

Engineering Committee Report

Republican River Compact Administration

August 28, 2014

EXECUTIVE SUMMARY

The Engineering Committee (EC) met 5 times since last September's Republican River Compact Administration (RRCA) Annual Meeting. Over the past year, the EC completed these assignments: 1) holding quarterly meetings, 2) exchanging accounting data and documentation, 3) discussing specific modeling and data tasks to be assigned to Principia Mathematica, 4) discussing issues preventing agreement on final accounting for 2006-2012, 5) discussing the establishment of a budget to accomplish tasks for Compact goals, and 6) reviewing the task descriptions in each state's contract with Principia Mathematica.

Ongoing assignments include 1) continuing efforts to resolve concerns related to varying methods of estimating ground and surface water recharge and return flows and related issues, 2) continuing efforts to finalize accounting for 2006-2012, 3) discussing any accounting changes that may be needed for surface water diversion for the purpose of recharging groundwater, 4) discussing developing an application and approval process for future augmentation plans, 5) exploring options for sharing evaporation charges for Harlan County Lake when accounts exist separate from the project water supplies of Bostwick Irrigation District, 6) exploring potential means to adjust the compact accounting of Harlan County Lake for the mutual benefit of the States, and 7) exploring the development of an RFP to determine contractor options for the annual model update and model repository.

The EC recommends discussion by the RRCA on the exchange of data and documentation and the modeling runs completed by Principia Mathematica for 2013, the establishment of a budget, the Conservation Terrace Study, and the recommended EC assignments for the following year.

Details of the various EC tasks are described further in the remainder of this report, including as attachments, the EC meeting notes.

COMMITTEE ASSIGNMENTS AND WORK ACTIVITIES RELATED TO THESE ASSIGNMENTS

1. The Engineering Committee will meet quarterly to review the tasks assigned to the committee.
 - a. Assignment Completed. The Engineering Committee held five meetings since the September RRCA Annual Meeting. Notes from the five EC meetings are attached: October 28 (Attachment 1), November 22 (Attachment 2), January 22 (Attachment 3), April 28 (Attachment 4), and August 14 (Attachment 5).
2. Exchange by April 15, 2014, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that

document, including all necessary documentation. By July 15, 2014, the states will exchange any updates to these data.

- a. Assignment Completed.
 - b. Kansas, Nebraska, and Colorado posted preliminary data by April 15. The status and details of the preliminary data exchange was discussed at the April 28, 2014, EC meeting (Attachment 4). Nebraska posted final data on June 6, 2014, Kansas posted final data on August 19, 2014, and Colorado will post final data shortly after supporting USDA statistics are released.
 - c. The Committee collected stream flow data, climate information, diversion records, and reservoir evaporation records from the three states in cooperation with the U.S. Geological Survey, U.S. Bureau of Reclamation, and U.S. Army Corps of Engineers for 2013.
 - d. Willem Schreüder of Principia Mathematica executed three modeling runs in advance of the April meeting. These three runs were for the purposes of evaluating the difference between the five-run procedure and the original procedure, as well as the difference between modeling Bonny Reservoir as dry or full. Details were discussed at the April 28, 2014, Committee meeting (Attachment 4). It was decided at the August 14, 2014, Committee meeting to continue doing all three runs until these issues are sorted out (Attachment 5).
 - e. Principia Mathematica completed a preliminary model run on June 6, 2014. The most recent results are included as Attachment 6. A final run will be completed when the USDA statistics are received.
 - f. The Committee discussed the process of updating documentation of the modeling processes and agreed that the documentation should focus on keeping the overall logic in plain view, as opposed to detailing small nuances that would need to be adapted year to year (Attachment 4). Principia Mathematica will continue to update the modeling process documentation to reflect both historical and current processes (Attachment 5).
3. The Engineering Committee recommends an assignment of continued discussion of specific modeling and data tasks to be assigned to Principia Mathematica, to be accomplished by December 15, 2013.
- a. Assignment Completed. This task was discussed at the RRCA Special Meeting on December 19, 2013.
4. Continue efforts to resolve concerns related to varying methods of estimating ground and surface water irrigation recharge and return flows within the Republican River Basin and related issues.
- a. Assignment Ongoing.
 - b. Kansas is working on a scope and needs document for this task regarding changes in irrigation efficiency through time.
5. Continue efforts to finalize accounting for 2006-2012.
- a. Assignment Ongoing

- b. Arbitration on the issues preventing the states from agreeing on the accounting has concluded. These issues remain unresolved.
6. Continue discussion of issues preventing agreement on final accounting for 2006-2012.
 - a. Assignment Completed.
 - b. Arbitration on the issues preventing the states from agreeing on the accounting has concluded. These issues remain unresolved.
 - c. The Committee discussed options for reaching consensus about how to model Bonny Reservoir, which is one issue that was included in arbitration.
 - d. The Committee discussed new accounting issues beyond those included in the arbitration. New issues include 1) Evaluation of whether to include direct return data from canals in accounting calculations and modeling (Column C of Attachment 7 to the RRCA Accounting Procedures) and 2) Kansas's request for beginning and ending meter data from the other states.
7. Discuss any accounting changes that may be needed for surface water diversions for the purpose of recharging groundwater, as data becomes available from Nebraska projects.
 - a. Assignment Ongoing.
 - b. Nebraska anticipates studies will be conducted during a wet year. The Committee recommends this task remain on the Engineering Committee list for future investigation as data become available.
 - c. The Committee identified the need for further discussion about how accounting procedures address evaporation and diversion at different times of the year.
8. Discuss developing an application and approval process for future augmentation plans.
 - a. Assignment Ongoing.
 - b. Arbitration on the augmentation plan process has concluded. This issue remains unresolved.
9. The Engineering Committee will explore options for sharing evaporation charges for Harlan County Lake when accounts exist separate from the project water supplies of Bostwick Irrigation District and explore potential means to adjust the compact accounting of Harlan County Lake for the mutual benefit of the States.
 - a. Assignment Ongoing.
 - b. Kansas submitted a proposal for calculating and assessing evaporation charges for certain special water impounded in Harlan County Lake. The Kansas proposal is available as Attachment A to the Engineering Committee January Meeting Notes (Attachment 3).
 - c. Kansas is putting together examples of how the proposed method would work, including both hypothetical examples and examples based on 2013 data.
10. The committee will engage in discussions to establish a budget to accomplish tasks needed by the Administration and States for Compact goals.
 - a. Assignment Completed and returned to the RRCA for Discussion.

