Non-binding Arbitrations Before
Martha O. Pagel, Arbitrator

Initiated Pursuant to Final Settlement Stipulation
Kansas v. Nebraska & Colorado
No. 126, Orig., U.S. Supreme Court
Decree of May 29, 2003, 538 U.S. 720

Colorado's Compact Compliance Pipeline Proposal
(Arbitration Initiated May 2, 2013)

and

Colorado's Bonny Reservoir Accounting Proposal
(Arbitration Initiated May 2, 2013)

PRE-FILED TESTIMONY OF KANSAS WITNESS SCOTT E. ROSS

September 18, 2013

1 Section 1 – Background and Qualifications

2 **Q: Please state your name and business address for the record**.

3 A: Scott E. Ross. Until my retirement on September 16, 2013, I served as Water
4 Commissioner for the Kansas Department of Agriculture, Division of Water
5 Resources ("DWR"). In that capacity, I supervised the appropriation, regulation,
6 and administration of water rights in the Stockton Field Office Area, which
7 includes all or portions of the thirty-three counties in northwest Kansas, the South
8 Fork Republican River and its tributaries in northwest Kansas, and the main stem
9 Republican River and its tributaries in north central Kansas.

10 **Q: Please describe your educational background and professional experience**
11 **in water management prior to joining DWR.**

12 A: I am a native of Atwood Kansas, which is in the Upper Republican Basin. I grew
13 up half a mile from Beaver Creek, one of the South Fork Republican River's
14 tributaries. I have lived and worked in this basin all my life. I have hiked, hunted,
15 fished and camped at Bonny Reservoir, Swanson Lake, Hugh Butler Lake, Harry
16 Strunk Lake, Keith Sebelius Lake, Enders Reservoir, and Harlan County Lake. I
17 graduated in 1977 from Fort Hays State University, Hays, Kansas, with a B.S. in
18 Geology. After graduation, I took a position with the Bureau of Reclamation
19 ("Reclamation"). From 1978 through June 1981 I worked for Reclamation at its Field
20 Office in McCook, Nebraska. This work included coordinating efforts with agencies
21 of the State of Kansas and the State of Nebraska. This work also included
22 managing construction projects within the Kansas Bostwick Irrigation District

("KBID"), and the Frenchman Cambridge Irrigation District ("FCID") in the Republican River Basin ("Basin").

Q: Please describe your work experience since joining DWR.

A: In 1981, I moved from Reclamation to DWR as the Assistant Water Commissioner for North-Central and Northwest Kansas. After training for several months at DWR headquarters in Topeka, I was assigned to the Stockton Field Office.

Q: As the Water Commissioner for the Basin, what Kansas water laws are you in charge of enforcing?

A: Three main categories. First, the most important set of laws is the Kansas Water Appropriation Act, ("KWAA"), K.S.A. 82a-701 *et seq.,* which governs all water rights in Kansas. Second is an important subset of the KWAA related to minimum desirable streamflows ("MDS"), which I have a duty to protect under the KWAA. Finally, I work on behalf of the Chief Engineer in fulfilling many of DWR's duties and responsibilities under the Groundwater Management District Act ("GMDA"), K.S.A. 82a-1020 *et seq.*

Q: Please describe the basic workings of the KWAA.

A: DWR is charged under the KWAA with the administration of water rights, the compliance of water users with the terms of their water rights, and the appropriation of water within the State of Kansas. That duty extends to maintaining Kansas' compliance with interstate water compacts, including the Republican River Compact. The KWAA governs both groundwater and surface water rights. These rights are real property rights, and are administered

according to the doctrine of prior appropriation. Every use of water except for domestic use requires a permit. A Kansas water right has five major attributes: (1) a priority date, which is the date of the filing for the right; (2) an authorized quantity, which includes both the rate of diversion and the annual authorized quantity; (3) a specific point of diversion; (4) a specific place of use; and (5) a specific type of beneficial use. The first two attributes cannot be changed. The other attributes can be changed, as long as the applicant for such a change can demonstrate that the change under review will not impair other water rights, whether senior or junior. Surface and groundwater rights are administered under the same priority system, and they are regulated and administered in conjunction with each other. In times of shortage the priority relationship between water rights serves as the foundation for water rights administration. In its simplest form, the priority system prescribes that the most senior water rights will receive water to the extent that water is available for use. The status of all water rights is entered into the Water Right Information System ("WRIS"). This database maintains information on each water right including their annual reported water use. This tracking system is used to evaluate relationships between existing water rights and new applications, track annual water use, and provide data to all internal and external water studies. WRIS is used to develop the water use information used each year in the annual Compact accounting. A great deal of time is also spent on the collection of annual water use data through our water use reporting process. Each water right is required to file an annual water use report, which includes beginning and ending meter readings, a total water diverted value,

number of acres irrigated or population served. This is done by point of diversion. This information is also the subject of a fairly extensive review process for compliance with the individual water right.

Q: In evaluating whether to grant new water rights or grant changes to existing water rights, does DWR conduct an analysis of the available water resources?

A: Yes. DWR conducts a safe yield analysis. For groundwater, this requires DWR to evaluate the quantity of groundwater available for appropriation which, for a given area (normally a 2-mile diameter circle) considers mainly: (1) the amount of water provided by precipitation recharge, (2) the amount of water already appropriated, and (3) any amount reserved for streamflow as required by law or deemed to be in the public interest. The precipitation recharge values are typically drawn from a report by the U.S. Geological Survey ("U.S.G.S."), although other more site-specific studies may be used if appropriate. In the South Fork Republican River in Kansas, the safe yield analysis evaluates site-specific impacts to stream flow caused by groundwater pumping.

