Response to Kansas' Reports on the Nebraska Rock Creek Augmentation Plan

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Qualifications and Compensation

I have prepared this expert report on behalf of the State of Nebraska. A true and accurate copy of my curriculum vitae is attached hereto as Appendix A. The opinions contained in this report are made to a reasonable degree of scientific certainty. In preparing this report, I utilized theories and methodologies that are accepted within the scientific community and which have been subject to peer-reviewed analysis and publication.

I have prepared this report as a part of my regular duties as an employee of the State of Nebraska and have received no compensation outside of my normal salary and benefits.

James C. Schneider, Ph.D.

1.0 Introduction

Nebraska's proposed Rock Creek Augmentation Plan (Plan), after being submitted to the Republican River Compact Administration (RRCA) and rejected by the State of Kansas in that forum, is now subject to the current arbitration pursuant to Section VII.B.1 and VII.C of the Final Settlement Stipulations (FSS). The general physical characteristics of, and proposed accounting for, the Plan are fully described in the submittal to the RRCA[1] and therefore will not be repeated here. Kansas has issued three reports outlining their objections to the Plan.[2] These objections can generally be characterized by the following statements:

1) Nebraska has not accounted for transit losses in the Plan;
2) The Plan does not limit pumping under the Plan to the historic consumptive use of the wells acquired for the project;
3) The Plan does not limit the augmentation credits to those required to offset any uses in Nebraska in excess of Nebraska's allocations;
4) The Plan is not for some defined term, does not provide for periodic review, and should contain additional reporting requirements;
5) The Plan does not ensure the usability of the augmentation water for Kansas water users; and
6) Kansas has not been provided adequate opportunity to evaluate the Plan.

This report will:

1) Give a general overview of water management practices which generally occur within the context of the plain language of statutory or other requirements, with a focus on various types of augmentation activities;
2) Demonstrate that the Plan is clearly in conformance with the plain language of the FSS and methods and formulae employed by the RRCA Accounting Procedures and Reporting Requirements (Accounting Procedures);
3) Demonstrate that none of the issues raised by Kansas constitute a flaw in the Plan; and
4) Demonstrate that the Plan should be approved as written, with two minor modifications as suggested by Kansas:
    a. Elimination of augmentation credits attributable to pumping required to offset what would otherwise be termed new depletions; and
    b. Implementation of a 20-year review such that the RRCA would be able to discuss potential modifications to the Plan at that time.

1.1 Water Management and Streamflow Augmentation

The practice of water management generally involves the implementation of various state and federal laws, rules, court decrees, and etcetera. In my job as the Deputy Director for the Nebraska Department of Natural Resources (Department), I routinely review new and existing statutes and other necessary documents to determine, based on the plain language of these documents, the duties of the Department, and the restrictions regarding how those duties are carried out. These include, for example:

[1] NDNR, 2013.
[2] Barfield, 2013; Book, 2013; Larson and Perkins, 2013.

1) Nebraska's statutes regarding the permitting and administration of surface water use;
2) Nebraska's Groundwater Management and Protection Act;
3) Nebraska's water planning statutes;
4) Nebraska's Safety of Dams and Reservoirs Act;
5) The Republican River Compact (Compact) and FSS;
6) The Big Blue River Compact;
7) The South Platte River Compact;
8) The Niobrara River Compact;
9) The North Platte Decree; and
10) The Platte River Recovery and Implementation Program documents, including Nebraska's New Depletions Plan.

These documents generally speak for themselves and I therefore generally rely on their plain language to determine the requirements therein. As a professional water manager, I do not read into such documents requirements that do not exist.

A common activity in the realm of water quantity management is the determination of the impacts of certain activities of man (i.e., water uses) on an aquifer, a surface water body, or both (i.e., water supplies). Reasons for these determinations vary, but generally they are important because there is some limitation imposed on potential impacts. Therefore the impacts are assessed, and if necessary, management strategies are developed to address certain impacts. Management strategies generally fall into one of two categories: 1) reducing the use of water, thus reducing the impact of that activity or 2) providing an offset to the impacts of the uses by adding water from another source. The latter is often termed streamflow augmentation.

As previously noted, stream augmentation involves the addition of streamflow from another source; this source generally is from a different location and/or a more optimal time. Examples of water from a different location might be an adjacent river basin or aquifer storage. Water derived from a more optimal time generally involves the identification of excess flows, or water supplies that are not being used, at one time, and some mechanism to retime that water so that it is available at another time when it is needed for use. The simplest form of such a retiming activity is a surface water reservoir, which holds back surface flows and releases them at a later time when those are needed for use downstream. As Mr. Barfield correctly explains, this is one function of Harlan County Lake, and it can be used to benefit Kansas water users, consistent with Compact requirements. A hydrologically connected aquifer could also be used to retime water supplies.

1.2 Streamflow Augmentation in the Republican River Basin

In the context of the Compact and FSS, various types of streamflow augmentation are currently occurring or show promise for future implementation. Water is currently imported to the Republican River from the Platte River through the slow percolation of water diverted from the Platte River, recharged to the aquifer from canals or applied surface water, and eventually augmenting stream baseflow in the Republican River Basin. In other words, this activity is a non-point source of stream augmentation from an

adjacent basin. Nebraska receives full credit for this water, which is termed the Imported Water Supply (IWS) Credit. Nebraska is also examining options for retiming water during times when Nebraska's Compact allocations exceed its uses by storing this water in either new or repurposed surface storage or utilizing the aquifer as a reservoir, thereby augmenting streamflow during later times when supplies may be less. One purpose of this would be to help ensure Kansas water users can use their water in a timely fashion.

The augmentation occurring under the Plan represents a project that utilizes aquifer storage as a source. Mr. Larson demonstrates in his report that the water levels in the aquifer in the vicinity of the Rock Creek project have been dropping over the past 25 years due to the extraction of groundwater for irrigation. This is consistent with Mr. Barfield's observation that the groundwater pumping rates are approximately ten times the rate of streamflow depletions.[3] The remainder of the groundwater pumping that does not result in streamflow depletions represents a reduction in or removal from aquifer storage (as well as a reduction in non-beneficial evapotranspiration from riparian vegetation).

This same phenomenon can also be observed by reviewing the hypothetical operations of the project presented in the Plan. From 1985-2010, the average rate of groundwater pumping on the irrigated acres retired under the Plan was 4,154 acre-feet per year.[4] The actual consumption of groundwater under historical operations, after accounting for irrigation return flows (i.e., net irrigation pumping[5]) was 3,269 acre-feet per year. In the example operations under the Plan for the same time period, the average rate of pumping is 5,388 acre-feet per year.[6] So the net increase in groundwater extraction under the hypothetical Plan operations for the same time period is approximately 2,119 acre-feet per year. The average rate of new depletion from Plan operations for the same time period was approximately 95 acre-feet per year[7], or less than 5 percent of the increase in net pumping.

All three states have removed significant quantities of water from aquifer storage, primarily for the purpose of irrigation. However, the Compact does not control any States' use of their aquifer, except to the limited extent that the groundwater pumping results in depletions to streamflow. In this respect, aquifer storage is like Platte River water imported from outside the Basin. The Plan would retire groundwater irrigation that relies primarily on aquifer storage as a source. Kansas fails to fully appreciate this fact. Groundwater will continue to be removed from aquifer storage to augment streamflows for the purpose of offsetting streamflow depletions that would otherwise be in excess of Nebraska's Compact allocations in some years. Additional pumping will also occur in intervening years to offset any increases in stream depletions from Plan operations,

[3] Barfield, 2013. Figures 3 and 4 (pages 5-6) show that for the portion of the Basin in Nebraska above Swanson Reservoir, groundwater pumping has been approximately 150,000 to 200,000 acre-feet per year, and the resulting depletion to streamflow is approximately 15,000 to 20,000 acre-feet per year.

[4] Table 1 from the Plan.

[5] The average efficiency rate, or difference between gross and net irrigation pumping, for the time period of 1985-2010 is 78.7 percent, based on an increase in efficiency from 70 percent in 1960 to 80 percent in 2000, with efficiency being static at 80 percent after 2000.

[6] Table 3 from the Plan.

[7] Table 4 from the Plan.

which, as seen above, will be minimal. In this way, Nebraska avoids running afoul of the "no new net depletions" requirement of the FSS.

1.3 Properly Accounting for Streamflow Augmentation

Streamflow augmentation practices are not unique to either the Republican River Basin or to Nebraska. Within Nebraska in the Platte River Basin, an augmentation project similar to the Plan is currently operating to replace depletions to streamflow under Nebraska's New Depletions Plan. Other projects currently being developed in the Platte River that will augment streamflow are the J-2 Reservoir, which will capture excess flows in a surface, off-channel reservoir and release the water during times of shortage, and several projects involving canals that will divert excess flows and allow those flows to recharge the aquifer and slowly percolate back to the stream.

In all cases, streamflow augmentation activities require some accounting of the water in order to assess the relative success of the augmentation. This accounting need not be complex, but simply must conform to the practices and methodologies being used to determine the need for (and amount of) streamflow augmentation. In other words, one would logically expect to use the same procedures to measure the offset provided by a management action (e.g., augmentation) that was used to determine that an impact existed in the first place.

In the Republican River Basin, the Accounting Procedures, as adopted in the FSS and subsequently amended by the RRCA, are utilized to determine the water supplies (i.e., the Virgin Water Supply (VWS)), the resulting Compact allocations, the water uses (termed computed beneficial consumptive use (CBCU)), and the IWS Credit. Any augmentation credits that are assigned under an augmentation plan must simply be computed in a consistent manner. To do otherwise would produce a complete mismatch between the computations that determine the requirement for augmentation water and the actual amount of augmentation water being provided. Kansas apparently wants to create an entirely new accounting procedure to address the Plan, which would operate outside of, but parallel to, the existing Accounting Procedures. This is not necessary and is prohibited by the FSS. The modifications to the Accounting Procedures under the Plan were developed within the context of the plain language of the methods employed for all other water accounting under the Compact, as described next.

2.0 The Plan Conforms to the FSS and the RRCA Accounting Procedures

The Plan consists of the following activities: 1) groundwater pumping and 2) the discharge of this water to a stream. The water then flows downstream, behaving as any other surface water in the basin, (i.e., it becomes surface water). The Accounting Procedures contain clear and consistent procedures for estimating and/or measuring these activities and Nebraska's proposed modifications are consistent with these Accounting Procedures. It is not necessary to create a new accounting method as Kansas proposes.

2.1 Groundwater Pumping

The three states developed the RRCA Groundwater Model (Model) as part of the FSS for the "[d]etermination of streamflow depletions caused by [w]ell pumping and [the] determination of [the] Imported Water Supply Credit … as used in the RRCA Accounting Procedures."[8] The Plan involves groundwater pumping, and therefore the operation of the Plan has an implication on groundwater CBCU. Therefore, the amount of groundwater pumping that occurs under the Plan will be included in the input files for the Model that specifies the amount and location of groundwater pumping in Nebraska. Unlike groundwater pumping for irrigation, which must be assessed an efficiency factor to account for the return of a portion of the pumped water to the aquifer (as discussed above), the full amount of the groundwater pumping under the Plan will be input into the Model. Therefore, the impact of groundwater pumping under the Plan on stream baseflows will be included in the assessment of Nebraska's groundwater CBCU.

2.2 Augmentation Discharge and Conveyance Downstream

Under the Plan, groundwater is extracted by ten high-capacity wells and delivered via an underground pipeline to the discharge point on Rock Creek. Therefore, the true measured quantity of water (as opposed to a modeled estimate) should be used in the Accounting Procedures for the Augmentation Water Supply (AWS) Credit. This AWS Credit is simply subtracted from the measured gage flow at the accounting point for Rock Creek (U.S. Geological Survey (USGS) streamgage 06824000, Rock Creek at Parks, Nebraska) for the proper determination of the VWS for the Rock Creek subbasin.

