FOULSTON SIEFKIN LLP

ATTORNEYS AT LAW

Topeka Tower, Suite 1400
534 South Kansas Ave.
Topeka, Kansas 66603-3436
785.233.3600
Fax 785.233.1610

Member LexMundi World Ready

1551 N. Waterfront Parkway, Suite 100
Wichita, Kansas 67206-4466
316.267.6371
www.foulston.com

32 Corporate Woods, Suite 600
9225 Indian Creek Parkway
Overland Park, Kansas 66210-2000
913.498.2100
Fax 913.498.2101

DGGi INDEPENDENT MEMBER

David M. Traster
316.291.9725
866.347.3138 Fax
dtraster@foulston.com

September 14, 2018

Sent Via Email: David.Barfield@ks.gov
David Barfield, PE
Chief Engineer
Division of Water Resources
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502-5000

Re: Comments on the Draft Master Order

Dear David,

We have reviewed the August 21, 2018 correspondence from Keller-Bliesner Engineering, LLC ("Keller"), including the subsequent comments from Balleau Groundwater, Inc. ("Balleau"), and the August 28, 2018, letter from Orrin Feril to Brent Turney with the Big Bend Groundwater Management District No. 5 comments on the Change Applications.

The Cities provide this letter in response to the August 21 and 28 letters. In addition, the Cities provide the attached letter from Burns and McDonnell, which addresses certain technical issues present in Keller's and Balleau's comments.

The GMD5 Model

In preparation for the Transfer Hearing, Burns and McDonnell prepared a computer model of the aquifer using the GMD5 model prepared by Balleau and peer reviewed by S. S. Papadopulos and Associates, Inc. Keller, and to a lesser extent, Balleau have comments, suggestions, and criticisms of the Burns and McDonnell version of the GMD5 model.

Most of the criticisms can be attributed to suggested alternative approaches to the project that are beyond the scope of the model runs that you requested.

While Burns and McDonnell did the work and is responsible for its content, they did not make decisions about how to prepare the model in a vacuum. Instead, Burns and McDonnell discussed the development of the model with you and other DWR staff at numerous face-to-face meetings including meetings on March 24, 2016; May 20, 2016; August 10, 2016; August 17, 2016; September 15, 2016; October 6, 2016; December 12, 2016; January 10, 2017; February 15, 2017; June 27, 2017; and October 24, 2017. In addition, there was extensive oral and written communication with you and Sam Perkins as the model was developed.

Through this iterative process, the Cities and DWR have ensured that the model accurately reflects the hydrologic conditions and provides the information needed to address the regulatory issues presented by the Change Applications.

Quantity Reductions

As we have discussed numerous times, DWR's reduction to 6,756.8 acre-feet and the additional reduction imposed by the Ten-Year Rolling Aggregate Limitation are not starting points for further reductions. *See, e.g.*, my May 3, 2018 email correspondence.

The Cities' Change Applications requested quantities that would have yielded up to 7,625.70 acre-feet of water per calendar year for municipal use in Hays and Russell based on K.A.R. 5-5-9(a)(1) and (4) (net consumptive use and maximum annual quantity authorized by the water rights).

And, while groundwater modeling is an important and useful tool to explain how the changes from irrigation to municipal use will affect the aquifer, there is no legal basis for the unilateral imposition of the Ten-Year Rolling Aggregate Limitation, which is over and above the reductions authorized by K.A.R. 5-5-9.

Nevertheless, after reviewing preliminary model runs, you imposed a further limitation on the quantity of water available from the R9 Ranch Water Rights.

After lengthy discussions, and for their own reasons, the Cities agreed to the reduced quantities. However, the reductions were the subject of extensive discussion even after the Cities finally decided to capitulate because the agreement was subject to conditions that permitted them to litigate your authority to impose the quantity reductions under certain circumstances.

The debate about reopening this issue was long and difficult. At the end of the day, the Cities again capitulated so that the Draft Master Order reduces the annual quantity by 868.90-acre-feet and the quantity that can be diverted year in and year out by another 1,956.80 acre-feet if, and only if, the Master Order is finally approved on terms that are acceptable to the Cities.

In a May 4, 2018 letter, written as we finalized the Draft Master Order that was sent to the GMD and posted on your web site for public comment, I said:

While the Master Order is still a working draft there has been give and take on both sides resulting in a carefully balanced and interrelated set of terms and conditions. The Cities believe that the current version of the Draft Master Order, taken as a whole, is reasonable and will provide them with a reliable source of high-quality water that will serve their needs for many years without adversely affecting our neighbors in Edwards County and the surrounding areas.

The Cities will continue to work with you and your staff to resolve any issues or concerns that arise during the coming comment period.

GMD5's Review of the Change Applications

While we understand the GMD's interest in the outcome of this matter, the applicable regulation requires that you to submit the Change Applications to GMD5 for review. The GMD's recommendations must be "consistent with the provisions of the Kansas water appropriation act, the groundwater management district act, and the regulations adopted by the chief engineer pursuant to those acts." K.A.R. 5-25-20(b).