- b. The Engineering Committee has examined budget options using examples from other interstate compacts and asserts that a budget can be done if the RRCA chooses to do so. The Committee recommends that if the RRCA wishes to move forward on this issue, a budget committee be formed to accomplish this task.
11. Review the task descriptions in each state's contract with Principia Mathematica to ensure that there is no latitude for Principia Mathematica to deviate from the standard procedures without prior approval by all three states.
 - a. Assignment Completed.
 - b. New contracts executed by Colorado and Kansas in early 2014. Nebraska contract was determined to be adequate as written and was not revised.
12. Explore the development of an RFP to determine contractor options for the annual model update and model repository.
 - a. Assignment Ongoing.
 - b. The Committee discussed the possibility of an RFP, but did not get anything developed this year.

OTHER COMMITTEE ACTIVITIES

1. The Engineering Committee reviewed Nebraska's plans to relocate the Beaver Creek Stream Gage because the gage had fallen into disrepair (Attachment 4).
2. A Conservation Committee Terraces Study Report was delivered to the RRCA representatives via a letter sent July 11, 2014, and discussed by the Engineering Committee at the August meeting (Attachment 5). Status updates were given on the report's progress throughout the year. This report is now final and has been provided to the RRCA for their consideration.
3. The USGS National Streamflow Information Program (NSIP) requested recommendations for which stream gages it would be appropriate for them to assume responsibility, as they have received an increased allocation of funds. Nebraska identified four gages that would be suitable: Beaver Creek, Medicine Creek below Harry Strunk, and Republican River at Guide Rock, and Republican River at Benkelman. USGS will manage three of these. Discussions are ongoing to determine for which three gages USGS will assume responsibility.
4. The EC discussed the required 2014 update for the Colorado one year augmentation plan.

ITEMS FOR RRCA DISCUSSION & ACTION

Based upon the EC discussions and information presented in this report, the EC recommends RRCA discussion and potential action on the following items:

1. Agreement that the Data Exchange & Modeling Results for 2013 are complete. The EC has examined the data exchanged and the results from Principia Mathematical and agrees that the 2013 modeling runs are complete.
2. Discussion and direction on the specific modeling and data tasks to be assigned to Principia Mathematica for 2014.
3. Discussion regarding the establishment of a budget to accomplish tasks needed by the Administration and States for Compact goals. The EC has examined budget options using examples from other interstate compacts and asserts that a budget can be done if the RRCA chooses to do so. The Committee recommends that, should the RRCA choose to move forward on this issue, the RRCA form a budget committee for this purpose.
4. Acknowledgement of completion of the Conservation Committee Terraces Study report and discussion of potential action based on the findings therein.
5. Discussion of the recommended EC assignments and other potential assignments for the next year and agreement on a final set of assignments. The EC presents the list of 9 items in this report as recommended assignments for 2014.

RECOMMENDED ASSIGNMENTS FOR THE COMING YEAR

The Engineering Committee recommends the Republican River Compact Administration assign the following tasks:

1. The Engineering Committee will meet quarterly to review the tasks assigned to the Committee.
2. Exchange by April 15, 2015, the information listed in Section V of the RRCA Accounting Procedures and Reporting Requirements, and other data required by that document, including all necessary documentation. By July 15, 2015, the states will exchange any updates to these data.
3. When possible, continue efforts to resolve concerns related to varying methods of estimating ground and surface water irrigation recharge and return flows within the Republican River Basin and related issues.
4. When possible, continue efforts to finalize accounting for 2006-2013.
5. Work to resolve issues preventing agreement on final accounting for 2006-2013, as identified in the 2014 Engineering Committee Report. These issues include:
 - a. Evaluation of whether to include direct return data from canals in accounting calculations and modeling (Column C of Attachment 7 to the RRCA Accounting Procedures),
 - b. Kansas's request for beginning and ending meter data from the other states, and
 - c. Reaching consensus about how to model Bonny Reservoir.
6. Discuss any accounting changes that may be needed for surface water diversions for the purpose of recharging groundwater, as data become available from Nebraska projects.

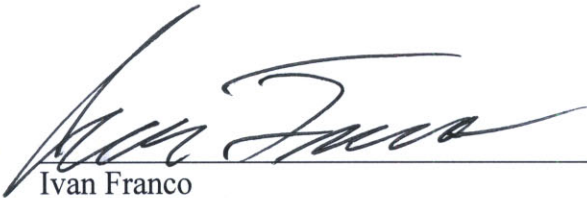
7. When possible, discuss developing an application and approval process for future augmentation plans.
8. Continue to explore options for sharing evaporation charges for Harlan County Lake when accounts exist separate from the project water supplies of Bostwick Irrigation District and explore potential means to adjust the compact accounting of Harlan County Lake for the mutual benefit of the States.
9. Continue to explore the development of an RFP to determine contractor options for the annual model update and model repository.

The Engineering Committee Report and the exchanged data will be posted on the web at www.republicanrivercompact.org.

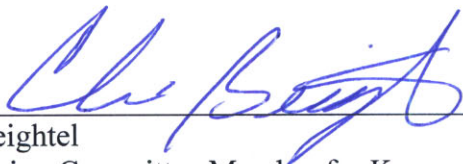
SIGNED BY



James Schneider
Chair, Engineering Committee Member for Nebraska



Ivan Franco
Engineering Committee Member for Colorado



Chris Beightel
Engineering Committee Member for Kansas

Notes from the October Meeting of the RRCA Engineering Committee
Drafted 10/30/2013
Kansas edits 11/08/2013
Nebraska edits 11/15/2013

Attendees:

Chris Beightel	Kansas	Ivan Franco	Colorado
Chelsea Erickson	Kansas	Jim Schneider	Nebraska
Sam Perkins	Kansas	Jennifer Schellpeper	Nebraska
Craig Scott	Reclamation	David Kracman	Nebraska
Scott Guenther	Reclamation	Tom Riley	Nebraska
		Willem Schreuder	Principia Mathematica