Mr. Book has presented his opinions relative to the transit loss of the augmentation water between the discharge point and the Rock Creek at Parks gage using data provided by Nebraska and some daily estimated flows from the USGS.[9] He concludes that "some loss is evident in the data, assuming the gain prior to pumping was approximately 7 cfs [cubic feet per second]. This is indicated by comparing the net change in streamflow in this reach after the pipeline began discharging with the gain prior to the pumping."[10] Mr. Book makes no effort to quantify the actual losses, so it is impossible to conclude from his work whether the losses are substantial or de minimis in nature. As discussed below, they can be nothing more than de minimis if they exist at all.

Mr. Book's analysis ignores several key points. The 2012 Water-Data Report for this gage[11] indicates that the "records are fair, except for estimated daily discharges, which are poor." The only measured value for the Rock Creek at Parks gage in Mr. Book's table is from March 7, 2013; the remaining values are estimated daily discharge values. All of

[8] FSS, Section IV.C. It should also be noted that the Accounting Procedures for determining the groundwater CBCU included the consumption of the IWS in contravention of Section IV.F of the FSS. The matter is the subject of pending litigation before the U.S. Supreme Court.

[9] Book, 2013, Table 4. Note that this table contains an error in the value for discharge at the Rock Creek at Parks gage for June 12, 2013. A check of the data posted on the USGS website at: http://nwis.waterdata.usgs.gov/ne/nwis/uv/?site_no=06824000&agency_cd=USGS indicates the discharge was 32 cfs on June 12, 2013.

[10] Book, 2013, pg. 7-8.

[11] See Appendix B.

the discharge values for the points upstream of the Rock Creek at Parks gage are measured values. Therefore, Mr. Book's analysis is not sufficiently robust to draw meaningful conclusions about losses of any kind.

Mr. Book has also ignored the fact that, while discharge at the Rock Creek at Parks gage appears to have been approximately seven cfs before the augmentation pumping began, the natural stream discharge (i.e., what the flows would have been without the streamflow augmentation) decreases through the year, before increasing again in the fall. The 2012 Water-Data Report shows stream discharges decrease to a range of three to five cfs during the summer months (i.e., June-August). Given the fair to poor rating for the Rock Creek at Parks gage data, and this expected decrease in natural stream discharge, the augmentation water appears to be conveyed very well down to the Rock Creek at Parks gage, with de minimis losses. The data collected indicate that any losses that may be occurring are within the confidence interval of the data. Furthermore, any loss that may be occurring is likely a temporary increase in water stored in the alluvial aquifer of Rock Creek (a.k.a. bank storage). Upon the termination of augmentation activities, Rock Creek flows may continue at levels greater than the natural stream discharge for some time, such that any "loss" that may occur during the period of stream augmentation simply is really only retimed water, and not really lost at all.

The preceding discussion has demonstrated that Mr. Book's examination of potential transit losses in Rock Creek is incomplete and insufficient to conclude that any transit losses are or will ever actually occur before the water flows past the gage on Rock Creek at Parks. If anything, the data actually seem to indicate that transit losses in Rock Creek are de minimis if they exist at all, and that it is appropriate to consider the full amount of water delivered to the stream through the augmentation pipeline as the AWS Credit to be deducted from the gaged flows to properly determine the VWS for the Rock Creek subbasin.

More fundamentally, it is not consistent with the RRCA Accounting Procedures to account for transit losses, particularly using the Model. The Accounting Procedures contain no assessments for transit losses for any water throughout the entire basin. While one can try to assess transit losses of augmentation water between the point of delivery and the accounting point for streamflow in the Rock Creek subbasin, the data do not support the conclusion that any augmentation water is being "lost" in the Rock Creek subbasin.

The Model results presented by Mr. Larson would suggest that several thousand acre-feet per year will be lost in this subbasin alone. Examination of the backup data provided by Kansas indicates that these modeled losses would occur nearly uniformly throughout the year, for a near-constant loss of approximately three cfs during initial years of operations. The available data, and common sense, certainly do not support the notion that streamflow losses of approximately three cfs would occur during months such as January and February and be nearly identical to the loss that supposedly occurs in July and August.

The simple response to this obvious problem is that the Model is not designed to assess transit losses. Mr. Book expresses his opinion that the use of the Model in this fashion is

"technically viable."[12] Indeed the Model, which utilizes the MODFLOW stream package,[13] does contain a very crude mechanism to route stream baseflows downstream. However, the fact that the Model technically does some routing of stream baseflows does not mean that it is in any way the appropriate tool for assessing transit losses of surface water flows. Kansas justifies this approach by claiming the FSS requires that augmentation credits be calculated by the Model. However, they are not using the Model to calculate the augmentation credit; they are using the Model to determine transit losses. It appears from the analysis provided by the Kansas experts that the Model does not accurately identify transit losses that may occur in the Rock Creek subbasin.

2.3 Changes to the Accounting Procedures to Incorporate the AWS Credit

Unlike the Kansas approach, Nebraska's modifications to the Accounting Procedures under the Plan are fully consistent with the methodologies employed to account for all other water in the Republican River Basin. The groundwater pumping under the Plan is incorporated into the Model in order to include the impact of that pumping within Nebraska's total groundwater CBCU. The augmentation water is incorporated as an AWS Credit, which is subtracted from the gaged flows so that the AWS Credit is not included in the VWS for the Rock Creek subbasin, consistent with the treatment of other credits in the accounting. No adjustment is made for transit losses because the augmentation water appears to be well conveyed by Rock Creek to the gage on Rock Creek at Parks and, more importantly, transit losses are not considered for any other surface water in the Basin in the Accounting Procedures. Therefore, the Plan is in full conformance with the FSS and the Accounting Procedures.

3.0 The Objections Raised by Kansas are Not Valid

As noted in Section 1.0, Kansas has raised various objections to the Plan. Those objections were generally described by a list of six statements above. These are discussed in turn below. As will be demonstrated, none of these objections constitute a valid reason for their rejection of the Plan.

3.1 Transit Losses

For the reasons just discussed, transit losses from the point of delivery to the Parks gage are a non-issue. Kansas is also concerned about the loss of water downstream from the Rock Creek subbasin. As Mr. Larson points out, in the reach of the "Republican River from the Colorado state line to Swanson Reservoir ... none of the inflows to this section of the river reach Swanson Reservoir for extended periods during the year."[14] However, this is not a situation that is created by the augmentation project on Rock Creek. Furthermore, the Accounting Procedures completely ignore this phenomenon. The basic formula for the VWS for the Republican River Mainstem is:

$$VWS_{Main\ Stem} = Hardy\ Gage - \Sigma\ Subbasin\ gages + All\ CBCU\ in\ the\ Main\ Stem + \Delta S - IWS$$

Where: Hardy Gage = Republican River near Hardy, Nebr. (Stn. No. 06853500)

[12] Book, 2013, pg. 8.
[13] Prudic, 1988.
[14] Larson, 2013, pg. 5.

Subbasin gages =
North Fork Republican River at Colorado-Nebraska (Stn. No. 06823000),
Arikaree Gage at Haigler, Nebr. (Stn. No. 06821500),
Buffalo Creek near Haigler, Nebr. (Stn. No. 06823500),
Rock Creek at Parks, Nebr. (Stn. No. 06824000),
South Fork Republican River near Benkelman, Nebr. (Stn. No. 06827500),
Frenchman Creek in Culbertson, Nebr. (Stn. No. 06835500),
Driftwood Creek near McCook, Nebr. (Stn. No. 06836500),
Red Willow Creek near Red Willow, Nebr. (Stn. No. 06838000),
Medicine Creek below Harry Strunk Lake (Stn. No. 06842500),
Sappa Creek near Stamford, Nebr. (Stn. No. 06847500), and
Prairie Dog Creek near Woodruff, Kansas (Stn. No. 06848500)
ΔS = the change in federal reservoir storage
IWS = the IWS Credit

Beaver Creek flows are included in the gaged flow on Sappa Creek. All of the surface water from the subbasins (not otherwise represented as CBCU in the Mainstem) is assumed to make it downstream to the Kansas state line. No transit losses are assessed. Doing otherwise for any other water (i.e., the AWS Credit) would be inconsistent with the Accounting Procedures.

Mr. Larson's and Mr. Book's point with regard to transit losses of subbasin gaged streamflows in the Mainstem is completely contrary to the assumptions they employed in their work conducted for the ongoing U.S. Supreme Court litigation. There they published five reports[15] which collectively dealt with two issues: 1) the measures that would have been necessary for Nebraska to have stayed in compliance during 2005-2006 and 2) a regulatory means for Nebraska to ensure compliance in the future.

The analysis for the 2005-2006 period employed reductions in surface water and groundwater CBCU, releases from reservoir storage to increase the VWS (and thus Nebraska's Compact allocations), and increases in the IWS Credit. The total increase in water supply available to Kansas generated through these activities, 78,960 acre-feet, was then assumed to be fully available for regulated deliveries from Harlan County Lake to the Courtland Canal. In particular, over 7,000 acre-feet of additional water supply was derived from the portion of the basin above Swanson reservoir. No transit losses were assigned to any of this water until it reached the Courtland Canal, where it is common practice to assign transit losses, through direct measurements, in the Accounting Procedures.

In looking at potential means for Nebraska to ensure future compliance, Mr. Book and Mr. Larson analyzed potential reductions in groundwater CBCU utilizing a hypothetical future scenario. After determining a baseline for the groundwater CBCU in this scenario, approximately 300,000 irrigated acres are retired to achieve a reduction in groundwater CBCU (increasing the streamflow available to Kansas) of approximately 65,000 acre-feet per year on average. While some allowance was made for an increase in Nebraska's surface water CBCU given the increase in streamflow, there was no adjustment made for

[15] Book and Schenk, 2011; Book, 2011a; Book, 2011b; Perkins and Larson, 2011a; Perkins and Larson, 2011b.

transit losses. The potential for transit losses is never discussed, and no adjustment was made to the VWS and resulting allocations, implying that they do not need to be considered. However, approximately 25 percent of the reduction in CBCU, about 16,000 acre-feet per year on average, is achieved above Swanson reservoir. In other words, the retirement of irrigation increases the streamflows above Swanson reservoir by approximately 16,000 acre-feet per year on average. Now, in this instance, Mr. Book and Mr. Larson simply ignore their prior assumptions.

In fact, had Kansas raised the specter of transit losses in these analyses, it would have completely called into question the result of the RRCA accounting upon which they were relying to make Kansas' damage claim pending before the U.S. Supreme Court. In both 2005 and 2006, the inflow to the Mainstem from the twelve subbasins totaled approximately 80,000 acre-feet per year. If, for example, this water should have been assigned a transit loss of 50 percent, only about 40,000 acre-feet would be subtracted from the Hardy gage in the computation of the Mainstem VWS, as opposed to the full approximately 80,000 acre-feet. As a result, the Mainstem VWS would be increased by 40,000 acre-feet per year, improving Nebraska's allocation on the Mainstem, and resulting accounting balance, by approximately 20,000 acre-feet per year. In this example, Kansas' damage claim would be reduced from approximately 80,000 acre-feet to only approximately 40,000 acre-feet, a dramatic decrease. Mr. Book's and Mr. Larson's present analyses cannot be squared technically with their representations to the Supreme Court.