The GMD reviewed the Change Applications and concluded that the Master Order complies with the consumptive use regulations and that each of the proposed municipal wells "meet required spacing to nearby wells and do not exceed the limitation on the distance moved."

The GMD recommended that the Cities' monitoring plan be modified to include water-quality monitoring pursuant to K.A.R. 5-25-7. While the Cities have no objection to revising the monitoring plan to reference that regulation, its seems unnecessary since the regulation does not impose routine monitoring requirements and the Cities are now and will continue to be subject to the regulation.

The other GMD5 recommendations relate to reductions that are over and above those imposed by the authorities referenced in K.A.R. 5-25-20 and beyond the scope of their review authority. The Cities remain willing to work with you and your staff to resolve any legitimate issues, but disagree with the additional reductions suggested by Water PACK, GMD5, Balleau, and Keller. The reductions are not supported by the model, are far outside the scope of the change-application process, would significantly undercut the benefits afforded by the water transfer, and are unreasonable.

The Cities remain committed to working with you and your staff to resolve legitimate issues and concerns, if any, to preserve the "carefully balanced and interrelated terms and conditions" set out in the current draft of the Master Order.

Very truly yours,

FOULSTON SIEFKIN LLP

David M. Traster

C: Aaron Oleen
Toby Dougherty
Jon Quinday

September 13, 2018

Mr. Toby Dougherty
City Manager
City of Hays, Kansas
1507 Main Street
Hays, KS 67601

Re: Keller-Bliesner Engineering and Balleau Groundwater Comments on the R9 Ranch Modeling Report

Dear Toby:

Burns & McDonnell (BMcD) has reviewed comments on the R9 Ranch Modeling Report made by Keller-Bleisner Engineering (K-B) in a letter to the Water Protection Association of Kansas (Water PACK) dated August 21, 2018. BMcD has also reviewed the comments that were made by Balleau Ground Water (BGW) on the K-B commentary which were received from the Groundwater Management District No. 5 (GMD5) public meeting packets.

In general, the comments provided by K-B or BGW simply provide an alternative approach to the modeling process utilized by BMcD. The suggested changes to model inputs provided by K-B and BGW are not anticipated to result in substantial differences to the existing modeling results.

The following is BMcD's response to the commentary provided by both K-B and BGW. K-B comments are provided in italics, followed by BGW's comments in red text. A BMcD provided response follows each comment.

Concerns Regarding BMcD Modeling Approach and Assumptions:

1. *Model scenarios should be forward looking to study the resultant effect of the proposed change of use against an irrigated baseline future, rather than simulating the change of use against historical conditions. The starting year for all BMcD scenarios is 1991. The purpose of the modeling, once calibrated and validated, is to estimate hydrologic effects resulting from a given scenario going forward from current conditions. Accordingly, the scenario simulation starting point should be 2016 (when BMcD started the modeling work). The BGW GMD#5 model input data should be updated for 2008 to 2016 and the model calibration checked near the R9 Ranch. The scenarios should start with 2016 initial conditions (water levels, lateral flows, no baseflow in the Arkansas River, etc.).*

   To illustrate the importance of starting scenario simulations with existing conditions, look at the KGS WIZARD reported water levels for the USGS monitored irrigation wells near the R9 Ranch with data for January 1991 and January 2016. These data indicate an actual average water level nearly 8 feet lower in 2016 than in 1991 (see Table 1 below).

> *Furthermore, for the long-term historical baseline irrigation simulation (BMcD Scenario 3), 11 out of 14 USGS monitored irrigation wells near the R9 Ranch with reported water levels in 2016 had lower actual water levels in January 2016 than the model generated water levels at the end of the 51-year baseline irrigation simulation (BMcD Figure 5). Even the model simulation of the baseline two percent drought ended with most of the January 2016 reporting USGS monitored irrigation wells having lower water levels than the model generated values.*

The BMcD long-term simulations (51 years) run from 1991 through 2042, which is a simulation that is half retrospective (1991 - 2017) and half prospective (2017- 2042). The K-B point that the model scenario should be forward-looking (prospective) is good. However, if BMcD addressed this in the form described by K-B, the updated results might not be significantly different. As described in our Aug 8, 2018 presentation (Slide 26), the BMcD scenarios are based on a difference between two simulations and the difference may be similar whether the 51-year scenario is run beginning in 1991 or beginning in 2017. BMcD could clarify this with a simulation.

K-B also reports that observed water levels at USGS wells in 2016 are lower than simulated water levels at the end of the 51-year simulation that ends in 2042 (note that in making this point, K-B refers to BMcD Fig 5, which is a map of simulated water levels in 2007, not 2042, which confuses the point). Other factors can affect the K-B water-level comparisons. Recharge from wetter than average conditions can cause water-level rise in the future (this behavior is known to occur in GMD#5). It is also not clear from the reports that K-B and BMcD are using the same datum for water-level elevation comparisons. However, if close examination reveals an issue with simulated water levels, then a causal explanation should be sought.

