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David Barfield
Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, KS 66502

RE: LEMA Data Request

Dear Mr. Barfield,

In an email sent on December 21, 2017, KDA requested further information regarding the items below:

1. End gun database referenced at line 112. (p. 3) **("End gun Baseline.xlsx")**
    a. Including the endguns referred to in lines 121-123 and (p. 3-4) **("AWEP.xlsx")**
    b. Including the water use for those systems at line 124 (p. 4) **("LEMA Points of Diversion.xlsx")**
2. Historical water use of end gun systems at 120. (p. 3) **("LEMA Points of Diversion.xlsx")**
3. All bases of assuming that 10% of the water put through a center pivot system with and end gun goes out the end gun at 127. (p. 4) **("Nelson End Guns.pdf")**
4. Model runs:
    a. At 128-130 (p. 4) **("BGW_Tech_Memo.pdf")**
    b. At 131-133 (p. 4) **("BGW_Tech_Memo.pdf")**
    c. At 220-222 (p. 6) **("BGW_Tech_Memo.pdf")**
    d. At 298-301 (p. 8) **("BGW_Tech_Memo.pdf")**
5. Analysis of augmentation at 231. (p. 6) **("BGW_Tech_Memo.pdf")**

End gun Baseline.xlsx - Identifies the presence of an end gun on each center pivot system in the District. An attempt was made to identify the type of end gun at the end of 2014 through beginning of 2015. This dataset was collected in order to quantify the potential irrigated acreage covered by end guns within the District. As you can tell from the sheets, we have pictures for each system to better identify the type of end gun as needed or to validate its presence.

AWEP.xlsx – Lists the water rights that participated in the Agricultural Water Enhancement Program in 2010-2012.

LEMA Points of Diversion.xlsx – This is the District's attempt to identify both the spatial and priority distribution of water rights throughout the proposed LEMA area. Included in this spreadsheet is a listing of water rights within each area, their respective water use, and summary sheets for comparison.

The District has considered several methods for determining the amount of water saved through the removal of end guns within the area. This has been necessary as there is no database or report that definitively quantifies this amount per end gun. As a result, the District believes that comparing the gallons per minute ("gpm") that a center pivot is operating and the gpm that is diverted by the corresponding end gun is the best approach. Included with this letter are the specification sheets ("Nelson End Guns.pdf") for the most prevalent end guns in the area (Nelson 75, Nelson 100, and Nelson 150). From our observations, the center pivot systems that are pumping <800 gpm have the smaller Nelson 75 end guns. In comparison, the center pivot systems that are pumping >1000 gpm have the larger Nelson 150 end guns. From discussions with center pivot dealers in the area, these end guns are operating at 75-100 gpm depending on the type of end gun and operation of booster pumps. The operational psi for these systems ranges from 30-60 psi, again, depending on type of end gun and operation of booster pumps. The specification sheets that rate these end guns at 75-110 gpm (typical bore size 0.7" – 0.8"). The District has seen and can obtain if needed the detailed nozzle sheets as examples showing the gpm diverted by the end gun in real-world conditions. To be very specific, typically a center pivot system operating at 800 gpm will have an end gun that will divert 80 gpm (10%).

The District understands that there may be errors in the datasets, please take a close look and identify any that are present. This process has required the combination of data from several data sources. As such, errors are possible.

Balleau Groundwater Inc. has compiled the modeling scenarios and results into a technical memorandum ("BGW_Tech_Memo.pdf"). This memorandum addresses the remaining items 3 and 4 of the request. Linked within this memorandum are the model files used in these analyses.

We look forward to discussing this data in the coming weeks. Please let us know if further information is needed to support the calculations identified in the draft LEMA document.

Sincerely,

Orrin Feril
Manager
Big Bend Groundwater Management District #5