

Hearing for Application to Appropriate A83862 (Water Right No. 92-695)



Ron Niebrugge (wildnatureimages.com)

November 14, 2023

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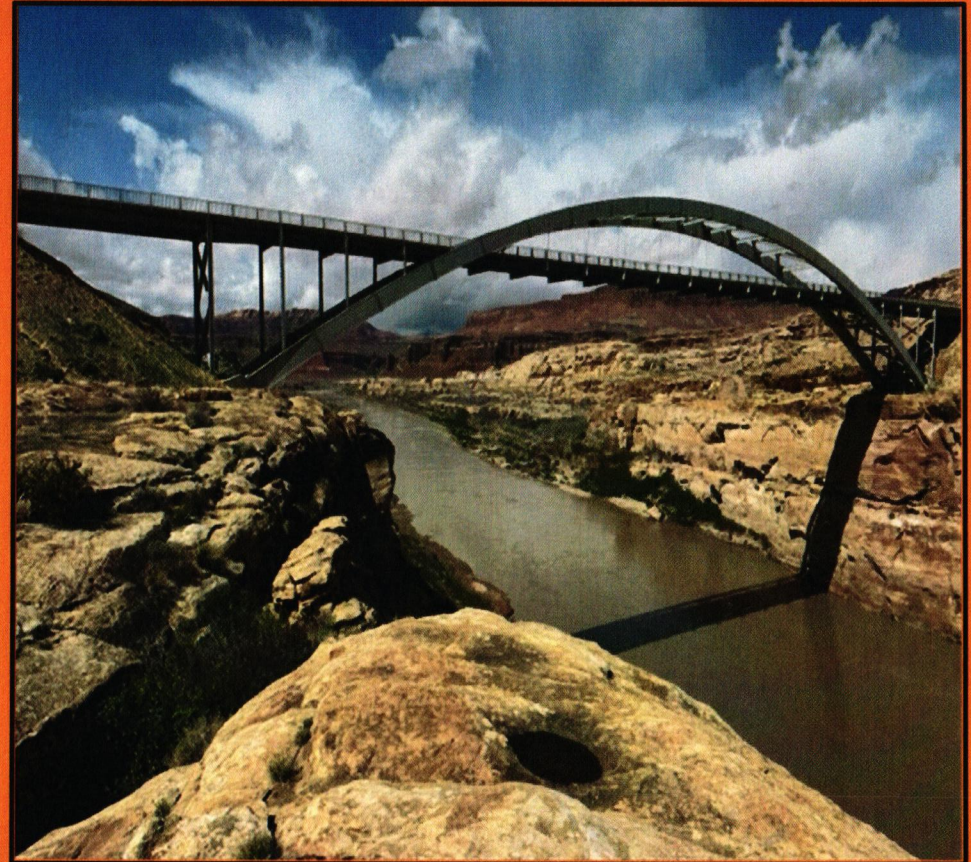
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Application to Appropriate A83862 (Water Right No. 92-695)

Concerns

- Application to Appropriate A83862 (the Application) doesn't meet the required criteria for "Area 92 - Lower Green River" or the State Engineer's Colorado River Policy.
- The Application will directly impact flows in the Green River that are associated with Green River Block Exchange Agreement and Colorado River Storage Project.
- DLE is a process that is not commonly used and has certainly been perfected. There are deficiencies in addition to numerous unknown variables. Data shows the success of DLE is hard to predict, consumes both freshwater and brine water, contaminates aquifers, reduces the groundwater table, hurts wildlife, worsens soil conditions, is environment dependent, and more.
- The Application lacks the required information needed to be properly review by the State Engineer. With the limited information provided, the State Engineer cannot complete an accurate review as required by the Utah Administrative Code. In addition, the public can't properly provide feedback or analyze potential impacts.



