Barfield, David [KDA]

From: Barfield, David [KDA]
Sent: Thursday, May 30, 2019 6:01 PM
To: Titus, Kenneth [KDA]; Preheim, Lynn; Orrin Feril; dnwfarm@gmail.com
Cc: Mike Beam [KDA] (Mike.Beam@ks.gov); Beightel, Chris [KDA]; Titus, Kenneth (Kenneth.Titus@ks.gov); Letourneau, Lane [KDA]; Lanterman, Jeff [KDA]
Subject: Technical review of LEMA Plan and backup / resend of informal review comments
Attachments: TechnicalReview_GMD5_2019-02-22LEMAplan.pdf; 2019-04-04 _Titus_InformalLEMAPlanComments_email_attachment.pdf

Orrin and GMD 5 Board,

We have completed a technical review of your February 22, 2019 LEMA proposal, including a review of the additional analysis and backup data GMD 5 has provided. See attached.

FYI, also attached are the informal review comments on the LEMA plan we provided GMD 5 on April 4, 2019, based on our preliminary review with the goal of identifying initial concerns.

We will finalize our response to the LEMA plan following the Secretary's visit with the Board on June 3, 23019.

Let us know if you have any questions.

David

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From: Titus, Kenneth [KDA]
Sent: Thursday, April 4, 2019 5:04 PM
To: Preheim, Lynn <lynn.preheim@stinson.com>; Orrin Feril <oferil@gmd5.org>; dnwfarm@gmail.com
Cc: Barfield, David [KDA] <David.Barfield@ks.gov>; Beightel, Chris [KDA] <Chris.Beightel@ks.gov>
Subject: Informal LEMA Plan Comments
Importance: High

Lynn, Orrin, and Darrell,

Based on the conversation during our recent Stafford meetings, Lynn indicated that it would be helpful to receive some informal feedback on your LEMA plan. I've attached a copy with a number of preliminary comments. As we explained at that time, this should not be considered a formal rejection of your proposed LEMA, but we have taken the time to identify some initial concerns that will need to be addressed during this process. We continue to work with BGW to firm

up our understanding of the various hydrological questions that have been discussed and are hopeful that we can provide a more complete review of your LEMA plan in the near future.

As always we are happy to try and answer any questions you may have about this review.

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KDA-DWR's review of GMD 5's February 22, 2019 LEMA plan proposal

May 30, 2019

Executive Summary

The United States Fish & Wildlife Service ("Service") has informally complained for decades that junior groundwater pumping within the Rattlesnake Creek Basin has impaired its water right for Quivira National Wildlife Refuge ("Refuge") and therefore hindered its ability to perform its mission as a refuge. After nearly two decades of working with the Kansas Department of Agriculture-Division of Water Resources ("KDA-DWR"), Big Bend Groundwater Management District No. 5 ("GMD 5") and other basin partners, the Service made a formal complaint of water right impairment in 2013. KDA-DWR investigated and in 2016, found that the Service's right is being impaired. The Service has properly pursued relief to its impairment under Kansas law and KDA-DWR is responsible to protect the Service's senior Kansas water right.

After three years of discussions on a remedy for the impairment, KDA-DWR and GMD 5 still do not agree on what is necessary to resolve the impairment. KDA-DWR communicated, starting in July 2017, that a long-term remedy of the impairment could be achieved through a combination of GMD 5's proposed augmentation project to relieve the immediate water shortages, and groundwater pumping reductions of approx. 15% to ensure the lasting effectiveness of the augmentation and slow the deterioration of streamflow in the basin. GMD 5 asserts that augmentation is by itself enough to resolve the impairment and that groundwater pumping does not need to be reduced.

Both KDA-DWR and GMD 5 are relying on detailed analyses using the GMD 5 Model. There is no disagreement regarding the validity of the model or the results of the simulations generated using the model. The differences come from the interpretation of what the model simulations show and what long-term water management policies are required to consider the impairment resolved.

GMD 5's most recent position, as communicated through the February 22, 2019 Local Enhanced Management Area ("LEMA") plan submitted by its board, seems to be that 1) augmentation will be available (at some future undetermined date), 2)

water use reductions are needed to reduce future growth to stream depletions, but no water reduction will be required, and 3) if in ten years the impairment is not resolved, a future GMD 5 board will request an Intensive Groundwater Use Control Area ("IGUCA") (although they do not possess the legal authority to commit a future board to action).

The latest LEMA plan comes after more than 18 months of GMD 5's discussions with KDA-DWR, several public meetings, and analyses and guidance from technical and legal consultants. Following a comprehensive review of latest GMD 5 proposal, as well as the additional analysis and backup data provided by GMD 5's consultant, KDA-DWR determined that while the plan does set forth a commendable list of voluntary water-saving measures, the plan fails to guarantee, by enforceable action, that what is needed to resolve the impairment will be accomplished. Lacking any enforceable water savings, and assuming credit for an augmentation project that is early in the planning stages (there is currently no funding, no water right is secured, there is no access to land, and no engineering plan), this plan is fundamentally flawed by its insufficiency to resolve the impairment.

The proposed LEMA plan's only corrective control, the ordering of irrigators to remove end guns from their center pivot systems, is also flawed because it does not reduce those irrigators' water allocations or the acres they are authorized to irrigate.

The technical work completed during these discussions has improved KDA-DWR's understanding of the local hydrology and alternatives for resolving the impairment and their impacts. Despite clear criteria and substantial support provided by KDA-DWR, GMD 5 remains unable or unwilling to provide a solution that KDA-DWR believes solves the impairment.

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I. The impairment to Quivira National Wildlife Refuge must be resolved

The Service owns and operates Water Right File No. 7,571 which is senior in priority to 95% of water rights that are in the area. As KDA-DWR's 2016 Final Impairment Report shows, these junior water rights are depleting the flows of Rattlesnake Creek.

The Service's water right is a Kansas water right, permitted and perfected pursuant to Kansas statutes, rules and regulations, and is entitled to the same protection from impairment as any other Kansas water right.

After decades of concern that junior groundwater pumping was preventing it from fully exercising its water right to capture the flows of the Rattlesnake Creek, in April 2013 the Service on behalf of the Refuge formally lodged its complaint and requested that the KDA-DWR conduct an impairment investigation.

KDA-DWR's initial report, published in December 2015, found that the Refuge was being impaired by junior users and the final report was published in July 2016. The Service formally requested on January 17, 2017 that KDA-DWR act to secure its water right for 2018. No administration of water rights occurred in 2018. The Service formally requested on December 13, 2018 for KDA-DWR to secure its water right for 2019.

It has now been nearly six years since the Service's formal complaint and nearly three years since the final impairment report was published. The Service has requested that KDA-DWR act to protect its water right. KDA-DWR has deferred regulating the impairing rights while it worked to help GMD 5 develop a locally-driven solution. But these efforts have stalled, and the law demands that the impairment of senior water right whose owner wishes to exercise that right cannot continue.

II. The overarching plan to resolve the impairment must meet certain hydrologic criteria

In 2017, given GMD 5's stated intent to use augmentation as an element of the solution and pursuant to GMD 5's request, KDA-DWR set forth the specific criteria required to resolve the impairment. There are two elements to the solution, augmentation and pumping reductions. Per statute written expressly for this impairment case, augmentation must be offered voluntarily. Pumping reductions require state administration by way of a LEMA, IGUCA, or strict water right administration.

a. The criteria for augmentation

The GMD 5 groundwater model ("Model") shows that pumping reductions, depending on how far from the stream they occur, may take years or even decades to affect streamflow. Likewise, reductions in pumping take years or even decades to benefit streamflow. Even with significant cuts to pumping, the Refuge would suffer impairment for many years before streamflow improved enough to relieve the shortages. Augmentation can provide water precisely when it is needed. This is why KDA-DWR supports the development of augmentation.

Based on what GMD 5 has stated that it is willing and able to build and operate, KDA-DWR's criteria for augmentation are:

The capacity to deliver at least 5,000 acre-feet per year of acceptable quality water at a rate of at least 15 cubic feet per second.

Building augmentation does not require a LEMA or any other special administrative district or area. To the extent that augmentation is discussed in the LEMA plan, it must be made clear that augmentation cannot be ordered by the chief engineer. K.S.A. 82a-706b. The only reason to refer to augmentation in GMD 5's LEMA plan is to note that it exists (or will imminently) and that when it is available it must be considered by the state along with the other management actions being undertaken by the basin.

Because it is a strictly voluntary action that can be implemented at any time, KDA-DWR has over the past two years repeatedly encouraged GMD 5 and all stakeholders in the basin to commence building an augmentation project to provide immediate relief to the Refuge.

b. The criterion for groundwater pumping reductions

The Model also shows that if current groundwater pumping behavior continues, the amount of water being taken from streamflow by groundwater pumping will continue to increase into the future. Though it fluctuates significantly from year to year, on average, the stream depletion rate is growing by about 400 acre-feet per year. This means, for example, if depletions to streamflow in 2020 are on the order of 50,000 acre-feet, then depletions in 2030 are projected to be around 54,000 acre-feet, and so on for each prospective decade.

As streamflow is reduced, impairment frequency and magnitude increase, thus reducing the effectiveness of the augmentation project because it would have to increase its capacity (volume and rate) to overcome the increasing continued loss of streamflow. This is the principal reason why KDA-DWR requires reductions in pumping. But there are other factors that require protecting a reasonable level of streamflow including slowing the degradation of the water quality in the stream and meeting statutory minimum desirable streamflow targets.

The KDA-DWR criterion for pumping reductions is not set to restore or even completely stabilize streamflow, but rather to slow the growth of depletions so that the augmentation project can be effective for a generation or more. The criterion is:

Reduce the stream depletion growth rate by one half.

This long-term, quantitative goal can be achieved in many ways and evaluated using annual water use reports and the GMD 5 Model. For instance, when KDA-DWR first presented this criterion it also presented a plan to achieve the goal by reducing groundwater pumping by 15% from recent historical use. GMD 5 used its groundwater model to validate its own proposal to reach the reduction goal by reducing pumping by about 10% over a wide area and by up to 25% in a targeted area close to the stream.

There is also an important water quality concern with the current groundwater pumping behavior. BGW's analysis shows that in the last decade of its 2008-2075 simulation, the modeled streamflow is about twice as dependent on runoff from precipitation events as it is now (and therefore not as reliable). And as pumping upstream continues to dry up baseflow (the contribution to streamflow from the aquifer), the remaining baseflow comes from the last few miles upstream of the Refuge where the water starts to become more saline. Given that the Refuge's mission to provide habitat is highly dependent on the chemistry of the water entering the refuge, water quality is a very serious concern.

III. KDA-DWR has provided GMD 5 a framework to enforce the water use reductions that GMD 5 acknowledges are necessary in its plan

Since August 2017 KDA-DWR and GMD 5 have negotiated how the water use reductions would be implemented and enforced.

KDA-DWR has always held that 1) the GMD 5 Model should be used to identify which water rights are impairing the refuge, 2) impairing water rights should be given multi-year (e.g. 5-year) allocations of water so that the goal of halving the depletion growth rate is met, 3) the allocations should be based on a combination of water right priority and degree of effect on the stream, 4) the allocations should be phased in assuming that augmentation is built and fully available in 3 years, and 5) if augmentation is not built, then more restrictive allocations (50%-60% cuts in historical use) will be implemented to restore streamflow.

a. GMD 5 has known what KDA-DWR requires in a LEMA since March 2018

In March 2018, KDA-DWR provided a draft LEMA plan[1] to GMD 5 that contained the elements set forth above and which would have been acceptable to the agency. GMD 5 declined to adopt the plan.

GMD 5's LEMA committee shared draft plans with KDA-DWR on July 12 and September 9 of 2018. KDA-DWR provided the committee with detailed feedback on those plans.[2]

b. KDA-DWR has compromised to allow flexibility

Through negotiation with GMD 5, KDA-DWR has agreed that instead of requiring allocations immediately, GMD 5 could be allowed to try to achieve the depletion goal with the combination of 1) significant progress on building augmentation, and a commitment to have augmentation available by 2022; and 2) a LEMA to remove end guns plus incentive-based, targeted water reductions in the high impact area. But KDA-DWR agreed to this more voluntary implementation only on the condition that the LEMA plan includes clear and enforceable controls that would be implemented in five years (2024) to achieve the goal if the incentive-based actions proved insufficient.

IV. Inadequacies of GMD 5's current plan to address the impairment

GMD 5's current proposed plan lacks clear and effective enforceable controls, and delays consideration of enforceable action until 2029, and even then, makes no enforceable commitment.

a. The plan lacks quantified goals and objectives

The plan's goal "to provide a satisfactory remedy to the impairment complaint at the Refuge", and its objective "to reduce water use in the LEMA area to a degree that will temper the growth of future streamflow losses" are only effective if those things are quantified and the plan lays out how they will be accomplished through enforceable action. But the plan includes only one action that can be ordered and enforced through the LEMA – removing end guns from center pivot systems in the LEMA area. And the only thing quantified about removing end guns is that the number of end guns in the LEMA area is known.

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[1] March 3, 2018 email from Chris Beightel [KDA-DWR] to Orrin Feril [GMD 5]

[2] https://www.agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/kda_review_of_gmd5_9-aug-18_draft_lema_managementplan_20180823_.pdf?sfvrsn=701c87c1_0

To address the impairment, the plan needs to include the water reduction criterion that KDA-DWR has prescribed – reduce the stream depletion growth rate by one half – and the plan needs to establish how much water can be pumped by appropriators junior to the refuge in the LEMA area over some term, e.g. 781,537 acre-feet over five years.