To be sure, there are many methodologies that could be appropriately employed to measure and account for potential transit losses. The Model, however, was not designed for this purpose and in my opinion it is not a suitable tool for this purpose. In any event, as Nebraska has repeatedly explained to Kansas, the issue of transit losses with the Plan is moot given the Compact Call provisions of Nebraska's Integrated Management Plans (IMPs).[16]

It is obvious that if water is added to the system through augmentation or any other measure, but that water does not get logged in at the Hardy gage (or diverted down the Courtland Canal), the benefits are significantly reduced. This can be seen using a simple example. Suppose that under the Plan, 10,000 acre-feet is pumped into Rock Creek and measured at the gage on Rock Creek at Parks. Under the Plan, this water is subtracted from the gaged flows so that it is not counted in the VWS and can be applied as a direct credit. However, there is no adjustment in the Accounting Procedures for the Mainstem VWS under the Plan. Therefore, if the full quantity of 10,000 acre-feet does not get to the Hardy gage, the augmentation benefits can be significantly eroded. In the worst case, if no additional water flows down to the state line, the VWS in the Mainstem is reduced by 10,000 acre-feet. As Nebraska is allocated 48.9 percent of this water, Nebraska's allocation suffers by 4,890 acre-feet in this case, and the net benefit of the augmentation pumping is only 5,110 acre-feet.

To avoid this outcome for all management actions taken in Nebraska, the IMPs specifically contain surface water controls that require surface water administration to

[16] Schneider, 2012, Appendix C; IMP-LRNRD, 2011; IMP-MRNRD, 2010; IMP-URNRD, 2010.

ensure the benefits of these management actions are realized. This water administration is actually conducted in a proactive manner such that the waters are frontloaded downstream, with the benefits of the management activities replacing the frontloaded water over the year.

This is not some abstract theory. For example, as a result of the IMPs and the resulting Compact Call in 2013, the natural resources districts (NRDs) in the basin are taking management actions to offset a forecasted shortfall of 9,060 acre-feet. The Department initiated surface water administration and to date approximately 8,000 acre-feet of Compact water has been delivered to Kansas with approximately 27,000 acre-feet of additional Compact water available in Harlan County Lake on July 1, 2013.[17] While the portion of the 27,000 acre-feet that will ultimately be delivered will depend on compliance projections this fall, it is all currently available to the water users in Kansas and current projections are that they will utilize approximately 11,000 acre-feet of Compact water. Therefore, Nebraska is ensuring that the quantity of water (if not necessarily the very same molecules of water) generated by Nebraska's management actions, including the augmentation pumping under the Plan, will be counted at Hardy (and/or at Guide Rock), thereby ensuring that the VWS for the Mainstem is not adversely affected.

The Compact Call provisions will be in effect during every year termed a Compact Operations Year in the Plan. Therefore, concerns over transit losses are misplaced and totally mute for these years.

3.2 New Net Depletions versus Historic Consumptive Use

Kansas has raised a concern over Nebraska's methodology in the Plan to address the limitation on augmentation wells found in Section III.B.1.k of the FSS, which allows for acquisition or construction of augmentation wells as an exception to the general moratorium on well development provided that operation of augmentation wells do not cause "any new net depletion either annually or long-term." Though this Section makes no mention of historic consumptive use, Kansas apparently feels that the meaning of this section is that an augmentation well cannot pump more than the historic consumptive use of some well or wells previously used for irrigation.

The simple response to this argument is that if Section III.B.1.k was intended to create a historic consumptive use limitation, then it would have likely stated: the augmentation pumping "of water from the new Well...[cannot be] greater than the Historic Consumptive Use of water from the Well."[18] In fact, as indicated by this quoted text, historic consumptive use limitations are imposed explicitly in several locations throughout Section III.B.[19] The FSS even defines historic consumptive use[20] and contains the provisions that Nebraska must use to compute historic consumptive use.[21] Furthermore, Section III.B.1.k clearly allows for the construction of a new well ("Wells

[17] See Appendix C.
[18] FSS, Section III.1.B.g.
[19] See FSS, Section III.B.1.g, III.B.1.h, and III.B.2.
[20] See FSS, Section II.
[21] See FSS, Appendix F.

acquired or constructed"). A newly constructed well would not have a record of historic consumptive use, unless it was really a replacement well, which is covered under a different subsection of Section III.B.1. It seems clear that if Section III.B.1.k were intended to limit augmentation pumping to some historic consumptive use requirement, it would have explicitly said that.

Instead, the limitation clearly applies to any new net depletion either annually or long term. These words obviously have some meaning and relevance to this section, and their plain meaning can be easily understood. The meaning of depletion is clear, as the Compact is concerned with the VWS of the basin and depletion would be some activity which utilizes that supply, thus depleting the availability for other uses. The qualifier "net" means that there can be some netting mechanism, which makes sense in the context of augmentation activities where there can be a depletion (e.g., from the pumping) along with the accretion that is also occurring (e.g., from the augmentation delivery). The qualifier "new" means that there may already be a depletion (e.g., from historical use of wells), and if that is the case, the augmentation plan need only concern itself with the new portion of the depletions that it causes. There is no mystery to these terms, and they are certainly not synonymous with "Historic Consumptive Use" as defined in the FSS.

Nebraska's compliance with the Compact often requires no additional actions in many years, with some significant action required in only a few years. Forcing Nebraska to retire irrigation uses sufficient to provide an annual value of historic consumptive use in the few years that it is needed would deprive Nebraska of the ability to utilize its Compact allocations in the other years. Mr. Barfield suggests that the water use could be averaged over a period of years, but that could lead to a case where new net depletions occurred in some years, in violation of the requirement that they not occur "annually." For example, if a ten-year historic average were employed, and ten years' worth of pumping was conducted in year 1, the likely effect would be to create new net depletions in the immediately subsequent years (e.g., years 2 and/or 3).

Mr. Book suggests Nebraska's method of preventing new net depletions outlined in the Plan would mean that it is not "subject to any limitation derived from the moratorium or FSS."[22] This reasoning is circular, however, as it is the limitations in the Plan that prevent new net depletions that he is complaining about. He further points out that "[t]he FSS provides that the wells are being used for the sole purpose of compact compliance."[23] Actually, Section III.B.1.k of the FSS applies to wells with "<u>the sole purpose of offsetting stream depletions</u> [emphasis supplied] in order ... [for a state] to comply with its Compact Allocations." Offsetting stream depletions is the sole purpose of the Plan.

Mr. Book then seems to suggest that the Maintenance Operations designed to offset new net depletions may not be available or will be unable to keep up with the increasing depletions caused by the Plan. The Model runs presented in the Plan were provided to address this very issue. As can be seen from those results, new depletions are very small, requiring very limited pumping to net those out to zero. Furthermore, in periods after Compact Operations at a rate of 15,000 acre-feet per year, new depletions only increase

[22] Book, 2013, pg. 5.
[23] Book, 2013, pg. 6.

for about four to eight years before declining. This is not by accident. Conceptually, the project was designed to pump water from a location with very small stream depletion rates. Kansas has performed no credible modeling to contradict Nebraska's conclusions.

Finally, Mr. Book invokes section III.A.3 of the FSS, stating "[t]his provision specifies that the States will not increase the level of development of wells in the basins located upstream of Trenton Dam." However, Mr. Book fails to mention that this same section is "subject to the exceptions set forth in Subsection III.B.1-2." The sole purpose of Section III.A.3 is to limit the state's ability to modify the moratorium through action of the RRCA, as generally provided for in Section III.A.1, by requiring the State's to petition the Supreme Court to modify the moratorium if such modification would increase the level of development above Trenton Dam.

Nebraska's conceptualization of the Plan within the scope of the plain reading of Section III.B.1.k of the FSS is appropriate. The FSS clearly does not have a limitation for augmentation wells that includes historic consumptive use, though this concept is used elsewhere in the FSS. The Plan provides a clear mechanism for determining the extent of any new depletions and providing offsets to those new depletions so that there are no new net depletions either annually or long term.

Upon careful consideration, it may be reasonable to limit the AWS Credit that Nebraska can claim so that it does not include any augmentation deliveries required to meet the provisions of no new net depletions. Therefore, if it satisfied Kansas' concerns and ensured approval of the Plan, Nebraska would concede that those augmentation deliveries not be accounted for as an AWS Credit as outlined in the Plan (i.e., an AWS Credit will only be granted to the extent that those augmentation deliveries are in excess of any new net depletion).

3.3 Augmentations Deliveries are for Compact Compliance

Mr. Barfield repeats Mr. Book's incorrect generalization that "the FSS limits augmentation plans to the purpose of compact compliance."[24] As noted above, Section III.B.1.k provides an exception to the general moratorium on the development of new wells to allow the acquisition or construction of wells by a state for the sole purpose of offsetting stream depletions in order to comply with its Compact allocations. As a simple matter, augmentation pumping under the plan will <u>always</u> be for the purpose of offsetting stream depletions. Offsetting stream depletions will <u>always</u> help a state comply with its Compact allocations, and because of the averaging provisions provided by the FSS such offsets can be spread out by up to five years. Furthermore, Nebraska has no desire or intention to pump groundwater into the Republican River, to flow downstream to Kansas, when it is otherwise not required to do so by the Compact. As a professional water manager, I can conceive of no possible scenario in which that would occur.

Mr. Barfield seems to suggest that Nebraska must first prove that augmentation deliveries will be required for Nebraska to comply with its Compact allocations before being allowed to make such deliveries. This paranoia regarding potential over-deliveries of

[24] Barfield, 2013, pg. 11.

water by Nebraska is difficult to understand outside of the context of his apparent desire to constantly frustrate Nebraska and Colorado's compliance efforts, as discussed below. It is also confusing given his portrayal regarding Nebraska's Alternative Water Short Year Plan, in which he seems to be encouraging Nebraska to begin taking actions well ahead of potential water short periods. He raises this issue in the guise of concerns regarding the usability of Kansas' compact allocations, which will be discussed below. However, it is first necessary to respond to his mischaracterization of Nebraska's forecast procedures.

Nebraska Revised Statutes § 46-715(6) requires the Department to "forecast on an annual basis the maximum amount of water that may be available from streamflow for beneficial use in the short term and long term in order to comply" with any applicable interstate compact. For the Republican River Compact, the Department has incorporated the specific procedures that it utilizes for this forecast into the IMPs for the basin NRDs. These procedures provide a forecast not only of available supplies (i.e., Nebraska's Compact allocation), but also of the expected uses (i.e., surface water and groundwater CBCU less any IWS Credit) without additional management actions. Accompanying these procedures is a specific timetable that is followed each year in the early development and eventual finalization of this forecast. If the forecast indicates that water use will be in excess of the water supply, taking into account the appropriate averaging period, then management actions are required. If no alternatives are available for a given NRD, they must shut down groundwater pumping in a defined area known as the Rapid Response Region.

Mr. Barfield notes "these methods are subject to change" and then claims they have been "far from transparent."[25] The first point is correct. The Department is always striving to improve the science behind its forecasting mechanisms so that it properly predicts the amount of offsetting that will be required. If Mr. Barfield is interested in Nebraska complying with the Compact, then he should view this as a good thing.

As to the second point, Kansas has spent three years attempting to convince the Supreme Court that the IMPs are unintelligible. To date this effort has failed. Mr. Barfield seems to be the only person unable to comprehend the IMPs clear provisions, and I can only conclude this is an intentional strategic decision designed to convince anyone who will listen that the IMPs are unworkable. Unfortunately for Mr. Barfield, the IMPs have been working effectively for years, and Mr. Barfield's feigned ignorance is tired and irrelevant.

As indicated in the forecast timeline, the Department holds a public meeting in November of each year to discuss the results of the preliminary forecast. The final forecast is then published no later than December 31 of each year and is a public document. The Department issued a news release on November 16, 2012, with the Republican River Basin preliminary forecast followed by an additional news release on December 7, 2012, regarding 2013 preparations for dry conditions in the Republican River Basin. Both news releases noted that the final forecast would be completed prior to January 1, 2013. The final forecast of allowable depletions for 2013 was released December 31, 2012, and

[25] Barfield, 2013, pg. 11.

available on the Department's website.[26] The process Nebraska uses for determining the need to take management actions is clear and transparent. Once a plan of action is put in place, there are no deviations allowed. Furthermore, on page 6 of the Plan it states:

> *Nebraska will notify the states prior to the initiation of Project operations in the upcoming year to inform them of the volume of water that is intended to be pumped by the Project. Additionally, the Model runs conducted by Nebraska to determine the Maintenance Operations Year pumping will be exchanged with the other states during the annual data exchange. This additional element of the annual data exchange is set forth in Appendix A and reflects the fact that the State of Nebraska would annually report on the operations of the Project.*

It is not clear what more Nebraska can do in this regard, although we would be open to specific suggestions, of which Mr. Barfield apparently has none to offer.