The Application Does Not Meet Area 92 or State Engineer Policy

Area 92 - Lower Green River

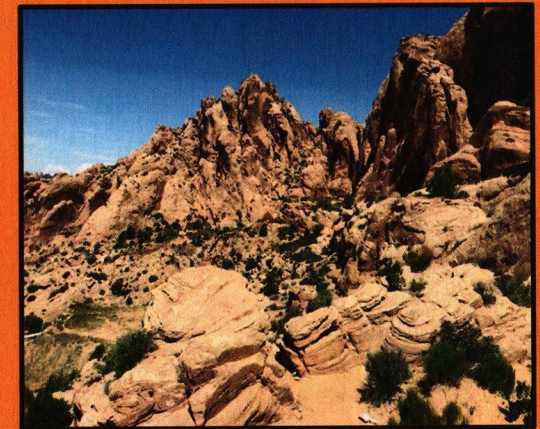
“The water resources of this area are considered to be limited. New appropriations are limited to small amounts of beneficial use sufficient to serve the domestic requirements of one family, the irrigation of one acre, and ten head of livestock (or equivalent livestock units). New diversions and consumptive uses that require more water than this must be accomplished by filing a change application on valid existing water rights owned or acquired by the applicant. However, some water is available for larger appropriations on a Temporary (one-year) or Fixed Time period basis. Non-consumptive uses such as hydroelectric power generation would be considered on the individual merits of each application.”



State Engineer's Colorado River Policy

1.) “Applications to appropriate water from either surface or underground will be limited to one family, up to one (1) acre of irrigation, and 10 equivalent livestock units or an appropriate acre-foot limitation based on these parameters and water availability.

2.) Larger surface and underground application applications may be considered for perpetual approval on a priority basis depending on the availability of water in the local area and within Utah's apportionment under the Upper Colorado River Compact. Such applications may also be considered on a non-priority order for fixed-time or temporary approval, depending on the availability of water.”



Green River Block Exchange Contract

Due to the complex and long nature regarding why the Green River Block Agreement was completed, it's necessary to understand the basic history regarding the water rights in the Green River and Colorado River Basin system.

The Green River is a major tributary of the Colorado River, which provides water to 40 million people for municipal use, supplies water for the irrigation of 5.5 million acres, is the lifeblood for at least 22 federally recognized tribes, 7 National Wildlife Refuges, 4 National Recreation Areas, and 11 National Parks.

Several interstate compacts, legislation, and agreements govern water use from the Colorado River. Some of the compacts and agreements include but are not limited to the following:

- Colorado River Compact of 1922
- Upper Colorado River Basin Compact of 1948
- 1956 Colorado River Storage Project Act
- Storage Project Act
- Central Utah Project
- Reclamation Projects Authorization and Adjustment Act of 1992
- Assignment Agreement of 1996
- Green River Block Exchange Contract