Q: How does the KWAA protect against possible impairment of senior water rights?

A: Any new appropriation cannot impair any other water right, and any change to a water right cannot impair other water rights. If the safe yield analysis of a new application or change application shows that existing water rights will be impaired, the application will be dismissed.

Q: Do you have personal knowledge and experience with water use, water rights, and water management in the Republican River Basin?

A: Yes. As Assistant Water Commissioner and later Water Commissioner, I have been responsible for knowing the surface water and groundwater rights and use in the Kansas portion of the Basin. I have attended the Republican River Compact Administration ("RRCA") annual meeting since 1985, where the States' water use data has been discussed and reviewed. As I discuss more fully below, since 2003, I have been a member of the Engineering Committee of the RRCA, where the States annually exchange water use data that is used to compile the annual Compact accounting. For these periods, I have personal knowledge and experience with the surface water and groundwater use data for Colorado, Kansas, and Nebraska, as well as the various water management practices undertaken in these States. Since 1998, I have attended meetings of the Four States Irrigation Council, which addresses irrigations practices and regulation in Colorado, Kansas, Nebraska, and Wyoming.

Q: What experience do you have with surface water rights in the Republican River Basin?

A: I have experience working with Reclamation on the administration of water rights related to its irrigation districts, including KBID, NBID, and FCID. I have also administered water rights to protect MDS in the Lower Republican River basin, and the administration of water rights on Beaver Creek.

Q: Do you know the relative priorities of irrigation district water rights in Kansas?

A: Yes. As with many surface water rights, they are senior to the majority of the groundwater rights in the Kansas portions of the Basin.

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2 Section 2 – Conditions in the Basin, 2003-Present

3 **Q: Please describe conditions in the Basin between 2003 and 2007.**

4 A: After the FSS was adopted in 2003, Basin-wide, precipitation declined and water
5 use by most users increased. The eastern portion of the Basin is most heavily
6 reliant on surface water diversion for irrigation, and it was simply dry with little
7 chance of adequate water until the weather changed. All of the Basin reservoirs
8 were at very low levels. However, those with access to groundwater had
9 significantly greater access to water for irrigation. Ground water users in all three
10 states were only limited by their water rights. In the case of Nebraska, these
11 limitations had only recently been established and were tempered with a 3-year
12 to 5 year limit on the total quantity. Therefore, we observed a marked increase in
13 overall water use throughout the basin. As the drought continued through 2006
14 into early 2007, surface water use by the Bostwick Irrigation Districts in the lower
15 portion of the Basin suffered an ever-increasing loss of access to water. During
16 this period, NBID was able to sell its rights to the groundwater users in Nebraska
17 west of NBID, but portions of KBID simply did not have any water available.

18 **Q: What happened between 2007 and 2011?**

19 A: By mid-2007 a more normal level of precipitation returned to the Basin. The
20 years 2008-2011 saw average to above average precipitation coupled with
21 slightly above normal temperatures. Water supplies for most of the basin were
22 adequate to meet the demands placed upon the surface water supplies of the
23 basin.

Q: Did dry conditions return after 2011?

A: Yes. By the end of the irrigation season in 2011 precipitation was beginning to go below normal again for most of the Basin. The fall and winter of 2011 could best be described as above normal temperatures and below normal precipitation. These dry conditions continued through 2012 to the present. Recorded rainfall was down to less than 50% in some areas of the basin. Again, the dry weather limits the use of surface water as it is simply not available. It also leads to increased groundwater use. The Republican River below Hardy, Nebraska was also very low and eventually went under the MDS limits, and approximately 190 junior water users in Kansas were regulated in August of 2012 for the remainder of 2012 and into the 2013 irrigation season. These MDS orders were only vacated in August of 2013.

Q: Did the MDS orders on the Republican River include those diversions from the South Fork Republican River?

A: No, none of those diversions had any water to divert. It was not a matter of regulating them, as the flows from Colorado had been exhausted, thus no orders were needed.

<u>Section 3: RRCA Work</u>

Q: When did you first begin attending RRCA annual meetings?

A: I began attending the RRCA annual meetings in 1985.

Q: What was the water availability situation in the Basin around that time?

A: At that time Kansas had closed most of the Upper Republican Basin in Kansas to new appropriations, as had Colorado. At this point, Chief Engineer David Pope began to insist that Nebraska take similar actions. At about that time I began working with other DWR staff to provide field support to conduct investigations and to address Nebraska water users when asked to do so.

Q: During the course of your time at DWR, how many Chief Engineers have you worked under?

A: Three. Guy Gibson, who served until 1982; David Pope, who served from 1983 to 2007; and David Barfield, who has served since 2007.

Q: From your viewpoint, could you give us a summary of the approach that each successive Chief Engineer took regarding the administration of the Republican River Compact?

A: Yes. Under Mr. Gibson, the Republican River Compact was not a priority, because he served during a time before Kansas began to seek relief from Nebraska. Mr. Pope took an entirely different approach. Soon after becoming Chief Engineer, he took steps to close the Upper Republican Sub-Basins to new appropriations of water, as he believed that these sub-basins had been fully appropriated. We aggressively addressed those rights that had been potentially abandoned, and we began to evaluate the basin hydrology in Colorado and Nebraska to determine those actions needed to secure our water supply for the Lower portion of the Basin. Upon joining DWR, David Barfield was assigned by Mr. Pope to fill a position with our Technical Services team. One of the first assignments given to Mr. Barfield was to evaluate the hydrology of the Upper Republican sub-basins and report on their remaining