3.4 Temporal Limits, Review, and Additional Reporting Requirements

Kansas has indicated that the Plan requires some temporal limit and periodic review. A time limitation (i.e., expiration date) for an augmentation project is neither required by the FSS nor is it appropriate. However, Nebraska would agree to periodically reviewing the Plan with the RRCA to discuss if any modifications to the Plan were appropriate. Mr. Barfield has suggested a 20-year timeframe for such review, and that would be acceptable to Nebraska. Furthermore, if at any time Kansas does not feel that the Plan is appropriately accounting for the augmentation water, they can raise this issue in the RRCA in the annual meeting as part of the annual accounting of the VWS and Compact compliance.

Additionally, they have indicated that the Plan does not contain sufficient reporting requirements. Kansas has not, however, indicated what is missing or should be added to the Plan to address this concern. Nebraska has applied the same standard for reporting on augmentation activities under the Plan that the FSS places on all other activities that are included in the Accounting Procedures. There is no reason or requirement for any greater standard to be applied to the Plan.

3.5 Kansas' Concerns Regarding Usability of it Allocations

At various locations in his report, Mr. Barfield makes references to the need for the Plan to ensure the "usability of Kansas's share of its allocation."[27] It is unclear what Mr. Barfield means by the Kansas share of its own allocation, but he appears to be concerned about some aspect of the Plan that will render some of the Kansas Compact allocation unusable by the water users in the State of Kansas. This concern is difficult to understand in light of the disregard he displayed for the best interests of his own water users during 2013, as discussed below.

[26] See Appendix D.
[27] Barfield, 2013, pg. 11.

However, generally speaking, the Compact offers no protections or guarantees regarding water usability outside of the allocations of the VWS to each state. As Mr. Barfield notes, "Nebraska's primary obligation under the Compact is to keep its CBCU within its allocation."[28] The Plan is simply designed to offset a portion of Nebraska's CBCU so that the remaining CBCU is within Nebraska's allocation. In his very next sentence, Mr. Barfield indicates that "[i]f Nebraska stays within its share and with the re-timing afforded by Harlan County Reservoir, Kansas will be able to make use of its share of the supply for the lower basin." So there is no issue with usability for Kansas as long as Nebraska "stays within its share," which the Plan is designed to ensure.

Mr. Barfield finally discloses his real issue with the Plan, expressing his opinion that "[t]he need for augmentation is evidence of a failure of water management and is a threat to the long-term hydrologic health of the basin." With this statement we finally get to the bottom of Mr. Barfield's real issue with the Plan; put simply, he is philosophically opposed to the activity. I am well aware of Mr. Barfield's preferences regarding water management in the State of Nebraska for Compact compliance, but the Compact only provides Mr. Barfield with the assurance that Nebraska must stay within its Compact allocations. It does not provide him with the ability to dictate the means by which Nebraska accomplishes this requirement.

3.6 Additional Discussion of the Plan with Kansas Would be Futile

Mr. Barfield, on pages 8 and 9 of his report, reviews some of the history of discussions regarding augmentation plans before the RRCA. Unfortunately, this is a highly selective portrayal of events apparently designed to cover up his failure to administer the Compact as required by Article IX of the Compact. To be sure, Mr. Barfield's failings are not limited to discussions related to augmentation plans. Throughout his tenure as Kansas' Commissioner to the RRCA, Mr. Barfield's actions (or lack thereof) have rendered the RRCA completely dysfunctional. Nebraska has learned the hard way that any attempts at good-faith discussion with the State of Kansas regarding the Compact and its implementation are always met with excessive delay, indifference, obfuscation, misdirection, or all of the above. In fact, Nebraska's frustration recently led to a letter informing Mr. Barfield that his poor performance constituted a direct violation of Article IX of the Compact.[29] To date Nebraska has received no response of any kind.

The history regarding an accounting issue discovered by Nebraska perfectly illustrates this problem. This issue regards the consumption of imported water, which is prohibited from being included as part of a state's CBCU or the VWS by the very clear language of the FSS[30] in full conformance with the Compact. Nebraska discovered that the Model runs used to compute the CBCU by the Accounting Procedures resulted in the states, primarily Nebraska, being charged with consumption of imported water.[31] Kansas countered by creating a "VWS Metric," the directly computed impact of all pumping and the imported water supply, and compared this VWS Metric to the sum of the individual

[28] Barfield, 2013, pg. 12.
[29] See Appendix E. Letter from Brian P. Dunnigan, May 24, 2013.
[30] FSS, Section IV.F.
[31] NDNR, 2007.

impacts computed by the Accounting Procedures and by Nebraska's proposal. By misrepresenting the results of their comparisons, they concluded that the Nebraska proposal to address the consumption of imported water was not appropriate.[32] Nebraska then expended considerable time and effort to develop a proposal to compute the groundwater CBCU and the IWS Credit in a manner that perfectly matched the Kansas VWS Metric.[33] Ultimately, Kansas' response to these efforts was that Nebraska had created an arbitrary standard to be met by the Accounting Procedures, and that there was no such requirement that this standard be met.[34]

Seeing the hopelessness in these attempts to address the concerns raised by Kansas, Nebraska reverted to its original proposal to address the consumption of imported water in the current trial before the U.S. Supreme Court. The Special Master in that case has recognized that consumption of imported water does occur under the current Accounting Procedures, and is currently hearing the issue of how to properly modify the Accounting Procedures to remove the consumption of imported water. Incredibly, Kansas has now resurrected their VWS Metric and has asserted that any method of modifying the Accounting Procedures must now adhere to this standard.[35] Finally, in an unbelievable turn of events, the Kansas proposal to modify the Accounting Procedures turns out to be nothing more than a repackaged version of Nebraska's previous proposal designed to meet the VWS Metric[36] which would obviously produce essentially identical results.[37] To be clear, this is the very proposal that Kansas rejected at the RRCA and over which Nebraska was originally forced to file a claim in the U.S. Supreme Court. Sadly, such an astounding demonstration of bad faith is nothing more than business as usual for Mr. Barfield in his role as RRCA Commissioner.

In an additional example, Mr. Barfield notes that "[o]n September 27, 2012, Kansas presented to the engineering committee of the RRCA an outline of its concerns and issues with augmentation plans, and invited further dialogue on the matter." However, this was not a proactive measure. In fact, the engineering committee had been assigned the task of generating a framework for augmentation plans during the annual meeting on August 31, 2011.[38] Nebraska repeatedly requested that Kansas indicate if there was any augmentation plan that they would be agreeable to. After over an entire year of complete inaction, Kansas provided a nonexclusive list of conditions that they felt must be satisfied in order for an augmentation plan to gain approval from the RRCA.[39] Nebraska responded by attempting to construct an initial framework for the projects being considered with the presentation that Mr. Barfield notes occurred on December 10, 2012. Kansas finally responded to this attempt by Nebraska to complete the assignment to the engineering committee by responding that Kansas would have to know all specifics of a project before being able to respond. Therefore, the final result of the assignment to the

[32] KDWR, 2007.
[33] NDNR, McDonald Morrissey Associates, and Alhfeld, 2008; Ahlfeld, McDonald, and Schneider, 2009; Schneider, 2011.
[34] Larson and Book, 2012.
[35] Larson, 2013.
[36] Schreüder, 2013.
[37] Schneider, 2013.
[38] RRCA, 2011.
[39] See Appendix F.

engineering committee to construct a framework for augmentation plans, which Kansas supported, was a response from Mr. Barfield that no such general framework could be considered by Kansas.

The Colorado Compact Compliance Pipeline (CCP) provides another example of Mr. Barfield's inaction related to Compact matters. Colorado first presented a proposed augmentation plan for the CCP March 12, 2008.[40] Initially, both Nebraska and Kansas expressed some concern over certain aspects of the CCP plan. Colorado brought the issue to a vote of the RRCA in 2009, and neither Nebraska nor Kansas was able to support the CCP plan at that time. As Colorado moved the issue into the non-binding dispute resolution process, Nebraska continued to work diligently and in good faith with the State of Colorado to resolve Nebraska's issues. Nebraska and Colorado were able to resolve those issues prior to the arbitration.

As Mr. Barfield notes, the arbitrator ruled that Kansas did have some legitimate concerns over the CCP. He also seems to imply that the arbitrators rulings have some bearing on the Plan at issue here, though this project was not considered by the arbitrator and Nebraska and Colorado rejected those rulings pursuant to Section VII.B.6 of the FSS, and Section VII.B.7 of the FSS requires that "no State shall assert that … [an arbitrators] decision is conclusive on any issue". Nevertheless, Colorado proceeded to specifically address the concerns identified in that arbitration in a subsequent CCP proposal resubmitted to the RRCA on April 5, 2013.[41] In spite of this, Kansas again rejected this revised proposal, and Mr. Barfield could offer no specific reasons for his position.[42] Nebraska voted in favor of this CCP proposal. It will now be the subject of a second arbitration, with the hearing currently scheduled for September 30 – October 4, 2013. In framing the issues for the arbitration of the CCP, Kansas has inexplicably brought up new issues beyond the scope of those decided in the previous arbitration over the CCP. Therefore, there seems to be little use in trying to address issues raised by Mr. Barfield as he will simply turn to new issues to justify his blocking of a proposal.

The preceding discussion fairly demonstrates why "Nebraska forced an up-or-down vote on the Plan."[43] The dispute resolution process and ultimately the Supreme Court are apparently the only practical means for doing business within the RRCA so long as Mr. Barfield is involved. The most astounding aspect of these disputes is that Nebraska and Colorado are spending hundreds of millions of dollars to ensure the water users in Kansas are provided their allocation of water under the Compact. The only conclusion I can draw from this situation is that Mr. Barfield's sole objective is to frustrate the efforts of Nebraska and Colorado to comply with the Compact.

[40] RRCA, 2008.
[41] Colorado, 2013.
[42] RRCA Special Meeting transcript, May 2, 2013, pg. 21-26.
[43] Barfield, 2013, pg. 9.

4.0 Conclusions

This report has demonstrated that:

1) Nebraska should not be required to account for transit losses under the Plan because transit losses are not assessed to surface water under the FSS or the Accounting Procedures and Nebraska's Compact Call provisions will ensure conveyance of the AWS to Kansas.
2) The FSS does not require the Plan to have limitations for augmentation deliveries that are related to the historic consumptive use of any irrigated lands associated with the Plan. The Plan will meet the requirement in the FSS of no new net depletions.
3) The Plan is clearly intended only to provide augmentation supplies in order to offset any of Nebraska's CBCU in excess of its Compact allocations.
4) The FSS does not require a defined term or periodic review of the Plan. The Plan has reporting requirements that are consistent with the FSS.
5) The Compact or the FSS has no requirements regarding usability of a state's allocations. However, the Plan will not erode the current usability of Kansas' allocations.
6) Nebraska should not expect to satisfy Kansas regardless of the amount of discussion in the RRCA.

Nebraska would concede to the following conditions on the Plan if doing so would ensure that Kansas would accept such a revised Plan:

1) Elimination of augmentation credits attributable to pumping required to offset what would otherwise be termed new depletions; and
2) Implementation of a 20-year review such that the RRCA would be able to discuss potential modifications to the Plan at that time.

The Plan is fully consistent with the limited and plain language of the FSS and the methods and formulae employed by the Accounting Procedures and should be approved.