An underlying point is that BMcD ran scenarios of municipal water use and presented results as a comparison to irrigation water use, but did not present the change in water levels associated with water use at the R9 Ranch. We illustrate the change at the R9 Ranch (Aug 8, presentation, Slide 21) for GMD#5 review. Slide 21 is based on the 51-year model simulations and illustrates the BMcD scenarios translate to 15 to 20 feet of drawdown (eastern boundary ofR9 Ranch). For planning purposes, that 15 to 20 feet of water-level change can be thought of as a projection from current conditions.

- As BGW points out, running the model forward under what amounts to different starting head conditions is not anticipated to significantly change the illustrated modeling results.
- Water level data from the letter report by BMcD dated August 6, 2018 to the Division of Water Resources (DWR) clearly indicates that 2018 water levels on the R9 Ranch have recovered several feet from 2016, further mitigating and limiting any delta in the

modeling results that would be achieved by utilizing the most current starting water levels on the R9 Ranch.

- As described within the BMcD modeling report, 1991-2007 was selected based on the availability of metered pumping information and the fact that this period included both wet and dry years. The long-term model runs conducted as part of BMcD's analysis utilized the historic climate data from 1991-2007 to project future conditions.
- This method of developing a forecasting model is similar to the method BGW used to develop their Baseline A case. The 1991-2007 original model inputs match the first 17-year period of the long-term baseline irrigation scenario; however, each of the long-term modeling scenarios should be considered prospective as they were developed, run, compared, and processed as forward runs to illustrate the effects of continued irrigation on the R9 Ranch as compared to various municipal wellfield development scenarios.
- GMD5 and BGW have invested a significant amount of time developing and calibrating the model. It has been thoroughly reviewed by modeling peers and the Division of Water Resources (DWR) and is the best available tool currently in place for aquifer evaluation and management. As noted in the peer review of the model, the calibration of the model is excellent. Updating the GMD5 68-year model calibration (1940 to 2007) with another nine years of data (from 2008 to 2016) would not provide any significant improvement to the model results.
- Referring to a decline in water levels between two specific points in time does not indicate an actual declining trend in water levels. As can be seen in Figure 1, illustrating the historical trend (1973-2013) of water levels at the three USGS monitoring wells located on the Ranch (Figure 2), water levels fluctuate four feet from average but are relatively stable throughout the period.

Figure 1
Historical Measured Water Levels and Annual Precipitation the R9 Ranch

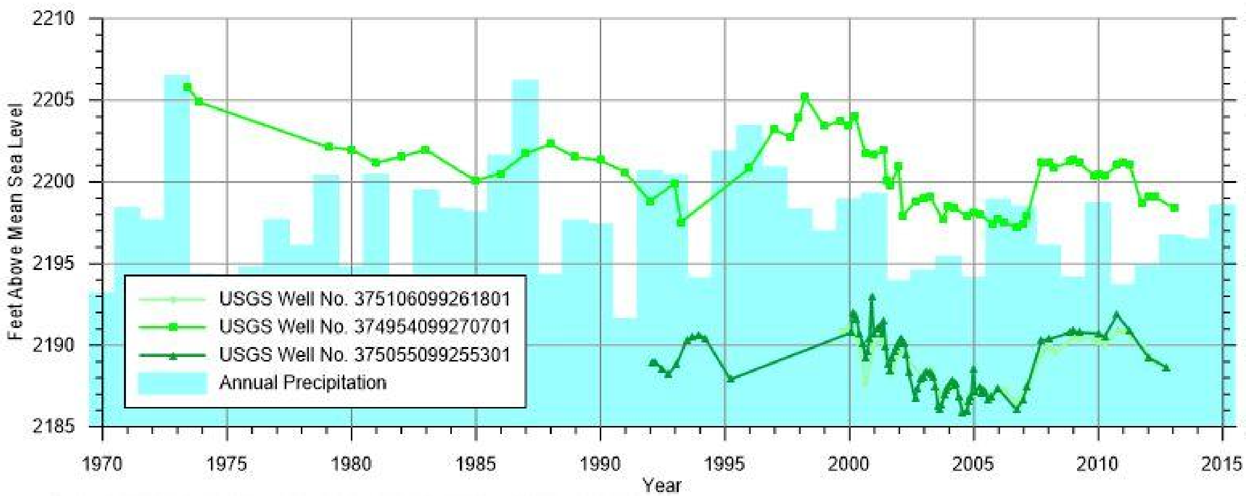
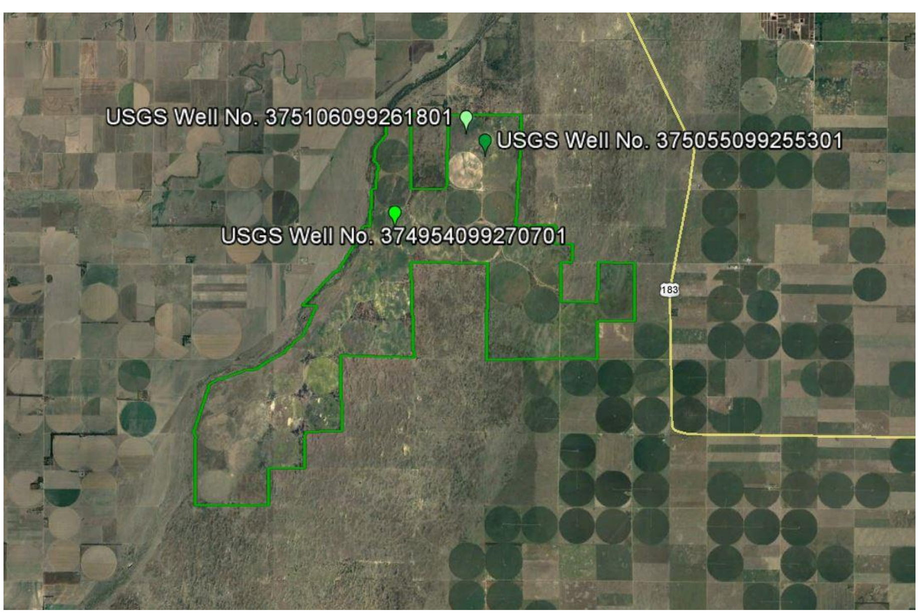