The plan also states that "…4,000 AFY of water use or its hydrologic equivalent needs to be curtailed in the high impact area around St John…", but this statement is not tied to any quantified goal and there is no requirement that this action be taken or enforced.

b. The plan requires no reduction in water use

The plan does not reduce the acres that can be irrigated after end guns are removed. The plan does not limit the amount of water that can be used after end guns are removed, explicitly stating "the LEMA plan does not have a water use reduction requirement". Rather, the plan simply assumes that by removing end guns, "The District estimates a savings of 14,750 AFY."

Thus, the plan implicitly assumes that producers will not change their farming practices to take full advantage of their historical water supply. Of course, many options are available to the producer, such as growing a longer season variety of crop, changing crop types or patterns, or simply applying more water to gain more yield. Without setting limitations on water withdrawals, removing end guns is little more than a hope that producers will voluntarily reduce their water use. The inability to enforce or rely on a specific reduction in water use also makes it impossible to determine if the impairment has been stopped.

c. The plan relies on an augmentation project which does not exist and cannot be ordered by the chief engineer

As explained section II above, KDA-DWR supports the basin's plan to use augmentation to provide and encourages GMD 5, or whoever is willing and able, to move forward with building a functioning augmentation project as soon as possible. But as of now, there is no functioning project.

To provide a comprehensive plan to resolve the impairment, the plan needs to specify what will happen if augmentation is delayed by several years or is never available.

d. The plan relies on binding a future GMD 5 board to action if the current plan fails to resolve the impairment

In their plan, GMD 5 says that following the LEMA Order review done at the end of the 10-year period, "If… the District is not able to meet its obligations, then the District shall submit a written request to the Chief Engineer for the formation of an

Intensive Groundwater Use Control Area ("IGUCA")." This language is similar to the language in the 2000 Rattlesnake Creek Management Program[3] where, if the goals were not achieved, GMD 5 committed to "consider requesting that an Intensive Groundwater Use Control Area (IGUCA) be established." But though the 2000 management program fell far short of its goals, the board made no such IGUCA request. The language in this LEMA plan is no more enforceable on a future GMD 5 board than the management program language was.

The idea of triggering a request for IGUCA could be realized if it was tied to quantified goals, e.g., the current board could request an IGUCA process be initiated automatically if withdrawals over ten years exceed a fixed limit. But such goals are absent from this plan.

V. KDA-DWR is still not persuaded that augmentation alone will resolve the impairment

In January 2019, KDA-DWR published its Memo on Sufficiency of GMD 5's Augmentation-Only Plan to Resolve Quivira Impairment[4]. The memo's argument was summarized as:

"…the proposed augmentation project alone is not sufficient to remedy the impairment of Quivira's water right because the current level of groundwater pumping, if not reduced, will dry up the reliable part of the streamflow that comes from the aquifer. Reliable and total streamflow will be significantly reduced to such a degree that the impairment will continue even with the proposed augmentation project, while other uses upstream are compromised and the hydrologic health of the basin continues to deteriorate."

In response, GMD 5's consultant Balleau Groundwater Inc. ("BGW") transmitted a February 20, 2019 letter[5] arguing that baseflow (the "the reliable part of the streamflow that comes from the aquifer" referred to in the passage above) does not completely disappear in model simulations of the basin's future hydrology. The letter goes on to state that cutbacks in pumping are not necessary. In Attachment 1, KDA-DWR provides inline comments to BGW's February 20, 2019 letter.

a. Baseflow, the reliable part of the stream, is still going away

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[3] https://agriculture.ks.gov/docs/default-source/bmt---rsc/rsc_management.pdf?sfvrsn=5a38e03f_2 page 20

[4] https://www.agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/sufficiencyofaugonly_2019-01-04_final.pdf?sfvrsn=ff2885c1_0

[5] http://archive.gmd5.org/LEMA/2019-02-20_BGW_LEMA_Issues.pdf

After BGW's recent work, KDA-DWR agrees with BGW on the fact that its simulation shows that baseflow and total streamflow will be significantly diminished over the next 50 years. BGW has demonstrated that there may still be a little more than zero baseflow available to the refuge in 50 years[6], but that contention is compromised by showing only an average of the last decade of the simulation. BGW's analysis does not show what shortages occur in the middle years of the simulation between 2020-2050, and due to averaging, BGW does not show the year-to-year shortages it anticipates. KDA-DWR analyzed the yearly baseflow output from BGW's simulation and found several years, beginning in about 2021 where there was no baseflow in the stream at Zenith[7]. See Figure 1 below

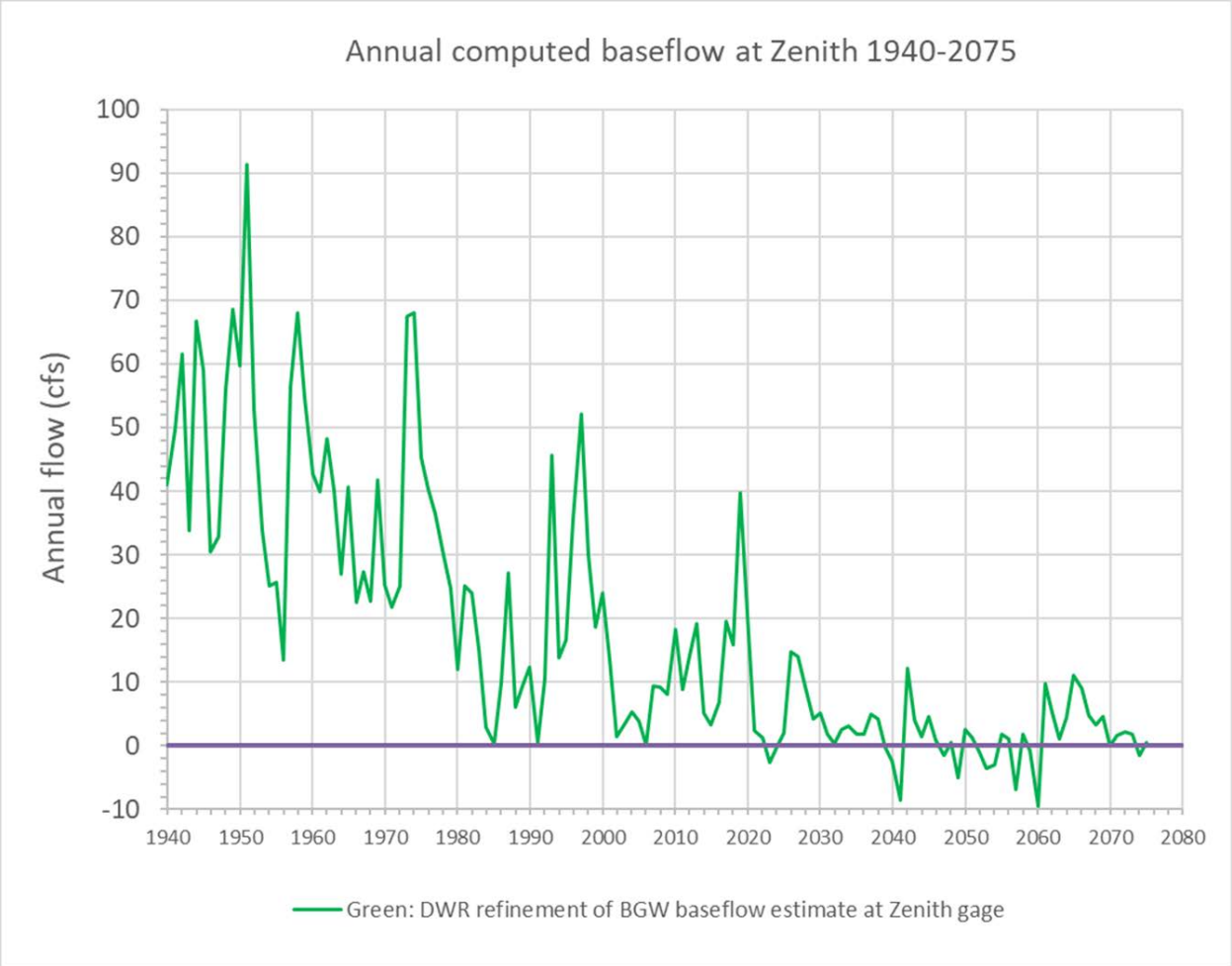

Figure 1 - Simulated Baseflow at Zenith Gage

[6] See attached KDA-DWR inline comments to BGW's February 20, 2019 note, Exhs. 1 and 2.

[7] Ibid, Figure 1.

And even with the critical dry years masked by averaging, in the last decade (2050-2060) BGW's analysis of its simulation shows that the only available baseflow (0-8 cfs) comes from the last few miles above the refuge where the water becomes more saline. Without the fresher water coming from upstream, the water quality at the refuge risks becoming unsuitable for maintaining habitat in the refuge, and therefore unacceptable[8].

b. Little Salt Marsh is habitat and the Service has the right to manage it for that purpose

In making its case for the sufficiency of augmentation only, BGW assumes that the storage capacity of Little Salt Marsh will be used to optimize delivery to the other refuge management areas. This assumption fails to consider that LSM is part of the Refuge and its use as habitat will at times conflict with what BGW assumes as optimal storage use.

c. Increasing augmentation capacity is not trivial, and reductions to pumping will help the stream

BGW also makes a two-pronged argument that even if the proposed augmentation is found to be insufficient 1) pumping reductions are unwise because only about 10% of the reduction helps streamflow, and only half of what helps streamflow helps the refuge (because the other half happens at times that the refuge doesn't need water); and 2) the augmentation project can easily be increased to provide the same or greater benefit that pumping reductions would produce.

The first point is difficult to accept since the "high impact area" referenced in several places in GMD 5's plan is defined as the area where 40% or more of the groundwater pumped comes from streamflow as determined by the GMD 5 Model. The remainder of the LEMA area is defined as the area where 10% or more of groundwater pumped comes from streamflow.

If BGW is describing the effects of only the 2020-2029 period when the GMD 5 LEMA is proposed to be in place, then the statement may be technically true, but it hides the long-term benefit of the reductions which at the end of the simulation are over 33%. That is, for every 100 acre-feet of reduction, the stream will benefit 33 acre-feet.

Based on the data currently available, the Kansas Department of Health and Environment believes GMD 5's concept of augmentation can be implemented within

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[8] See table at page 16 of https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/kdhe_2018_initial_water_quality_analysis_of_augmentation_at_quivira_national_wildlife_refuge_wtl.pdf?sfvrsn=3b2985c1_4

required water quality constraints, but the project will require careful monitoring to ensure this[9]. Thus, the level (rate and quantity) of augmentation allowed under GMD 5's concept will only be known with operational experience.

d. Drying up the stream is bad for the basin and may lead to water quality problems at the refuge

Given that the currently proposed location of GMD 5's augmentation wellfield is in an area with elevated chlorides and given that BGW's analysis demonstrates that in a few decades streamflow will diminish significantly and the only remaining baseflow will be more saline, it does not seem reasonable to assume that decreasing the quality of the water supporting the refuge will be acceptable.

Furthermore, drying up the stream above the refuge puts more pressure on the augmentation project which, even as designed, relies on marginal-quality water[10]. As stated previously, when the fresher water from upstream goes away, depleted by groundwater pumping, only the remaining saltier streamflow a few miles above the refuge will be available to dilute the augmentation water.

e. Conclusion

BGW's arguments understate the dire condition of Rattlesnake Creek streamflow for most of its simulation, understate or omit the challenges of simply increasing augmentation capacity, overstate the ability to use Little Salt Marsh for storage and delivery of water to the rest of the Refuge, and understate the positive effects that reducing groundwater pumping will have on streamflow.

KDA-DWR continues to hold that a reasonable augmentation project accompanied by reasonable reductions in groundwater pumping are necessary to resolve the impairment for the long term.

VI. Current status

After KDA-DWR provided clear and specific criteria to resolve the impairment, in August 2017, GMD 5 informed KDA that it would pursue using a LEMA to meet the criteria. KDA-DWR met with GMD 5, its LEMA committee, its counsel, and its technical consultant numerous times to work through how to develop a LEMA plan to meet KDA-DWR's requirements for resolving the impairment. The main points of contention between KDA-DWR and GMD 5 are that 1) GMD 5 argues that it can provide enough augmentation to resolve the impairment for the long term, and 2)

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[9] Ibid. pages 15-18

[10] Ibid. pages 10-15

reductions in pumping are not necessary to resolve the impairment. As set forth above, KDA-DWR disagrees with both of these assertions by GMD 5.

So now, some 20 months after it committed to resolving the impairment with a LEMA, GMD 5's second formally submitted plan is unacceptable because it makes no commitments to reduce water use and relies solely on an augmentation project that remains in the conceptual design stage. GMD 5 has repeatedly and consistently resisted making any commitments to reducing water use, and though it has repeatedly and consistently committed to building augmentation which, thanks to K.S.A. 82a-706b (2015) it could have been doing for the last two years, GMD 5 has not yet even retained technical consultants to design the project, much less secured access to the land, the water right, and most significantly, funding.

KDA-DWR's 2016 final impairment report quantified the impairment to the Refuge and Service as required pursuant to KDA-DWR regulations. Further, the Service properly requested that junior appropriators be administered in 2018 and 2019 to protect the Service's senior Kansas water right. However, citing progress towards resolving the impairment through a LEMA, KDA-DWR has not regulated junior users.

Through the course of our work together, KDA-DWR and GMD 5 have explored several ways to accomplish the goal to reduce the growth rate of streamflow depletions. KDA-DWR has developed response maps, used the GMD 5 Model to evaluate several possible solutions, and has developed sophisticated allocation tools that would distribute the necessary pumping reductions as allocations of allowable withdrawals to junior water users based on their relative priority and to some degree, their relative effect on streamflow (closer to stream has more effect).

GMD 5's latest LEMA plan is a clear indication that GMD 5 is not moving towards meeting the criteria that KDA-DWR has set forth as requirements to resolve the impairment.