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Appendix A

Curriculum Vitae for James C. Schneider, Ph.D.

Curriculum Vitae for James C. Schneider, Ph.D.

Areas of Specialization

- Water resources management and planning
- Groundwater flow modeling
- Administration of interstate water Compacts, Decrees, and Agreements
- Hydrogeology
- Statistical analysis of hydrologic data
- Surface-water hydrology
- Environmental geophysics

Education

- Ph.D. in Geology (May 2003) - University of South Florida, Tampa, Florida
- M.S. in Geology (May 1998) - Northern Illinois University, DeKalb, Illinois
- B.S. in Geology (May 1996) - Northern Illinois University, DeKalb, Illinois

Professional History

- **Deputy Director (2010-)** ***Nebraska Department of Natural Resources (DNR)***

  Responsibilities: Advising and assisting the Director in formulating and administering department policies, budget, organization, and work assignments; assisting in formulation of state water policies, particularly as they pertain to water quantity issues, including serving as liaison with the legislature, other state and local agencies, and public interest groups; overseeing the general administration of the department and assuming responsibility for the department's operation in the Director's absence; assisting the Director in administration of interstate compacts and decrees; serving as the State's Representative on technical committees for compacts and decrees; overseeing the work of consultants and preparing special reports related to surface water or surface and groundwater interactions; assisting the Director in reviewing permit applications and groundwater management plans; and assisting the Director in water rights hearings and analysis of permit applications; supervising the Integrated Water Management Division.

- **Head, Integrated Water Management Division (2008-2009)** ***Nebraska DNR***

  Responsibilities: Manage the integrated water management planning process at the Department, including oversight of surface- and groundwater related studies, development and implementation of integrated management plans, supervision of the Integrated Water Management Division and coordination with other Department Divisions, Natural Resources Districts, and other State and Federal agencies.

- **Senior Groundwater Modeler (2007)** ***Nebraska DNR***

  Responsibilities: Serve as NDNR groundwater flow modeling expert.

- **Senior Hydrogeologist/Geophysicist (2006)** ***SDII Global Corporation***

  Responsibilities: Manage hydrogeology and geophysics projects and prepare contract reports and publications. Serve as company groundwater flow modeling expert. Serve as company geophysics expert.

- **Staff Geologist (2003–2005)** ***SDII Global Corporation***

  Responsibilities: Conduct hydrogeology projects and prepare hydrogeology contract reports and publications. Assist senior staff as technical resource for litigation and peer reviews of technical reports. Serve as company groundwater flow modeling expert. Serve as resource to subsidence investigation group.

- **Research Assistant (1998 – 2002)** ***University of South Florida, Geology Dept.***

  Responsibilities: Conducting field research, data interpretation, geophysical surveys and groundwater model development for a variety of projects throughout Florida as well as in other states and in Jamaica. Teaching undergraduate and graduate level lab and lecture courses.

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Kruse, S.E., *J.C. Schneider*, J.A. Inman, and J.A. Allen, 2000. Ground Penetrating Radar Imaging of the Freshwater/Saltwater Interface on a Carbonate Island, Key Largo, Florida. GPR 2000: Proceedings of the 8th International Conference on Ground Penetrating Radar, Gold Coast, Australia, SPIE Vol. 4084: 335-340.

Schneider, J.C. and P.J. Carpenter, 1998. Geophysical Identification of Karst Fissures Near a Landfill in Southwestern Illinois. Proceedings from the Symposium on the Application of Geophysics to Environmental and Engineering Problems, p. 985-992.

Interstate Organizations

- **Republican River Compact Administration (2007-)**

  Responsibilities: Participate in Engineering Committee and Compact Administration Meetings representing State of Nebraska. Serve as official representative on the Engineering Committee beginning in 2010.

- **Platte River Recovery Implementation Program (2007-)**

  Responsibilities: Participate in Water Advisory Committee and in implementation of Nebraska New Depletions Plan. Represent Nebraska on the Governance Committee (Chair 2011) and the Finance Committee beginning in 2010.

- **North Platte Decree Committee (2010-)**

  Responsibilities: Nebraska alternate to the North Platte Decree Committee.

- **Interstate Council on Water Policy (2010 -)**

  Responsibilities: Represent Nebraska on Committees and at annual meetings. Elected to the Board of Directors in 2011.

Expert Witness Testimony

- **Non-binding arbitration in *Kansas v. Nebraska & Colorado*, No. 126 Orig. (2008)**

  Responsibilities: Provided deposition and trial testimony in non-binding arbitration initiated in October 2008 relating to Kansas' claims for damages and future compliance, and Nebraska's proposal to fix accounting errors.

- **Non-binding arbitration in *Kansas v. Nebraska & Colorado*, No. 126 Orig. (2010)**

  Responsibilities: Provided deposition and trial testimony in non-binding arbitration initiated in May 2010 relating to Nebraska's Crediting Issue and Colorado's Augmentation Pipeline.

- **U.S. Supreme Court litigation in *Kansas v. Nebraska & Colorado*, No. 126 Orig. (2012-2013)**

  Responsibilities: Provided deposition and trial testimony in U.S. Supreme Court litigation in 2012 and 2013relating to Kansas' claims for damages and future compliance.

Appendix B

Annual Water-Data Report 2012 for Rock Creek at Parks

06824000 Rock Creek at Parks, Nebr.

Republican Basin
North Fork Republican Subbasin

LOCATION.--Lat 40°02′32″, long 101°43′41″ referenced to North American Datum of 1983, in SW ¼ NE ¼ sec.21, T.1 N., R.39 W., Dundy County, NE, Hydrologic Unit 10250002, on right bank at west edge of Parks, 100 ft downstream from county road bridge and 0.5 mi upstream from mouth.

DRAINAGE AREA.--23.6 mi^2 of which 3.60 mi^2 probably is noncontributing.

SURFACE-WATER RECORDS

PERIOD OF RECORD.--DAILY DISCHARGE--October 1940 to current year.

PERIOD OF RECORD.--DAILY GAGE HEIGHT--October 2009 to current year.

REVISED RECORDS.--WSP 1630: 1951(M). WDR NE-94-1: Drainage area.

GAGE.--Water-stage recorder with satellite telemetry. Datum of gage is 3,093.35 ft above sea level.

REMARKS.--Records fair except for estimated daily discharges, which are poor. One diversion about 2 mi above station for irrigation of 215 acres; flow regulated at times by reservoir at State fish hatchery 7 mi upstream.

DISCHARGE, CUBIC FEET PER SECOND
WATER YEAR OCTOBER 2011 TO SEPTEMBER 2012
DAILY MEAN VALUES
[e, estimated]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	e6.2	6.1	e5.4	e6.2	7.1	6.6	5.4	10	5.6	4.6	4.7	3.9
2	e6.2	6.5	e4.9	e6.0	7.0	6.6	5.1	9.1	5.5	4.5	4.6	3.8
3	e6.2	6.3	e5.6	e6.5	e6.9	6.5	5.9	8.3	5.7	4.3	4.4	4.0
4	e6.1	5.9	e5.1	6.3	e7.2	6.4	8.1	7.8	5.6	4.2	4.3	4.8
5	5.5	5.9	e4.4	6.4	e7.0	6.4	8.8	6.9	5.4	4.5	4.2	4.4
6	5.3	7.2	e4.0	6.5	e6.7	6.4	7.7	6.5	6.0	4.3	3.9	4.4
7	6.0	7.5	e4.7	6.5	e6.4	6.6	6.7	6.3	6.4	4.3	4.1	4.3
8	8.2	7.3	e5.6	e6.5	e6.2	6.6	6.1	6.1	6.4	6.0	4.5	4.4
9	8.3	7.1	e6.2	e6.3	e6.1	6.4	5.8	6.1	6.0	7.0	4.4	4.4
10	7.4	7.7	e6.6	6.6	e6.1	6.3	5.9	6.1	5.5	6.1	4.1	4.3
11	6.9	7.4	e6.7	e6.4	e5.6	6.5	5.9	6.2	5.3	5.6	3.8	4.2
12	6.7	6.8	e7.3	e5.6	e5.7	6.8	6.1	6.4	5.2	5.2	3.9	4.3
13	6.7	6.7	e7.6	e6.1	e5.9	6.8	6.5	6.6	5.2	5.0	4.1	4.4
14	6.7	6.7	e8.1	e6.4	6.4	6.7	6.3	6.5	5.1	4.9	3.9	4.4
15	6.4	6.6	8.6	e6.3	6.4	6.6	6.4	6.4	5.2	4.7	3.6	4.5
16	6.5	6.5	8.0	e5.8	6.4	6.7	6.6	6.1	5.5	4.4	3.7	4.4
17	6.6	6.7	e7.3	e4.4	6.3	6.6	6.3	5.9	5.4	4.2	3.7	4.4
18	6.9	6.8	7.2	e5.3	6.3	6.5	6.7	5.8	5.1	3.9	3.7	4.4
19	6.5	6.9	6.8	e5.5	6.4	6.1	7.1	6.1	4.9	3.4	3.7	4.4
20	6.4	6.7	6.4	e6.2	6.8	6.1	7.2	6.7	4.8	3.1	4.0	4.5
21	6.3	6.7	e6.4	e6.6	7.2	6.7	6.7	6.6	4.7	2.8	4.2	4.5
22	6.2	6.6	e6.1	e7.1	7.0	7.5	6.1	6.2	4.7	2.4	4.1	4.5
23	6.0	6.8	e5.9	e7.3	7.2	7.4	5.5	6.1	4.7	2.2	4.2	4.6
24	5.9	6.8	e6.4	e7.2	7.3	6.7	5.0	6.3	5.0	2.4	4.5	4.6
25	5.6	7.1	e6.7	e7.4	7.0	6.3	5.0	6.3	5.0	2.7	4.6	4.6
26	7.2	e6.5	e6.5	7.6	7.0	6.1	5.1	6.3	4.7	2.8	4.6	4.6
27	8.4	e5.0	e6.2	7.6	7.1	5.6	11	6.1	4.5	2.8	4.5	4.6
28	7.2	e4.3	6.3	e7.2	6.5	5.7	13	5.9	4.6	2.8	4.1	4.8
29	6.5	e4.9	e6.7	e7.3	6.5	5.5	11	5.8	4.6	3.2	3.9	5.0
30	6.1	e5.1	e6.9	7.0	---	5.3	11	5.7	4.6	4.7	3.7	5.0
31	6.0	---	e6.7	7.2	---	5.1	---	5.7	---	4.8	4.0	---
Total	203.1	195.1	197.3	201.3	191.7	198.1	210.0	202.9	156.9	127.8	127.7	133.4
Mean	6.55	6.50	6.36	6.49	6.61	6.39	7.00	6.55	5.23	4.12	4.12	4.45
Max	8.4	7.7	8.6	7.6	7.3	7.5	13	10	6.4	7.0	4.7	5.0
Min	5.3	4.3	4.0	4.4	5.6	5.1	5.0	5.7	4.5	2.2	3.6	3.8
Ac-ft	403	387	391	399	380	393	417	402	311	253	253	265