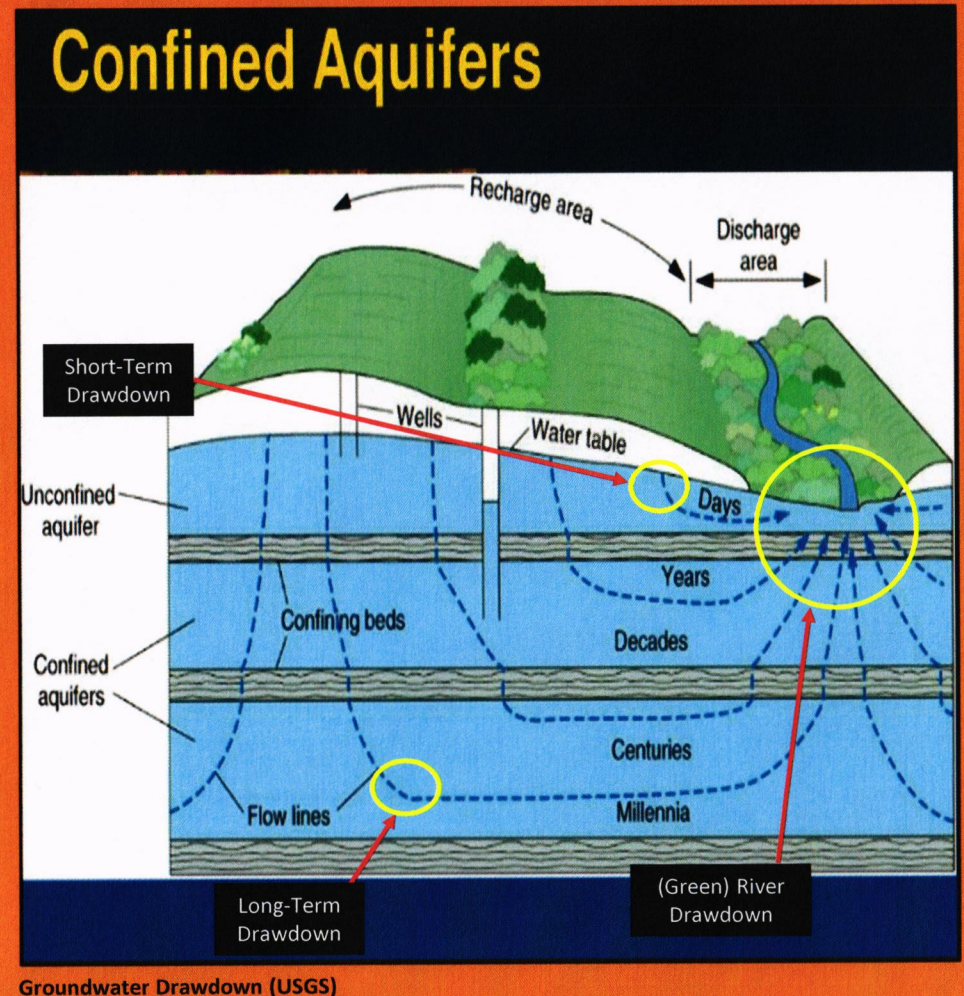
Upper and Lower Colorado Basins (Green River Block Agreement Appeal)

Drawdown on the Aquifer and Reduced Flows in the Green River

Drawdown on the Aquifer and Reduced Flows in the Green River

The United States Geological Survey (USGS) states, "The water stored in the ground can be compared to money kept in a bank account. If you withdraw money at a faster rate than you deposit new money you will eventually start having account-supply problems. Pumping water out of the ground faster than it is replenished over the long-term causes similar problems.

Continuing, the USGS states, The pumping of wells can have a great deal of influence on water levels below ground, especially in the vicinity of the well, as this diagram shows. If water is withdrawn from the ground at a faster rate that it is replenished, either by infiltration from the surface or from streams, then the water table can become lower, resulting in a "cone of depression" around the well. Depending on geologic and hydrologic conditions of the aquifer, the impact on the level of the water table can be short-lived or last for decades, and it can fall a small amount or many hundreds of feet. Excessive pumping can lower the water table so much that the wells no longer supply water—they can "go dry."



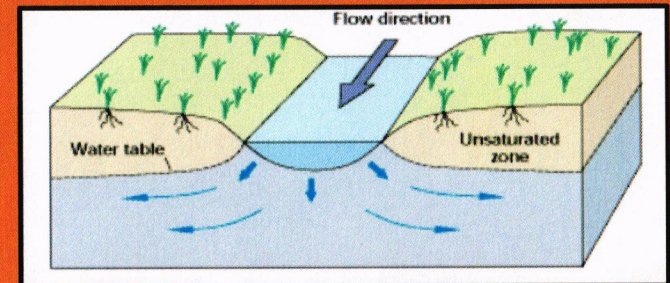
Continued - Drawdown on the Aquifer and Reduced Flows in the Green River

Drawdown on the Aquifer and Reduced Flows in the Green River

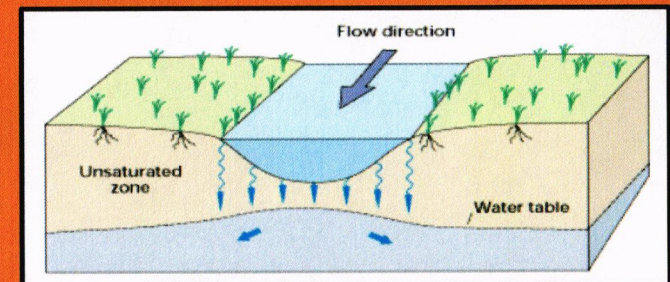
The USGS provides additional information regarding how rivers interact with groundwater. "The interaction takes place in three basic ways: [rivers] gain water from inflow of groundwater through the streambed, they lose water to groundwater by outflow through the streambed, or they do both, gaining in some reaches and losing in other reaches."