- 1 Introductions
- 2 Review / Modify Agenda
 - Schneider proposed adding an item: Beaver Creek Stream Gage
- 3 Publication of RRCA Annual Reports
 - **Kansas is taking the lead, will distribute to President of US and federal agencies, and each Party**
 - **Each Party will distribute to their Governor and Basin Stakeholders**
 - **The format will be electronic**
- 4 Modeling and Data Tasks for Principia Mathematica
 - Schneider emphasized that a centralized repository and the experience with the project are two factors of high importance to Nebraska
 - Franco noted that Colorado agrees with Nebraska
 - Beightel summarized Kansas' proposal (attachment A), noting that there is a potential for conflict of interest with the current procedures because Colorado's expert witness in litigation between Kansas, Colorado, and Nebraska is being paid to perform model updates and to generate model runs for the RRCA
 - Beightel noted that
 - The ability of each state to run the model authoritatively and the ability of the States to come to agreement on a model run in the absence of Principia Mathematica was important to Kansas
 - Kansas feels strongly that any contract for model update work done on behalf of the RRCA should be with a neutral party
 - Kansas' concern was illustrated when Principia modeled Bonny Reservoir according to Colorado's proposal which the RRCA has not approved
 - Schneider stated that Nebraska is not comfortable rotating modeling duties among the 3 states and has concerns about cost and time involved with transitioning to a new consultant
 - **Nebraska will schedule another meeting in 3-4 weeks for the EC to meet and discuss only this agenda item**

Notes from the October Meeting of the RRCA Engineering Committee

Drafted 10/30/2013

Kansas edits 11/08/2013

Nebraska edits 11/15/2013

- 5 Conservation Committee Terraces Study
 - Scott Guenthner summarized status
 - **Reclamation will follow-up with Derrel Martin to address his comments, do final edits and distribute a final draft to the EC**
 - **Reclamation will also follow-up on the question of where the data will be housed**

- 6 Data Exchange for 2013 Accounting
 - No Discussion expected until April

- 7 Estimating Ground and Surface Water Irrigation Recharge and Return Flows
 - Beightel noted Kansas' perception that irrigation practices across the Basin have changed to generally become more efficient, asks if the other States are interested in participating in a study
 - **Kansas will provide a draft "Scope and Need" document to the EC regarding changes in irrigation efficiency through time**
 - Schneider pointed out Column 3 of Attachment 7 to the RRCA Accounting Procedures and asked if the Parties had any recollection on the reason this column has not historically been used
 - Schneider noted that Nebraska has installed new flumes on several surface water returns/spills and believes that Column 3 is intended to contain that data
 - Craig Scott noted that the BOR reports on the data given to them by the producers, so if they do not receive the data it would not be reported
 - Schneider noted that NDNR had granted a convey water permit involving Meeker-Driftwood and Bartley canals and believes that Column 3 of the accounting sheet should be used to properly account for this activity and other canal wasteways
 - Further discussion on Column 3 of Attachment 7 is tabled until the next meeting

- 8 Accounting Issues 2006-2012
 - **Before the next meeting each Party will make a list of any items in this category that are not already in arbitration and send them to the group**

- 9 Accounting Changes for Nebraska Groundwater Recharge Projects waiting for results of the Basin Study
 - Discussion needed on how to deal with non-irrigation season evaporation from canals

- 10 Future Augmentation Plans - Application and Approval Process
 - Discussion will wait until current arbitration is complete
 - Schneider noted that the TBNRD may be developing a new project

Notes from the October Meeting of the RRCA Engineering Committee
Drafted 10/30/2013
Kansas edits 11/08/2013
Nebraska edits 11/15/2013

- 11 Harlan County Lake - Evaporation Charges and Compact Accounting Adjustments
 - Schneider summarized this year's agreement
 - Craig Scott noted that the 2013 proportioning of evaporation is consistent with historic Reclamation practice
 - Beightel described Kansas' proposal to calculate HCL evaporation in such cases
 - **Kansas will develop a proposal for calculating the incremental increase in reservoir area and assignment of evaporation and send it to the EC**

- 12 Budget to Accomplish Compact Goals
 - **Nebraska will send examples of the Blue River and North Platte Decree Committee budgets**
 - **Kansas will send examples of the Arkansas River Budgets with Colorado and Oklahoma**
 - **Colorado will send other example budgets**
 - The committee discussed funding such things as stream gages, studies, web/cloud storage of data, court reporters, and other meeting costs

- 13 Beaver Creek Stream Gage
 - Schneider explained that the Beaver Creek Stream Gage is in disrepair and will be moved to a near-by bridge
 - Schneider offered tours of the new location
 - **Nebraska will send a map showing the current and proposed gage locations**

- 14 Summary of Meeting Actions / Assignments
 - Schneider summarized the action items from the agenda

- 15 Future Meeting Schedule
 - **Nebraska will send out potential dates to hold an EC meeting in a few weeks**

 - The next regularly scheduled meeting is in January

Notes from the November Meeting of the RRCA Engineering Committee

Drafted 11/26/2013

Corrected 12/19/2013

Attendees:

Chris Beightel	Kansas	Ivan Franco	Colorado
Chelsea Erickson	Kansas	Jim Schneider	Nebraska
Sam Perkins	Kansas	Jennifer Schellpeper	Nebraska

- 1 Introductions
- 2 Review / Modify Agenda
 - Beightel proposed adding discussion on the budget at the end if there was time.
- 3 Review October Meeting Notes
 - No further comments were supplied. Comments are to be provided before finalization of the EC report for the December 19th RRCA meeting.
- 4 Modeling and Data Tasks for Principia Mathematica
 - Schneider summarized two potential ways to move forward in the immediate future: The RRCA signs one contract with Willem either using an outside entity such as the Nebraska Community Foundation, like the NPDC does or as an entity like the Blue River Compact OR the RRCA could investigate hiring a new 3rd party using an RFP process.
 - Beightel stated that KS is willing to begin the work on the RFP process. He also summarized his review of the current KS contract with Principia, and noted that the language is clear that Principia has no latitude to make judgment calls on how to complete the annual model runs.
 - Schneider and Franco agreed that the intent of each state's contracts are the same.
 - Schneider noted that there is little use in obtaining an official run from Principia while there are any disputed issues that affect the model run.
 - **It was agreed that Principia should continue work on the current calendar year, though the EC should review all three state's contracts with Principia to ensure that there is no latitude for Principia Mathematica to deviate from the standard procedures without prior approval by all three states. At the same time the EC will work to develop an RFP for a 3rd party contractor and continue to evaluate the costs and benefits of a new contractor.**
 - **Everyone agreed to circulate a copy of their current contract with Principia to the other members of the EC.**
 - **The EC drafted a report to the RRCA; this will be routed along with the meeting notes for review and comment.**
 - **Nebraska will research how the EC report becomes available on the website:**
<http://www.republicanrivercompact.org/>
- 5 Budget
 - Discussion on the CO email occurred with agreement that further discussion would occur during the January meeting, with everyone following up on the action items in the October meeting minutes.
- 6 Summary of Meeting Actions / Assignments
 - Schneider summarized the action items from the agenda.
 - **Nebraska will include an Outlook mail invitation in future EC meeting emails.**
- 7 Future Meeting Schedule
 - The next regularly scheduled meeting is in January

