rates back to the surface of the brine pond.

BAT Performance Monitoring

Best available technology monitoring will include minimum vertical freeboard and maximum allowable leakage rate monitoring. These performance standards are based on the precedence of previous ground water discharge permits and *Action Leakage Rates For Leak Detection Systems* (USEPA, Office of Solid Waste, January 1992).

Minimum Vertical Freeboard. A minimum of 36 inches of vertical freeboard shall be

maintained to ensure total containment of solution mining liquids.

Maximum Allowable Leakage Rate. The leak detection system is the primary compliance monitoring point because it is the early warning system that demonstrates protection of ground water quality. The estimated maximum liner leakage rate was established by standard engineering practice using the method described in *Equations for Calculating the Rate of Liquid Migration through Composite Liners due to Geomembrane Defects* (Giroud, 1997). Based on a pond water surface area of approximately 138 acres, the maximum allowable leakage rate through the primary HDPE liner is 439 gallons per minute.

Maximum Allowable Head. The maximum allowable head imposed on the secondary HDPE liner and leak detection sump will be determined following system construction. Any fluids collected in the leak detection sump will be pumped back to the brine evaporation pond. As long as the leak detection system complies with the BAT performance standards of the permit, the facility is compliant. In the event that the leak detection system has flows or heads that exceed the BAT performance standards of the permit, a BAT failure exists and the permittee will be required to regain BAT by a number of solutions including identifying and repairing the BAT failure.

Potential Impacts to Ground Water

Potential impacts to ground water have been minimized by employing best available technology for the brine evaporation pond. The Division of Water Quality will provide periodic onsite inspections during construction and operation of the facilities described above. The Brine Evaporation Pond Operating Manual/Standard Operating Plan will ensure that the facility is operated in accordance with design specifications and will also ensure that any indications of facility problems will be detected early and resolved. In addition to BAT performance monitoring, ground water quality monitoring of the water table aquifer will be conducted in monitoring wells to determine if ground water quality has been impacted by leakage from the brine evaporation pond.

Geologic Description

Regional. The brine evaporation pond is situated over a subsurface salt deposit in the Sevier – Black Rock Desert in the Basin and Range physiographic province of Utah. The mountains that surround the basin of the Sevier Desert are composed of a variety of consolidated sedimentary, metamorphic and igneous rock. The basin is underlain by deposits that consist primarily of semi-consolidated and unconsolidated sediments of Tertiary and Quaternary age. The basin-fill includes sand, silt, clay and gravel deposited as alluvial fans, stream alluvium, mudflows, lacustrine (lake) sediments and deltas. The basin fill also contains scattered basalt flows and tuffs of late Tertiary and Quaternary age. Tertiary and Quaternary basin-fill deposits are over 7,000 feet thick. Oligocene and Miocene basin-fill sediments contained evaporate deposits. Through time, evaporites in the area flowed to form a salt dome.

The soil profile at the site consists of three units. The upper unit is comprised of fine-grained glacial lacustrine deposits consisting of deep-water calcareous silts and may

contain younger alluvium up to 10 feet thick. The upper unit is underlain by pre-Lake Bonneville alluvium consisting of sand and sandy gravel beds. The lower unit consists of alluvium, silt and sandy silt deposited in large low-gradient alluvial fans, river terraces, and abandoned river channels on the river delta. This unit ranges up to 30 feet in thickness.

Hydrogeology

The principal regional groundwater system is the unconsolidated basin-fill deposits that formed from erosion of the surrounding mountains and were laid down by streams, lakes, and mudflows. These regional deposits consist of interbedded and lenticular deposits of clay, silt, sand, gravel and boulders. The regional depositional processes created alternating and interfingering layers and lenses with regional horizontal and vertical heterogeneity. Differences in sorting and grain size influence local permeability and storage capacity, which can vary greatly depending on the nature of local depositional processes. Sediments are generally coarser near the mountain front and grade finer towards the valley centers. Stream channel deposits are coarser and better sorted than alluvial fan and mudflow deposits that generally occur at the base of steep drainages. Vast lakes that occupied the valleys many thousands of years ago deposited interbedded clay and finegrained sands. Rivers flowing into these lakes formed coarse-grained delta deposits near the ancient lake shore, such as near the mouth of Leamington Canyon.