These wells were strategically placed. Why not propose a location a little further outside the town of Green River? Or maybe a couple miles away from the bank of the Green River? The reason this location was chosen is because it's most probable these well locations will provide the most water. Why is there more water, and where does that water come from? The Green River.

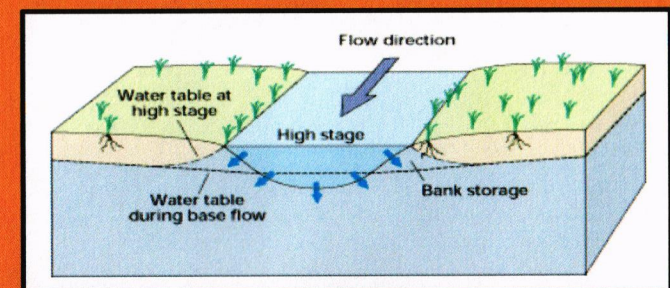
Pumping from deep underground wells will create voids that will then need to be replenished. Water will continue to infiltrate deep into the surface to fill those voids. That water, also needing to be replaced, will come from the largest reliable source nearby, the Green River. Any additional infiltration will directly impact the current flows. Due to these changes occurring, the aquifer will also be impacted.



River Interaction with Groundwater (USGS)



River Interaction with Groundwater (USGS)



River Interaction with Groundwater (USGS)

Challenges and Unknowns of Direct Lithium Extraction

Title: Environmental Impact of Direct Lithium Extraction from Brines

Authors: Maria L. Vera, Walter R. Torres, Claudia I. Galli, Alexandra Chagnes & Victoria Flexer

Website: Nature Reviews Earth and Environment

Water Consumption

- 1.) "Determining whether excessive water extraction is occurring is difficult in the absence of hydrological data, and unfortunately, hydrological records in the Lithium Triangle are either unavailable or incomplete. . . However, it is of the utmost importance to also consider the decrease in underground water reservoirs, both brine and fresh water."
- 2.) "Satellite data reveal that the total water storage in Salar de Atacama [(Salar meaning "salt lake" or "salt flat")] decreased by -1.16 mm [(-0.046 inches)] per year in the period 2010-2017 and soil moisture indexes decreased on average by -0.005 yearly in the period 1997-2017. Direct observation wells showed a radical reduction in the water table from pre-extraction to current time frames (1986-2015). In the region where brine wells are located, water table decreases of up to 9 m [(29.53 feet)] were recorded in 1990-2015. To date, these decreases are limited to the nucleus of the salar and do not seem to reach the salar borders or the regions where brine and freshwater mix."
- 3.) "Three variables indicate a trend towards desertification. Satellite imaging data revealed a reduction in normalized difference vegetation index in the period 1997-2017, indicating an overall trend of more sparsely vegetated areas. The same satellite data showed land surface temperature increases averaging 0.74% and 2.68% yearly in summer and winter, respectively. Finally, in one of the mining properties, a third of carob trees, a species known to be drought-tolerant, died in the period 2013-2017, strongly indicative of underground water shortages."
- 4.) "Fresh water consumption of direct lithium extraction (DLE) needs to be urgently quantified. Many DLE technologies might require larger freshwater volumes than current evaporative practices, compromising their applicability in arid locations."
- 5.) "Environmental monitoring guidelines have been drafted with evaporitic technology in mind, but they should also be applied to the implementation of any DLE technology, which still consumes brine, uses fresh water and produces residues, the latter two hopefully at considerably lower volumes."
- 6.) "Although segmented and not sufficient to generate an overall measure of sustainability, publications from 2018 onwards strongly suggest that a negative impact [has] been produced, mostly regarding the water balance. Because of the complex nature of hydrogeological studies, it is difficult to quantify the extent of the impact."