unappropriated water supply. These sub-basins were closed to new appropriations based largely on the reports prepared by Mr. Barfield and his team. Mr. Barfield's lengthy experience with DWR and the RRCA has been largely technical. His duties were to make sure that Kansas understood the technical aspects of the RRCA accounting and modeling. As problems with Nebraska's compliance mounted, Mr. Barfield became the DWR representative to the Engineering Committee of the RRCA, and Mr. Pope's primary liaison to the modeling and accounting committees during development of the Final Settlement Stipulation ("FSS"). As Chief Engineer, Mr. Barfield has been committed to ensuring that Kansas remains in compliance with the Compact, and that any changes approved by the RRCA are technically sound. His charge to the staff and Kansas' technical consultants involved with the RRCA has been and continues to be to closely examine each new proposal brought to the RRCA, and to make sure it has specifically stated goals and technically verifiable outcomes. In my view, his approach has not changed in the nearly 30 years that I have worked with him. Mr. Barfield does not approach the RRCA or any other task at DWR with personal passion or prejudice. He is simply trying to make the technically correct decisions regarding the future water supply of the Basin. As you might expect, being Chief Engineer is not an easy job, and it has been especially trying during dry periods, when Mr. Barfield has been forced to make numerous unpopular decisions.

Q: How would you describe the transition from David Pope as Chief Engineer to David Barfield as Chief Engineer?

A: I would describe it as seamless. By the time Mr. Barfield became Chief Engineer, he had already devoted more than two decades of work to Republican River issues, so

the transition was very smooth. The two men both invested significant portions of their careers in the resolution of the issues facing the Republican River Compact. Both men believed that they were dealing with honest, straightforward, and technically capable individuals representing the other states. Both men were and are committed to protecting the long term future water supplies from the Republican River. This must by necessity include the Republican River water users in the two other states.

Q: When did you become a member of the Engineering Committee?

A: After the FSS was signed, so probably in 2003 or shortly thereafter.

Q: **When did you become chairman of the Engineering Committee?**

A: In 2012. I was Chairman of the Engineering Committee of the RRCA until their annual meeting in September of 2013. The Chairmanship changes to the host state as those duties rotate to the new host state every other year.

Q: **What are the duties of the Engineering Committee?**

A: Members of the Engineering Committee in each state are responsible for completing the data collection and reporting water use annually. They are responsible for producing the annual accounting of water use and for establishing the allocations for each state, and therefore for determining whether each state is in compliance. The committee also has the annual task to discuss and provide recommendations for the resolution of various issues that the FSS has required the RRCA to resolve.

Q: Have there been any problems with resolving some of these issues?

A: Yes. Since 2006 the States have not been able to agree on the final accounting, or the accounting procedures. We have not even been able to agree on the

actual water use data submitted by all three states. Kansas has asked for the metered water data collected by both Nebraska and Colorado. Nebraska has given us a summary by county as well as a summary by Natural Resources District ("NRD"), but Nebraska has been unwilling to provide the Engineering Committee with actual metered data collected by the NRD's, or the meter data from Nebraska surface water users in the Basin. As for Colorado, its wells in the Basin were not initially metered. Meter orders were issued in 2009, but we have not been provided with complete access to Colorado meter data. This has not, to date, been available without a well by well query of the Colorado water well data base.

Q: How would you describe Mr. Barfield's interaction with the Engineering Committee?

A: The Kansas interstate water group is really one team with different players who each have a different job. The Engineering Committee venue typically provides the most frequent direct communication among the three states during the period between annual meetings. Mr. Barfield has wanted to be informed of any progress the Engineering Committee is making on various assignments, and he provides input when decision points are developed. I would not describe Mr. Barfield as directly involved in the workings of the Engineering Committee.

Q: Has Mr. Barfield ever directed you or anyone else on the Kansas team, including the Engineering Committee, to reject any proposal brought to the RRCA by Colorado or Nebraska?

A: No, in fact quite the contrary. When either of these states chooses to make a

proposal, Mr. Barfield and the interstate team have invested a great deal of time evaluating each proposal offered from either of the other states. Mr. Barfield continues to seek resolution of these proposals, without sacrificing Kansas water supplies.

Q: How would you describe the recent operation of the Engineering Committee?

A: In 1985 Kansas first introduced the concept of groundwater and surface water being interactive, at least at the RRCA level. This was also the first time Kansas had pointed out that Nebraska and Colorado were exceeding their respective allocations under the Compact. I observed the Engineering Committee meetings as a friendly forum for the exchange of data and other technical matters. Between 1985 and 1997, the Engineering Committee meetings became increasingly more technical and a bit less cordial, but certainly not what I would describe as hostile. During the period from 1997-2003, the same time as the litigation in *Kansas v. Nebraska & Colorado,* the Engineering Committee's work load was concentrated on technical issues, with a great deal of focus on how to resolve various issues of accounting and modeling. While I was not directly involved in the negotiations or the final writing of the FSS, those meetings I did attend were certainly courteous and largely productive. Since the adoption of the FSS in 2002-2003, the meetings have been more difficult to schedule, and very little is being accomplished regardless of the setting. Colorado has withdrawn from most of the discussions of the Engineering Committee, while Nebraska and Kansas have been prompt in providing adequate data to complete the Accounting Procedure computations, Colorado waits until the last possible moment to provide their water use records leaving little time for review. The Colorado water use

information is not really a measurement of water use, but an estimate of Crop Water Requirement via theoretical calculations. Although required to produce water meter records, Colorado water use records have never been provided under the FSS. While they have provided summary data for the RRCA accounting, Nebraska and Colorado continue to withhold the actual meter data, so little confirmation of the other States' water use has been possible.

Q: Do you believe that Kansas has taken a position of opposition at the RRCA level to proposals brought by either Colorado or Kansas?