Attachment 1 – KDA-DWR's in-line responses to BGW letter of Feb 20,2019

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February 20, 2019

Mr. Orrin
Feril Manager
Big Bend Groundwater Management
District 5 125 S Main St
Stafford, KS 67578

Subject: Hydrologic Issues Pending for LEMA (Local Enhanced Management Area) to Remedy Quivira Impairment

Dear Mr. Feril:

Several hydrologic questions remain to be clarified to support administrative approvals in remedying the impairment at Quivira National Wildlife Refuge. This letter outlines some pending issues and the hydrologic rationale for proceeding on the Big Bend Groundwater Management District 5 (GMD5) management plan presented as a LEMA. The Quivira water right is certified at 14,632 acre-feet of water per calendar year, with the water to be stored and accumulated in marsh areas within the Refuge. The priority date is 1957 and is senior to many of the Rattlesnake Creek basin's farm-well dates. The Refuge has released a demand schedule calling for that volume to be diverted from the watercourse to the Refuge facilities at rates ranging up to 30 cubic feet per second (cfs) in spring and fall seasons or lesser rates of 8 to 12 cfs in winter.

<u>Agency Guidance on Impairment and Basin Health</u>

In January, the KDA (Kansas Department of Agriculture) summarized their views on this matter in a paper "Resolving the Quivira Impairment, Q&A"[1], where KDA found that *"… an augmentation project, along with modest reductions in groundwater use… will resolve the impairment…"*. Impairment means *"diminished in value or utility"* the test for which is *"whether the Refuge could have more fully exercised its water right…"*.[2] KDA supports augmentation of streamflow with wellfield discharge to relieve the impairment, but holds that cutbacks in farm pumping to maintain lower levels of water use are also necessary,

[1] Resolving the Quivira Impairment, KDA, January 11, 2019

[2] Final Impairment Report, KDA-DWR (Division of Water Resources), July 15, 2016

based on reasons given in a technical memorandum, *"because the current level of groundwater pumping, if not reduced, will dry up the reliable part of the streamflow that comes from the aquifer…and the hydrologic health of the basin continues to deteriorate."*[3] The KDA projects (absent any cutbacks in farm pumping) that the LEMA proposed 15 cfs nominal augmentation rate would be inadequate to remedy over 3000 of the 14,632 acre-feet Refuge demand in some future dry years, while most years would have a lesser shortfall, and in some wetter years Refuge demand would be fully satisfied. The LEMA proposal by GMD5 includes a measure of cutbacks in pumping that would reduce that reported shortage for Refuge demand.

KDA-DWR: We agree that if pumping reductions occur, shortages to the Refuge are reduced. However, the LEMA plan provides no certainty as to whether, amount, or when claimed water use reductions from the voluntary actions envisioned in the plan will occur.

The LEMA plan does not set quantitative goals to reduce water use, e.g. limit pumping withdrawals to some specific amount, or reduce the rate of growth of depletions to streamflow by some certain amount as determined by the model. Since there are no quantitative goals, there are also no means to enforce that quantitative goals are met. This is the fundamental inadequacy of the LEMA plan.

Effect of End-Gun Removal

Another hydrologic matter of concern is the accounting of water from end guns on center-pivot sprinkler systems. The LEMA proposes to remove end guns in the enhanced management area. Based on acreage reduction, a saving of water is estimated by GMD5 at about 14,750 acre-feet per year. The savings on farms show up in two ways, mostly as a relative rise in water-levels in the aquifer, and secondly as a much-reduced fraction of the

savings that appears in the flow of Rattlesnake Creek in response to the rising water levels. The DWR responds that water might be saved by removing end guns, but not necessarily so if the acreage reduction is less and if equivalent use is added as water applied and consumed on remaining center-pivot water-deficit acreage. On the other hand, the historical farm- water application has been shown to be explained 98 percent by a match with consumptive- irrigation requirements, which suggests both that additional water on existing acreage would not be much consumed and that historical farm-water operations are highly efficient.

KDA-DWR: First, the assumption that removing the 1,306 end guns will save 14,750 AFY has little technical basis. Our analysis of amounts of water used by the participants in the AWEP program showed that the participants used as much or more water after they got paid to remove their end guns as they did before the program when adjusted for rainfall and crop water need.

GMD 5's LEMA plan would require removal of end guns but does not reduce irrigable acres, nor does it reduce the water available to the producer. While some waterusers may continue with exactly the same cropping as before on reduced acres leading to reduced wateruse and profits, available data evaluated by KDA-DWR supports the contention that given no other restriction than the loss of an end gun, producers have the capability to adjust farming practices to maximize the benefits the water available. GMD 5 consistently refuses to commit to the savings that it claims from end gun removal.

Finally, BGW's point in this section is a misunderstanding of our analysis. Our analysis found a 98% correlation between pumping and climate factors, not consumptive irrigation requirements. In applying these same methods to water-short counties and water-long counties we found strong correlations in all cases; the water-long counties averaging greater than NIR; the water-short counties at less than NIR.

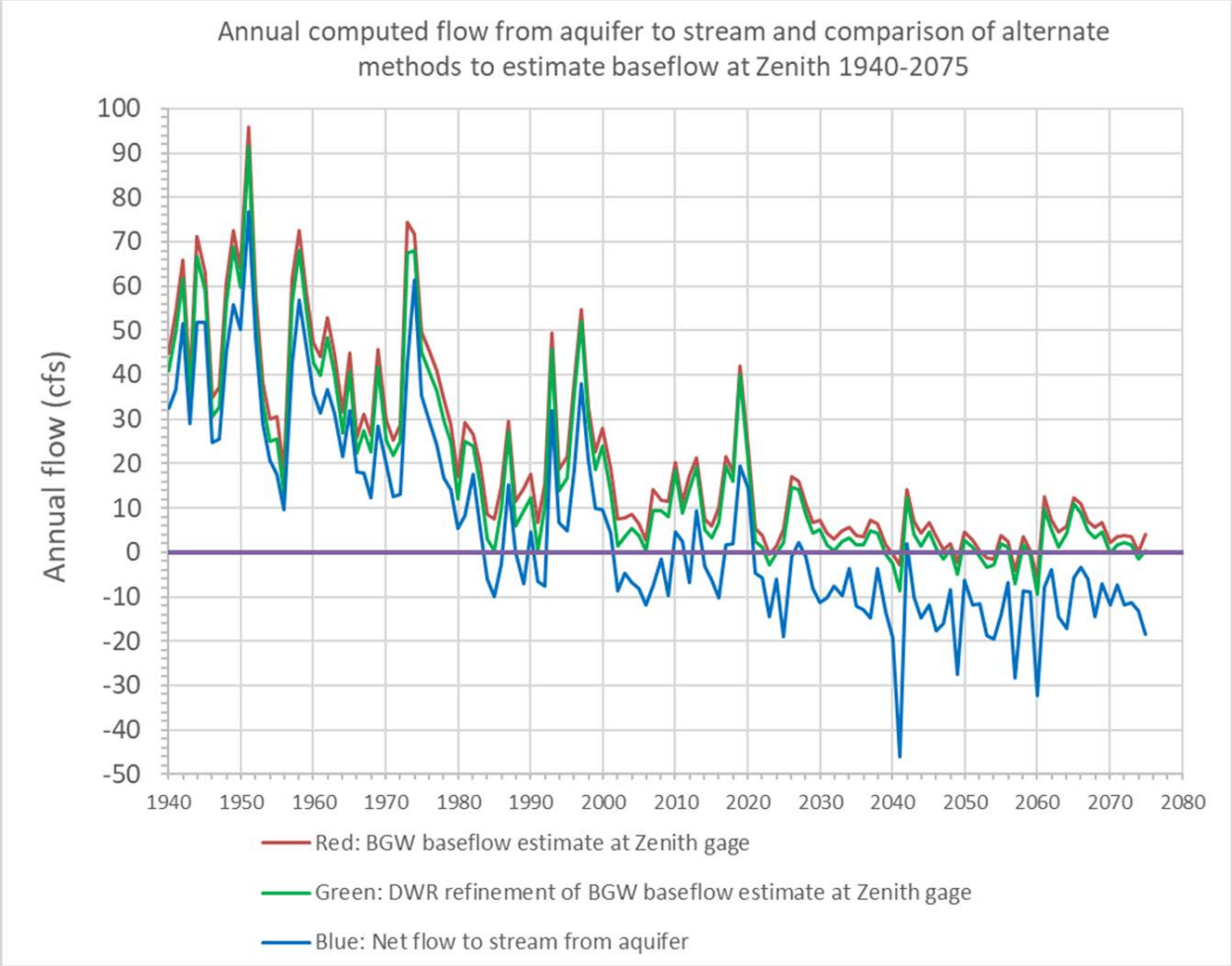
GMD5 Information on Baseflow

Information has been exchanged between KDA and GMD5 on these points and GMD5 has the pertinent technical exhibits that display the data. As GMD5's consultant, my office has looked more closely at the streamflow pattern from the headwaters of Rattlesnake Creek to the Zenith gaging station near the Refuge boundary. We re-examined future baseline conditions using the groundwater model applied by all parties for making such projections. The model details show that Rattlesnake Creek loses water to the ground as reported in the DWR technical memorandum above, but shows also that some of that groundwater returns to feed the Creek above Zenith station, with the result that the reliable part of the streamflow that comes from the aquifer is not dried up in the future. Baseflow remains available to support Refuge diversions.

KDA-DWR: We have reviewed the matter further including discussions with BGW on its work to evaluate future baseflow including BGW's Exhibits 1 and 2 attached. Both KDA-DWR and BGW agree that baseflow and total streamflow are significantly diminished into the future. BGW's work shows that over the course of its simulation, about 20 miles of live stream are dried up, though some baseflow remains in the last few miles before RSC enters the Refuge.

On this issue, there seems little disagreement over the modeling. But we do differ on outputs that best characterize the matter and what the data means. KDA-DWR was able to replicate BGW's method of evaluating baseflow and produced KDA-DWR Figure 1below, an annual series of average baseflow at Zenith, showing periods of little to no baseflows dominating the future of the Rattlesnake at Zenith, with wetter periods temporarily producing a bit more baseflow.

KDA-DWR work shows that by the end of BGW's model simulation approximately 70 cfs of baseflow (flow from aquifer to stream) is depleted by groundwater pumping.



KDA-DWR Figure 1– BGW Simulated future baseflow at Zenith Gage

Our additional review does not change our fundamental conclusions on the matter of future baseflows.

[3] Memo on Sufficiency of GMD 5's Augmentation-Only Plan to Resolve Quivira Impairment, KDA, January 7, 2019

GMD5 Information on the Effect of Cutbacks in Farm Pumping

The LEMA scenario includes end gun and focused-area curtailment of almost 19,000 acre-feet per year in terms of reduced use of farm water. Some of that estimated saving is doubted by DWR, so we examined the model again to see how sensitive the total flow at Zenith is to that factor. The LEMA pumping cutback causes about a 10 percent response at Zenith station in the future, so around 2000 acre-feet per year appears as increased streamflow due to the simulated LEMA cutback. But only half of that is helpful to the supply for Refuge demand because the rest is bypassed during times of no shortage and no need on the Refuge. Thus, the proposed 19,000 acre-feet per year of cutbacks in farm pumping generate only about 1000 acre-feet per year of help to offset impairment. Cutbacks are the least effective way to aid the remedy for impairment. If the scenario were to model less-effective cutbacks as DWR presumes them to be, then we would expect that a roughly proportional less-helpful response would be seen at Zenith. Baseflow, though, would remain characteristically positive.

BGW's response estimate is inconsistent with our analysis which shows pumping reductions have a much more significant effect.

The principal benefits of the reductions are long-term. The cuts help to maintain the viability of the augmentation project and some level of baseflow. The remaining streamflow helps to dilute the lower quality water (the remaining baseflow) originating east of US 281.

In August 2017 we provided Zone maps that showed the pumping impacts to streamflow geographically. GMD 5 nor BGW have expressed no concerns with the validity of the Zone maps. That work supports the following conclusions on stream responses from pumping reductions, generally, targeted and overall:

- 4,002 AF of stream response from 15,000 AF of general (Zone A) cuts, 26.7%;
- 2,481 AF of stream response from 4,408 AF of targeted (Zone D) cuts, 56.3%; and
- 6,484 AF of stream response overall, 33.4% (approx. 9 cfs vs. the 1.5-3 cfs estimated by BGW).

See https://agriculture.ks.gov/docs/default-source/dwr-water-appropriation-documents/quivira_response_22x34_20170804.pdf?sfvrsn=e12482c1_0

Status of the Basin Health

On the question of the deteriorating long-term health of the basin hydrology, the DWR has received model runs that show conditions stabilize without progressive depletion of Rattlesnake Creek after about year 2050. Depletion of Rattlesnake Creek streamflow results from the water table being lowered by farm wells and feeding less water to the stream. Thus, a LEMA plan that accommodates depletion for another 30 years, would also be expected to perform satisfactorily in the longest term. The LEMA as proposed can reasonably perform in that way.

KDA-DWR: As is noted above, our additional baseflow analysis based on BGW's method above shows periods of little to no baseflows dominate the future of the Rattlesnake at Zenith, with wetter periods temporarily producing a bit more baseflow. Again, BGW's modeling shows that the remaining baseflow in the later portions of the future simulation is dominated by poorer quality water upwelling in the last 10 miles or so above the refuge. These factors are cause for great concern for the health of the basin and appear inconsistent with Legislative intent for the basin reflected in the MDS values it adopted.

