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**REVIEW OF DRAFT UP-GRADIENT GROUNDWATER QUALITY  
TECHNICAL MEMORANDUM FOR TDS, ARSENIC AND  
PERCHLORATE, PREPARED FOR NDEP BY HACKENBERRY  
ASSOCIATES, LLC, FEBRUARY 27, 2015**

Date June 15, 2015

Dear Mr. Dotchin:

On behalf of the Nevada Environmental Response Trust (NERT or the Trust), Ramboll Environ US Corporation (Ramboll Environ) has completed a review of the Nevada Division of Environmental Protection's (NDEP's) February 27, 2015 memorandum entitled *Draft Up-Gradient Groundwater Quality Technical Memorandum for TDS, Arsenic and Perchlorate*, prepared by Hackenberry Associates LLC for NDEP (the "Memorandum" or "Memo"). We understand that the intent of the Memorandum is to "develop and defend the definition of up-gradient groundwater quality" for the BMI Plant Sites, Common Areas Projects and Other Industrial Sites in Henderson, Nevada, as established in NDEP's January 21, 2014 Regional Groundwater Goals and Directives letter (the "BMI Regional Goals and Directives"). The Memorandum was provided to the Trust and other BMI companies on April 15, 2015 in draft form and NDEP requested that any comments or concerns be submitted to NDEP by June 15, 2015. On behalf of the Trust, Ramboll Environ has reviewed the Memorandum and provides the following general and specific comments.

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**General Comments**

- The Memorandum was prepared to "develop and defend the definition of upgradient groundwater quality" for total dissolved solids (TDS), perchlorate, and arsenic. While the Memo provides the results of an evaluation of concentrations of these constituents in groundwater samples collected from a set of monitoring wells located generally along the boundaries of the BMI Plant Sites, the Memo does not specifically define the constituent concentrations that NDEP considers to be representative of upgradient conditions.
- The BMI Regional Goals and Directives established by NDEP indicate that upgradient groundwater quality may be different at each facility/property

and may influence complex wide RAOs. The BMI Regional Goals and Directives also indicate that site-wide and downgradient RAOs will take into consideration how upgradient groundwater concentrations compare to remediation standards (which are “defined as either BCLs or Background”). The Memo does not evaluate differences in concentrations of constituents in groundwater upgradient of each facility, nor does the Memo evaluate if upgradient concentrations exceed remediation standards. It is unclear if the scope of the evaluation presented in the Memo included an evaluation of these issues.

- The Memo appears to use the terms “upgradient” and “background” interchangeably. Each of these terms should be defined and appropriately used throughout the Memo. Is the data used for this analysis representative of upgradient groundwater conditions, background groundwater conditions, or both?
- The Memo is focused on an evaluation of upgradient concentrations of TDS, arsenic, and perchlorate, which we understand are the focus of NDEP’s BMI Regional Goals and Directives. Ramboll Environ notes; however, that other potential constituents of concern (e.g., metals, radionuclides) could be important for evaluation at the BMI Plant Sites or Common Areas.
- The Memo indicates the source of data for this evaluation is the “NERT online groundwater database” maintained by Neptune and Company, Inc. A reference, including a link to the database, should be provided. Moreover, because the database includes data from other parties and other sites in addition to NERT, we recommend referring to this database as the “NDEP Regional Database”.

### Specific Comments

- The Memo indicates that sampling and analysis plans became consistent site wide in 2004. Additional detail could be provided to the Memo regarding this statement to better understand the basis for this statement and the use of data only from samples collected since 2004.
- Monitoring wells chosen for the analysis were located along the eastern, southern, or western perimeter of company properties. It is not clear from the Memorandum whether any other criteria were used in selection of the wells used in the analysis. Ramboll Environ notes that some wells (in particular, the DBMW wells, AA-UW wells, MCF-03B, and HMWWT-6) appear to be located cross-gradient, rather than upgradient, of portions of the BMI Complex. A figure showing the BMI Plant Sites, the locations of selected and other existing monitoring wells, and potentiometric surface contours for the Shallow Water Bearing Zone (Shallow WBZ) would be useful if included in the Memo (Figure 1, cited in the Memorandum, was not included in the version reviewed by Ramboll Environ). In addition, for those selected wells that are not clearly upgradient of the BMI Complex, it would be useful to include a discussion of the criteria used for selection.
- The Memo text indicates that data from 2004-2013 was used for the analysis; however, the spatial plot figures indicate that data from 2004-2014 were used. This discrepancy should be corrected in the Memo.
- It appears that the data used for the spatial plots includes data from many wells located throughout the BMI Plant Sites, Common Areas, and other areas, and that the data used for the box and quantile plots are only from the 16 wells identified as upgradient wells. However, it is unclear what data sets were actually used to develop the various plots. Furthermore, it is unclear which data over the approximately 10 year period was used for plotting on the spatial plots. A discussion in the Memo describing the data sets used could provide clarity.