Figure 2 –
USGS Well Locations on the R9 Ranch



2. *For the long-term (51-year) scenarios BMcD simply repeated the 1991 through 2007 climate history and pumping stresses three times. At a minimum, a longer historical climate record extending to the present should be used to better capture climate variability. For example, BGW used the 1940 to 2007 climatology copied forward for 2008 to 2076 for one baseline future ("A"). (BGW also developed a second baseline, "B", from the 68-year historical climatology using the K-nearest neighbor bootstrap technique.) Given climate change and the breakdown of stationarity, we believe that in addition to reference conditions based on the long-term climate history, future climate scenarios should be derived using other techniques (e.g. adjustments to reflect climate model trends). We note that BMcD did develop a 2% drought scenario using the 1952 - 1957 historical climate record, however, imbedding this sequence once in a three-times repeat of the 17-year (1991— 2007) climatology does not adequately capture the climate variability of the longer-term historical record or of current and projected climate trends.*

Traditionally, scientists have defined a Climate Normal as an average over a recent 30-year period (https://www.ncdc.noaa.gov/news/definina-climate-normals-new-ways). The long-term BMcD simulations are over a 51-year period. It is true that a longer period can better capture climate variability, but the 51-year simulation chosen by BMcD is longer than the 30-year period typically used to characterize climate. We agree with K-B that the 2 percent drought scenario implemented by BMcD is an inadequate characterization of drought conditions. The general idea is stationary data has the property that the mean does not change over time, so if there is a trend of drying associated with climate, then a trend of drying in the baseline is a better representation of an expected projection for planning. BMcD can address how a climate trend in the baseline affects their reported results with a model simulation(s).

- Climate change modeling and analysis is speculative and beyond the scope of this evaluation.
- As BGW states, a 51-year simulation exceeds the normal standard of practice period typically used to characterize climate. Arbitrarily extending the period further would not provide any significant improvement in the simulations.
- The long-term modeling simulations were made using conservative assumptions to make the simulations a reasonable evaluation of the future conditions:
  - The 1991-2007 climate data that was used in the 51-year model was selected because it includes both wet and dry periods and because the average annual precipitation during this time period was 25.55 inches (as measured by the Offerle 5 S gage located approximately 5 miles west of the R9 Ranch).

- The historic average annual precipitation for Edwards County, Kansas is 26.76 inches based on the 1980-2010 data (as provided by the 1980-2010 Average, Kansas State University, Research and Extension, Weather Data Library).
- The 1991-2007 period represents a five percent drier annual average precipitation when compared to the extended 1980-2010 30-year climate normal.
- Combining the 1952-1957 drought climate data with a period that is already five percent drier than climate normal is a sufficiently conservative approach for the long-term drought simulations.

3. *There is no baseflow in the Arkansas River near the R9 Ranch. Therefore, the river should be treated as having no flow for all years and scenarios, not just after year 16.*

We agree the flow in the simulated Arkansas River is overestimated during low flows (Aug 8, 2018 presentation, Slide 23). On slides 16,18 and 20, we report average depletion to aquifer storage, ET and the river to clarify impacts for GMD#5. If BMcD simulated the river with no flow for all years and all scenarios, the river depletion reported on slides 16,18 and 20 would be redistributed to capture of ET and depletion of aquifer storage. The additional depletion to aquifer storage would increase drawdown to local water levels; we estimate the change in water levels on slides 16,18 and 20 would be on the order of a couple feet or less. A model run by BMcD can quantify this aspect of additional aquifer depletion to address K-B's comment.