Cutbacks Not Critical

Calculations of future hydrologic conditions involve assumptions about scenarios to be played out and assumptions of standards of performance to be met. Model calculations have inherent error which can cut either way, but must be allowed-for in planning. In this case, the degree of benefit from end-gun removal is estimated at different levels by GMD5 and by DWR, but is found not to be critical to the action because of its relatively small contribution (up to 1000 acre-feet per year) to the impairment offset. A similarly small- proportional impact would be seen under mandatory cuts in pumping rates. Augmentation pumping has sufficient flexibility to make up the small benefit that cutbacks generate under either assumption. A moderate increase above the nominal 15 cfs wellfield capacity could produce thousands of acre-feet per year to deal with any such remedial gaps.

KDA-DWR: As is noted above, the value of pumping reductions should be evaluated over a longer term and are much more significant than characterized above, both for the impairment and other instream needs. Further, while we believe BGW has done sufficient evaluation of the augmentation project concept (induced capture of evapotranspiration from adjacent water-logged soils and wetland vegetation, in addition to sources captured from formerly-rejected recharge) to support moving forward with the project, it is unknown if it will perform at the envisioned design capacity, much less any expanded capacity, without inducing upwelling of poor quality waters from the lower geologic

formation. Running the project for longer periods in many cases will not be effective in meeting the needs of the Refuge.

GMD5 on Drought, Storage, and Need

The standard of performance for an acceptable remedy is not clear cut. Further consideration of the role of drought, storage, and need leads GMD5 to the view that an effective full supply will be available to the Refuge with the LEMA in place, offsetting any future impairment.

KDA-DWR: There is no ambiguity here. We provided clear cut criteria for an acceptable remedy and have communicated these criteria to GMD 5 on several occasions.

- GMD 5 has offered to build an augmentation project capable of delivering at least 5,000 AFY at a minimum rate of 15 cfs.

Assuming the augmentation project gets built and operates as envisioned, KDA-DWR set the standard of performance as:

- Reduce the growth rate of streamflow depletion by half.

To accomplish this by managing the geographic area significantly affecting RSC streamflow, and following GMD 5/BGW's analysis of general and focused groundwater pumping reductions, KDA-DWR used the model to find that the criteria require:

- Allowable junior use inside Zone A but outside of Zone D: 134,108 AFY (avg)
- Allowable junior use in Zone D: 22,200 AFY (avg)

Natural supply (without farm pumping) has in the past and necessarily will in the future include drought times of insufficient supply for the Refuge's modern demand curve. Such a shortage is not due to impairment and reasonably would not require augmentation.

The Refuge water-right impairment analysis authored by the Chief Engineer[4] was quantified by including filling Little Salt Marsh with 1865 acre-feet per year (about 13 percent of the total right). Storage provides some flexibility in timing for Refuge operations and can soften the peak rate requirement for augmentation. That volume is equivalent to a large part of the peak period of demand scheduled for Refuge use, thus release from storage added to 15 cfs of wellfield augmentation would be able to make up peak demands for 2 months with no other sources. We expect that augmentation will serve direct uses, but will not be called upon to fill storage, under the principle that the

senior right should utilize its own sources, including storage, before calling for augmentation. Filling storage is best done by natural flows. (If not filled and released, storage might be not an operating demand at all, since an additional right serves lake evaporation.) One scenario of the future with storage and drought operated this way shows that 15 cfs of wellfield capacity remedies the impairment even to a betterment of the natural supply.

KDA-DWR: Little Salt Marsh is essential habitat. While in periods of short supply the Service does release water from LSM to downstream marshes, we cannot constrain them to reduce their habitat function.

The LEMA proposal provides that the real-time operation of Refuge diversions is to be met by augmentation, but it is not firmly-known what those rates and amounts may be in practice. Actual future diversions might be either more or less than anticipated. Past diversion reports compared to gaged flow shows that the Refuge's historical exercise of diversion is appreciably under 100 percent of available supply. The Refuge operations have not availed themselves of the full amount of the supply. Refuge operations are pertinent to the test for impairment given above as to whether the Refuge could (or would) have more fully exercised its water right. It is plausible that the available water was not needed. The practical need for water has been and might in future be less than scheduled. Nevertheless, the LEMA pledges to *"…deliver a make-up flow to the stream depending on conditions of streamflow and diversion requirement as observed…* and…*proposes that the delivery rate be set weekly in coordination with Refuge requests and KDA-DWR staff review…".* GMD5 has the means to match augmentation deliveries to reviewed and agreed requirements as they may prove to be.

KDA-DWR: The math and the concept of remedying impairment are both straightforward here. The augmentation project is expected to provide 15 cfs. Peak demand at the refuge is 30 cfs, so the water that is not provided by the augmentation project must come from the stream. Reducing the rate at which streamflow depletions are growing, as required by KDA-DWR, ensures that there will be enough streamflow to compliment the augmentation and meet the Refuge's needs. The Refuge is entitled to have its full right protected from impairment by junior appropriators.

<u>Hydrologic Uncertainties</u>

These uncertainties in hydrologic planning are usually addressed by a factor of

[4] Final Impairment Report, DWR, July 15, 2016

safety. The nominal 15cfs of augmentation wellfield capacity is reported by DWR to be inadequate, but with allowance for historic drought, storage operations, and consideration of past practice regarding need, it is thought by GMD5 to be fully adequate. The shortfall foreseen by DWR is a few thousand acre-feet in some years and nil in other years. The nominal 15cfs can deliver up to 10800 acre-feet per year. Some redundancy necessarily will be part of the wellfield capacity. If called upon to do so, an incremental increase in wellfield cfs and acre-feet is practical. On the other hand, over-building capacity that is finally unused constitutes waste. Thus, an augmentation project staged to deliver the water required as pledged in the LEMA is hydrologically reasonable and is thought by GMD5 to be better insurance of performance than are pumping cutbacks or rate controls. The DWR preference for modest reductions in groundwater use would produce less benefit to the Refuge at greater cost to farms. Although, I understand that there may be considerations distinct from Refuge impairment, such as regional hydrologic status of the basin, in the DWR position.

KDA-DWR: see above concerns regarding the challenges to increasing the capacity of GMD 5's conceptual augmentation project

Conclusion

Thank you for requesting this summary statement of the hydrologic factors in current consideration as I understand them. I conclude that flexible augmentation would be a preferred means of satisfying impaired supply at the Refuge. Please let me know if more information or discussion is needed.[5]

Very truly yours,

BALLEAU GROUNDWATER, INC.

W. Peter Balleau, CPG, P.Hg.

Mr. Orrin Feril
February 20, 2019

WPB/tb

Attachments made by DWR: BGW's Exhibits 1-2, provided via email on March 8, 2019

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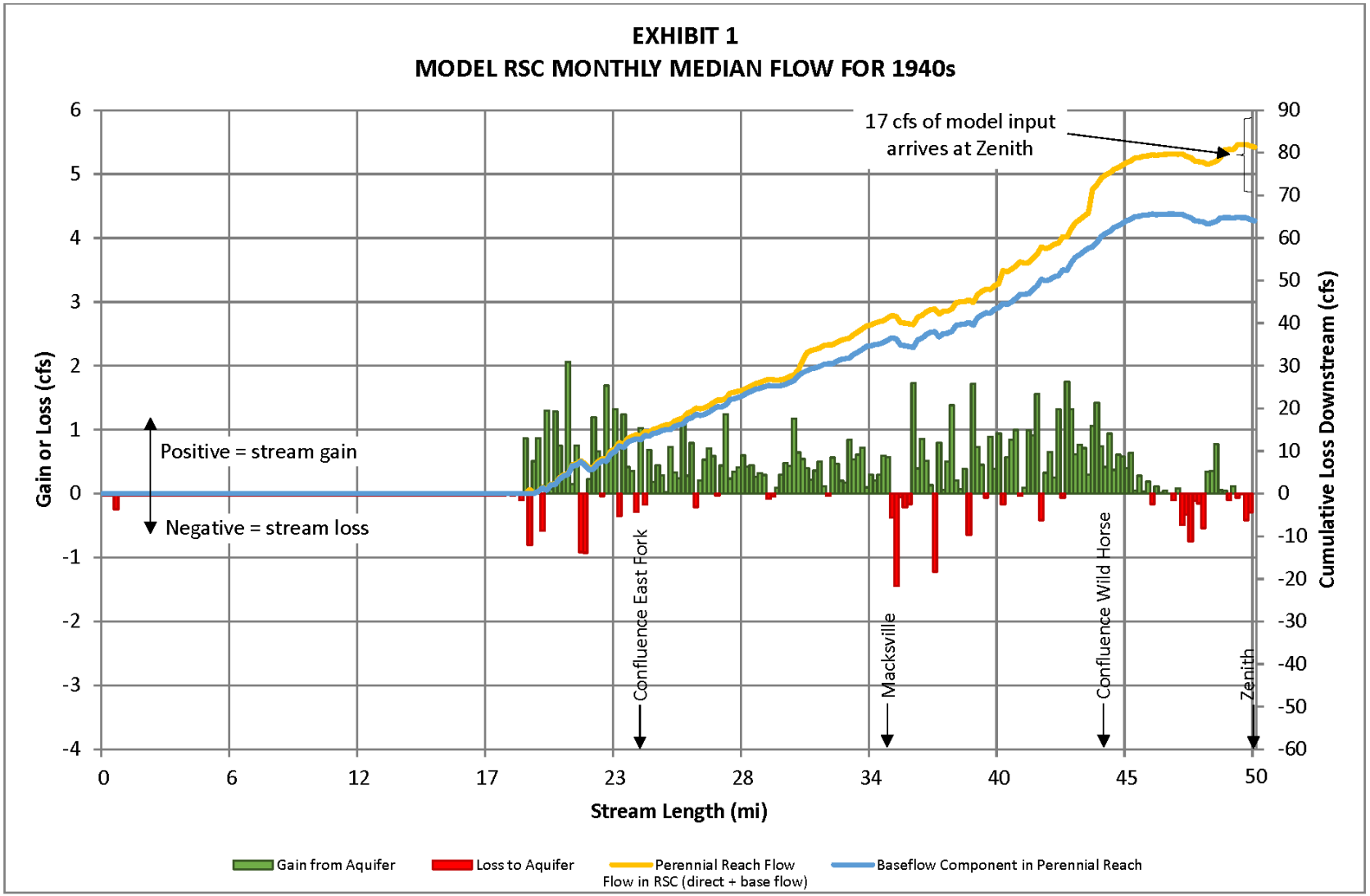
[5] W. Peter Balleau is a career ground-water geologist, a licensed Geologist in Kansas (686), certified by the American Institute of Hydrology, with over 10 years of study in the Rattlesnake Creek Basin.

EXHIBIT 1
MODEL RSC MONTHLY MEDIAN FLOW FOR 1940s



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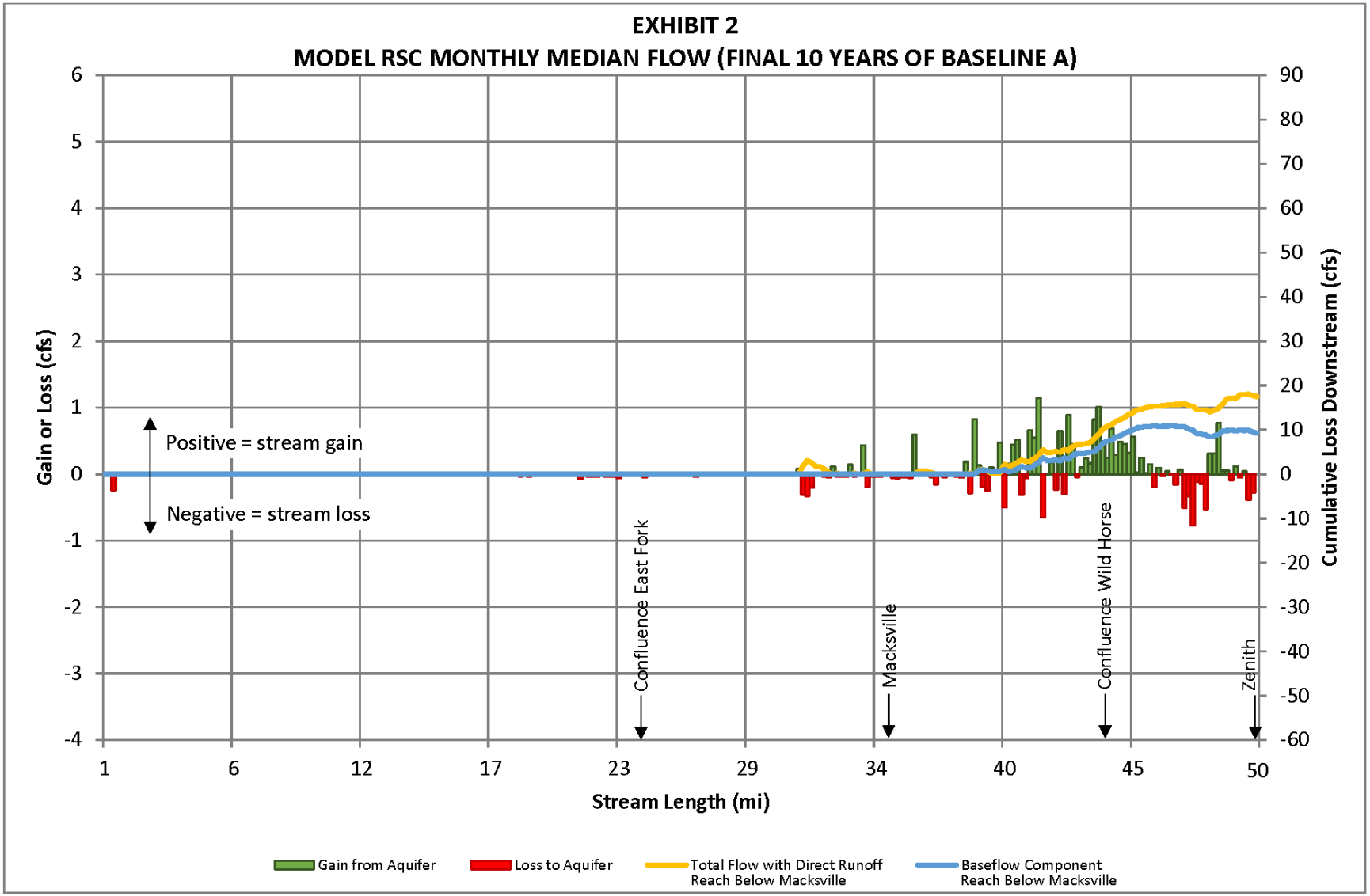
BY
1/24/2019



RSCBLAV2.xlsb
BY
1/24/2019

Barfield, David [KDA]

From: Titus, Kenneth [KDA]
Sent: Thursday, April 4, 2019 5:04 PM
To: Preheim, Lynn; Orrin Feril; dnwfarm@gmail.com
Cc: Barfield, David [KDA]; Beightel, Chris [KDA]
Subject: Informal LEMA Plan Comments
Attachments: 2019-02-21 Quivira NWR LEMA Request to DWR Approved (KT 040419).docx

Importance: High

Lynn, Orrin, and Darrell,

Based on the conversation during our recent Stafford meetings, Lynn indicated that it would be helpful to receive some informal feedback on your LEMA plan. I've attached a copy with a number of preliminary comments. As we explained at that time, this should not be considered a formal rejection of your proposed LEMA, but we have taken the time to identify some initial concerns that will need to be addressed during this process. We continue to work with BGW to firm up our understanding of the various hydrological questions that have been discussed and are hopeful that we can provide a more complete review of your LEMA plan in the near future.