A: Not at all. In 2002 Kansas signed the FSS with the three States all understanding that changes would be needed to Nebraska's water management approach. The FSS is a document that sets forth those areas of agreement and those areas where additional work and agreement are needed. With the signing of the FSS, the States intended and expected to work into the future to resolve those issues that were not expressly stipulated in detail. Those areas that were not identified in the FSS as being agreed upon were very quickly placed in the forefront, as the drought intensified between 2002 and 2006. Nebraska found itself in violation of the FSS, and in excess of its allocations for every year during that period. Kansas placed a great deal of trust in those who signed the FSS and believed it had every right to expect the States to honor their commitments. Kansas was asked to trust the other states to do what needed to be done to come into compliance. Since the signing of the FSS, neither of the other states has been consistently able to get into compliance. Kansas has found it necessary to continue to spend its valuable time and money in numerous attempts to find mutually acceptable solutions. We have provided technical input, and

suggestions on methods to achieve compliance, only to find ourselves being criticized for making demands. Kansas has never been out of compliance with the Compact or the FSS. It should be clearly understood that the problems to be resolved are not Kansas problems. They become Kansas damages when left unresolved. Kansas has carefully reviewed every proposal provided for our review by either Colorado or Nebraska, but as a downstream state our only protection is the Compact. Therefore, any proposed changes are carefully evaluated and should not be expected to be approved off-hand.

Section 4: Bonny Reservoir

Q: Mr. Ross, how familiar are you with Bonny Reservoir?

A: Having family in Cheyenne County, Kansas I spent a great deal of time as a child and young adult around Bonny Reservoir. It was a place that our family camped in the summer, and hunted around during the fall and winter. Bonny was one of the more stable reservoirs in the area. Without a substantial irrigation component, the water levels stayed relatively high when compared to the other Republican River Reservoirs. In 1978 and 1979 I was working for Reclamation in McCook, NE. This office is the field office under which Bonny was operated. During that time I had occasion to supervise some of the work installing flow measurement Parshall flumes on some of the discharge points on Bonny Dam. I was working with Reclamation when they were negotiating the contract with the Colorado Division of Wildlife for the storage in Bonny Reservoir. In 1981, I went to work for DWR. At that time the Stockton Field Office was assigned the task of

making monthly stream flow measurements at the Colorado/Kansas state line on the South Fork of the Republican River below Bonny Reservoir. For several years, DWR did this any time the river was not frozen. In 1985 I became more involved with the Republican River Compact team conducting field investigations in the area when needed. This included occasional measurements of the flow in the South Fork Republican River at the state line during a time when the United States Geological Survey had removed the "state line" gage.

Q: How would you describe the South Fork Republican flows you measured during this early period of your employment with DWR?

A: Generally stable. We were instructed not to measure the flow unless it was relatively clear and not the result of a run-off event. We measured the flows in the South Fork any time we were in the area and it met those conditions and the river was not iced over. We had a very good section of the river to measure, very close to the Colorado/Kansas state line. It was nearly always 20 cubic feet per second, plus or minus 2 cfs.

Q: In a more recent period, since 2005, the State of Colorado began making an effort to drain Bonny Reservoir. Are you familiar with that process?

A: Yes, I have been involved with the Republican River Compact since before the FSS was signed. During that time you mentioned, I was involved with the ongoing negotiations between Kansas and Colorado regarding the Colorado Compliance Pipeline (CCP). I have been asked on a number of occasions to observe the draining of Bonny Reservoir.

Q: Do you recall when Colorado began to require the draining of Bonny Reservoir?

A: As I recall, it began in the fall of 2011.

Q: When was the draining of Bonny complete?

A: I have only recently observed a dry lake bed. So, I'm not sure that it is complete.

Q: Can you describe what you have observed during this draining process?

A: Initially, the outlet works were ordered to be opened by the State Engineer of Colorado. Reclamation complied with the order and opened the outlet works. I observed this process on several occasions in late 2011 and early 2012. The outlet became plugged with dead and dying fish, which made the release a bit erratic. As the staff of Reclamation and the State of Colorado continued to remove the fish, the reservoir was eventually contained in an area west and south of the outlet works. After May of 2012, the reservoir was only draining about 1 cfs as the head was so low on the outlet works, that this is all the water that could escape. It seems to me that in the fall and winter of 2012 and early 2013 the outflow was about 1 cubic foot per second.

Q: Can you describe the reservoir conditions during this period?

A: The water level in the reservoir area has been down for a number of years, which has allowed the phreatophytes to take over much of the upper portion of the reservoir. With the more recent rapid draining of the reservoir, the lower portion exhibited the look of a mud flat. When visiting the reservoir in 2012, much of the time the area above the camp grounds on the south side of the reservoir area was either standing water or cracked and drying. I found that in the area above

the campgrounds, Cottonwood and Russian Olive trees were growing in the cattails, along with smart weed and phragmites.

Q: How would you describe the water in the reservoir?

A: During all but my last visit on September 6, 2013, some water was pooled in the lake bed. During a visit in April 2013, a number of campers were in the campground observing the migrating water fowl. I noted about 100 acres of open water just south and west of the outlet works. I also observed a number of Great Blue Herons in the water about to their knees, so the water would not have been more than 18 inches deep in that area. Assuming an estimate of 100 acres, and an average depth of around a foot or so, I would roughly estimate that volume to be about 100 acre-feet. I normally access the reservoir from Kansas along the south side of the South Fork Republican River. Most recently I observed that while the river is dry at the USGS gage on the South Fork, I'd estimate about 1 cfs flows in the river below Bonny Dam, even though no flow is leaving via the outlet works. I have also been upstream of Bonny Dam to the nearest bridge crossing the South Fork Republican River. This is a location where Reclamation makes periodic measurements, they recorded an average base flow of about 1.5 cfs. In recent trips to the area I observed that level of flow during both of my last two visits to the area.