Notes from the January Meeting of the RRCA Engineering Committee
Drafted 2/24/2014

Attendees:

Chris Beightel	Kansas	Jim Schneider	Nebraska
Chelsea Erickson	Kansas	Jennifer Schellpeper	Nebraska
Ivan Franco	Colorado	Carol Flaute	Nebraska
Willem Schreuder	Principia Mathematica		

- 1 Introductions
- 2 Review / Modify Agenda
 - No modifications were supplied.
- 3 Publication of RRCA Annual Reports
 - Erickson confirmed that the CDs were sent out in late December.
 - Schneider stated that Nebraska received the CD from Kansas.
 - Franco stated that he needed to find out if the CD had been received.
- 4 Modeling and Data Tasks for Principia Mathematica
 - Willem stated that the amended Colorado contract has gone out and is waiting on signatures.
 - Beightel confirmed that the Kansas contract is being routed for signatures.
 - **It was agreed to follow up on this in April.**
- 5 Conservation Committee Terraces Study
 - Reclamation was not present to give an update.
 - Erickson stated that Scott Gunther told her that he received the final draft from Derrel, is reviewing it, and will circulate it to the states in late January or early February.
 - **Willem will post the final report to the RRCA website as soon as he receives the DVD.**
- 6 Data Exchange for 2013 Accounting
 - Modeling
 - Bonny
 - Schneider stated that the dry reservoir problem needs to be addressed and that Colorado's proposal is one option.
 - Franco stated that Colorado is not in agreement with the old method and agreed that some consensus is needed.
 - Willem stated that he needs clarification on what the default modeling scenario is to account for the Bonny Reservoir empty condition.
 - **Beightel will get back to the group regarding the Kansas position on how to model Bonny Reservoir.**
 - # of Runs
 - Schneider stated that the preliminary data should be run by April and preferably a second earlier run sometime in late January/early February.
 - Beightel asked whether it is useful to do 2 early runs before the data are finalized in August and clarified that Kansas' concern is with spending funds wisely when documentation also needs to be completed.

Notes from the January Meeting of the RRCA Engineering Committee
Drafted 2/24/2014

- Willem stated that estimating pumping using last year's data can give a pretty good picture of impacts, so there is some value to doing it now and getting a decent guess at this point to use for future planning. He also stated that limiting the number of model runs is not cost efficient as setting up the data is the time-consuming part, that there is value in comparison of early runs to later runs for quality control purposes.
 - Schneider stated that for Nebraska's management purposes, early runs are the most useful and suggested that the final runs might be the least valuable.
 - **Beightel will talk with other Kansas staff about not completing an August run.**
 - **It was agreed that Willem will begin the first 4 runs now, with 2 using the current method and 2 using Colorado's proposed method. 2 additional runs will be run once Kansas has worked through how they want Bonny to be modeled.**
 - Willem clarified that the 5-run procedure is already set up and ready to go.
 - Schneider summarized that **there will be three runs: one in late January or early February, one in April, and the final run.**
 - **Schneider will take the lead on making sure that this doesn't get pushed back to April.**
 - Documentation
 - Beightel – Kansas would like the documentation to be updated within the 2014 calendar year.
 - Willem stated the documentation could be updated to the same level of detail as the current documentation within the year, but if the goal is to describe the algorithms in greater detail, he would be unlikely to finish this year.
 - Beightel suggested that the group narrow the updates to topics that are of most interest. He suggested a level of detail so that a person experienced with groundwater modeling could replicate the work.
 - Willem clarified the documentation would explain what to do, not "why".
 - Schneider stated that **a continuing discussion of the documentation issue needs to occur in April.**
- 7 Estimating Ground and Surface Water Irrigation Recharge and Return Flows
— Beightel stated that Kansas has not done anything with this yet.
- 8 Accounting issues for 2006-2012
— Schneider stated that the utilization of direct returns for surface water accounting has not been used in the past but needs to be used in the future and described a specific canal where it would be especially helpful.
— Beightel reminded Colorado and Nebraska that Kansas has asked for beginning and ending meter data. Kansas obtained some of these data through discovery, but Colorado and Nebraska have not sent any of these data yet. The lack of these data is preventing Kansas from finalizing accounting.
— Franco stated that Colorado has no accounting issues to add.

Notes from the January Meeting of the RRCA Engineering Committee
Drafted 2/24/2014