As always we are happy to try and answer any questions you may have about this review.

Kenneth B. Titus | Chief Counsel
Kansas Department of Agriculture
1320 Research Park Drive
Manhattan, Kansas 66502
Phone: (785) 564-6717 | Fax: (785) 564-6777
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Request for Quivira NWR LEMA Submitted to the
Chief Engineer, Kansas Department of Agriculture – Division of Water Resources

February 21, 2019

Overview and Goal Expression

In an effort to address the Quivira National Wildlife Refuge ("the Refuge") impairment complaint in Big Bend Groundwater Management District #5 ("the District"), the District Board of Directors proposes the following plan be submitted via the Local Enhanced Management Area ("LEMA") process per K.S.A. 82a-1041for an area designated in Attachment 1.

The goal of the LEMA is to provide a satisfactory remedy to the impairment complaint at the Refuge. The LEMA is intended to reduce the hydrologic stress from irrigation operations on the aquifer and the interrelated stream systems, while restoring the supply to prior uses on the stream system. The objectives are to reduce water use in the LEMA area to a degree that will temper the growth of future streamflow losses and to restore the useful supply to diversion points of the Rattlesnake Creek region.

This LEMA shall exist only for the ten-year period beginning January 01, 2020 and ending December 31, 2029. The LEMA shall include all points of diversion within the LEMA boundaries with priority date after August 15, 1957 located in the following sections as indicated by Attachment 1:

LEMA Boundary

Edwards County

Township 24 South, Range 16 West, Sections 1-3, 9-16, 20-29, 32-36
Township 25 South, Range 16 West, Sections 1-36
Township 25 South, Range 17 West, Sections 13, 20-36
Township 25 South, Range 18 West, Sections 25, 34-36
Township 26 South, Range 16 West, Sections 1-36
Township 26 South, Range 17 West, Sections 1-36
Township 26 South, Range 18 West, Sections 1-5, 8-17, 19-36

Kiowa County

Township 27 South, Range 16 West, Sections 1-36
Township 27 South, Range 17 West, Sections 1-36
Township 27 South, Range 18 West, Sections 1-17, 20-28, 33-36
Township 28 South, Range 16 West, Sections 1-12, 16-18
Township 28 South, Range 17 West, Sections 1-18
Township 28 South, Range 18 West, Sections 1-3, 11-12

Pawnee County

Township 22 South, Range 15 West, Sections 24-26, 34-36
Township 23 South, Range 15 West, Sections 1-4, 8-17, 19-36
Township 23 South, Range 16 West, Sections 24-25, 35-36

Pratt County

Township 26 South, Range 13 West, Sections 2-10, 15-22, 28-33
Township 26 South, Range 14 West, Sections 1-36

Commented [TK[1]]: In order to establish a LEMA, one of the conditions in K.S.A. 82a-1036(a)-(d) must exist in the area to be designated. See for example the GMD4 District-Wide LEMA and SD-6 LEMA proposals on our website, they specifically state their purpose is to reduce groundwater declines.

Commented [TK[2]]: Good that you have a goal statement, but as currently formulated, this will cause us problems. In order to initiate LEMA proceedings, K.S.A. 82a-1041(a)(3) requires that a plan propose goals and corrective controls as authorized under (f) that will meet the stated goals. Unless your overall goal is something measurable, it will be difficult to say if the corrective controls can meet the goal. For example, this could include provide X acre-feet of water to Quivira or to reduce withdrawals to X acre-feet per year, etc.

Commented [TK[3]]: Again, a good goal, but without it being something that can be quantified, it is not really possible to say whether any proposed corrective controls are adequate.

Commented [TK[4]]: What is the rationale for putting an end date when you consider this plan necessary to help solve the impairment? Instead, listing criteria at which the LEMA can be dissolved would be better.

Township 26 South, Range 15 West, Sections 1-36
Township 27 South, Range 13 West, Sections 5-7
Township 27 South, Range 14 West, Sections 1-12, 14-21, 29-30
Township 27 South, Range 15 West, Sections 1-36
Township 28 South, Range 15 West, Sections 4-7

Stafford County

Township 21 South, Range 12 West, Sections 28-29, 31-36
Township 22 South, Range 11 West, Sections 7, 16-21, 28-33
Township 22 South, Range 12 West, Sections 2-36
Township 22 South, Range 13 West, Sections 1-2, 6-36
Township 22 South, Range 14 West, Sections 1-3, 9-36
Township 23 South, Range 11 West, Sections 4-9, 17-18
Township 23 South, Range 12 West, Sections 1-35
Township 23 South, Range 13 West, Sections 1-36
Township 23 South, Range 14 West, Sections 1-36
Township 24 South, Range 12 West, Sections 1-24, 26-35
Township 24 South, Range 13 West, Sections 1-36
Township 24 South, Range 14 West, Sections 1-36
Township 24 South, Range 15 West, Sections 1-36
Township 25 South, Range 12 West, Sections 3-9, 17-19
Township 25 South, Range 13 West, Sections 1-35
Township 25 South, Range 14 West, Sections 1-36
Township 25 South, Range 15 West, Sections 1-36

The LEMA will combine the efforts of several parties to create a holistic approach to stabilizing the use of water in and around the Rattlesnake Creek subbasin. The District is seeking partner agencies at the state and federal levels in addition to working with both public and private organizations to bring all available resources together into a unified plan.

Commented [TK[5]: Just above you say an objective is to reduce water use, not stabilize. Can you clarify the intent of these different statements?

1) Background

The District has, for the past forty (40) years, striven to fulfill the following mission statement:

> *"Big Bend Groundwater Management District #5 was organized through the efforts of concerned citizens to conserve, promote, and manage groundwater resources so that quality and quantity of that resource will be maintained for present and future needs. The Groundwater Management laws (K.S.A. 82a-1020-1035) establish the right of local landowners and water users to determine their own destiny with respect to the use of groundwater within the basic law of the State of Kansas"*

In the years leading up to the establishment of the District, the local landowners made a large investment to construct and operate wells for irrigation, stockwater, industrial and other types of beneficial use. The District's management programs and subsequent regulations have greatly limited the groundwater development in many areas of the District.

In the District's first management program approved June 6, 1976, the Board of Directors recognized the unique nature of the local area and implemented guidelines to protect and conserve the Great Bend Prairie aquifer. These included strict monitoring of water use with flow meters,

well spacing requirements, discouragement of waste of water and encouragement of the re-used water sources. In the 1979 district management program, the Board of Directors implemented a safe yield policy and maximum reasonable quantity for irrigation to limit the development even further. The District further solidified the safe yield for the area through the promulgation of K.A.R. 5-25-4 in 1980. By revising K.A.R. 5-25-4 in 1984, the Board of Directors further limited the safe yield policy to 3,000 acre-feet ("AF") in a two-mile radius. The District formally closed to new appropriations on December 17, 1998 through another revision to K.A.R. 5-25-4. As a result of these management objectives and regulations, the water level declines have been limited. In severely dry years, the District does experience declines in the local Great Bend Prairie aquifer. However, in years of average to above average precipitation, the District recharges quickly.

In 1993, the Rattlesnake Creek Partnership ("Partnership") was formed to develop and implement solutions to water resource concerns within the subbasin. The Partnership was comprised of the District, Water Protection Association of Central Kansas ("Water PACK"), Kansas Department of Agriculture – Division of Water Resources ("KDA–DWR"), and United States Fish and Wildlife Service (the "Service"). In 2000, the Partnership developed the Rattlesnake Creek Management Program ("program") following several years of hydrologic study and public outreach. The program utilized new management tools (end gun removal, water banking, streamflow augmentation, multi-year flex accounts, etc.), education outreach programs, and enhanced compliance and enforcement to achieve the established goals. Several of these programs were voluntary/incentive-based tools that were not available at the beginning of the program. In fact, some of the programs did not get significant participation until after 2012. As a result, not every conservation goal outlined in the program was met at the end of the program in 2012.

In 1999, a task force was established to study the viability of water banking in Kansas. The task force determined that water banking could be a powerful incentive-based tool for conservation that would result in water being put to its most economic and beneficial use. However, there was no mechanism in Kansas statutes that would allow the establishment of water banks in Kansas. In 2001, K.S.A. 82a-761 *et seq*. was adopted by the legislature. K.S.A. 82a-765 requires that each chartered water bank will result in a savings of 10 percent or more in the total amount of groundwater consumed for a representative past period. In 2005, the Central Kansas Water Bank Association ("Association") became the first chartered water bank in the state. While the Association covers the same geographic boundaries, has the same staff, and utilizes the same monitoring network as the District, the Association is governed by a separate board of directors and funded entirely through its own administrative fees. The Association has undergone several changes since its inception in 2005, but still offers the same services to the water users of the region. The Association offers area water users two programs for the flexible use of the water resource. The first program is for the transfer of a portion of the historical water use of a water right(s) to other areas within the same subbasin. The second program allows a portion of unused water to be preserved for future use at the same location. These programs have gained in popularity and give water users added water use flexibility while conserving water.

In 2008, the District, with technical assistance and peer review from the Partnership, contracted with Balleau Groundwater Inc. to develop a high-resolution hydrologic model of the District (Balleau Groundwater, Inc., 2010). This hydrologic model ("BBGMDMOD") is designed to have seven layers representing unique geologic formations below the ground surface. One of the primary reasons for multiple layers is to be able to track the movement of water between these

layers. This is especially important for the area surrounding the Refuge, where the tracking of poor quality water will be important. BBGMDMOD has been the primary tool utilized by KDA–DWR and other stakeholders to evaluate the effects of groundwater pumping and surface drainage within the subbasin. However, the majority of the work conducted by KDA–DWR to date has been done using an alternative version of the model which flattens the seven layers into a single layer. When evaluating water movement, specifically lower quality water, the seven-layer model is the only option available that can conduct this analysis properly.

On April 8, 2013, the Service officially filed an impairment claim on the Rattlesnake Creek against junior appropriators within the subbasin. The Service alleged that junior appropriators were reducing the flows in the Rattlesnake Creek such that their use prevented the Service from exercising Water Right File No. 7,571. Following this filing, the Chief Engineer and KDA–DWR staff began investigating the hydrologic effects of junior pumping on the subbasin. The District's BBGMDMOD was used to conduct this investigation, in addition to further discussions with Service staff regarding water management at the Refuge. In July 2016, the Chief Engineer published the final report detailing the investigation (Barfield, 2016).

Since 2016, the District has submitted proposals to the Service in an effort to settle the impairment complaint through agreement (Big Bend Groundwater Management District No. 5, 2016) (Big Bend Groundwater Management District No. 5, 2017). These proposals have been declined. The District remains committed to working to resolve the impairment complaint utilizing the most current science, effective tools, and programs available.

In June 2017, the District requested an outline from KDA–DWR regarding the basic requirements for a successful remedy to the impairment complaint at the Refuge. In July 2017, the Chief Engineer and staff described the remedy as an augmentation wellfield capable of supplying 15 cfs to the stream channel and achieving a reduction of the future streamflow depletion as of 2003. With this goal established for an effective remedy, the District board by formal motion in August 2017, determined that a LEMA plan would be the framework for the remedy. The District has worked since 2017 to develop this LEMA plan that is based on the best data available, including BBGMDMOD data, economic impact data and expert hydrology recommendations.

Commented [TK[6]]: This reference to 2003 is unclear and seems inconsistent with our statements about reducing depletions.

Commented [TK[7]]: It appears that this plan is intended to implement the water use reductions prescribed by KDA-DWR in 2017. To do that, the allowable withdrawals by time period and geographic area need to be defined, and the means by which these withdrawal limits will be enforced needs to be unequivocally defined.

The plan must contain, and people need to know:
When will augmentation be available?
If aug is fully developed:
How much can be withdrawn, in what area, over what time period?
Who can withdraw it (priority, proximity)?
If aug is delayed: same questions
If aug never happens: same questions

2) Reduce Hydrologic Stress and Augment Depleted Flows

a. Hydrologic Stress Factors

The District will work with water right holders and users to enhance the water use efficiency for all types of use within the LEMA boundary including, but not limited to, irrigation, municipal, stockwater, recreation, domestic, and industrial uses. A few dozen pre-1957 priority operators will be excluded from the end gun curtailment program detailed in subsection (i) unless they voluntarily elect to participate.