Q: You mentioned phreatophytes. Can you give us a bit of background on your experience with phreatophytes?

A: I am not a botanist or an expert on phreatophytes, but I am an avid duck hunter. That makes me very interested in the types of habitat that ducks frequent in the

fall. Ducks seem to like those plants that grow in about 18 inches to 2 feet of water. These plants provide most of their fall and winter food. While these types of plants may not have this much water throughout the year, they don't do well in areas where it dries out completely for long periods of time. As a youngster, I spent a great deal of the fall along the South Fork Republican River in both Kansas and Colorado in those low areas that contained cat tails and willows with my relatives hunting ducks. So, I am able to generally recognize those phreatophytes found in the High Plains.

Q: Please give us your definition of a Phreatophytes.

A: Phreatophytes is a term coined by the United States Geological Survey in the 1950s. Generally, it means a "plant well," or a plant that survives by tapping the ground water to survive, one that is not dependent on precipitation.

Q: What phreatophytes have you observed at Bonny Reservoir?

A: Cottonwood, Russian Olive, Cattails, Salt Cedar and Phragmites.

Q: What do phreatophytes have to do with what you observed at Bonny Reservoir?

A: They can give an indication of what stage the evolution of a dry lake bottom is going through.

Q: What experience do you have with drying lake bottoms?

A: When I began working for Reclamation, several of the reservoirs in the Basin were at a low level and had been for several years. I was supervising a group called the Young Adult Conservation Corps. One of the tasks we were charged with was to destroy the phreatophytes that were invading the lake bottoms after

the irrigation season. These plants, Cottonwood trees, Russian Olive, Willows and some Salt Cedar were growing in areas that had recently been drained. Reclamation believed that these invasive plants were robbing the soil of water and had become so dense that they would impede the flow of water into the reservoirs in the Basin, and thus impair those with contracts for the water from the reservoirs.

Q: What methods were employed to address or control the phreatophytes?

A. The best and cheapest way was to flood them out. If you can increase the water depth to greater than about 24 inches, most of these type plants cannot survive. However, in a drought, when water is not available, Reclamation used herbicides. In areas where the size of the Cottonwoods and Russian Olives had become too great, we used a dozer and a Rome plow to simply plow them under. In situations where it looked like those areas would not receive water for several years, they were placed into agricultural production.

Q: In your experience are only large reservoirs subject to this type of infestation?

A. No, I have also observed the same evolution in two smaller reservoirs. Atwood Lake, near Atwood, KS, became so full of silt that it had a very shallow reservoir area. The lake is owned by the Atwood Township Board. While they were seeking funding to dredge the lake, it went through the same initial sequence of events I have observed at Bonny Reservoir. Initially, the lake bed is over grown with Kochia, just as the dry portion of the lake bed at Bonny. Over the next several years, the lake bed became increasingly over grown with Cottonwood,

Cattails and Willows. Eventually, the Atwood Township Board got the funding they needed, and cleared the phreatophytes with heavy equipment and removed the silt from the lake bed. The other example is Rooks County State Fishing Lake. In about 2002, the Kansas Department of Wildlife and Parks found a problem with the dam and had to drain the lake to make the repairs. During the next several years, as the lake bed remained dry, the lake bottom became over grown with Cottonwood and Salt Cedar. Even though the lake has filled again, the remnants of the phreatophytes remain a problem.

Q: What problems can phreatophytes cause in the long term?

A. The western states all have significant problems with phreatophytes in river and canal systems. These plants consume a significant amount of water in the growth process, causing stream flow reductions was well as blocking channels and preventing flow from moving efficiently down the channel. In sufficient densities, these plants can actually cause streams to over flow their normal channels in times of higher flow causing some flooding concerns. Nebraska has spent millions of dollars on programs to clear their river channels of these invasive species. Kansas has been involved in several scientific studies with the Kanas Geological Survey to determine the impacts on stream flow by phreatophytes.

Q: Have you taken any photographs during some of your visits to Bonny Reservoir?

A: Yes. Several of those photographs from visits on January 4, 2012; June 1, 2013; July 16, 2013; and September 6, 2013, are contained in Ex. CCP/BR-K25. I have

attached six of these photos to my testimony as Attachment 1, and they are referred to as Figures 1 through 6.

Q: Do those photographs fairly and accurately represent the conditions that you observed on your visits?

A: Yes.

Q: During your recent visits to Bonny, have you observed periods when water was pooled within the lake bed, but not running through the outlet works?

A: Yes. Of the pictures I took with a digital camera on June 1, 2013, Attachment 1 Figure 1 illustrates that water is pooled in areas that do not drain to the outlet works. These areas are isolated within the lake bed and do not drain at all, this water simply evaporates.

Q: Would you say that Bonny Reservoir has a dead pool?

A: Yes. While I haven't been on site during the exact moment when the reservoir pool is at the outfall elevation, I have observed a significant pool of water within the reservoir area at times when the outlet works is not in operation.

Q: Could you estimate the size of that dead pool?

A: I have only been able to see that portion of the lake bottom visible from the dam. The pool that is visible from that vantage point would not exceed an estimated 100 acres.

Q: Have you observed any reason that the outlet was not in operation while water was pooled in the reservoir area?

A: On September 6, 2013, while I was observing the lake bed vegetation, I was able to look into the outlet works from the trash rack. While it was relatively dark, I

saw no evidence that any debris on the trash rack would prevent flows from draining through the outlet works.

Q: What information is available from Reclamation on the outlet discharge?