- Willem noted that Kansas was unhappy with how Bonny, which was dry May through December, was modeled in 2012.
 - **Beightel will take the Bonny Reservoir issue to the Kansas team for follow-up.**
 - **Schneider stated to keep this topic open, with the goal of having a complete list for the annual RRCA meeting.**
- 9 Accounting Changes for Nebraska Groundwater Recharge Projects
- Schneider stated that as these calculations were not done in 2012 because of the drought, there are more important items to deal with now. Some discussion is needed over how accounting procedures address evaporation and diversion at different times of the year.
- 10 Future Augmentation Plans – Application and Approval Process
- Schneider stated that it is necessary to get through the N-CORPE litigation and other disputes before progress can be made on this.
- 11 Harlan County Lake – Evaporation Charges and Compact Accounting Adjustments
- Beightel summarized the Kansas proposal regarding Special Water (Attachment A).
 - Schneider expressed that he has concerns about using mixed methods for Special Water and Project Water. He suggested examples be developed including using 2013 and other hypothetical examples.
 - All parties agreed that this would be useful.
 - **Kansas will put examples together.**
- 12 Budget to Accomplish Compact Goals
- Schneider summarized his understanding of the current status of this discussion: Kansas is interested in a budget to smooth out costs over time. Nebraska could accommodate working with a budget or not. It would be a challenge for Colorado to do so.
 - Franco confirmed that Colorado is not interested in a budget at this time. He acknowledged that a budget would be a useful tool for joint studies and suggested that if a joint study comes up, that might be a better time to talk about a budget.
 - Beightel stated that Kansas is also interested in a budget for ongoing expenses like year to year tasks and stream gages, and that it could help the States' annual planning. It would also benefit Kansas to smooth the budget out year to year.
 - Schneider suggested that the Engineering Committee has taken this issue as far as it can. This can be taken to RRCA with examples of how other compacts do it, a list of items that could be included, and reasons for having a budget.
 - Beightel suggested that it could also be useful to include an example of how the budget could work, such as a possible allocation per state.
 - **Beightel asked that this item be left on the agenda for next time while he follows up with Kansas to see if they feel the progress so far on this task is enough.**
 - Erickson suggested that the Engineering Committee recommend that RRCA set up a standing budget committee.
 - Schneider expressed support for a budget committee.
 - Franco suggested keeping the suggestion of recommending a budget committee in mind until after Beightel has had a chance to follow up with Kansas.

Notes from the January Meeting of the RRCA Engineering Committee
Drafted 2/24/2014

- 13 Beaver Creek Stream Gage
 - Schneider stated that Nebraska did not get a map out due to personnel changes. He is unsure whether it has been moved yet.
 - **Schneider will have a full report on this topic at the next meeting.**

- 14 Summary of Meeting Actions / Assignments
 - Schneider stated that Actions and Assignments will be included on the meeting notes that are sent out.

- 15 Future Meeting Schedule
 - The next meetings are scheduled for April 23 and July 23, both @ 1pm Central Time, 12 pm Mountain Time.

Kansas Proposal to Calculate and Assess Evaporation Charges for Certain Special Water
Impounded in Harlan County Lake

Submitted to the RRCA Engineering Committee

on

January 21, 2014

1. Special Water may include, but is not limited to, water impounded in Harlan County Lake pursuant to Nebraska Compact Call Year administration.
2. Special Water shall be designated upon the agreement of Kansas and Nebraska.
3. Evaporation of the Special Water pool shall be calculated by:
 - a. Determining the incremental increase in surface area caused by the Special Water pool, and
 - b. Distributing the total evaporation, daily and *pro rata* according to surface area, between the Special Water pool and the remaining pool
4. Kansas shall be charged in the RRCA Accounting with all evaporation losses suffered by the Special Water pool for the accounting year.

Meeting Notes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
April 28, 2014, 3:30 PM Central, 2:30 PM Mountain

Attendees:

Chris Beightel	Kansas	Jim Schneider	Nebraska
Chelsea Erickson	Kansas	Jennifer Schellpeper	Nebraska
Ivan Franco	Colorado	Craig Scott	Reclamation
Willem Schreuder	Principia Mathematica	Scott Guenther	Reclamation

1. Introductions
2. Review / Modify Agenda
 - a. At Beightel's suggestion, the agenda was revised to move "Documentation" from 6c (under "Data Exchange for 2013 Accounting") to 4b (under "Modeling and Data Tasks for Principia Mathematica").
3. Publication of RRCA Annual Reports
 - a. Colorado received a copy of the reports via download from an FTP site.
4. Modeling and Data Tasks for Principia Mathematica
 - a. Follow up on Email Discussions
 - i. The Kansas contract has been executed.
 - ii. Modeling runs
 1. Willem has executed three modeling runs so far.
 2. He evaluated two differences: (1) the 5-run procedure vs. the original procedure and (2) Bonny Reservoir dry vs. full.
 3. The three runs were (1) original procedure, Bonny Reservoir dry, (2) original procedure, Bonny Reservoir full, and (3) 5-run procedure, Bonny Reservoir dry. The 5-run procedure and the Bonny Reservoir procedure have effects only in different stream reaches from one another, so it was not necessary to do a fourth run.
 4. Beightel said Kansas is happy with the three runs that were done.
 5. Beightel asked a question about the impacts that Willem was referring to. Willem clarified that he was referring to a visual comparison of the columns on the Impacts 2013 page.
 - b. Documentation
 - i. Willem stated that the update can be done in a few months if the level of detail is similar to that on the current website.
 - ii. Status: each state pre-processor has been updated, but the documentation is not updated.
 - iii. There was some discussion about the appropriate level of detail. In striking a balance between detailing the small nuances that need to be adapted year to year and keeping the overall logic in plain view, lean towards the latter.

Meeting Notes for the
**QUARTERLY MEETING of the
ENGINEERING COMMITTEE of the
REPUBLICAN RIVER COMPACT ADMINISTRATION**
April 28, 2014, 3:30 PM Central, 2:30 PM Mountain

- iv. **Willem will try to get the documentation finished before the July EC meeting.** He will ignore the CCP pipeline for now since it does not apply to 2013.
5. Conservation Committee Terraces Study
 - a. Reclamation discussions with Derrel Martin, final draft, and data housing
 - i. Guenther received a copy of a revised report from Derrel Martin in January and sent it to the states in February with a 30 day review period. They later received comments from Chelsea and are in the process of incorporating those comments. **Reclamation will try to complete this report by the end of May 2014.**
 - ii. Guenther mentioned discussing with Jesse Bradley in March the possibility of one of the states collecting the data from this study and housing it in a central place. **Guenther will follow up with Bradley to revisit this topic.** Willem can put the data on the RRCA website without an increase in his costs, but the data will need to be sent to him on a DVD first. It would be best for them to include information describing what the various files represent and what they were used for (especially shapefiles).
 - iii. **This item will be kept on the agenda for the July meeting and the Bureau of Reclamation will be kept on the mailing list.**
 6. Data Exchange for 2013 Accounting
 - a. Schneider gave an update on Nebraska's status. Most of their data was posted on the 15th, but they have not finalized the preliminary datasets for the model. Progress has been delayed by Paul's health issues, but they are very close to finished. Paul is hopeful that it will be finished later this week. **Willem will wait for the Nebraska data to finalize the April runs.**
 - b. Beightel gave an update on Kansas's status. Data were posted before the 15th. Note that there are some empty groups (dead cells) at the edge of the model – about 200 acres. Willem explained how this was handled. He will try to streamline this process for the next go-around.
 - c. Franco gave an update on what was done differently for Colorado this year: 2013 pumping, CIR method vs metered data. The difference between these two methods was less than 10%.
 - d. **Everyone will try to have all data finalized and exchanged by the July 22 meeting.**
 7. Estimating Ground and Surface Water Irrigation Recharge and Return Flows
 - a. Beightel – **Kansas is still working on a scope and needs document.**
 - b. **This item will be kept on the agenda for the July meeting.**
 8. Accounting Issues for 2006-2012
 - a. Schneider summarized the previously discussed issues.
 - i. We need to start using direct return data from canals from the Bureau of Reclamation (table 7 in Accounting Procedures).