The reduction in water use in this area will be achieved through the execution of several objectives that include, but are not limited to: 1) permanent retirement of water rights through the expansion of the Conservation Reserve Enhancement Program ("CREP") and the Water Transition Assistance Program ("WTAP"), 2) permanent purchase and retirement of water rights by the District or other third parties, 3) permanent movement of

water from hydrologically sensitive areas to less sensitive areas, 4) temporary water leases through the Association, 5) temporary set aside and rotation programs, 6) enrollment in Water Conservation Areas, 7) removal of invasive tree species (*i.e.*, Russian olive, salt cedar, etc.), or 8) any combination of these programs that have the positive hydrologic effect to the region as confirmed using BBGMDMOD.

The response to the LEMA program will be seen slowly during the LEMA period. It is not practical to measure that response at the Zenith gage, due to the other factors that affect the baseline in the absence of the LEMA program (weather and a myriad of variables in streamflow other than irrigation).

i. Irrigation Use: Consumptive use savings by irrigation use will be achieved by requiring the removal of any nozzle at the end of the center pivot system that has a larger bore diameter than the previous nozzle on the center pivot system, commonly referred to as end guns. Effective December 31, 2019, all these types of end guns will be removed to prevent the wetting of the acres beyond the end of the center pivot system.

   District staff has compiled a database of the end guns within the LEMA boundary. These locations are indicated in Attachment 2. As of January 2015, the District determined that there were 1306 end guns installed on center pivot systems within the LEMA boundary. The District has worked hard to estimate the water savings that will result by removing end guns. The District estimates a savings of 14,750 AFY.

   Additional management action to reduce consumptive use will also be needed. BBGMDMOD suggests that another 4,000 AFY of water use or its hydrologic equivalent needs to be curtailed in the high impact area around St John (Attachment 1). BBGMDMOD suggests that this reduction amount in water use will lessen the growth of future streamflow losses at Zenith gage. The high impact area is further defined by the sections in the list below:

Commented [TK[8]: These are good voluntary efforts that can be taken at any time without a LEMA. Please keep in mind that these are not corrective controls that can be ordered by the Chief Engineer, so are not considered part of the LEMA.

Commented [TK[9]: As will be noted later, this is a problem because it eliminates one of the ways we would could actually measure the effectiveness of any corrective controls. How will the effectiveness be measured? The objective of the pumping reductions is long-term, to slow the on-going growth of depletions. We have used the model to determine what level of pumping reductions will accomplish that goal. While an improved and recalibrated model might adjust the numbers, we have never envisioned nor do we think it practical to "measure a response at Zenith."

Commented [TK[10]: This is the only corrective control that you propose, i.e., this is the only thing in your plan that the Chief Engineer can order to be done by water users.

Commented [TK[11]: You state on the next page that "the LEMA plan does not have a water use reduction requirement".

Commented [TK[12]: Ok, but problematic because no where in this document to you actually require this amount of water to be reduced. It would be appropriate to explain why end guns are being singled out for administration

Commented [TK[13]: This needs to be 4,400 AF or equivalent.

Commented [TK[14]: Again, confusing because you also consistently say use doesn't need to be reduced.

High Impact Area

Pratt County

Township 26 South, Range 14 West, Section 6
Township 26 South, Range 15 West, Section 1-6

Stafford County

Township 22 South, Range 11 West, Sections 30-31
Township 22 South, Range 12 West, Sections19-20, 25-36
Township 22 South, Range 13 West, Sections 25-27, 32-36
Township 23 South, Range 12 West, Sections 1-10, 17-19, 30-31
Township 23 South, Range 13 West, Sections 1-36
Township 23 South, Range 14 West, Sections 12-14, 23-28, 32-36
Township 24 South, Range 13 West, Sections 1-23, 26-34
Township 24 South, Range 14 West, Sections 1-36
Township 24 South, Range 15 West, Sections 12-13, 24-26, 35-36
Township 25 South, Range 13 West, Sections 4-8, 18
Township 25 South, Range 14 West, Sections 1-24, 26-34

The District will hold meetings throughout the LEMA area to showcase how to utilize technology effectively to maximize the economic yield into the future while reducing the water diverted within the LEMA area. Such technologies include, but are not limited to, mobile drip irrigation, soil moisture probes, telemetry monitoring, and variable rate irrigation. The District will work with state and federal agencies to provide attractive cost shares for the implementation of technologies that conserve water. Water technology farms are a good way to showcase these technologies to nearby producers. Through these farms, producers can see how the implementation of new technologies can save water while maintaining or improving the economic viability of the area. Through the LEMA, the District will work to promote the establishment of additional technology farms within the LEMA boundary.

The implementation of Water Conservation Areas ("WCA") will be encouraged to allow water users to achieve water savings specific to their own needs. The WCA statute was established in 2015 to provide a "simple, streamlined and flexible tool that allows any water right owner or group of owners the opportunity to develop a management plan to reduce withdrawals" from the aquifer. The WCA tool will be promoted to allow extra flexibility to water users while conserving the water resource.

Throughout the development of the LEMA plan, the District has explored many options to give due consideration to past conservation. Because the LEMA plan does not have a water use reduction requirement the consideration to water users who have already implemented reductions is not an issue.

ii. Municipal Use: According to the U.S. Geological Survey (Lanning-Rush & Restrepo-Osorio, 2017), the average gallons per capita per day ("gpcd") for public water suppliers ("PWS") in Kansas is 138 gpcd over the past five years. There are seven PWS within the LEMA boundary:

Public Water Supplier	GPCD (2011-2015)	UFW (2011-2015)
Belpre	152	21 %
Greensburg	283	11 %
Haviland	152	8 %
Macksville	123	12 %
Mullinville	203	15 %
Stafford	124	12 %
St John	140	20 %

The U.S. Geological Survey study also calculated the percent unaccounted for water ("UFW") for each PWS. The gpcd and ufw are listed in the chart above.

The Great Bend Prairie Regional Advisory Committee ("the RAC") has a goal to attain less than 20 percent water loss by 2025 and less than 10 percent water loss by 2045. The District will work with the RAC and each municipality to reduce the gpcd and ufw.

Commented [TK[15]: Similar to other comments. You seem to acknowledge that water needs to be reduced but don't actually require it.

Commented [TK[16]: You state several places above that water use will be reduced, but this directly contradicts that. This plan prevents a measure of savings through water use and through the actual effect at Zenith, so there is no way to practically measure the effect of any corrective controls and if they actually meet the stated goal. Further, there is nothing in the place the **requires** water use to be reduced.

Commented [TK[17]: If you have misstated what your intent was, then it creates a new problem in that people that have already voluntarily removed their endguns have been using less water and you aren't making any accommodations to support them as required by statute.

The District's efforts will include educational outreach to schools and public service groups.

iii. Stockwater Use: The District will work with each livestock facility, KDA–DWR, and KLA to improve the efficiency of water delivery where feasible through existing tools available. These tools include the utilization of thermostatically controlled tanks versus continuous flow water tanks and the implementation of water reuse systems. The water savings will be on a case-by-case basis.

Livestock facilities utilizing effluent from the facility's lagoon in accordance with K.A.R. 5-6-14are exempt from the end gun removal requirement to allow the use of the end gun for that purpose.

iv. Recreation Use: There are water rights within the LEMA area for recreation use. The District intends to work with the holders of these rights to ensure the water is put to beneficial use when appropriate for the area in which the holders are diverting water.

The District will work with state agencies to ensure that existing conservation plans are updated to promote more efficient methods of operations that are specific to the needs of each water right.

v. Industrial Use: There are water rights for industrial use within the LEMA area. These uses will be reviewed to determine where water efficiencies can be gained. The District will encourage the use of lower quality water where feasible as a replacement for fresh water.

b. Streamflow Augmentation Program

In 2014, Governor Sam Brownback signed into law revisions to K.S.A. 82a-706b(a)(1) which is specific to the Rattlesnake Creek subbasin to "allow augmentation for the replacement in time, location and quantity of the unlawful diversion, if such replacement is available and offered voluntarily." This legislation was the subject of overwhelming supporting testimony from several groups from across the State, which resulted in unanimous action from the Kansas legislature to approve the bill. The concept of augmentation is to utilize the aquifer underground as a reservoir to supply water to the stream in times of shortage.

Streamflow augmentation will be implemented from a to-be-constructed wellfield designed with a delivery capacity of nominally 15 cubic feet per second ("cfs"), more or less, to the Rattlesnake Creek stream channel. Based on the analysis conducted by Balleau Groundwater Inc. ("BGW"), the intent of augmentation is to provide an additional water source to enhance the unique habitat the Refuge provides for various endangered species. The ability to utilize underground water in times of need further protects the biological integrity, diversity and environmental health of the Refuge. The area surrounding the Refuge has been underdeveloped for large-scale irrigation historically due to the water quality in the upper zones of the aquifer. However, this area does have a quantity of water that can be appropriated in a sustainable manner. The sources supporting the augmentation wellfield have been examined in BBGMDMOD as was done in the impairment analysis.

Commented [TK[18]: You need carefully consider your approach here. This LEMA is to solve an impairment and therefore if these water rights are junior to Quivira, some form of priority needs to be considered, even if it is a minor cut. This is not like GMD4 where there is no impairment.

Commented [TK[19]: Just a reminder that the LEMA itself does not order augmentation. Perhaps you would be better served to list augmentation and the other voluntary programs in an appendix to the LEMA, so as to avoid giving the public the impression that the Chief Engineer is authorizing those activities as part of the LEMA. Although it is fine to reference those things in your plan as well….

The augmentation wellfield yield is supported by induced capture of evapotranspiration from adjacent water-logged soils and wetland vegetation, in addition to sources captured from formerly-rejected recharge by making space available in the aquifer. Rattlesnake Creek is to be augmented by waters that are now lost to the atmosphere, bypassed as storm runoff in Peace Creek, or discharged as brackish baseflow to the east. This further supports the concept of augmentation as a remedy for the impairment complaint at the Refuge.

According to the various augmentation studies conducted within this subbasin, there are several key factors that need to be addressed. These include, but are not limited to: wellfield location, wellfield capacity, pumping rate, delivery rate, water quality, delivery frequency, and delivery location. The District has analyzed augmentation for each factor.

i. Location

A wellfield south of the Refuge has been identified as an optimal location for the foreseeable future. The precise locations of this wellfield have not been finalized as further studies will be needed to determine water availability and quality. However, a conceptual augmentation system is shown in Attachment 3. The water table in this area is stable enough to support augmentation. The large-scale development for irrigation and other practices has been limited due to the natural water quality in the area. The water quality in the upper zones of the aquifer is very similar to the water quality already feeding the Little Salt Marsh. The conceptual wellfield is thought to overlie areas that can safely yield higher quantities of freshwater without risk of up-coning poor-quality water. Further site-specific test drilling will be required to ensure proper placement of wells in a way to protect the upper zone of the aquifer from degradation. BBGMDMOD simulates shallow fresh-water ingress to the wells at a higher rate and volume, dominating and diluting any smaller upward migration from saline sources. Observation wells will be installed to provide additional locations to test water quality and verify water table elevations and eventual trends of water quality. The concept is to use a location in T23S, R11W south of Peace Creek and west of Salt Marsh Road. Wells will be sited with screen lengths and depths to access the yield and quality of water suited to the Refuge requirement as presented, or the range of 3,000 to 9,000 µS/cm in terms of specific conductance.

ii. Diversion & Delivery Rate

The District will pay the cost to develop, construct, and operate a 15 cfs wellfield south of the Refuge. Based on conversations with the Chief Engineer, KDA–DWR has determined that up to 15 cfs is an appropriate max flow rate/instantaneous capacity. Water will then be delivered directly to the Rattlesnake Creek channel immediately upstream of the Refuge. The discharge released to the stream is intended to make up the diversions required to serve the Refuge water right file # 7571 of 1957 priority date. The end gun program is not expected to fully reverse trends or to provide a complete offset of future streamflow losses; thus, the augmentation wells will serve to deliver flow sufficient to meet the objective for serviceable supply on this reach of Rattlesnake Creek. Water lines will be installed in a manner that will minimize any disturbance to surface lands and utilize already authorized right of ways where possible to get access to the creek channel. This delivery location complies with the statutory requirement of K.S.A. 82a-706b (a)(2) to allow augmentation as a remedy. It is assumed that the Kansas Department of Health and Environment ("KDHE") will require special permitting approved due to the similarity of ground and

Commented [TK[20]: It seems incorrect to state that this was an agreed upon maximum, especially based on recent conversations. Further, whether it is sufficient for the long term is dependent upon water use reductions, which needs to be reflected here also.