A: Reclamation has a curve representing the discharge rate through the outlet.

Q. Have you reviewed the discharge curve provided by Reclamation?

A. Yes, I spoke with Bill Peck from the Reclamation office in McCook, NE, who provided me the outlet discharge curve, which is attached to my testimony as Attachment 2 (Ex. CCP/BR-K26). We were discussing the potential outfall discharge rate limitations. My understanding is that the outfall curve was developed from the outlet works as constructed and the current area capacity table of the reservoir. He indicated that the size and location of the outlet works is a significant limit to the discharge rate. He indicated that the flow at the normal pool elevation would be approximately 50 cfs. However, with the outlet tube being partially plugged with silt, and the low lake levels that were anticipated to occur under Colorado's order to drain the reservoir, he felt the outflow discharge would be significantly less than the projected 50 cfs. He also pointed out that the maximum that could be expected would be 80 cfs at the top of conservation pool and that hadn't happened in a long time. The pictures that I took on June 1, 2013 show the remaining pool level in Bonny Reservoir. On that date, the Bureau of Reclamation recorded a lake elevation of 3638 feet msl and an outflow of 7 cfs. At this elevation, the discharge curve shows zero storage and therefore zero outfall discharge. The ability to evacuate the storage at Bonny Reservoir

through this outlet is very limited. Therefore, any appreciable inflow will potentially require months to evacuate.

Q: Have you discussed other problems of measuring discharge at Bonny with Reclamation?

A: Yes. In my dialogue with Mr. Peck at Reclamation, we have discussed the problems that arise because of vegetative growth and siltation when the level at Bonny is low. When the level is as low as it is now, which is the same low level at which Colorado plans to keep it, the equipment used to monitor the reservoir level and reservoir discharge become inoperable or inconsistent. Moreover, discharge rates are affected by that vegetative growth, and sedimentation buildup in the outlet pipe, both of which slow discharge. See Attachment 2 (Email from Bill Peck to Scott Ross, July 18, 2013).

Q: Have you read Mr. Slattery's August 21, 2013 report?

A: Yes.

Q: Are you familiar with the Figures presented in this report?

A: Yes.

Q: Beginning with the 1938 aerial photograph provided with Mr. Slattery's report, Mr. Slattery feels that the dark areas within the area of Bonny Reservoir represent trees. Do you have a different view?

A: Yes. I would point out that the photo indicates that it was taken on February 10, 1938. Mr. Slattery suggests that the white areas are sand dunes. I have not observed any dune sand in this area, especially the area just south of the center of Section 17. The black areas generally represent agricultural areas under

1 several irrigation ditches that were in operation prior to the construction of Bonny
2 Reservoir. I would suggest that these dark areas are open farm land. Please
3 note that this is a winter time photograph and would not illustrate any growing
4 vegetation.

5 **Q: What is the latest date in which you visited Bonny Reservoir?**

6 A: September 6, 2013, just a month after the pictures taken by Mr. Slattery on
7 August 5, 2013.

8 **Q: Did you have any additional observations on the conditions of the reservoir**
9 **bottom?**

10 A: I have a different perspective on the vegetation in the lake bottom. As can be
11 seen in his Figure 7 as well as those I took on June 1, 2013, in particular
12 Attachment 1 Figure 2, the lighter areas in Figure 7 were areas that had standing
13 water on June 1, 2013. During my visit to the outlet works on September 6,
14 2013, I took photographs of the Smartweed and Cottonwood trees that were
15 growing about 100 yards west of the outlet works. I also have photographs of
16 Salt Cedar just west of the outlet works. See Attachment 1 Figure 3. While the
17 vegetation in Figure 9 of Mr. Slattery's report shows a close up of the Kochia
18 weeds growing near the outlet works, Mr. Slattery's Figure 8 clearly shows the
19 area south and west of the outlet having evidence of Smartweed, the reddish
20 colored vegetation. My close up pictures of this area show Cottonwood trees
21 and Smartweed. See Attachment 1 Figure 4. I also observed smaller Russian
22 Olive trees in the mix just west of the outlet works on September 6, 2013. Figure

11 in Mr. Slattery's report clearly illustrates the Smartweed growing in the cracked lake bottom. It is the red-colored plant in the picture.

Q: What can you tell us about these invasive phreatophytes?

A. Their seeds are carried by the wind or birds to a new location. When they find a suitable location, they grow easily and when conditions remain suitable for their reproduction, they produce a massive number of seeds from which to grow. The Smartweed is an annual plant, meaning that it reproduces from a seed each year. The United States Department of Agriculture publications indicate those seeds can remain viable for years in the soil. Smartweed is an excellent source of forage for shorebirds and waterfowl. They produce large seed heads, and so are a good source of food for these birds. The seeds can be carried long distances on their feathers and in their digestive systems. Other phreatophytes such as Cottonwoods, Salt Cedar and Russian Olive are perennial plants. While they produce seeds, they live through the winter and thus produce more seeds each year. The Cattails and Phragmites grow in areas where they are inundated with water at least a portion of the year. They are also annual plants, which produce large seed heads with hundreds or even thousands of seeds.

Q: Do any of these pictures provided by Mr. Slattery surprise you?

A: No, they are clearly included to demonstrate his points, but I feel his perspective was too narrow. Mr. Slattery's photos were taken with specific goals in mind. My photographs and observations simply sought to document the broader picture.

Q: Earlier you mentioned the irrigation ditches that predate the construction of Bonny Reservoir area, and are submerged by it. What can you tell us about these ditches?

A: Not a great deal. I have been to the Hale ditch diversion and have observed releases made to the Hale Ditch in the past while with Reclamation. I have heard of the Cook Ditch as well as others, but I have not visited these diversions. They would have been inundated by the reservoir for much of the history of Bonny.