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- ii. Beginning and ending meter readings are still an issue for Kansas.
9. Accounting Changes for Nebraska Groundwater Recharge Projects
- a. Discussion on how accounting procedures address evaporation and diversion at different times of the year
 - i. Schneider summarized the problem: 2014 is dry, so Nebraska will need to discuss this later when there is enough water available to use for recharge projects. Under the standard assumption, 18% is charged as evaporation. Is that appropriate in the off-season or ice-over conditions when less evaporation is occurring?
 - ii. **Beightel needs to bring this up with the Kansas team.**
 - iii. **Nebraska will summarize evaporation data monthly for a couple of reservoirs.**
10. Future Augmentation Plans – Application and Approval Process
- a. This item is held up until arbitration is wrapped up. **It may be possible to talk about this and move forward on it at the July meeting.**
11. Harlan County Lake – Evaporation Charges and Compact Accounting Adjustments
- a. Kansas examples for calculating the incremental increase in reservoir areas
 - i. Schneider: Bostwick Irrigation Districts have remaining project water that they have agreed to transfer to the Frenchman-Cambridge Irrigation District by storing some water upstream. Because of this, Nebraska-Bostwick is not likely to have any diversions of storage during the irrigation season or share in any evaporation.
 - ii. **Kansas is still working on examples.**
12. Budget to Accomplish Compact Goals
- a. Kansas update from internal discussions
 - i. Beightel: Kansas is ok with doing a budget, but will not press hard for it if no one else is interested. There has been enough progress on this to kick it up to the commissioners.
 - b. Schneider: The EC will tell RRCA that the EC has looked at ways of doing a budget, a budget can be done if they choose to do so, and the EC recommends that they form a budget committee. All agreed, so the budget task is complete for this year.
13. Beaver Creek Stream Gage
- a. Nebraska Report (Schneider)
 - i. Nebraska sent a map (Attachment A) out to everyone and is waiting for a shipment of new gage houses to come in. **Nebraska will inform everyone else when the gage gets moved.**

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- ii. Meeting with USGS – NSIP (National Streamflow Information Program) got an increased allocation of funds in the budget. Asked for recommendations of which gages would be appropriate for them to take over. This one, Medicine Creek below Harry Strunk, and the Republican River at Guide Rock are all already in the NSIP inventory, so Nebraska suggested that those would be good ones for USGS to pick up. Compact language says that USGS is supposed to be doing these gages.

14. Summary of Meeting Actions / Assignments

- a. Assignments will be summarized in the notes.