- As BGW pointed out, modifying the upstream flow contribution for the first 16 years will have a very limited effect on water levels on the Ranch.
- It should be noted that the model underestimates the simulated flow in the Arkansas River during low flow conditions at locations upriver of the R9 Ranch, such as Dodge City and Garden City. This results in less water flowing downstream within the river channel from those upstream locations, providing less water as recharge to the R9 Ranch.
- The objective of the model runs completed was to illustrate the difference between irrigation usage of the water rights and municipal use. As BGW points out, additional model runs with zero upstream contribution to the Arkansas River are not likely to provide significant changes in the simulated results.

4. *BMcD assumed the same recharge for the municipal pumping scenarios as the irrigation scenarios (Table 3 and Figure 7). Recharge under the dryland conditions of the municipal pumping scenarios will be less than under the irrigation scenarios because more of the precipitation will be consumed by the non-irrigated vegetation growing on the formerly irrigated fields. We estimate the recharge under established dry land*

conditions on the R9 Ranch could be as much as 3,000 acre-feet/year less than under irrigated conditions.

This relates to our comments on Slide 35 of our Aug 8, 2018 presentation. K-B is indicating that to maintain a hydrologic balance of the transferred water right, post-transfer consumption of precipitation at the R9 Ranch should be considered. Otherwise, there is a new stress on the hydrologic system resulting from the change in water use.

A factor to consider relates to what condition post-transfer consumption of precipitation is compared to. K-B estimates that post-transfer conditions compared to irrigated fields results in a hydrologic imbalance because non-irrigated prairie grass consumes more precipitation. If the post transfer conditions are compared to unmanaged vegetation conditions that existed prior to irrigation, then the change in the hydrologic balance with the transfer may be less. In either case, BMcD should quantify this imbalance and associated hydrologic effects to address the comment.

- K-B's comment provides an estimate that recharge could be less, without any supporting scientific data.
- As described in the BMcD response to Item No. 2, the 1991-2007 recharge from precipitation used in the long-term model represents an approximately five percent reduction when compared to climate normal.

5. *The yearly average return flow calculations applied model-wide in the BGW GMD#5 model (BGW GMD#5 model report Table 5) and used in the BMcD modeling should be validated for the specific conditions on the R9 Ranch and, as noted in our first concern above, updated to current conditions. The necessary data for such validation and update should be available to BMcD. Based on our 1984 and 1985 (perfection years) consumptive use analysis for the R9 Ranch, we estimated crop evapotranspiration to be 72% of optimal for the ranch, which compares favorably, but is lower than the model-wide adjustment of 80% assumed by BGW. We believe return flow fractions for the R9 Ranch, given its fine sandy soils, are greater than the 17% model-wide average (1991—2007) estimated by BGW, although we have not made any return flow calculations for the ranch.*

The points raised by K-B relate to analyzing R9 Ranch return flow conditions at a scale more local than the regional approach we used to develop the model. BMcD can resolve the question with model simulations that investigate the sensitivity of their results to variations in return flow.

- The model provides an average return flow calculation model-wide.

- It is unlikely that an eight percent difference in return flow will significantly influence water levels on the Ranch.
- The BGW model is the accepted best tool available for managing and evaluating the aquifer and using the model-wide average developed by BGW is a reasonable approach.

Concerns Regarding BMcD Model Results and Reporting:

1. *The BMcD report water level contour figures (6, 9, 10, and 13) were created by subtracting the model generated ending water levels for the associated municipal well pumping scenarios from the model generated ending water levels for the irrigation pumping baseline scenarios. Not shown or reported are the change in model generated water levels from the beginning to the end of each scenario or the model generated ending water levels for the municipal scenarios. The latter can be derived by combining BMcD Figures 6, 9, 10, and 13 with the associated baseline Figures 5, 8 and 11, however not providing change in water levels and ending water levels masks the magnitude of the decline in water levels under all scenarios. For example, if one compares elevations from Figure 5 (Scenario 1: 1991-2007 Historical Irrigation Pumping) to those at the end of the 51-yr Historical Irrigation simulation (Scenario 3) in Figure 8, on average there is about a 5 to 10-ft drop in water levels. Combining that drop with Figure 9 indicates that at the end of the 51-year municipal pumping of 4,800 acre-feet/year simulation (Scenario 4) the model generated drop in water level is as great as 10 feet from the 2007 levels. Additional figures showing the water level contours at the end of the municipal pumping scenarios, like Figure 8 for the irrigation baseline, and change in water levels from the beginning to end of simulation, would be helpful.*