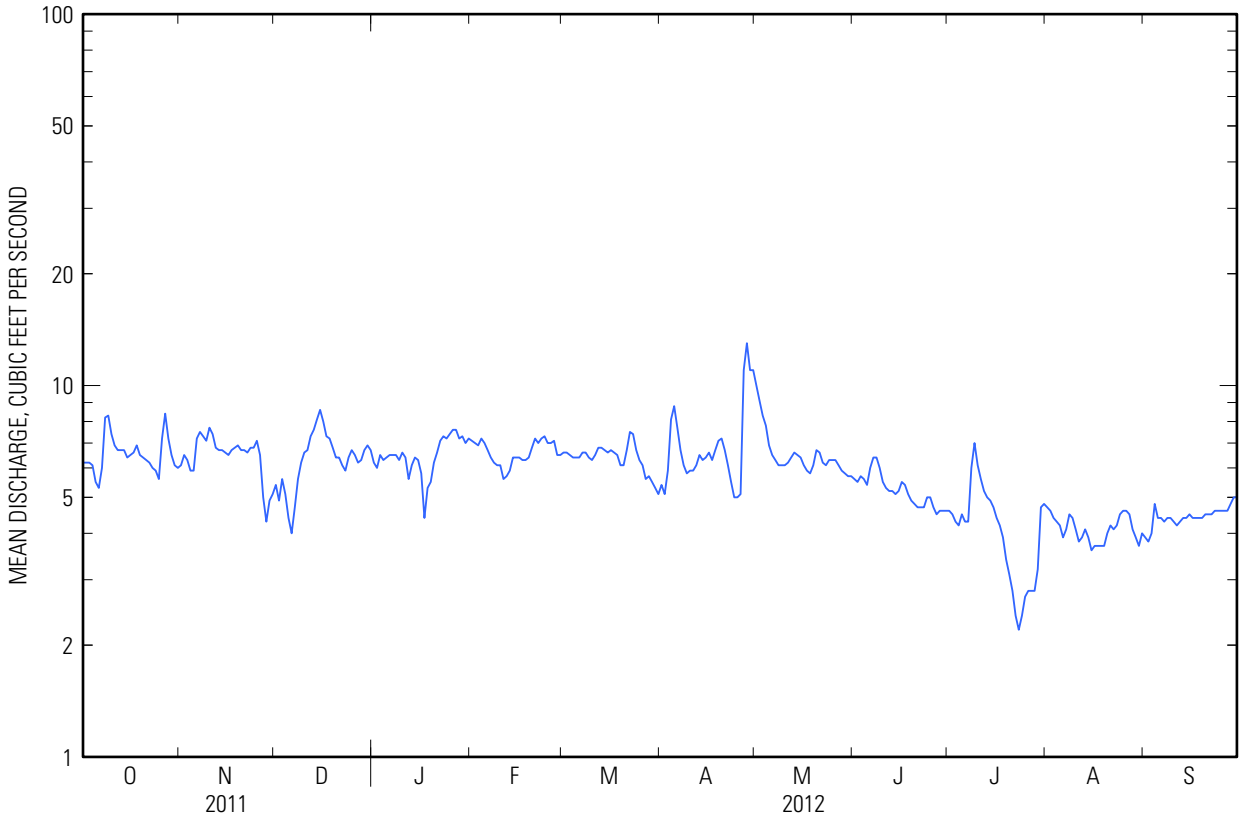
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2012, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	11.5	12.3	12.3	12.3	12.6	12.7	12.7	12.5	12.0	10.8	10.5	10.7
Max	16.2	19.7	17.1	17.9	17.5	18.1	18.1	19.0	19.0	30.3	17.7	18.8
(WY)	(1966)	(1943)	(1941)	(1942)	(1949)	(1949)	(1949)	(1969)	(1965)	(1965)	(1950)	(1951)
Min	3.05	3.15	5.96	4.61	5.33	6.06	6.32	5.38	5.23	4.12	4.12	4.45
(WY)	(2004)	(2004)	(2008)	(2011)	(2011)	(2011)	(2007)	(2007)	(2012)	(2012)	(2012)	(2012)

SUMMARY STATISTICS

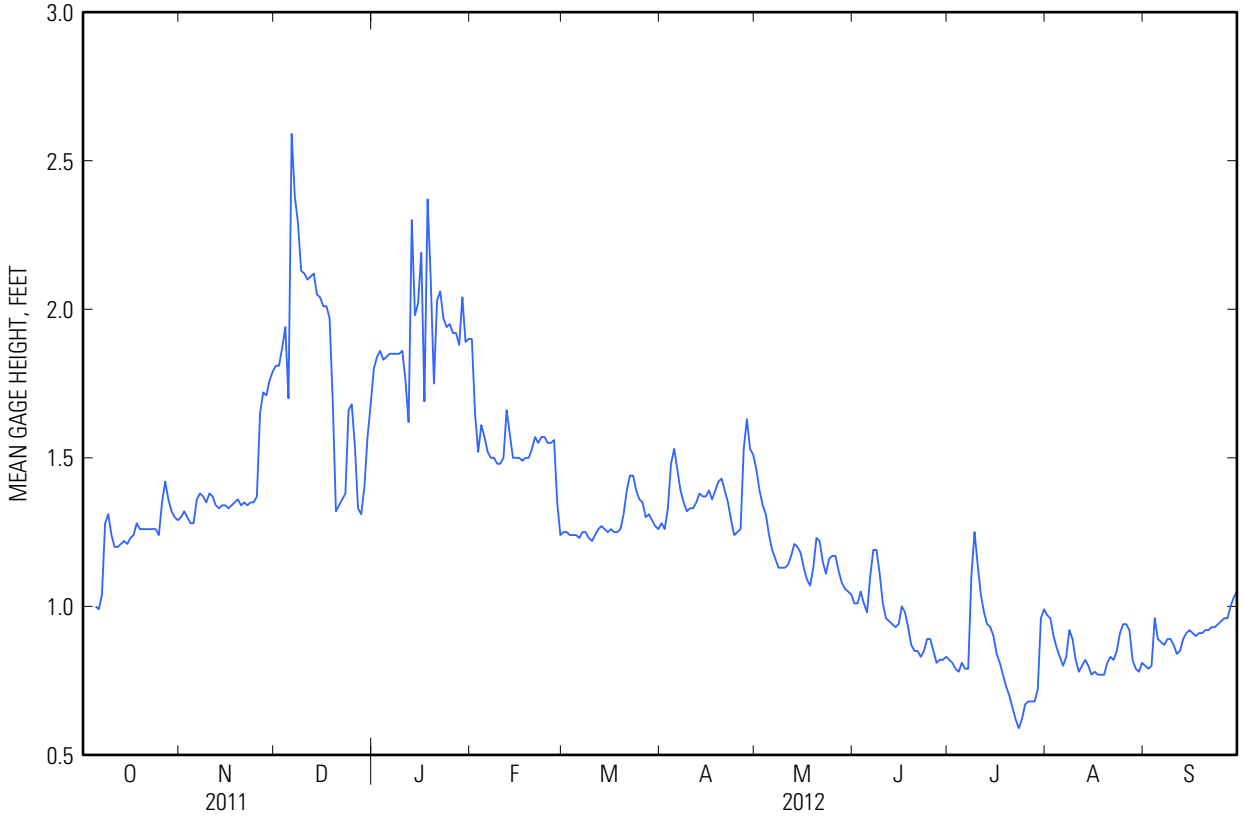
	Calendar Year 2011		Water Year 2012		Water Years 1941 - 2012	
Annual total	2,190.64		2,145.3			
Annual mean	6.00		5.86		11.9	
Highest annual mean					15.8	1949
Lowest annual mean					5.86	2012
Highest daily mean	14	Apr 15	13	Apr 28	111	Jul 6, 1965
Lowest daily mean	0.94	Feb 1	2.2	Jul 23	0.63	Oct 26, 2003
Annual seven-day minimum	2.7	Jan 27	2.6	Jul 21	0.64	Oct 23, 2003
Maximum peak flow			[a]14	Apr 27	[b]493	Jul 5, 1965
Maximum peak stage			[c]3.16	Dec 6	6.00	Jul 5, 1965
Annual runoff (ac-ft)	4,350		4,260		8,620	
10 percent exceeds	7.8		7.2		16	
50 percent exceeds	6.1		6.1		12	
90 percent exceeds	4.1		4.2		7.0	

[a] Gage height, 1.69 ft.
[b] From rating curve extended above 40 ft³/s on basis of slope conveyance.
[c] Backwater from ice.



GAGE HEIGHT, FEET
WATER YEAR OCTOBER 2011 TO SEPTEMBER 2012
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	---	1.30	1.81	1.80	1.90	1.25	1.28	1.46	1.01	0.82	0.97	0.80
2	---	1.32	1.81	1.84	1.65	1.25	1.26	1.39	1.01	0.81	0.96	0.79
3	---	1.30	1.87	1.86	1.52	1.24	1.33	1.34	1.05	0.79	0.90	0.80
4	---	1.28	1.94	1.83	1.61	1.24	1.48	1.31	1.01	0.78	0.86	0.96
5	1.00	1.28	1.70	1.84	1.57	1.24	1.53	1.24	0.98	0.81	0.83	0.89
6	0.99	1.36	2.59	1.85	1.52	1.23	1.46	1.19	1.10	0.79	0.80	0.88
7	1.04	1.38	2.38	1.85	1.50	1.25	1.39	1.16	1.19	0.79	0.83	0.87
8	1.28	1.37	2.29	1.85	1.50	1.25	1.35	1.13	1.19	1.10	0.92	0.89
9	1.31	1.35	2.13	1.85	1.48	1.23	1.32	1.13	1.11	1.25	0.89	0.89
10	1.24	1.38	2.12	1.86	1.48	1.22	1.33	1.13	1.01	1.14	0.82	0.87
11	1.20	1.37	2.10	1.76	1.50	1.24	1.33	1.14	0.96	1.04	0.78	0.84
12	1.20	1.34	2.11	1.62	1.66	1.26	1.35	1.17	0.95	0.98	0.80	0.85
13	1.21	1.33	2.12	2.30	1.58	1.27	1.38	1.21	0.94	0.94	0.82	0.89
14	1.22	1.34	2.05	1.98	1.50	1.26	1.37	1.20	0.93	0.93	0.80	0.91
15	1.21	1.34	2.04	2.02	1.50	1.25	1.37	1.18	0.94	0.90	0.77	0.92
16	1.23	1.33	2.01	2.19	1.50	1.26	1.39	1.13	1.00	0.84	0.78	0.91
17	1.24	1.34	2.01	1.69	1.49	1.25	1.36	1.09	0.98	0.81	0.77	0.90
18	1.28	1.35	1.97	2.37	1.50	1.25	1.39	1.07	0.93	0.77	0.77	0.91
19	1.26	1.36	1.69	2.10	1.50	1.26	1.42	1.13	0.87	0.73	0.77	0.91
20	1.26	1.34	1.32	1.75	1.53	1.31	1.43	1.23	0.85	0.70	0.81	0.92
21	1.26	1.35	1.34	2.03	1.57	1.39	1.39	1.22	0.85	0.66	0.83	0.92
22	1.26	1.34	1.36	2.06	1.55	1.44	1.35	1.15	0.83	0.62	0.82	0.93
23	1.26	1.35	1.38	1.97	1.57	1.44	1.29	1.11	0.85	0.59	0.85	0.93
24	1.26	1.35	1.66	1.94	1.57	1.39	1.24	1.16	0.89	0.62	0.91	0.94
25	1.24	1.37	1.68	1.95	1.55	1.36	1.25	1.17	0.89	0.67	0.94	0.95
26	1.35	1.65	1.54	1.92	1.55	1.35	1.26	1.17	0.85	0.68	0.94	0.96
27	1.42	1.72	1.33	1.92	1.56	1.30	1.53	1.12	0.81	0.68	0.92	0.96
28	1.36	1.71	1.31	1.88	1.35	1.31	1.63	1.08	0.82	0.68	0.82	1.00
29	1.32	1.76	1.40	2.04	1.24	1.29	1.53	1.06	0.82	0.72	0.79	1.03
30	1.30	1.79	1.57	1.89	---	1.27	1.51	1.05	0.83	0.96	0.78	1.05
31	1.29	---	1.68	1.90	---	1.26	---	1.04	---	0.99	0.81	---
Mean	---	1.41	1.82	1.93	1.53	1.28	1.38	1.17	0.95	0.83	0.84	0.91
Max	---	1.79	2.59	2.37	1.90	1.44	1.63	1.46	1.19	1.25	0.97	1.05
Min	---	1.28	1.31	1.62	1.24	1.22	1.24	1.04	0.81	0.59	0.77	0.79