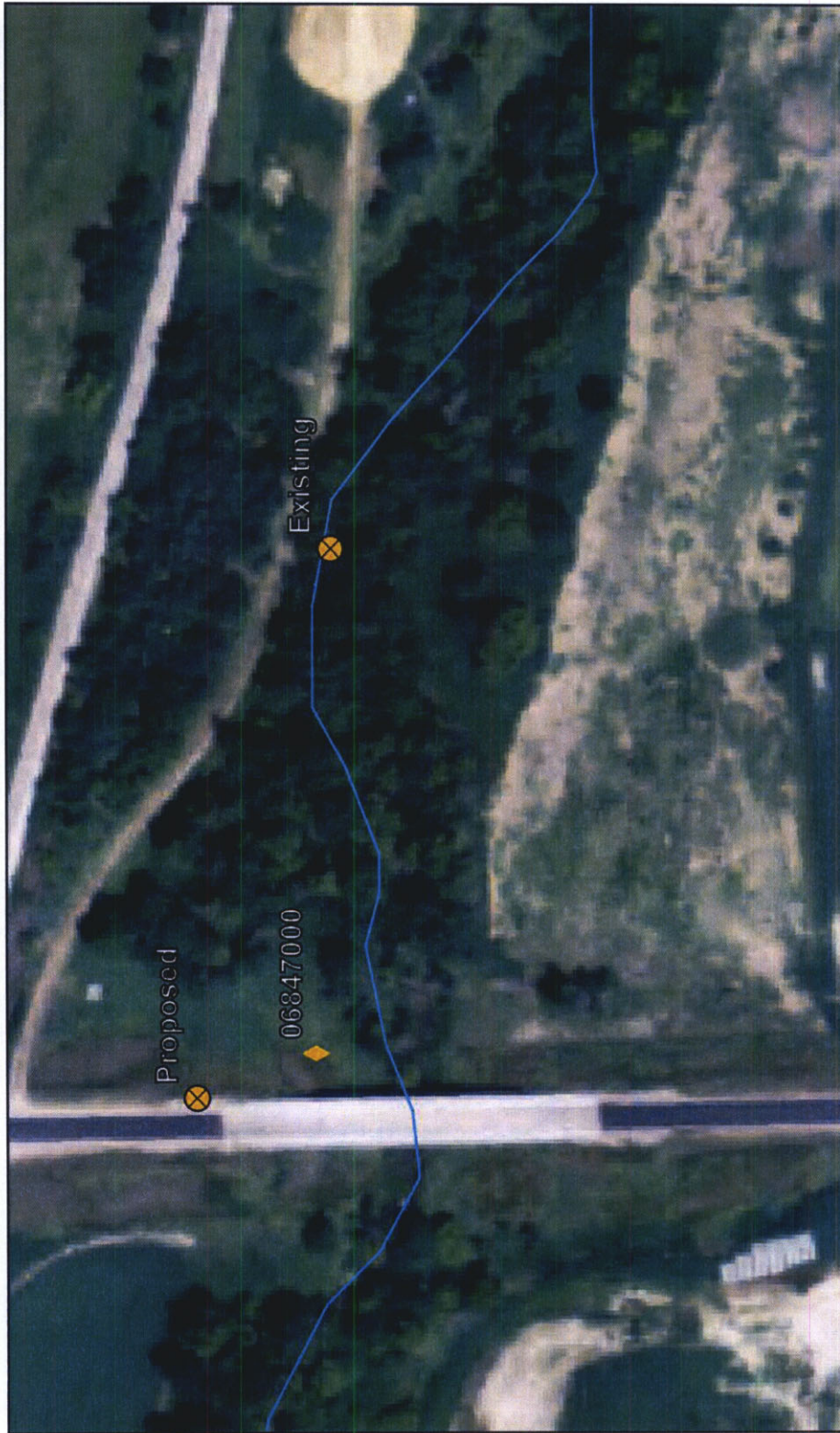
15. Future Meeting Schedule

- a. July 23 at 1:00 pm Central Time.

Proposed and Existing Location of Beaver Creek Near Beaver City Gage
Submitted to the RRCA Engineering Committee
April 28, 2014

Section 23 T02N-R23W
Date: 3/5/2014

Proposed and Existing Location of Beaver Creek Near Beaver City Gage



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Attendees:

Jim Schneider	Nebraska	Chris Beightel	Kansas
Jennifer Schellpeper	Nebraska	Chelsea Erickson	Kansas
Paul Koester	Nebraska	Willem Schreuder	Principia Mathematica
Brian Dunnigan	Nebraska	Scot Guenther	Reclamation
Carol Flaute	Nebraska	Craig Scott	Reclamation
Ivan Franco	Colorado		

1. Introductions
2. Review/Modify Agenda
 - a. At Schneider's suggestion, the agenda was revised to include an additional item for "List of Additional Issues Preventing Finalization of Accounting" after agenda item number 7 ("Estimating Ground and Surface Water Irrigation Recharge and Return Flows").
3. Publication of RRCA Annual Reports
 - a. All states have received the 2007 to 2012 reports
 - b. Erickson gave an update on the states of the Annual Reports for 2013. Kansas is working through them now and does not have an exact date for when they expect them to be finalized. Beightel indicated that he thought having them ready for approval at the Annual Meeting would be ambitious given how many of them there are to review. He suggested the following process: **Kansas will get one 2013 meeting's materials together at a time to send to Colorado and then Nebraska for review and Nebraska will return their comments to Kansas. If additional review is necessary, they will be sent around to all states again.** Schneider and Franco agreed.
4. Modeling and Data Tasks for Principia Mathematica
 - a. Documentation
 - i. Willem reported that he has made no substantial progress on this task. It is going to take much longer than he originally estimated due to the need to describe the small procedural differences that changed each year.
 - ii. Beightel asked for reaffirmation on the purpose of the documentation. Willem summarized that he is documenting both historical and current processes with the ultimate goal of describing both how we currently do things and how things have changed over time such that if the documentation is passed on to a third party groundwater modeler, the historical calculations could be duplicated.
5. Conservation Committee Terraces Study
 - a. Reclamation discussions with Derrel Martin, final draft and data housing
 - i. Guenther reported that he sent out a final draft of the report in mid-July, with hard copies for the Administration Committee and PDFs to everyone else.
 - ii. One task still remains, which is to review the collected data that were used for the report. **Guenther hopes to be able to send a DVD of the data to Willem for**

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posting within the next few months. Guenther clarified that the purpose of the data review is to identify whether the Conservation Committee has pulled together all of the data used in the study and also to try to document the data better.

- iii. Beightel stated that Kansas would like to have someone from Reclamation at the Annual Meeting to be formally on the record saying that the report is finished and to give an overview of the status of the data and where it will be housed. Schneider and Franco agreed. **Guenther and Scott will arrange for someone to give this report at the Meeting.**

6. Data exchange for 2013 Accounting

a. Exchange update

- i. Schneider stated that Nebraska's data are final.
- ii. Franco explained that Colorado's data have not been finalized because the 2013 crop statistics in the annual bulletin are not yet available. He is hoping to receive the crop statistics next week, and **Willem is ready to get the Colorado data finalized as soon as the missing information becomes available, which should be before the Annual Meeting.** The current runs for Colorado data include values from 2012, but switching to the 2013 values when they become available will make a slight difference in the results.
- iii. Willem identified a problem with Kansas's data involving 3 cells with large acreage. **Beightel stated that Kansas will find the source of the error and fix it. He hopes to send the corrected data today.** Willem stated that it will not take long to run the Kansas data again once the correct data are sent.
- iv. Beightel asked Franco why the Colorado runs were still based on crop distribution information even though Colorado had metered data available this year. Franco explained that metered data are still missing in a small portion of the basin. Even though it is only a small percentage of the total number of wells in the basin, Colorado will wait to switch calculation methods until they have metered data for 100% of their wells.
- v. Schneider stated that **the Engineering Committee will include the most recent products of Willem's work in the EC report.**

7. Estimating Ground and Surface Water Irrigation Recharge and Return Flows

- a. KS draft scope and need document regarding changes in irrigation efficiency
 - i. No update was provided.

8. List of Additional Issues Preventing Finalization of Accounting

- a. Schneider inquired whether Kansas had discussed using return flow data in Table 7 of the Accounting procedures. Beightel said that he did discuss it with the Kansas team, but did not make it clear to them that this was something that Nebraska considered to be holding up finalization of accounting. **Beightel will bring this issue to the Kansas team again. Schneider stated that Nebraska would provide a simple write-up of the issue for Kansas.** Schneider also underscored the situation in the context of the Meeker-Driftwood

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Canal, where they are passing water through to run it to Bartley because of improved conveyance to the Bartley Canal.