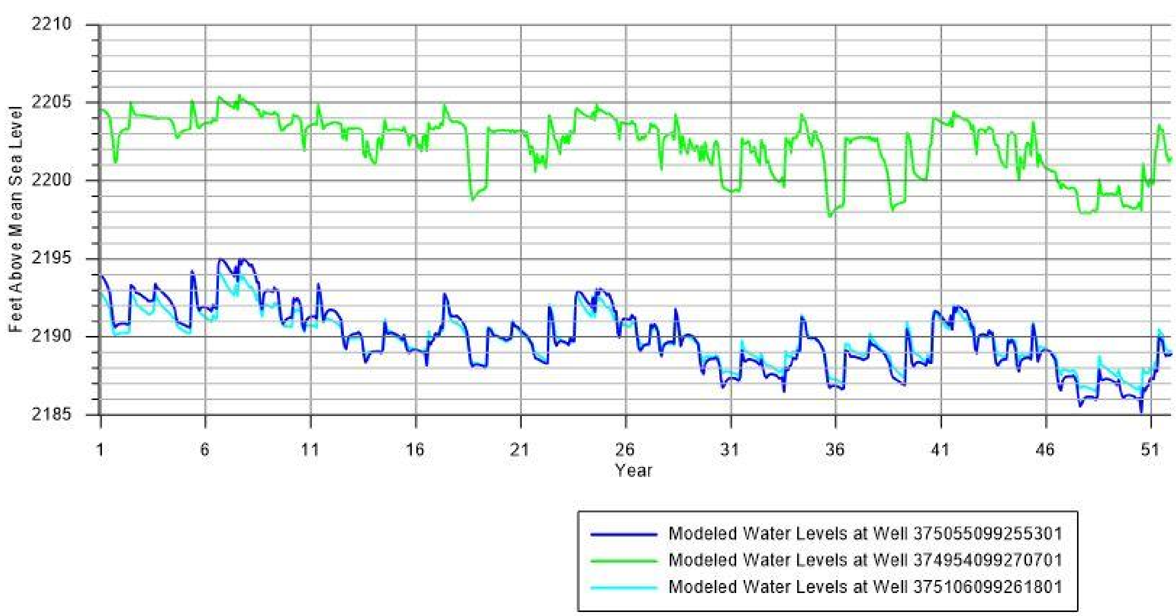
We agree with K-B that showing the change in water levels for the simulations would be helpful, so we showed a generalized summary on Slide 21 of our Aug 8, 2018 presentation for review by GMD#5. The BMcD model scenarios project 15 to 20 feet of change in water levels over a 51-year period that can be considered a projection from recent conditions. That type of information should be assessed and reported by BMcD as K-B suggests.

- The BMcD runs of the 51-year baseline irrigation model produce water levels that are slightly lower (approximately 4 feet), but not 10-15 feet lower at the end of the 51-year model as referenced by K-B. Figure 3 is a graph showing the model generated water levels at the three USGS monitoring well locations located on the R9 Ranch. Water level elevations fluctuate on average four to five feet correlating to changes in recharge, pumping, and season. It should be noted that the water levels plotted on Figure 3 are from the revised model runs with the SFR package operating correctly.

- The model runs were designed to show any changes in water levels caused by switching from irrigation pumping to municipal pumping. The results of the model runs were presented as differences in water levels to emphasize those changes.
- The available historic water levels measured on the Ranch from 1973 – 2013 show generally stable water levels (see Figure 1 and Figure 3). The BGW runs of the GMD#5 model indicate water level declines on the Ranch during this same period, as shown in hydrographs of wells 1173 (USGS Well No. 375106099261801), 1187 (USGS Well No. 375055099255301) and 1211 (USGS Well No. 374954099270701).

Figure 3

Model Generated Water Levels from the Baseline Irrigation Long-Term Model Run



2. *The change in storage reported in all BMcD report tables should be negative values, i.e. there is a net loss in groundwater storage for all scenarios. This explains why model generated water levels are declining. The cumulative decrease in storage should be discussed in the report. The report should also note whether the model is approaching*

steady and sustainable water levels at the end of the long-term simulations or if water levels and storage are continuing to decline.

The model results reported by BMcD are comparative between a baseline of irrigation and a scenario of municipal water use. The comparative results do not show the regional decline in water levels (or aquifer stored contents) that K-B is describing, but they are in the model results and could be shown. BMcD does not report whether water levels continue to decline at the end of the 51-year simulations. Slide 21 of our Aug 8 presentation shows that a simulated drawdown trend is still occurring at the end of the 51-year simulations. As K-B suggests, information on projected water-level trends should be assessed and reported by BMcD for a more complete picture.

- The net change in storage generated by the model remains positive in all six scenarios (see Table 3 in the BMcD R9 Modeling Report).

3. *The R9 Ranch Hydrostratigraphic Unit (R9 Ranch HSU, Figure 1 in BMcD report) for the mass balance computations should include additional model cells to avoid flow lines crossing multiple times in and out of the HSU. This can be done without incorporating cells with irrigation wells outside of the ranch.*

We do not entirely follow this comment. BGW clarified (Aug 8, 2018 presentation) that hydrologic effects from the water transfer propagate outside of the HSU implemented by BMcD and we quantified hydrologic effects without using the HSU approach on slides 16,18 and 20. An evaluation of that type of information by BMcD might address the K-B comment.