Recharge to the principal groundwater aquifer system (basin-fill deposits) in the Sevier Desert occurs by stream infiltration along mountain fronts, subsurface inflow from consolidated rocks of mountain areas, subsurface inflow from adjoining basins, seepage from rivers, canals, reservoirs and unconsumed irrigation. Groundwater generally flows from recharge areas near the mountains on the northeast and east of the Sevier Desert toward discharge areas in the central and western parts of the area.

Aquifers in the area have been clearly defined using data collected during the installation of multiple wells constructed in the region around the Magnum site, including Magnum's MH-1 Test Well (constructed in 2009). The unconfined water table aquifer is located above the shallow artesian aquifer and is generally confined to the upper 50 to 150 feet, the shallow artesian aquifer to depths of about 150 to 700 feet, and the deep artesian aquifer between about 700 to 1,400 feet (the bottom of historically drilled wells). A previously undefined deeper confined aquifer (defined as the basement aquifer) is located at depths greater than 1,400 feet.

Ground Water Quality

Ground Water Classification. In accordance with UAC R317-6-3.5 and ground water quality data provided in the permit application which includes ground water monitored in nearby groundwater compliance wells, is classified as Class II Drinking Water Quality Ground Water. As required in Part II.H.3 of the permit, an accelerated background monitoring program will be completed by the permittee to collect data for calculating well-specific background ground water quality statistics. After securing Director approval of the Accelerated Background Monitoring Report, background concentrations may be adjusted in accordance with the reopener provision in Part V.N of the permit.

Class II Protection Levels. In accordance with UAC R317-6-4.5, Class II ground water will be protected for use as drinking water or other similar beneficial use with conventional treatment prior to use. Class II protection levels are established in accordance with the following criteria in UAC R317-6-4.2B:

- a. Total dissolved solids (TDS) may not exceed the greater of 1.25 times the background concentration or the background plus two standard deviations.
- b. When a contaminant is present in a detectable amount as a background concentration, the concentration of the pollutant may not exceed the greater of 1.25 times the background concentration, 0.25 times the ground water quality standard, or background plus two standard deviations; however, in no case will the concentration of a pollutant be allowed to exceed the ground water quality standard.
- c. When a contaminant is not present in a detectable amount as a background concentration, the concentration of the pollutant may not exceed the greater of 0.25 times the ground water quality standard, or the limit of detection.

COMPLIANCE SCHEDULE

- Brine Evaporation Pond Operating Manual/Standard Operating Plan. Pond monitoring, operation, maintenance, and repair procedures shall be described in the manual for Director review and approval before authorization to operate is granted.
- Ground Water Monitoring Plan. A draft version has been provided in the ground water discharge permit application. It will be finalized based on as-built conditions of the pond before the pond is allowed to be placed in operation.
- Accelerated Background Monitoring Report. Newly installed ground water monitoring wells shall be sampled on a quarterly frequency for 8 consecutive quarters. Statistical calculations shall be presented in the report for the purposes of establishing ground water class protection levels in accordance with UAC R317-6-4.
- Final Closure Plan. In the event that the permittee decides to discontinue its operations at the facility the permittee shall notify the Director of such a decision and submit a Final Closure Plan within 180 days prior to the closure of the facility.

Permit Application Documents

The documents that comprise the Groundwater Discharge Permit Application (for Brine Pond 4) submitted under cover letter dated March 12, 2021 by Magnum Solution Mining, LLC and subsequent revisions are considered part of the administrative file for this permit.

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