- The scale of the spatial plots is such that it is difficult to see the colors of the symbols (and therefore understand the concentrations), particularly for the 16 wells identified as upgradient wells. Ramboll Environ notes that the concentrations plotted on the spatial plots do not always appear to match with those plotted on the box plots (e.g., the concentrations of TDS in wells AA-UW2 through AA-UW4 appear to be less than 2,600 mg/L on the TDS spatial plot, but are shown as greater than 3,000 mg/L on the TDS box plot).
- It appears that some of the “whiskers” on the box plots, representing the maximum concentrations, are missing from the plots. The Memo should include a discussion of the basis for exclusion of certain data points from the plots.
- The quantile plots provide a “potential outlier cutoff” value; however, a discussion of how these values were determined is not provided in the Memo. It is unclear if these values are intended to represent values below which groundwater concentrations would be considered representative of upgradient concentrations. The perchlorate quartile plot legend indicates the chart shows the MCL at a value of 18 µg/L; however, this value is Nevada’s provisional action level for perchlorate.
- The Memo should provide information explaining if and how non-detect values were used in the analysis.
- It is suggested that the terms “bubble plot” and “bubble points,” which are used in the Memo, be avoided for increased clarity.
- The TDS Summary section uses the term “plant site”. It is unclear if this refers to the entire BMI Complex or only one or more of the individual Plant Sites. This section also indicates that “data for the remaining wells are considerably less than 3,000 mg/L”; however, based on a review of the TDS box plot, use of the word “considerably” does not appear to be warranted in this sentence.
- The Arsenic Summary section (3<sup>rd</sup> sentence) indicates that “the wells to the west of the BMI Complex appear to exhibit lower concentrations again”. The Memo should specify which wells or analytical results are being used for comparison in order to draw this conclusion. The text in this section also indicates that well MCF-03B has concentrations generally greater than 80 µg/L; however, this does not appear to be the case based on the data on the box plot, which shows most concentrations in this well are less than 50 µg/L.
- In the Perchlorate Summary section, a statement is made about several wells with the highest values for the upgradient wells with concentrations generally greater than 1,000 µg/L. However, while the maximum values are greater than 1,000 µg/L, many reported concentrations from these wells are considerably less than 1,000 µg/L.
- In the Perchlorate Summary section, a conclusion appears to be made indicating “background levels” of perchlorate are “considerably less, and probably do not exceed about 250 µg/L”, as compared to the statement in the prior sentence that the “reasonable upper end of the upgradient data” of approximately “400 µg/L to several thousand mg/L”. These sentences appear to distinguish between “upgradient” and “background”. Further explanation of the basis of these statements and a discussion regarding how the Memo defines “upgradient” and “background” would allow for an increased understanding of these conclusions. Furthermore, the following sentence which indicates that “perchlorate impacted groundwater has extended beyond these upgradient wells” is confusing. What is meant by the phrase “has extended beyond”? Which data and analyses was used as the basis for this statement? Lastly, should the reference to “several thousand mg/L” have been “several thousand µg/l”?

- Each of the constituent summary sections include a statement indicating concentrations that represent the “upper end” of upgradient and/or background. The basis for these statements is unclear and should be presented in the Memo. How do these values relate to the “potential outlier cutoff” values shown on the quantile plots? It is also uncertain what is meant by “upper end”. In addition, a distinction should be made between upgradient and background conditions.

We appreciate the opportunity to review this Memorandum. Please contact John Pekala at (602) 734-7710 if you have any questions regarding our comments.

Yours sincerely,



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