- The HSU area was selected based on the model cells that include the R9 Ranch.
- BMcD assumes that K-B is referring to the fact that since groundwater flow is generally to the east-northeast, groundwater can flow into the southwestern portion of the Ranch, out of the HSU into the "notch" in the bottom of the Ranch, and back into the eastern portion of the Ranch. MODFLOW accounts for flow through each side of the cube that makes up each cell within the model, so flow into, out of, and back into the HSU does not impact the results calculated by the model.
- The only wells incorporated in the HSU are irrigation return wells. Due to the size of the model grid, some of the surrounding irrigation crop circles extend onto the model cells in the HSU. The returns that BGW calculated for those crop circles are included

in the HSU totals, as it is assumed that the surrounding landowners will continue to irrigate.

4. *The 2% drought condition simulation should also be applied to the 4800-acre-foot/year maximum average municipal pumping scenario. Applying the drought condition to the baseline irrigation and projected municipal operations only masks the probable decline in water levels that would result under drought conditions with the 4800-acre-foot/year maximum average municipal pumping the cities are requesting.*

There is a masking here as described by K-B. K-B's comment could be addressed with a model simulation that examines a drought applied to the 4,800 AFY maximum average pumping scenario.

- A run applying the 4,800 acre-foot/year simulation during the two percent drought was not completed because that was not deemed a reasonable scenario. The Cities do not intend to operate the R9 well field at 4,800 acre-feet per year on a continuous basis, but on a 10-year rolling average. The two percent drought scenario run under the proposed operational conditions (Scenario 6) is representative of the actual planned operation plus a maximum use scenario during the drought years.
- The model results presented represent the changes in water level impacts caused by the change from irrigation to municipal use. The results were reported to reflect those changes.

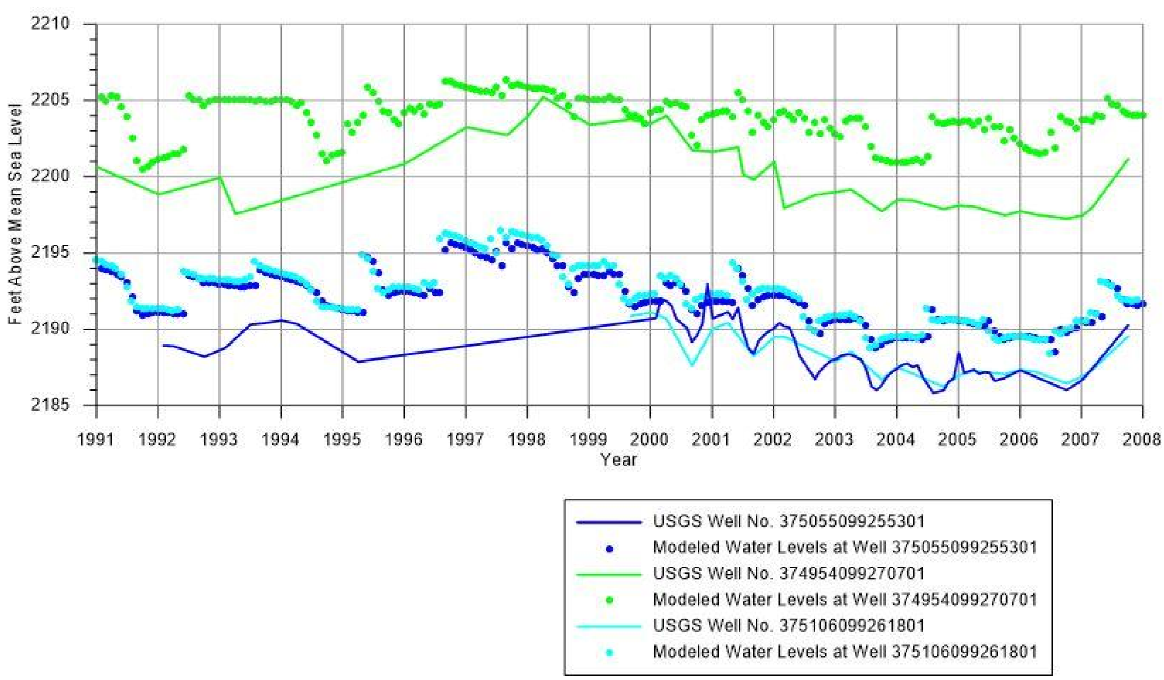
5. *From BMcD report page S, second paragraph: "As shown in Figure 3, water levels calculated by the model from 1991 through 2007 correlate well with the observed water levels from USGS monitoring wells located on the R9 Ranch." We would like to see plots of model generated water levels for the same model cells as the USGS monitored irrigation wells located on and near the R9 Ranch. We note from Table 1 above that the model appears to have a significant bias towards generating water levels higher than the USGS monitored irrigation wells near the ranch. January 2008 reported water levels for some monitoring wells near the ranch are 9 to 18 feet lower than the model generated waters for the baseline irrigation Scenario 1 (see Table 1 above and BMcD report Figure 5).*