Commented [TK[21]: It might helpful to reflect that end gun removal will extend the life of the augmentation project so that reliable flows are available?

surface-water quality in the area. Kansas Surface Water Quality Standards recognize the chloride content of Rattlesnake Creek above Little Salt Marsh being 1400 mg/l.

iii. Real-Time Operation

The hands-on operation of the augmentation wellfield does not hinge on knowing the magnitude of effects from the end gun program. The wellfield will deliver a make-up flow to the stream depending on conditions of streamflow and diversion requirement as observed. Diversion requirements are given by the Refuge and applied with practical considerations in the Chief Engineer's impairment analysis. The peak 15 cfs wellfield has the ability to serve those requirements. Calculations and diversion reports suggest that about one-third of the time augmentation will not be needed, one-third of the time 15 cfs will be needed, and a wellfield release of 5 or 6 cfs will characterize the middle third of days. The Refuge is understood to have operable storage capacity to accommodate at least a week's volume if the deliveries over or under perform by a few cfs for a few days. The District proposes that the delivery rate be set weekly in coordination with Refuge requests and KDA–DWR staff review of conditions on the stream. Rain, high flows or bypass of the Refuge diversions would warrant shut-down of augmentation delivery, then restoration when those conditions pass. The Refuge reports about 25 cfs as the peak month average diversion rate. If that is the current diversion capacity on the Refuge, then augmentation can be shut down at higher flows. The Refuge and District will need to coordinate such factors. As confidence in standard practice is realized, the initial hands-on control of discharge might be handed over from the District to KDA–DWR or Refuge staff.

iv. Annual Water Quantity

The augmentation wellfield will release an adequate volume of suitable groundwater delivered to the creek channel for use by the Refuge to meet the management objectives for maintaining forage and habitat. The water provided will be measured for rate and quality at the point it is placed in the creek channel. The capacity of the wellfield exceeds the amount suggested to relieve the impairment complaint, in most years, of the Service's water right at the Refuge in the Chief Engineer's final impairment report. In the Chief Engineer's final impairment report, the analysis conducted was retroactive and reviewed any impairment that may have occurred prior to the Refuge's claim of impairment in 2013. Based on a prospective analysis by BGW that looks at years after the 2013 claim of impairment, augmentation pumping is sustainable, effective, and does not degrade the quality of water the Refuge requires. The authority for such water will be processed in the same manner as any other water right with KDA–DWR. This evaluation by KDA–DWR will further ensure that there will not be an increase in permitted consumptive use in the area. The new appropriative water right will be considered non-consumptive as the quantity authorized will be combined and limited to the authorized quantity already appropriated under Water Right File No. 7571. In no calendar year will the combined quantity diverted from the augmentation wellfields and the surface diversions at the Refuge exceed 14,632 AF.

v. Water Quality

The quality of this water would fall within the specified range (3,000 to 9,000 µS/cm) presented by the Service. The water quality can be managed based on the requirements of Refuge staff by providing more or less fresh water from redundant capacity of wells with

Commented [TK[22]: This whole section might be better as an appendix on operation of augmentation or something along those lines as it doesn't directly relate to the LEMA itself.

Commented [TK[23]: As this is somewhat unknown, it should be something like "will be designed to…"

Commented [TK[24]: The Service has indicated LSM has a significant habitat function that is stage dependent at times. While the Service can and does release from LSM does to marshes below, it cannot be assumed that storage can be used in this way.

Commented [TK[25]: Should be 30 CFS.

Commented [TK[26]: Mentioned in previous drafts, but please strike KDA-DWR from this section as the state is not authorized to take over or operate such a project.

Commented [TK[27]: Can you explain how the addition of water from the augmentation system does not increase consumptive use?

varying water quality. As stated before, the water quality in the aquifer surrounding the Refuge is analogous to the source of the baseflow water quality utilized in Little Salt Marsh. As a result, the water quality at the Refuge will not be altered in suitability for use through the implementation of the augmentation plan. Coordination with KDHE will be crucial in this process to ensure the water quality of the Rattlesnake Creek stream channel is maintained throughout this project.

vi. Drought

In times of severe drought, as defined by the Palmer Drought Severity Index of -3.0 or less, augmentation will continue to be provided to those water management structures defined in the Service's water conservation plan as amended in 2019.

Augmentation shall not occur in times of bypass flow or times of release from storage in Little Salt Marsh. The augmentation water must be put to a concurrent beneficial use or held in storage for later beneficial use.

Commented [TK[28]: Needs clarification to match actual Refuge operations.

c. Hydrologic Effect

Throughout the development of the LEMA plan, the District has consulted with BGW to conduct a thorough analysis of the LEMA plan using BBGMDMOD. Combining the effects of the end gun removal from center pivot systems, streamflow augmentation, water rights retirement and water right transfers, the BGW concluded that the LEMA plan improves the Service's ability to meet its water needs more frequently than before the Refuge was established in the 1950's as shown in Attachment 4.

Commented [TK[29]: If you want to include this section, it needs to contain additional data and citations.

3) Central Kansas Water Bank Association

Commented [TK[30]: It does not appear that this section adds anything to the LEMA plan. If there is a direct role for the Water Bank in the LEMA, it should be spelled out, otherwise, it is unnecessary in this document.

a. The District is fortunate to have the only functioning water bank in the state of Kansas. This provides a unique opportunity to allow for additional flexibility in the water use of the area while implementing real water conservation. In the early years (2005-2010), there was little participation in the Association due to restrictive rules, an uninformed public, and confusing methodologies. The Association has addressed these issues through public outreach meetings and amendments to statutes, rules, and policies governing water bank activity. In recent years there have been significant advances in the participation from area water users. It is anticipated that this growth will continue in coming years. The Association is beginning another evaluation as required by statute by an independent panel of experts in water law, economics, geology, and hydrology. The District intends to work with the Association to update the programs to promote the movement of water away from highly sensitive areas within the Rattlesnake Creek subbasin.

b. The review process will take time to be completed. As a result, it is difficult to estimate the outcome of the review in addition to the timeliness of the updates. The District will work closely with the Association to ensure that the Association programs continue to provide area water users with flexible water conservation options.

c. The District has partnered with The Nature Conservancy ("TNC") to pursue funding to incentivize the transfers of water out of areas of concern. The intent of this funding is to

provide added financial incentive to water users in priority areas to deposit water into the Association for use outside of these priority areas. By providing financial incentive it is believed that this will further promote these transfers and provide added water conservation for areas of high impact to the stream channel.

4) Violations

a. The LEMA order of designation shall serve as initial notice of the creation of the LEMA and its terms and conditions to all water right owners within the LEMA area on its effective date.

Commented [TK[31]: Other LEMAs actually provide notice to each user in the area, such as sending a post card with a link a website with a copy of the Order of Designation.

b. Upon the District learning of an alleged violation, District staff will provide KDA–DWR with the information the District believes shows the alleged violation. KDA–DWR shall investigate within 60 days and impose restrictions and fines as described below or allowed by law.

c. In the event that the District or KDA–DWR determine that a water user is operating a center pivot system with a functional end gun installed without a written exception from the District, KDA–DWR will address these violations as follows:

Commented [TK[32]: If there are written exceptions, there needs to be some criteria spelled out in this plan.

i. operation of the end gun within the first six months of the LEMA plan will result in notification of the offense to the landowner;
ii. operation of the end gun following the first six months of the LEMA plan will result in an automatic one-year suspension of the water right and a $1,000 fine for every day of operation up to a maximum of $10,000.

d. KDA–DWR will address violations of the authorized quantities in accordance with K.A.R. 5-14-12, as amended July 14, 2017.

e. In addition to other authorized enforcement procedures, if the District Board finds by a preponderance of evidence that watering of unauthorized acres, waste of water, meter tampering, removing the meter while pumping, or any other overt act designed to alter the metered quantity as described in K.A.R. 5-14-10 occurred, then the District Board will make a recommendation to the Chief Engineer that a written order be issued which states:

i. the nature of the violation;
ii. the factual basis for the violation; and
iii. that the water right is suspended for 5 years.

5) Meters

a. All water right owners shall be responsible for ensuring their water flow meters are in compliance with state and local law(s). To ensure accurate measurement of water throughout the LEMA, the District and/or KDA–DWR will place a seal on all water flowmeters or measuring chambers in 2020.

b. In addition to maintaining compliance and reporting water usage annually from each point of diversion, all water right owners shall install and maintain an alternative method of

determining the time that the well is operating. This information must be sufficient to be used to determine operating time in the event of a meter failure. Should the alternative method fail or be determined inaccurate, the well shall be assumed to have pumped its full annual authorized quantity for the year in question. Well owners/operators are encouraged to give the details of the alternative method in advance to District staff in order to ensure that the data is sufficient.

c. Any water right owner or authorized designee who finds a flow meter that is inoperable or inaccurate shall within three business days contact the District office concerning the matter and provide the following information:

i. water right file number;
ii. legal description of the well;
iii. date the problem was discovered;
iv. flow meter model, make, registering units and serial number;
v. the meter reading on the date discovered;
vi. description of the problem;
vii. what alternative method is going to be used to track the quantity of water diverted while the inoperable or inaccurate meter is being repaired/replaced;
viii. the projected date that the meter will be repaired or replaced; and
ix. any other information requested by the District staff or Board regarding the inoperable or inaccurate flow meter.

d. Whenever an inoperable or inaccurate meter is repaired or replaced, the owner or authorized designee shall submit form KDA–DWR 1-560 Water Flowmeter Repair/Replacement Report to the District within seven days.

e. This metering protocol shall be a specific annual review issue and if discovered to be ineffective, specific adjustments shall be recommended to the Chief Engineer by the advisory committee.

6) Advisory Committee

a. The LEMA Advisory Committee shall consist of nine (9) members. Seven (7) of the Advisory Committee members shall be appointed and maintained by the District board as follows: five (5) District Board members representing each of the five counties included in the LEMA area; one (1) representative of Water PACK; and one (1) stakeholder from within the LEMA area. The remaining two (2) Advisory Committee members shall be nonvoting members ex officio as follows: one (1) District staff member and one (1) KDA–DWR staff member. One of the Advisory Committee members shall chair the committee, whose direction shall be to further organize and meet annually to consider:

Commented [TK[33]: Consider adding USFW representative as a non-voting member.

i. water use data;
ii. water table information;
iii. economic data as is available;
iv. compliance and enforcement issues;
v. any new and preferable enhanced management authorities become available; and

vi. other items deemed pertinent to the advisory committee.

7) LEMA Order Reviews

a. In addition to the annual status reviews per Section 6, the LEMA Advisory Committee shall conduct a formal LEMA Order review no later than 18 months before the ending date of the LEMA Order, which will allow the parties to revisit the terms and evaluate its efficacy after a meaningful period of observation. Review items will focus on economic impacts to the LEMA area and the local public interest. Water level data may be reviewed by the committee.

b. The committee, in conjunction with KDA–DWR and the District, shall produce a report following the formal review to the Chief Engineer and the District board which contains specific recommendations regarding future LEMA actions. All recommendations shall be supported by reports, data, testimonials, affidavits or other information of record.

8) Corrective Controls

a. The LEMA Order review identified in Section 7 shall be conducted in a manner to determine if further revisions to the order are necessary at that time. The LEMA Advisory Committee, in conjunction with KDA–DWR and the District, shall review:

i. The water use reports and imagery of end gun acres reduced will be examined alongside BBGMDMOD results to determine annual water use in the LEMA area. When evaluating the effects of the amount of water savings achieved, if there is a different distribution of water savings that has the same hydrologic result as demonstrated with the BBGMDMOD and approved by the Chief Engineer, then the program will be considered successful and no modified controls will be necessary.

ii. The augmentation wellfield implementation will be reviewed to determine the effect augmentation has on the immediate area surrounding the wellfield. The goal for augmentation implementation is a fully-operational peak 15 cfs wellfield and delivery system to the Rattlesnake Creek stream channel.

b. If during the LEMA Order review, the capacity of the augmentation wellfield is either insufficient or excessive, the appropriate modifications to the augmentation wellfield will be made to come in line with the hydrologic conditions as determined by BBGMDMOD. These modifications will be based on the most up-to-date modeling available at the time. The District will plan to have BBGMDMOD updated and calibrated six months prior to the review outlined in Section 7 and 8.

c. Following the LEMA Order review, if the LEMA Advisory Committee, with assistance from KDA-DWR and the District, determines that an augmentation wellfield cannot reasonably satisfy the District's obligations contained herein, the District shall explore additional methods to meet said obligations, including but not limited to the possible the retirement of additional water rights. If those attempts are not successful and the District is not able to meet its obligations, then the District shall submit a written request to the

Commented [TK[34]: 82a-1041(j) requires a public hearing review conducted by the Chief Engineer. How does this review fit into that process? There must be a public hearing review within 7 years (unless you state later within this plan), and it would be more appropriate to submit the Advisory Committee report/ recommendations to the CE at the public hearing. In any case, how all these reviews intertwine needs to clarified.

In summary, this section is confusing regarding what reviews will take place, what standards they are actually reviewing against, and what purpose the reviews serve.

Commented [TK[35]: This is an odd title as there are no corrective controls listed here. This entire section lacks clarity, objective criteria, and measurable timelines. It is not possible to read this and understand what exactly will happen during a review or what will trigger an IGUCA.

Commented [TK[36]: What does this mean?

Commented [TK[37]: You have not set any clear goals about what annual water use should be.

Commented [TK[38]: Again, not a corrective control and this can't be ordered by the Chief Engineer. This is also too vague to be measured in any case. It also suggests that there is some metric that has been determined using the model. What is this metric? If it is going to be cited in the corrective controls, it should be part of the goals.

Commented [TK[39]: There are no obligations of the district. The only "obligation" is that people within the LEMA remove their endguns.

Commented [TK[40]: This is vague and could not be used to hold anyone accountable because there are no goals to meet. There are no timelines or concrete steps to follow and it is unclear what obligations that the district could fail to meet to trigger this provision. What happens if aug. is not built?

Chief Engineer for the formation of an Intensive Groundwater Use Control Area ("IGUCA").

Commented [TK[41]]: The Chief Engineer cannot bind a future board of directors to take action. If you want this to be a meaningful part of the plan, then it needs to be phrased such that when these specific criteria or conditions are met, this board is asking the Chief Engineer to initiate IGUCA proceedings.

9) Impairment Complaints

a. While this program is being undertaken, the District stakeholders request that any impairment complaint filed in the District while the LEMA plan is in effect, which is based upon either water supply issues or a regional decline impairment cause, be received by the Chief Engineer, and be investigated by the Chief Engineer with consideration to the on-going LEMA activities.