Q: From your previous testimony, it appears that you frequently speak to the staff of Reclamation in McCook, NE about Bonny Reservoir. Has that included any discussion of the technical issues surrounding the area-capacity tables and the discharge curve related to the outlet works at Bonny?

A: My duties with DWR included the administration of water from and into all the Reclamation reservoirs in Northern Kansas. My conversations with Reclamation staff included the release of water from Bonny and therefore the technical aspects of those releases. This information is essential to understand the impact on Kansas water users. The area capacity tables were a source of concern when Colorado asked that the Engineering Committee review the latest area-capacity tables for possible use in the RRCA accounting. My conversations with Bill Peck and Craig Scott of Reclamation staff in McCook included some of their concerns that the area capacity table was not as accurate or complete as they would have liked it to be. The same is true about the discharge curve at the outlet works as it relates to the area-capacity tables.

Q: Can you generally explain their concerns?

A: The area-capacity tables are normally done when the reservoir is at a higher elevation. The technical staff is able to run grid patterns across the lake and establish a relatively accurate topographic survey of the lake bottom. With this information, the volume of water contained within each increment of elevation can be readily and relatively accurately determined. The confidence level can be fairly high when surveyed in this manner. In the case of Bonny Reservoir, no survey had been done since construction in the 1950's. Reclamation had planned on completing a new technical survey of the reservoir on several occasions. However, each time the lake level was so low that an accurate survey was limited. In 2010 with the continued discussion of draining Bonny, Colorado insisted on a technical survey to develop a new area-capacity table. This survey was done when the reservoir was relatively low. It may not have been possible to survey some of the shallow water areas within the reservoir at this lower level. Therefore, a new area capacity table was developed for the lower reaches of the reservoir, but not for the upper reaches of the reservoir. The lower reach survey was simply attached to the 1950s capacity table through interpretation. While we have a new area-capacity table and it's based on the best information possible, it is not as accurate as it might be under better circumstances. The discharge curve raises a parallel concern. The lower level survey did not provide for access to a portion of the lake bottom, so that topography needed to be estimated. The discharge curve is related to the head at the discharge point; any questions raised about the actual depth of water at

the outlet will influence the accuracy of the discharge curve. Thus their concern for the relative accuracy of the area-capacity tables. While it probably represents the best available information, it has the potential to be more accurate.

Q: Continuing with your review of Mr. Slattery's report of August 21, 2013, are you familiar with Opinion 1?

A. Yes. While he seems to accurately describe those concepts expressed in the FSS that are related to the use of the unallocated water in a sub-basin, he fails to mention that Kansas is being impaired by water use in Colorado. Colorado's continued depletion of the South Fork sub-basin groundwater impacts flows into Bonny Reservoir. This is evidenced by the decline in storage. Long before opening the gates at Bonny, water available for storage began to decline. This led to a decrease in annual reservoir releases, along with a decrease in seepage coming into Kansas. Mr. Slattery makes no mention of the decline in flows coming into Kansas at the Colorado line. As I mentioned earlier, I had occasion to measure flows into Kansas in the South Fork Republican River at the state line monthly in 1981 and 1982. Those flows were relatively stable at approximately 20 cfs. Since the USGS has re-established a gage at the state line with Colorado, the flows entering Kansas had dropped to 6 cfs mean flow in 2002 through 2007. Subsequent to 2007 Colorado began making releases for compact compliance. Less water into Kansas means less water leaving Kansas through the South Fork.

Q. Are you familiar with the Opinion 3 in Mr. Slattery's report?

A. Yes, I have read this report and disagree with Mr. Slattery's conclusion in Opinion 3. He states that "This method of modeling simply represents what is physically happening when Bonny Reservoir is drained and all inflows are passed to the downstream reach." On July 16, 2013 and September 6, 2013 in CCR/BR Figure 5, I observed inflows to Bonny Reservoir approximately 3 miles above the HWY 385 bridge crossing the South Fork Republican River. This inflow does not flow through Bonny Reservoir as both Mr. Slattery and I have illustrated, during these periods the outlet is not in operation. Water is not flowing through Bonny Reservoir, so transit loss in this reach does occur. In the next paragraph Mr. Slattery states, "The inflow to Bonny Reservoir flows thorough the South Fork stream channel and is allowed to interact with the physical processes that effect streamflow in a stream channel." Figure 6 shows the phreatophytes growth in the South upper end of Bonny Reservoir. No channel really exists, the area is overgrown with cattails, phragmites, willows and cottonwood. The physical process referenced by Mr. Slattery is that of uncontrolled phreatophytes consuming all the base flow in the river. Phreatophytes are not native, and are in many cases considered noxious or invasive species.

Q. Are you familiar with Opinion 5 of Mr. Slattery's report?

A. Yes. In Opinion 5, expresses his position as being that "There is currently very little phreatophyte growth in the bottom of Bonny Reservoir." My observations and photographs differ in that I feel that phreatophytes do exist in the bottom of Bonny Reservoir and in areas they exist in abundance. They have continued to

multiply and have for a number of years been increasing to the extent that they can now completely consume the normal baseflow coming into Bonny Reservoir. Mr. Slattery's statement that "Therefore, we conclude that there is less native consumptive use occurring in the area previously inundated by Bonny Reservoir, than was occurring prior to the period when Bonny Reservoir was constructed." This a like a very true statement, every evidence suggests that most of the native plants growing in that area before the construction of Bonny Reservoir have been pushed out by invasive phreatophytes.

Figure 1 South end of Bonny Dam looking west

Figure 2 North end of Bonny Dam looking west-southwest.