3.0
2.5
2.0
1.5
1.0
0.5
MEAN GAGE HEIGHT, FEET
O
N
D
J
F
M
A
M
J
J
A
S
2011
2012

Appendix C

Harlan County Lake water supply accounting provided by the U.S. Bureau of Reclamation

H A R L A N C O U N T Y L A K E A C C O U N T I N G

Date	HARLAN COUNTY LAKE EOM Elevation	Total Storage* (AF)	Shutoff Capacity	TOTAL Releases (AF)	FLOOD CONTROL Release for Flood control (AF)	Flood Control Storage (AF)	EVAP NET Evap (AF)	INFLOW NET Inflow (AF)	2013 Compact Water Inflow Share (AF)	Use (AF)	Evap Share (AF)	Storage (AF)	Irrigation Pool Inflow Share (AF)	Use (AF)	Evap Share (AF)	Storage (AF)
												0				70493
Jan-13	1935.30	191638	120632	0	0	0	403	916	916	0	0	916	0	0	403	70090
Feb-13	1935.51	193484	120632	0	0	0	12	1858	1858	0	0	2774	0	0	12	70078
Mar-13	1935.94	197895	120632	0	0	0	199	4610	4610	0	8	7377	0	0	192	69886
Apr-13	1937.10	210152	120632	0	0	0	947	13205	13205	0	90	20491	0	0	857	69029
May-13	1937.48	214272	120632	7765	0	0	835	12721	12721	7765	191	25256	0	0	644	68385
Jun-13	1936.33	201995	120632	10019	0	0	5443	3184	3184	0	1468	26972	0	10019	3975	54391
Jul-13			120632													
Aug-13			120632													
Sep-13			120632													
Oct-13			120632													
Nov-13			120632													
Dec-13			120632													
Total	---	---		17784	0	0	7839	36494	36494	7765	1757	---	0	10019	6083	---

Appendix D

Republican River Forecast of Available Water Supplies for 2013 and News Releases

Forecast of Allowable Depletions in the Republican Basin During 2013 and 2023

Nebraska Department of Natural Resources
December 2012

Background

Pursuant to *Neb. Rev. Stat.* § 46-715(6), the Nebraska Department of Natural Resources (Department) in consultation with the Lower Republican Natural Resources District, Middle Republican Natural Resources District, and Upper Republican Natural Resources District (Districts), is required to provide an annual short-term and long-term forecast of maximum allowable depletions to streamflow that will ensure compliance with interstate compacts. The Department has determined that the short-term forecast should apply to the upcoming year (2013), and that the long-term forecast should be for a decade later. Therefore, this document includes the dry-year forecast of allowable depletions to streamflow in 2013 and 2023.

Short-Term Forecast

The outcome of the Department's short-term forecast is largely dependent on three key elements. The first key element is the identification of the averaging period that will be utilized for assessing compliance for the upcoming year. The averaging period is determined based on irrigation water supplies contained in Harlan County Reservoir. The Bureau of Reclamation (Reclamation) is responsible for projecting these water supplies and determining if a Water-Short Year (two-year averaging[1]) designation is warranted. The current projection by Reclamation is that 2013 will be a Water-Short Year and thus, the two-year averaging compliance standard above Guide Rock will be in effect.

The second key element in the short-term forecast is an evaluation of the recent Republican River Compact (Compact) balances for the State of Nebraska as determined using the current Republican River Compact Administration (RRCA) accounting procedures. These procedures allow for the determination of Nebraska's Compact balance for years through the current year (2012).

The third key element is the forecast of available water supplies and consumption within Nebraska for the upcoming year. To carry out this forecast the Department has determined a simplified method of estimating the streamflow-related available water supply of the Republican River Basin for Nebraska's use. The water supply is related to eight variables:

- Surface water consumptive use in Colorado,
- Surface water consumptive use in Kansas,
- Surface water consumptive use in Nebraska,

[1] Nebraska did submit an Alternative Water Short-Year Administration Plan to the RRCA for approval in 2012. This plan would have provided for three-year averaging, but this plan was rejected by the State of Kansas.

- Groundwater consumptive use in Colorado,
- Groundwater consumptive use in Kansas,
- Groundwater consumptive use in Nebraska,
- Nebraska's Imported Water Supply Credit, and
- Surface water flow at the Kansas – Nebraska state line.

These eight variables may be estimated for the next year:

- Surface water consumption in Colorado has reduced to a low near-constant number in recent years, and may be estimated using a two-year average,
- Surface water consumption in Kansas is related to evaporation from lakes in Kansas and the water available for irrigation in Harlan County Lake at the end of each year,
- Surface water consumption in Nebraska is related to water available for irrigation in the five Bureau of Reclamation project reservoirs in Nebraska at the start of each year,
- Groundwater consumption and the Imported Water Supply Credit show little variation from year to year and may be estimated in all three states using a two-year average, and
- Streamflow, assuming that the upcoming year is a dry year, may be estimated from the volume of water in Harlan County Lake and the most recent five years of streamflow.

Historically, Nebraska's share of the available water supply has been approximately half of the total water supply calculated using these methods. The information used to estimate the 2012 Compact balance as well as forecast the available water supply and allowable depletions for 2013 is summarized in Table 1.

Table 1. Information Used for 2012 Provisional Accounting and 2013 Forecast of Allowable Depletions.

Year	Item	Information Source
2012 Provisional	Pumping	Power records estimate
	Surface Water Use	Estimated from preliminary data and previous years values
	Streamflow	Provisional records through December 25, 2012, end of year estimated
	Evaporation	T-1 and 2012 records
2013 Forecast	Groundwater Consumptive Use and Imported Water Supply Credit	Average of 2011 and 2012
	Surface Water Consumptive Use	Colorado: Previous two-year average
		Kansas: + (0.1858 x HCL content) + 9,575
		Nebraska: - (0.0000004) x (NE lake volume)^2 + (0.5151) x (NE lake volume) - 41,518
	Streamflow	+ (5-year average of state line flows) x 0.41 + 0.23 x HCL content - 27,450

Utilizing the data sources outlined in Table 1 the required components of the forecast can be calculated (Table 2).

Table 2. 2013 Forecast Values for Basin Upstream of Hardy.

Forecast Component	Forecast Value
Colorado GWCBCU[1]	27,920
Kansas GWCBCU	19,110
Nebraska GWCBCU	200,600
Nebraska Imported Water Supply Credit	20,380
Colorado SWCBCU[2]	1,250
Kansas SWCBCU	45,010
Nebraska SWCBCU	69,100
Stateline Streamflows	126,820

[1]GWCBCU – groundwater computed beneficial consumptive use
[2]SWCBCU – surface water computed beneficial consumptive use

Combining the results from the current RRCA accounting procedures and forecast procedures contained in the Monitoring and Studies Section of the Districts' Integrated Management Plans, an early estimate of Nebraska's 2012 and 2013 Compact balances can be obtained (Table 3).

Table 3. Estimated Allocations (available water supply), Computed Beneficial Consumptive Use (groundwater and surface water consumption), and Imported Water Supply Credit for 2012 and 2013 (the projected compliance period for next year).

Year	Allocation	Computed Beneficial Consumptive Use	Imported Water Supply Credit	Allocation - (CBCU - IWS Credit)
2012 Provisional	278,650	282,060	17,310	13,900
2013 Forecast	223,300	266,640	20,380	-22,960
Two-Year Average				-4,530
Two-Year Total				-9,060

Note: 2012 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2012 values are not finalized by the RRCA.

The resulting two-year average is approximately -4,530 acre-feet (two-year sum is -9,060 acre-feet). Thus, given that the projected balance is negative, a Compact Call Year will be in effect in 2013.

A Compact Call Year designation requires that each District within the basin that has a projected negative two-year balance submit a plan to the Department by January 31, 2013, describing the actions they will take to ensure that its groundwater consumption is less than the Districts

allowable groundwater depletions. If the Department determines that a District's plan is insufficient then that District will be required to curtail all groundwater uses in the Rapid Response Area. A summary of the Districts' 2012 balance, 2013 balance, and summed balances for the compliance period is provided in Table 4 below.

Table 4. Summary of Balances for each District within the Basin.

Year	LRNRD	MRNRD	URNRD
2012 Provisional	2,610	8,820	2,470
2013 Forecast	-5,520	-4,290	-13,150
Two-Year Total	-2,910	4,530	-10,680

Note: 2012 values are based on current RRCA accounting procedures at the Guide Rock location. Forecast values are computed at the Guide Rock location. 2012 values are not finalized by the RRCA.

In addition to the actions that will be taken by the Districts, the Department will issue an order designating next year as a Compact Call Year and carry out the necessary administration of natural flow and storage surface water appropriations within the basin (see Table 5).

Table 5. Compact Call Streamflow Volume

Forecast Component	Forecast Value
Forecasted Streamflow Volume	126,830
District Management Actions	13,590
Compact Call Streamflow Volume	**140,420**

Long-Term Forecast

Due to the absence of a long-term trend in water supply, the lowest water supply in the future is likely to be similar to the lowest available supply in the past. So, the allowable depletion during 2023, assuming several dry years, is estimated to be approximately 200,000 acre-feet.

Summary

Utilizing the best available information, the current RRCA accounting procedures, and the forecast procedures developed by the Department, it is currently predicted that if next year is dry and the two-year averaging period (2012-2013) is in effect that additional management actions will be necessary to ensure compliance. The implementation of these management actions will be carried out in a manner consistent with the procedures set forth in the Monitoring and Studies Section of the Districts' Integrated Management Plans.

NEWS RELEASE

Nebraska Department of Natural Resources

301 Centennial Mall South - P.O. Box 94676 - Lincoln, Nebraska 68509-4676 - (402) 471-2363

FOR IMMEDIATE RELEASE
November 16, 2012

Contact:
Laura Paeglis
Office Services Manager
Phone (402) 471-2366
laura.paeglis@nebraska.gov

Republican River Basin Preliminary Forecast

The Nebraska Department of Natural Resources released its preliminary forecast for the Republican River Basin today at the Nebraska Republican River Management Districts Association (NRRMDA) meeting in Imperial. This forecast serves to notify local natural resources districts (NRDs) in the Republican River Basin when they are required to perform additional management actions due to limited water supplies. The water supplies in the basin that are available to Nebraska are determined by a 1943 Interstate Compact signed by Nebraska, Kansas, and Colorado. Brian Dunnigan, Director of the Department, said, "*The forecast is a significant advancement over past tools that were available to the Department and basin NRD's and allows for the greatest opportunity for Nebraska to optimize its use of available water supplies in the basin*."

Past non-compliance with the Interstate Compact is the subject of current litigation before the United States Supreme Court. Since that period of non-compliance (2005-2006), the Department and basin NRDs have taken significant steps to support efforts to reduce groundwater pumping and identify other management actions that are designed to ensure that Nebraska will comply with the terms of the Compact, even during dry periods. Director Dunnigan said, "*It is unfortunate that these dry periods require these additional actions, but I am confident that we are now well prepared to proactively address the dry conditions that the basin is currently facing*."

