UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

In the Matter of CROW BUTTE RESOURCES, INC. (Marsland Expansion Area)	Docket No. 40-8943-MLA-2 ASLBP No. 13-926-01-MLA-BD01

Hearing Exhibit

Exhibit Number: OST016

Exhibit Title: Dr. LaGarry Rebuttal Testimony

September 7, 2018

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NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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CROW BUTTE RESOURCES, INC. ,	)	Docket No. 40-8943 – MLA - 2
	)	ASLBP No. 13-926-01-MLA-BD01
(Marsland Expansion Area)	)	
	)	September 7, 2018

REBUTTAL OPINION TESTIMONY OF HANNAN LAGARRY

I, Hannan LaGarry, do hereby swear that the following written testimony is true to the best of my knowledge:

I. Points made in CBR & NRC Staff Testimony.

General comments: My understanding of NEPA is that all license conditions (e.g., 11.3.4) and related pumping tests to demonstrate confinement must be completed and evaluated before issuance of the license to mine. This continues to not be the case. With the proposed "we'll make it up as we go, trust us" approach, the public does not have the necessary information to make an informed choice and reviewers of the EA and TR do not have all the data. The EA is therefore incomplete. The Niobrara River is a National Scenic River, and along with the Pine Ridge Escarpment, form the basis of the recreational economy of the region. One serious spill or excursion will extremely detrimental to all of that.

Response to A.23: In my original opinion I expressed concerns about secondary porosity in the form of joints, fractures, and faults. However, NRC focuses on the Niobrara River and Pine Ridge faults. These faults have been described as "scissor faults," which have variable (sometimes small) amounts of displacement. However, the joint sets visible in the bedrock exposed around MEA can be described and evaluated by pedestrian survey. Should leaks and excursions occur, they will likely be transmitted through joints. Maher and Shuster (2012) describe these systems of joints, fractures, and faults in the Chadron Formation in great detail in both Nebraska and South Dakota. Also, Maher and Shuster (http// maps.unomaha.edu/Maher/GPFS/IntroSection.htm) propose causal mechanisms, several of which involve fluctuations in groundwater levels resulting from ISL/ ISR mining.

Maher, H., Jr., and R.D. Shuster. 2012. Significance of an ESE fracture direction in Tertiary strata of South Dakota and Nebraska. Geological Society of America Abstracts with Programs 44(7):547.

Response to A.25: According to NRC's rebuttal, CBR employed geophysical logging of boreholes and constructed cross sections to demonstrate the absence of faulting in the region. However, such methods do not delineate faults. Better techniques would have been electrical resistivity, seismic reflection, and seismic reflection techniques, or possibly ground penetrating radar (see Lewis and Haeni [1987]). The provided cross sections are unlikely to recognize faults, joints, or fractures unless there is significant displacement. Such displacement is immaterial to whether or not a joint, fracture, or fault will transmit fluids.

Lewis, M.R., and F. P. Haeni. 1987. The use of surface geophysical techniques to detect fractures in bedrock – an annotated bibliography. U.S. Geological Survey Circular 987, 14 pp.

Response to A.26: Unreported pump tests discussed in Dr. Kreamer's supporting rebuttal apparently showed lack of containment. This suggests cherrypicking or suppression of adverse data, which according to NEPA must be reported. These data may be the "smoking gun" that confirms my opinions presented here and previously at CBR.

Response to A.27 and 28: Reproduced from Hallum & others (2018):

1. White River Group outcrops along the valley margins create the impression and subsequent misconception (when analyzed regionally) that the reach lacks hydraulic connection between surface water and groundwater. This is not the case locally.
2. There is sufficient near-surface alluvium to conduct water between the stream and groundwater wells. Transmissivity is limited by the relative thinness of alluvial sediments and/or the fineness of sandy sediments in the subsurface.
3. Transmissivity in the reach is spatially variable, due primarily to significant irregularity in thickness of sediments capable of conducting water in significant volumes.
4. Irrigation wells in the aquifer absent area near the Niobrara River are hydraulically connected to the High Plains Aquifer and/or alluvial fill of the Niobrara River valley.
5. Because of the limited thickness of aquifer materials and spatial uncertainty of their occurrence, it is appropriate to consider the reach in question as an aquifer absent area at regional scales. Any study that telescopes from generalized regional

to more specific localized questions will experience challenges created as scale-related uncertainty is magnified. Interestingly, smaller scale multi-state maps of the High Plains Aquifer do not include an aquifer absent area in the reach.
6. At larger scales, it becomes apparent that the reach is in contact with sediments capable of conducting water, and that the ability to conduct water will likely be affected by the available thickness of conductive sediments and the physical configuration of said sediment.
7. At points, such as individual irrigation well locations, uncertainties regarding the nature and proportion of hydraulic connection among the High Plains Aquifer, the respective FINAL PROJECT REPORT – NeDNR Contract #994 Page 3 of 74 well, and the Niobrara River (including associated alluvium) are high. In other words, the direct relationship of every individual well is not defined at the scale of this investigation.

Hallum, D.R., S.S.Sibray, and L.M. Howard. 2018. Hydrogeologic framework studies of portions of the Niobrara River. Geological Survey Investigation 12, Conservation and Survey Division (IANR School of Natural Resources), University of Nebraska-Lincoln, 74 pp.

Pursuant to 10 CFR 2.304(d) and 28 USC 1746, I declare under penalty of perjury, that the foregoing is true and correct to the best of my knowledge and belief.

Signed in Pagosa Springs, Colorado, on 7 September, 2018.

9/7/2018

DocuSigned by:
Hannan LaGarry
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Hannan E. LaGarry

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