Figure 3 Salt cedar and cottonwood on the north side of Bonny Dam near the outlet.

Figure 4. Date 9-6-2013 Lake bottom of Bonny Reservoir. Cottonwood, Smartweed, and Kochia.

Figure 5 South Fork Republican River above Bonny Reservoir.

Figure 6 Low water crossing – upper Bonny Reservoir.

Peck, William <wpeck@usbr.gov>

Bonny Dam - Discharge Curve

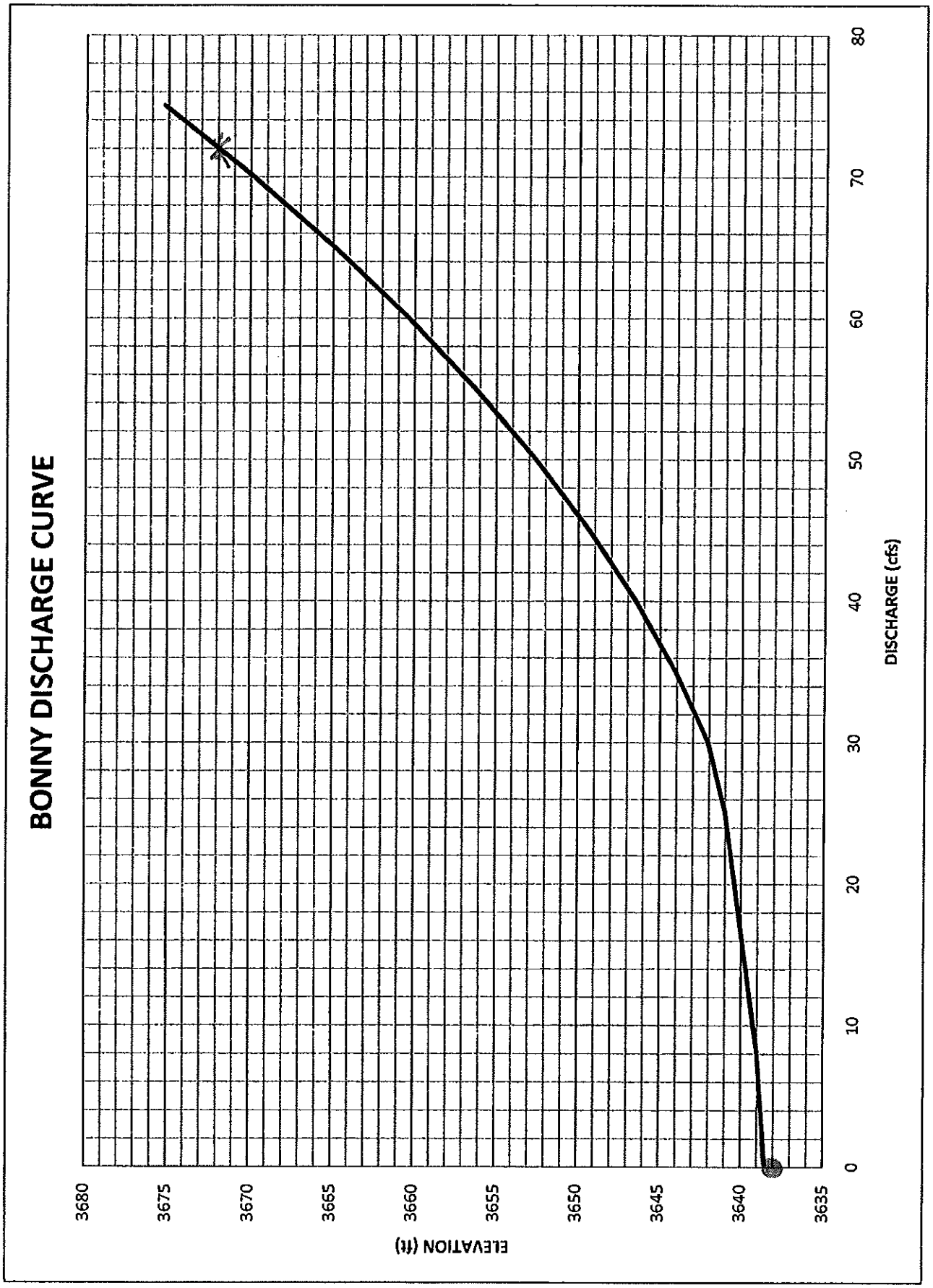
Peck, William <wpeck@usbr.gov> Thu, Jul 18, 2013 at 3:11 PM
To: Scott Ross <scott.ross@kda.ks.gov>

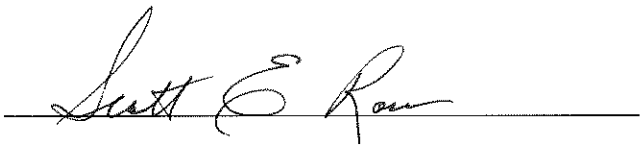
Hello Scott,

Attached is the updated discharge curve developed for Bonny Dam. As we discussed, the discharge data for reservoir levels below the top of the trashrack (elevation 3642.3 feet) are estimated to the best of our ability. The equipment used to monitor reservoir level and discharge become inoperable or inconsistent at this extremely low level. Also, discharge rates will be impacted by vegetative growth above the intake structure (empty reservoir) and sedimentation buildup in the outlet pipe (low flow).

Bill

Bonny Dam Discharge Curve.pdf
118K


BONNY DISCHARGE CURVE
ELEVATION (ft)
3680
3675
3670
3665
3660
3655
3650
3645
3640
3635
DISCHARGE (cfs)
0
10
20
30
40
50
60
70
80

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct.

Executed on September 18TH, 2013.