K-B is clarifying that on Figure 3 of the BMcD report, the simulated water levels are not shown in the same model cells where the USGS monitor wells are located. We interpret

BMcD's Figure 3 to illustrate that the model is capturing water-level changes that occur during the historical period from 1991 to 2008 in the area of the R9 Ranch (i.e. rather than specifically at the wells). It is possible that water levels at the model cells that contain the cells may show a somewhat different trend. The model is not a perfect representation of each well, but it generally provides a reasonable representation of well areas. That is, although specific wells may show water levels different from the model, the model can represent conditions that adequately characterize the area where wells are located.

Figure 3 of the BMcD report shows that the model reasonably characterizes the historical change in water levels, which supports the conclusion that the model is suitable for estimating the change in water levels that occurs in the scenarios, despite the fact that there may be a bias in local simulated heads. However, the model comparison to specific wells should be evaluated and reported by BMcD as K-B suggests.

Figure 4 -
Comparison of Historic and Model Generated Water Levels



- BGW's comment adequately addresses the issue brought up by K-B. BGW provides detailed calibration plots of actual and model water levels in Appendix C.

BURNS McDONNELL

Specifically graphs for wells identified as 1173, 1187 and 1211 are monitoring wells located on the R9 Ranch and used by BGW for calibration.

- The wells used in the BMcD report represent the locations of observation wells installed in 2014 and intended for water level monitoring into the future.
- Figure 4 illustrates the water levels measured at the three USGS monitoring wells on the R9 Ranch and compares them to the model generated water levels at those same locations. It should be noted that the model generated water levels plotted here are from the revised runs of the model, where the SFR package is running correctly.

6. *From BMcD report page 5, fourth paragraph: "Figure 4 shows the change in water levels in comparison to pumping rates on the R9 Ranch for six of the iterative model runs. Water levels are dropping at higher pumping rates, rising at lower pumping rates, and are reasonably stable in the zone where the yield is sustainable. As can be seen in this figure, with 4,800 acre-feet of pumping, water levels are relatively stable with a drop of only 0.6 feet at the end of the 1991 to 2007 model runs." Not shown is what would happen to water levels over a longer simulation period with more realistic climatology including drought cycles. Furthermore, Figure 4 implies that under the baseline scenario with a net irrigation pumping average of 4,054 acre-feet/year for 1991 to 2007, we would expect model generated water levels to rise by about 0.8 feet at the end of Scenario 1. Instead, Figure 3 shows a drop by 2.5 to 5 for model observation points No. 1 and 2. Perhaps, Figure 4 is intended to show the model generated water level effect of municipal pumping rates relative to the modeled baseline irrigation pumping water level decline of 2.5 to 5 feet after 17 years. If that is the case, then it is incorrect to conclude 4,800 acre-feet of municipal pumping per year is sustainable.*

As described on slides 32, 33 and 37 of our Aug 8, 2018 presentation, 4,800 AFY is prospective for long-term production from the wells at the R9 Ranch. Determining what is sustainable relates to the hydrologic effects from that pumping that are deemed acceptable by area water users and administrators. The 4,800 AFY may be less if the river is managed for a specific quantity of flow for downstream use or if local water levels are managed to maintain a certain water-level elevation.

- A longer time period for the model simulation has previously been addressed in this letter.
- The 1952-1957 drought utilized exhibits a roughly two percent probability of exceedance, and is also only likely to statistically occur once within the 51-year

simulated period. The 51-year drought model run also includes periods of drought that are not as great in magnitude or duration as the 1952-1957 drought.

- Water levels at the monitoring wells shown in Figure 3 are subject to seasonal variations, localized pumping effects, and changes in the overall aquifer levels. It is not accurate to state that water levels in the aquifer have dropped by a given amount when looking at two specific points on a graph.

In summary, the comments provided by K-B and BGW in general provide an alternative approach to the modeling process utilized by BMcD. The suggested changes to model inputs and assumptions provided by K-B and BGW are not anticipated to result in substantial differences in the existing modeling results. More importantly, none of the comments provided indicate that the model itself or the modeling results are in any way invalid for examining the sustainable use of groundwater from the R9 Ranch or quantifying the effects of the proposed change from irrigation to municipal use.

If you have any questions regarding our response to these comments, please contact me at 816.695.3940 or pmccormick@burnsmcd.com.

Sincerely,
BURNS & MCDONNELL

Paul A. McCormick, P.E.
Associate Geological Engineer

cc: Jon Quinday – City of Russell
John T. Bird – Glassman, Bird, Brown & Powell
David Traster – Foulston Siefkin
Daniel Buller – Foulston Siefkin