Extraction

Title: Environmental Impact of Direct Lithium Extraction from Brines

Authors: Maria L. Vera, Walter R. Torres, Claudia I. Galli, Alexandra Chagnes & Victoria Flexer

Website: Nature Reviews Earth and Environment

Water Consumption - Continued

7.) "Many researchers and technologists propose the re-injection of spent brines although from a technological perspective re-injection could dilute a valuable resource. For example, in 80% of the cases in geothermal fields, re-injection wells show a rapid interference with production wells."

8.) "One mining operation has been active at Salar del Hombre Muerto since 1996, and this location is a full-scale example of a DLE facility in practice. Li^+ is selectively captured in ion exchange resins and subsequently, a fairly pure LiCl solution is recovered by elution with fresh water^{19,106,107}. Freshwater volumes required for elution have not been disclosed. The overall water use of the entire facility is reported as 71 m³ per tonne Li_2CO_3 , 200% and 50% higher than the volume used at Salar de Atacama and Salar de Olaroz, respectively, highlighting that a given DLE might be more water-intensive than standard evaporitic technology."

Contamination

1.) "Arguing that brine water is far from being suitable for either human consumption or agricultural use strong proponents of mining propose that brine should be completely disregarded in water footprint calculations. However, we suggest that brine must be considered, as the brine volume that is pumped will directly determine the amount of fresh water that naturally flows from outside the brine aquifer, is mixed with brine and thus is no longer considered fresh water or can be used as such."

2.) "Ecosystems in the vicinity of lithium deposits are extremely fragile and linked in a food chain in which ecosystem services are crucial for livestock and rural populations. Soil composition could be affected by decreasing water tables, but also leaching or drainage from accumulated waste, which could produce an increase in soil salinity."

Scalability

1.) "Some proposed DLE approaches, such as ion pumping or Li^+ -selective membranes, are completely new and will require more ample engineering efforts to reach industrial scale."

2.) "Lithium extraction should be continuously monitored from the start of exploitation, as environmental impacts might only be observable over the long term. Finally, in addition to monitoring by mine operators themselves, more measurements should be performed by independent experts or national authorities, a fundamental safeguard that is often not in place in South America."

Additional Questions & Concerns

Summary

Additional Information is Needed for the Following:

- 1.) Proposed water uses (volumes, flow rates, rate of extraction and injection, etc.)
- 2.) Analysis of consumptive water uses.
- 3.) Anticipated impacts to the aquifer.
- 4.) Expected impacts to the Green River.
- 5.) Hydrogeologic conditions of the aquifer.
- 6.) Proposed construction timeline.
- 7.) Needed approvals and permits.
- 8.) Contamination in the area.



Variable	Number
Diameter (miles)	1.04
Area (acres)	550.25
Circumference (miles)	3.29
Drawdown Depth (feet)	25
Total Quantity (acre-feet)	13,755

Information has not been provided to know:

- 1.) How much water can reasonably be pumped from the aquifer. How much water will each well pump? What are the anticipated volumes, flow rates, rate of reinjection, etc.? Is the rate of extraction and injection the same? What data or supporting evidence can be provided to support the estimates?
- 2.) Information as to how the water use is 100% non-consumptive. Articles by credited sources have been included in this presentation showing that some water use will be consumptive. The amount can vary from little to excessive. How much water will be consumed in this operation because it seems to be inevitable.
- 3.) Radius of influence. Seeing that drawdown in an aquifer occurs near the top of the surface and can have a large radius of influence, how does the Applicant know they won't be taking water that is associated with storage in the Green River and as a result, be using water associated with the Green River Block Agreement?
- 4.) Anticipated impacts to the aquifer. If 19 cfs is pumped continuously from the aquifer near the Green River, what will happen to the aquifer? Where exactly is the water being pulled from? What ranges of depth? What are both the short-term and long-term impacts? What is the anticipated draw down of the aquifer? Is it confined or unconfined? What studies or models have been referenced to support this evidence?
- 5.) Hydrogeological conditions of the aquifer. What are the soil conditions? What materials are present? Is the aquifer confined or unconfined? Have geotechnical reports been produced in the area? Have hydrogeological models been completed?
- 6.) How long it will take to extract lithium from the extracted water. Is it hours? Days? Can the length of time in which the water is withdrawn negatively impact the aquifer or operations of the Green River?
- 7.) Summary of needed permits and approvals from other agencies. What are all the approvals or permits needed and what's the associated timeline for those? What are all the required steps to complete this project?
- 8.) Information why the Application to Appropriate and Mining Exploration Plan submitted to the BLM contained different information. Will the Environmental Assessment and National Environmental Policy Act continued to be completed by the BLM? Are wells on BLM land no longer considered an option?
- 9.) Since the Applicant has withdrawn one point of diversion and two points of return from Bureau of Land Management (BLM) land, is 19 cfs still the proposed quantity of water? Can that amount of water be produced and returned by the reduced number of wells? Have test wells been drilled in the area previously?
- 10.) Anticipated timeline for construction and operation of the mining operations. Considering it will take some time to construct, what is the Applicant's proposed timeline? If they requested the removal of wells on BLM land, is the timeline soon?

Additional Questions & Concerns

Information has to not been provided to know (Continued):

11.) Potential Contamination in the area. Is there contamination that could take place in the surround area from these operations? How will they keep brine water from entering the Green River? Could contamination impact downstream water users?

12.) Have any groundwater modeling studies been completed regarding the aquifer and the expected results from pumping such a significant amount of water?

13.) Does the US Army Corps of Engineers require permits or agreements to drill on their property? There's one proposed point of return that lies on their property and needs to be addressed.

14.) Consideration of public welfare. Has public welfare seriously been considered regarding the interest of Green River residents? Has their concerns been directly addressed? Would this benefit the public or cause harm?

15.) Recovery rate of the lithium. What is the estimated recovery rate for lithium in the area? Is it sufficient to be profitable and reach the desired lithium production level?

16.) Where is the process currently with the approval of the wells for the Environmental Protection Agency (EPA) and Utah Department of Water Quality (DWQ)? Has approval for the wells been given? What information was given to them? Would that information be beneficial for the Division of Water Rights to review regarding proposed operations?

17.) Mixing of freshwater and brine water in the aquifer. Will freshwater and brine interact within the aquifer and result in additional contamination?

18.) Energy needed for efficient production. Has the required energy needed for this project been determined? Could larger than anticipated amounts of energy impact how much water is used or impact the rate of consumption?

Summary of Additional Question & Concerns

In summary, the Applicant has not provided enough information that should result in approval of the Application. For seeking the Appropriation of 13,755 acre-feet, the Applicant has not provided anywhere near enough information for an operation of that size. On October 24th, a response to a Protest Letter from the BLM was addressed by Mr. Bruce Richardson, the CEO of Blackstone Minerals. In the letter, Mr. Richardson writes, "For Blackstone to receive approval for these injection wells; extensive data is required to ensure that any returned brine does not interfere with other sources."

Where is this required data? Has detailed data already been given to the EPA and DWQ? If so, why was the information not given to the Division of Water Rights?

What's at Stake?

- 1.) Green River Block Authorization Contract – Water consumed is Federal water and impacts much larger operations.**
- 2.) Colorado River Compact – Water consumed affects operations and flows associated with the Compact and its anticipated allotment to users.**
- 3.) Public Welfare – Negative impacts can hurt or impact the resources of residents and downstream water users.**
- 4.) Environmental – Endangered fish species and critical river habitat for birds and other animals in the area are threatened by any contamination.**
- 5.) Tribal – There are 30 federally recognized Tribes in the Colorado River Basin. 7 have land within the state of Utah.**
- 6.) Water Right Policies – The Application does not meet criteria for approval. The approval will set a negative precedence for future applications filed.**
- 7.) More**