The final forecast by the Department will be completed prior to January 1, 2013. Should the final forecast by the Department still indicate a potential shortfall next year, the next steps for the NRDs will be to develop and implement the necessary actions to keep their individual groundwater uses limited to their individual water supplies or in the alternative curtail groundwater pumping within the rapid response area. The next steps for the Department will require the issuance of closing notices to all surface water appropriations of natural flow, including those to store additional water subsequent to January 1, 2013. These closing notices will not prevent the release and use of water that is in storage on December 31, 2012. More information can be found in the presentation given at the NRRMDA meeting in Imperial and it is available at: http://dnr.ne.gov/IWM/docs/IWM_Presentations-Others.html

# # #

NEWS RELEASE

Nebraska Department of Natural Resources

301 Centennial Mall South - P.O. Box 94676 - Lincoln, Nebraska 68509-4676 - (402) 471-2363

FOR IMMEDIATE RELEASE
December 7, 2012

Contact:
Laura Paeglis
Office Services Manager
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laura.paeglis@nebraska.gov

2013 Preparations for Dry Conditions in the Republican River Basin

The Nebraska Department of Natural Resources is continuing to prepare for dry conditions in the Republican River Basin next year. These continued preparations include efforts by the Department to update and refine its forecast for the Republican River Basin for the upcoming year as well as reassigning staff resources to carry out the administration that may be necessary. The preliminary forecast was released on November 16th and is available at:
http://dnr.ne.gov/NewsReleases/NRRMDAPressRelease11162012.pdf.

In addition to these preparations, Department officials recently met with officials from the United States Bureau of Reclamation (Reclamation) in Billings, Montana, to discuss potential impacts and measures that could be available to surface water users next year. Reclamation manages the major reservoirs that supply irrigation water within the basin. The meeting's discussions focused on the opportunity that the Department will provide Reclamation in the upcoming year to reregulate flows in Harlan County Reservoir that would otherwise be required to pass downstream into the State of Kansas. Department Director, Brian Dunnigan said, *"I have made it clear to Reclamation that they have an opportunity to develop a plan that would be beneficial to basin water users while not jeopardizing Nebraska's ability to comply with the Compact*." Actions by Reclamation will play a key role in the need and duration of time that surface water uses would be limited next year.

The Department's current forecast indicates that approximately 20,000 acre-feet of water will need to be put into streams by the Natural Resources Districts in the basin to prevent potential overuse of Nebraska's allocation. The water supplies in the basin that are available to Nebraska are determined by a 1943 Interstate Compact signed by Nebraska, Kansas, and Colorado. Brian Dunnigan, Director of the Department, said, "*The forecast is a significant advancement over past tools that were available to the Department and basin NRDs and allows for the greatest opportunity for Nebraska to optimize its use of available water supplies*."

Should the final forecast by the Department indicate a potential shortfall next year, the next steps for the NRDs would be to develop and implement the necessary actions to limit NRD groundwater uses to their water supplies or in the alternative, curtail groundwater pumping within the rapid response area (areas near streams).

Should the final forecast by the Department indicate a potential shortfall next year, the next step for the Department would be to require the issuance of closing notices to all natural flow and storage permits in the basin. Beginning on January 1, 2013, natural flow surface water appropriations would be prohibited from diverting surface water. In addition, reservoirs would be prohibited from storing additional water. These closing notices would not prevent the release of water that has legally been stored prior to December 31, 2012. As a condition of these closing notices, all inflows would be required to be released downstream. Surface water administration would continue until conditions improved. Owners of unpermitted jurisdictional dams that do not have a permit would be required to apply for a permit and receive that permit before water may be stored. Landowners are encouraged to contact the Department if they have questions regarding permitting.

The final forecast by the Department will be completed prior to January 1, 2013.

# # #

Appendix E

Letter from Brian P. Dunnigan, P.E., dated May 24, 2013

STATE OF NEBRASKA

Dave Heineman
Governor

DEPARTMENT OF NATURAL RESOURCES
Brian P. Dunnigan, P.E.
Director

May 24, 2013

IN REPLY TO:

David Barfield, P.E.
Kansas Commissioner, RRCA
Kansas State Engineer
Division of Water Resources
109 SW 9th Street, 2nd Floor
Topeka, KS 66612-1283

RE: Republican River Compact Administration

Dear Commissioner Barfield:

The State of Kansas is violating the Republican River Compact (Compact) by failing to administer it. Kansas' unwillingness or inability to resolve key elements of Compact implementation has harmed and continues to harm Nebraska's water users. Through its neglectful or intentional acts, Kansas has failed to comply with its duty under Article IX of the Compact, and Nebraska demands that violation be remedied.

Article IX of the Compact reads in material part:

> *It shall be the duty of the three States to administer this compact through the official in each State who is now or hereafter may be charged with the duty of administering the public water supplies, and to collect and correlate through such officials the data necessary for the proper administration of the provisions of this compact.*

Kansas has breached this duty by, among other things: 1) neglecting to devote sufficient resources to the tasks required for Compact administration; 2) arbitrarily rejecting the efforts of the other States to comply with the Compact; and 3) unnecessarily burdening Nebraska's water users by frustrating Nebraska's Compact compliance efforts.

This is a serious allegation, but I have reached my conclusion based on years of experience trying to work with Kansas within the RRCA context. Kansas has consistently blocked matters critical to Compact administration, including: 1) Nebraska's proposed correction of the Accounting Procedures to avoid the consumption of imported water (submitted in 2007); 2) the Colorado Compliance Pipeline (CCP) and Bonny Reservoir accounting change (submitted by Colorado in 2008); and 3) the more recent submittals of Nebraska's Alternative Water-Short

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Year Administration Plan and an augmentation plan for Rock Creek. Proposals of Colorado and Nebraska have been rejected without sound or sufficient analysis, and in some cases for no stated reason.

Kansas' actions, or lack thereof, in resolving important technical matters before the Republican River Compact Administration (RRCA) have caused Nebraska to unduly burden its water users with regulations and management actions. For example, by refusing to approve Colorado's CCP, Kansas has precluded additional water from entering Nebraska at the stateline in the North Fork. Kansas initially indicated that there were three issues with the CCP proposal (see letter from David Barfield to Dick Wolfe dated November 30, 2009). During the subsequent arbitration Kansas raised a total of eight issues. The arbitrator, Martha Pagel, concluded in her final decision dated October 7, 2010:

> *The CCP Proposal, in general, provides a reasonable and necessary approach for meeting Colorado's Compact obligations. With changes as recommended herein, the revised CCP Proposal should be approved. However, the facts presented in this Arbitration proceeding do not support a conclusion that Kansas has acted in bad faith or has breached a duty of fair dealing in questioning and challenging key aspects of the proposed augmentation plan.* ***To be sure there is a risk that, at some point in the future, continuing objections by Kansas may suggest there is nothing that Colorado can do to develop a plan that would meet with approval by Kansas.*** *(bold emphasis added)*

Now, Colorado has addressed the arbitrator's recommendations; however, the State of Kansas continues to block the CCP Proposal and has forced Colorado to initiate a second arbitration. Moreover, the states have very recently learned that Kansas intends to raise additional, new issues in the upcoming arbitration (see letter from Chris Grunewald to Scott Steinbrecher and Justin Lavene dated May 15, 2013). It would appear that, with regard to the CCP, we have reached that "point in the future" envisioned by arbitrator Pagel in 2010.

This is not the only example of Kansas' obstructionist tactics. Recently, we received the Kansas Expert Report on Nebraska's 5-Run Proposal. Therein, Kansas' expert Mr. Larson explains that Kansas analysis of Nebraska's initial solution to the problem of imported water supply consumption was only "cursory." Nevertheless, that analysis generated the Virgin Water Supply (VWS) Metric, to which Nebraska responded by devoting substantial resources over a three-year period to develop a 16-Run Solution to address the problem. Of course, Kansas rejected and litigated that proposal despite its perfect satisfaction of the VWS Metric, and Mr. Larson went so far as to state that the VWS Metric was meaningless. Now, Kansas has inexplicably proposed a new solution to resolve imported water consumption that relies entirely on the VWS Metric and has the exact same effect as Nebraska's 16-Run Solution. It is very likely that, had Kansas devoted something more than a "cursory" analysis to the original problem in 2007, we might have avoided litigation of the issue altogether.

To be clear, I respect Kansas' right to disagree with Nebraska's plans and proposals. But, in order to perform its duty under Article IX, Kansas must work to resolve technical disputes within the RRCA framework. Kansas' pattern of obfuscation, misdirection, delay and neglect has continued for over five years.

I still hold out hope that the states can begin to work in a cooperative fashion to find solutions to fully implement the Compact, but that will require a major shift in Kansas' behavior and attitude toward its Article IX duties. Kansas' actions during my tenure as Director have left me only with the sense that Kansas has no intention of working cooperatively with Nebraska or Colorado. My hope is running out.

In conclusion, Nebraska respectfully requests that, no later than September 1, 2013, Kansas submit to the RRCA a plan for ensuring Kansas complies with Article IX. If Kansas is unable to provide Nebraska (and Colorado) assurance that it can perform its obligations under Article IX, Nebraska intends to submit this issue to the RRCA for resolution under Section VII of the Final Settlement Stipulation. Should Nebraska be required to work through the dispute resolution process, Nebraska will be required to seek full compensation in the form of money damages or an offset in the RRCA accounting for water rendered unavailable to it as a result of Kansas' efforts to frustrate Nebraska's and Colorado's Compact compliance actions.

Sincerely,

Brian P. Dunnigan

Brian P. Dunnigan, P.E.
Director

cc: Dick Wolfe, P.E., Colorado Commissioner, RRCA

Appendix F

Email from Scott Ross to the Engineering Committee dated September 27, 2012

From: Ross, Scott [mailto:Scott.Ross@KDA.KS.GOV]
Sent: Thursday, September 27, 2012 11:56 AM
To: Schneider, Jim; Ivan <> Franco (Ivan.Franco@state.co.us); Juricek, Chelsea
Subject: Discussion of RRCA considerations of Nebraska Augmentation Plans
Attachments: Discussion of RRCA considerations of Nebraska Augmentation Plans.docx

Jim and Ivan,

These are some initial questions Kansas would like to discuss. The intent is to open a discussion on the concept of augmentation and how it might be most efficiently be implemented. This document will hopefully facilitate a dialog to answer the questions raised and undoubtedly identify others.

Let me know if you would like to schedule further discussion on this topic.

Scott

Discussion of RRCA considerations of Nebraska Augmentation Plans
September 27, 2012

Basic information that should be provided with the plan

- Basics of plan:
  - Quantity requested to be authorized
  - Source locations to be converted to augmentation
  - Augmentation delivery point
  - Computations to substantiate no increase in consumptive use.
  - What depletions are augmentation flows under the plan meant to replace?
  - Basics of envisioned operations.
    - When will the augmentation be used? Will it be operated only during Compact Call Years?
    - How the amount of water that will be allowed for augmentation credit in any year be determined (limited).
    - Operating season envisioned:

- Proposed Groundwater modeling
  - Of groundwater pumping
  - Of augmentation flows
- Proposed accounting
  - How will the RRCA accounting reflect the operations?
    - Surface water leases
    - Rock Creek calculations
    - Mainstem calculations
    - Tables 3, 4, 5
    - Examples would be helpful to work through.
- Proposed reported and monitoring data
- Accounting for deliveries made beyond those allowed under the plan (or before approval)?

Questions for discussion (Rock Creek focus)

1. To what extent does this "non-native water" need to be tracked separately from native flows in the accounting? How does the storage of these waters in federal reservoirs effect VWS, CVS calculations?
2. What are the potential fates of the water delivered? (Storage and NE use from Swanson; pass through Swanson to HC; reserve for Kansa use, groundwater depletions; unaccounted for loss, etc).
3. If NE surface water users divert the flows, will this receive any specific treatment in the accounting?
4. If there are unaccounted losses in the mainstem of e.g. 20%, will that not reduce the mainstem allocations of both KS and NE (as the entire amount will be subtracted in the determination of the mainstem).
   a. Will NE factor this into its IMP credit to the project sponsor?
5. Will water be passed through to Harlan County and reserved for Kansas use during CCYs?

   a. How does NE propose for these augmentation flows to affect the Harlan County evaporation split?
   b. What if these waters are retained in HC beyond the year? Will there be any special accounting?
6. Long-term viability of the source of augmentation water?
7. Percent of water pumped the manifests itself in stream depletions after: 1 year, 2 years, 5 years, 10 years, 20 years.