10) Water Level Monitoring

a. The District maintains a routine water level measurement network throughout the Rattlesnake Creek subbasin area. This monitoring will continue throughout the term of the LEMA plan. In addition to the existing network, the District will install observation wells as necessary to monitor the impact of the augmentation wellfield. These measurements will be a part of the existing WIZARD database curated by the Kansas Geological Survey.

11) Water Quality Monitoring

a. The District has been monitoring the surface water quality along the Rattlesnake Creek channel for several years. This monitoring will continue throughout the term of the LEMA plan on at least a quarterly basis. The observation wells that will be installed around the augmentation wellfield will be sampled routinely to enhance the understanding of the water quality in this area. Coordination with Kansas Department of Health and Environment will be crucial in this process to ensure the water quality of the Rattlesnake Creek stream channel is maintained throughout this project.

12) Coordination

a. The District stakeholders and the Board of Directors expect reasonable coordination between the Chief Engineer's office and the District board on at least the following efforts:

i. Development of the LEMA Order resulting from the LEMA process;
ii. Compliance and enforcement of the LEMA order;
iii. Installing and maintaining seals on water flow meters; and
iv. Annual reporting of water usage and evaluation of progress toward overall LEMA goals.

Commented [TK[42]]: Need something to measure and quantify here.

References

Balleau Groundwater, Inc. (2010). *Hydrologic Model of Big Bend Groundwater Management District No. 5.* consultant report prepared for Big Bend GMD #5.

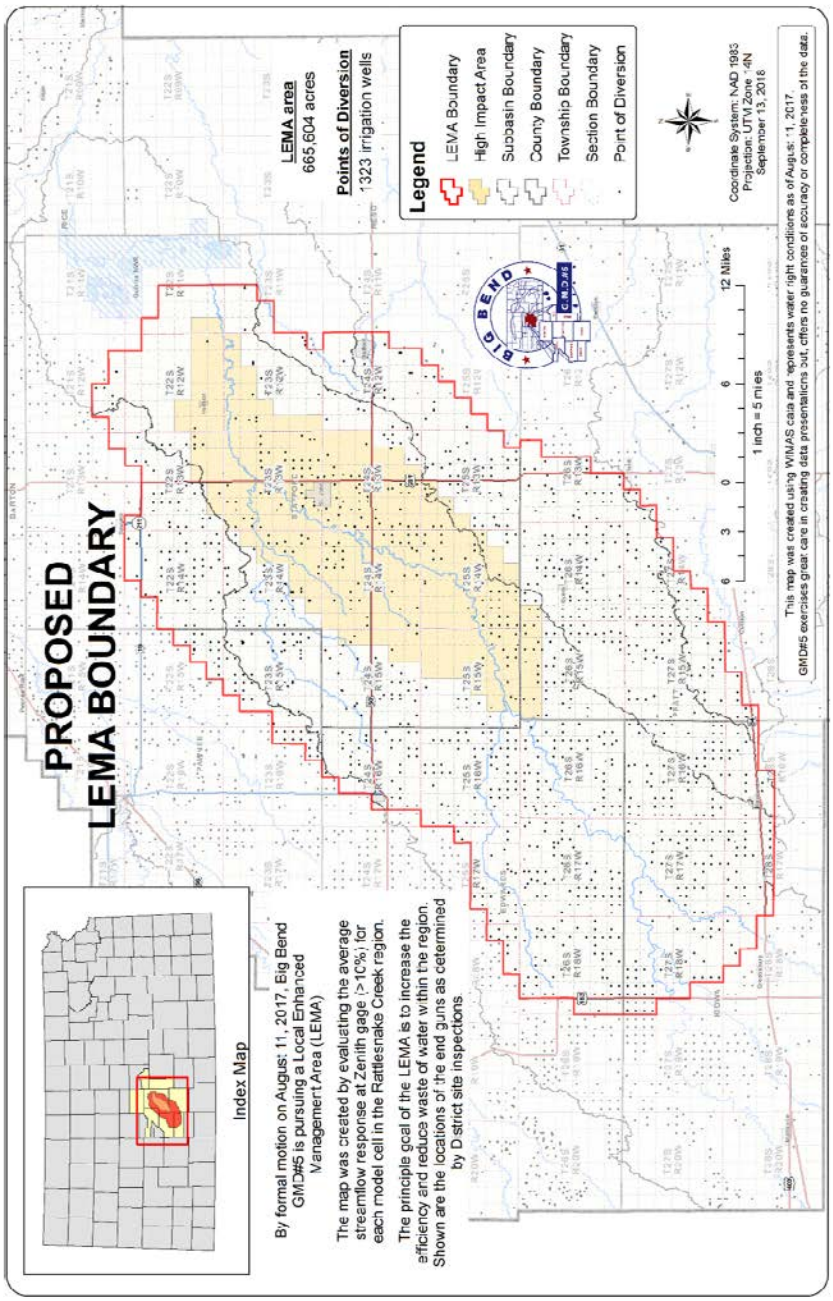
Barfield, D. (2016). *Final Report of the Chief Engineer.* Manhattan: Kansas Department of Agriculture - Division of Water Resources.

Big Bend Groundwater Management District No. 5. (2016). *Stakeholder Proposal in Connection with USFWS Impairment Complaint.* Stafford: Big Bend Groundwater Management District No. 5.

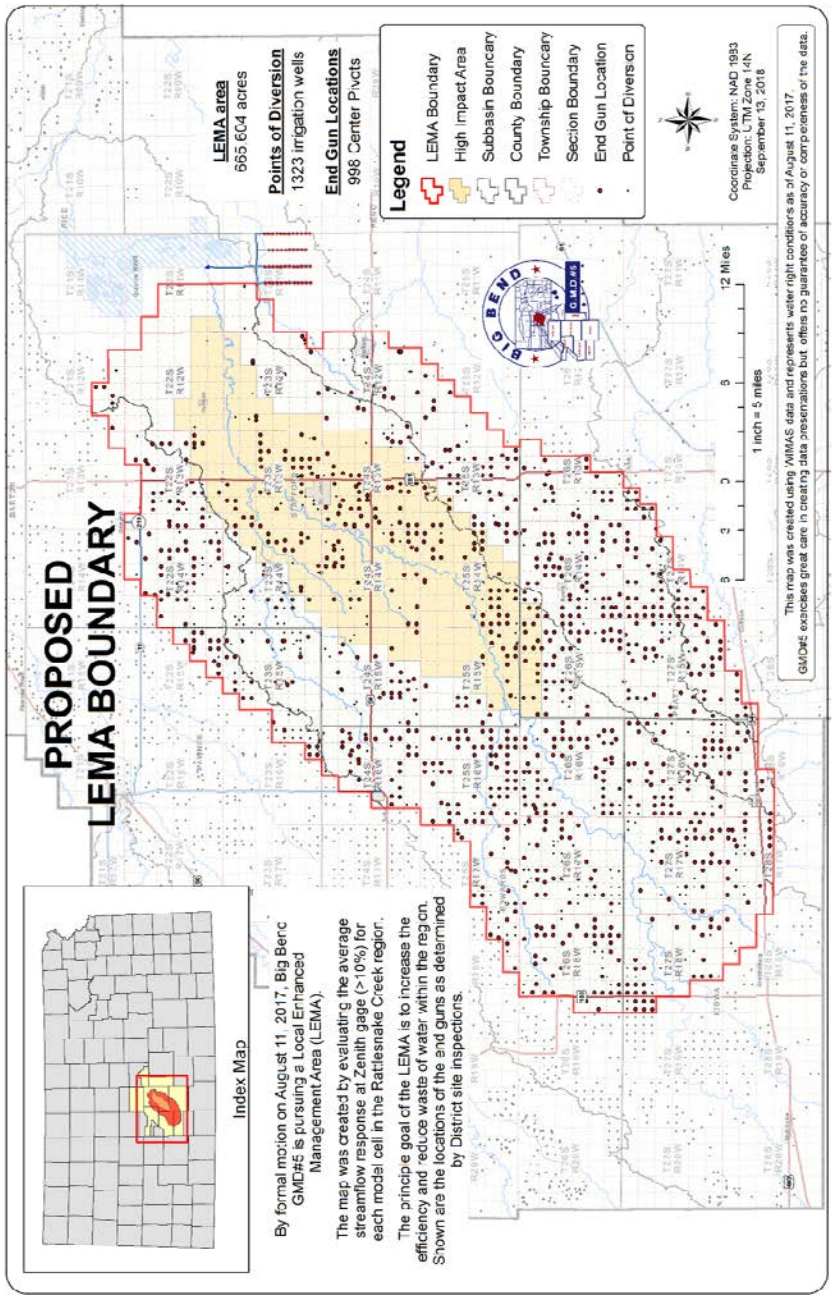
Big Bend Groundwater Management District No. 5. (2017). *Second Stakeholder Proposal in Connection with USFWS Impairment Complaint.* Stafford: Big Bend Groundwater Management District No. 5.

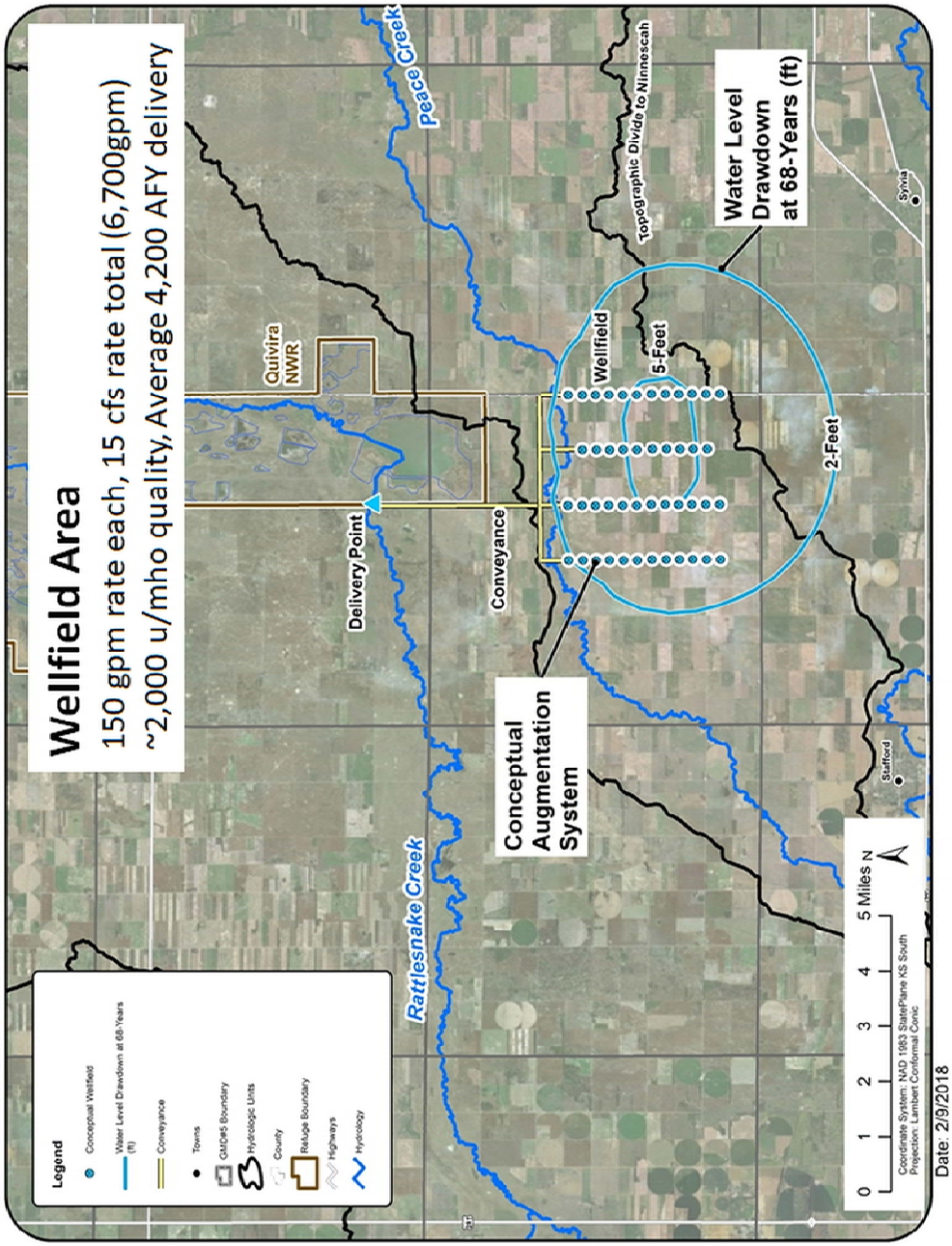
Lanning-Rush, J., & Restrepo-Osorio, D. (2017). *Public-Supply Water Use in Kansas 2015.* U.S. Geological Survey.

Attachment 1



Attachment 2




Wellfield Area
150 gpm rate each, 15 cfs rate total (6,700gpm)
~2,000 u/mho quality, Average 4,200 AFY delivery
Legend
Conceptual Wellfield
Water Level Drawdown at 68-Years (ft)
Conveyance
Towns
GMD#5 Boundary
Hydrologic Units
County
Refuge Boundary
Highways
Hydrology
Quivira NWR
Delivery Point
Conveyance
Conceptual Augmentation System
Wellfield
5-Feet
2-Feet
Water Level Drawdown at 68-Years (ft)
Topographic Divide to Ninnescah
Peace Creek
Rattlesnake Creek
Stafford
Sylvia
0 1 2 3 4 5 Miles
N
Coordinate System: NAD 1983 StatePlane KS South
Projection: Lambert Conformal Conic
Date: 2/9/2018

Attachment 4