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- 2.) Arkansas Smackover Project. Standard Lithium <https://www.standardlithium.com/projects/arkansas-smackover> (2022).
- 3.) Flexer, V., Baspineiro, C. F. & Galli, C. I. Lithium recovery from brines: a vital raw material for green energies with a potential environmental impact in its mining and processing. *Sci. Total Environ.* 639,, 1188–1204 (2018).
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- 6.) Image. 2023. "The Colorado River Authority of Utah." November 8, 2023.
- 7.) Image. 2023. "Center for Biological Diversity; Living Rivers; Colorado Riverkeeper; Utah Rivers Council; Sierra Club v. U.S. Department of the Interior; U.S. Bureau of Reclamation, and Washington County Water Conservancy District; State of Utah; Utah Board of Water Resources." November 8, 2023.
- 8.) Liu, W. & Agusdinata, D. B. Interdependencies of lithium mining and communities sustainability in Salar de Atacama, Chile. *J. Clean. Prod.* 260, 120838 (2020).
- 9.) Liu, W., Agusdinata, D. B. & Myint, S. W. Spatiotemporal patterns of lithium mining and environmental degradation in the Atacama Salt Flat, Chile. *Int. J. Appl. Earth Obs. Geoinf.* 80, 145–156 (2019). Pioneering publication with solid data highlighting the environmental impacts related to lithium mining from continental brines.
- 10.) Marazuela, M. A., Vázquez-Suñé, E., Ayora, C. & García-Gil, A. Towards more sustainable brine extraction in salt flats: learning from the Salar de Atacama. *Sci. Total Environ.* 703, 135605 (2020). Conceptual hydrogeological modelling, calibrated with field data, proposing clever strategies to minimize water impacts during brine pumping.
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- 15.) Parker SS, et al. *Potential lithium extraction in the United States: environmental, economic, and policy implications* (The Nature Conservancy, 2022); https://www.scienceforconservation.org/assets/downloads/Lithium_Report_FINAL.pdf.
- 16.) Water Science School. 2018. "Groundwater Decline and Depletion." United States Geological Survey. November 11, 2023. <https://www.usgs.gov/special-topics/water-science-school/science/groundwater-decline-and-depletion#overview>.
- 17.) United States Court of Appeal. 2023. "Center for Biological Diversity; Living Rivers; Colorado Riverkeeper; Utah Rivers Council; Sierra Club v. U.S. Department of the Interior; U.S. Bureau of Reclamation, and Washington County Water Conservancy District; State of Utah; Utah Board of Water Resources." November 8, 2023.
- 18.) United States Geological Survey. "Natural Processes of Groundwater and Surface Water Interaction." November 11, 2023. https://pubs.usgs.gov/circ/circ1139/htdocs/natural_processes_of_ground.htm.
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- 20.) Utah Division of Water Rights. 2023. "Approved Applications." November 8, 2023. <https://www.waterrights.utah.gov/cgi-bin/webdivdepest.exe?WRArea=92>.
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Doralee Cannon <doraleecannon@utah.gov>

Fwd: Hearing Presentation - Application to Appropriate A83862

1 message

Willa Knight <willaknight@utah.gov>
To: Doralee Cannon <doraleecannon@utah.gov>

Mon, Nov 13, 2023 at 11:10 AM



Willa Knight
Public Inquiry Program Manager

W: (801) 538-7407
E: willaknight@utah.gov

Utah Department of Natural Resources
Division of Water Rights



waterrights.utah.gov

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From: **Roper, Tyson D** <troper@usbr.gov>
Date: Mon, Nov 13, 2023 at 10:42 AM
Subject: Hearing Presentation - Application to Appropriate A83862
To: willaknight@utah.gov <willaknight@utah.gov>
Cc: Woodbury, Dustin H <dwoodbury@usbr.gov>

Hey Willa,

Here's the presentation I'll be referring to for the hearing tomorrow on Application to Appropriate A83862. Please reach out if there's anything else I can provide. Thanks!

Tyson Roper

Civil Engineer

Interior Region 7: Upper Colorado Basin

Bureau of Reclamation

Provo Area Office

Office: (801) 379-1193

Cell: (435) 609-0350

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