- b. Beightel indicated that Kansas's previously raised issues related to beginning and ending metered data and wanting metered data from Colorado are essentially the same issue. Schneider asked why Kansas has not pursued the option, given to Kansas in the Settlement, to do site visits to check whether the other states are reading their meters right. Beightel clarified that Kansas has considered checking that, but that they think the data is there and just want to look at it. They are operating under a trust-but-verify model. They just want to see the raw data so that they can get comfortable with it.
 - c. The issues with modeling Bonny Reservoir should also be on the list.
 - d. No additional issues were raised at the meeting, but **Beightel stated that he will check with the Kansas team one more time.**
9. Accounting Changes for Nebraska Groundwater Recharge Projects
- a. Discussion on how accounting procedures address evaporation and diversion at different times of the year
 - i. Kansas update from internal discussions
 1. Beightel said that Kansas will consider a proposal to evaluate potentially changing how the accounting procedures address evaporation and diversion at different times of the year.
 - ii. Nebraska reservoir evaporation data summary
 1. Schneider stated that Nebraska looked at some reservoir evaporation data but did not get far enough to be able to send it out to the rest of the Committee, **and will provide a review at a future meeting.** He said that it looks like there's a good potential for using reservoir evaporation data as a surrogate. **We will put into the report that we will continue to look into this next year.** Once the drought is over, there is a lot of potential benefit to both Kansas and Nebraska to be able to retain the water instead of sending water downstream that no one can use.
10. Future Augmentation Plans - Application and Approval Process
- a. There was no discussion of this issue at this meeting, except to mention that it has been brought up at the larger state group's meeting.
11. Harlan County Lake - Evaporation Charges and Compact Accounting Adjustments
- a. KS examples for calculating the incremental increase in reservoir areas
 - i. Beightel stated that Kansas does not have anything to send out about this yet, and suggested that it may be a conversation for the larger state group.
12. Beaver Creek Stream Gage
- a. Nebraska Report
 - i. Schneider stated that the Beaver Creek Stream Gage has been moved and has been in place for about a month.
 - ii. Schneider gave an update on the status of the stream gages that the USGS will assume responsibilities for. Nebraska provided the USGS with a list of four

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stream gages that would be suitable: Beaver Creek, Medicine Creek below Harry Strunk, Republican River at Guide Rock, and Republican River at Benkelman. USGS has responded that they will only manage three of the four. Nebraska is still in negotiation with USGS about which three gages will be taken over by USGS. USGS would prefer to do the three Compact gages, but for logistical reasons, Nebraska would prefer that USGS do Benkelman instead of Medicine Creek.

- iii. Schneider reported that Nebraska installed two additional gages on Medicine Creek above the reservoir. These gages will be visited during the September tour. Beightel asked whether data from these gages is available. Schneider responded that Nebraska is working on real-time data availability for all of its gages and will be launching a beta version online soon.

13. Summary of Meeting Actions / Assignments

a. Draft Engineering Committee Report

- i. **Nebraska will update the draft report based on today's discussions and will send it out to Kansas and Colorado as soon as possible for review. Comments should be returned by the Friday before the meeting.** Kansas and Colorado should pay special attention to verifying details like the dates for data exchange.
- ii. For assigned Task #12 in the EC Report (exploring the possibility of an RFP), we will note that we had discussions about it but didn't get anything developed this year. Schneider asked whether the EC wanted to keep this as an ongoing assignment or consider it complete, that an RFP was not necessary. **Beightel will ask the Kansas team for input.**
- iii. For ongoing tasks transferred from last year's task list to this year's list, the biggest change is that last year's list of tasks included identifying issues preventing finalization of accounting data, whereas this year's suggested list has been changed to working on the specific issues that are identified in this year's report.
- iv. Willem asked whether he should continue to do the three separate runs (Bonny dry vs. full and original procedure vs. five-run procedure). All agreed that he should continue doing all three until those issues are sorted out. Beightel added that it was interesting to compare the three runs to be able to see the magnitude of difference in the outputs.
- v. Willem mentioned that he put up the 2014 update that was required under the one year augmentation plan. Schneider agreed **that this should be included on the report's list of other items discussed.** Schneider asked whether Willem planned to do any additional updates. Willem said yes, because he was still waiting on information from Colorado about the amount of pumping for the last couple of months of the year. He anticipates having this information before September 1. Schneider asked whether Willem would use August meteorological data. Willem said no, because August meteorological data will not be available before September 1, which is when the report is due.

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www.republicanrivercompact.org/restricted/2013/html/2013.html

Impact 2013 (acre-feet)

Location	Colorado Pumping			Kansas Pumping			Nebraska Pumping			Nebraska Mound		
	Dry Bonny RRCA-runs	Full Bonny RRCA-runs	Dry Bonny 5-Run	Dry Bonny RRCA-runs	Full Bonny RRCA-runs	Dry Bonny 5-Run	Dry Bonny RRCA-runs	Full Bonny RRCA-runs	Dry Bonny 5-Run	Dry Bonny RRCA-runs	Full Bonny RRCA-runs	Dry Bonny 5-Run
Arkaree	458	458	458	197	197	197	126	126	126	0	0	0
Beaver	0	0	0	2985	2985	2985	1999	1999	1999	0	0	0
Buffalo	428	428	428	0	0	0	3349	3349	3349	0	0	0
Driftwood	0	0	0	0	0	0	1049	1049	1049	0	0	0
Frenchman	1125	1125	1125	0	0	0	76871	76871	76788	0	0	0
North Fork	15647	15647	15647	0	0	0	1059	1059	1059	0	0	0
Above Swanson	-1931	-1935	-1931	136	64	136	8910	8910	8910	0	0	0
Swanson - Harlan	-15	-15	-16	600	600	-842	26189	26189	9004	2044	2044	2044
Harlan - Guide Rock	0	0	0	0	0	0	24680	24680	24326	379	379	379
Guide Rock - Hardy	0	0	0	91	91	91	2306	2306	2312	-11	-11	-11
Medicine	0	0	0	0	0	0	20102	20102	19619	9992	9992	9992
Prairie Dog	0	0	0	608	608	608	0	0	0	0	0	0
Red Willow	0	0	0	0	0	0	5517	5517	5455	35	35	35
Rock	103	103	103	0	0	0	4452	4452	4452	0	0	0
Sappa	0	0	0	-663	-663	-699	990	990	985	0	0	0

http://www.republicanrivercompact.org/restricted/2013/html/2013.html

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South Fork	3315	10864	3315	1855	2558	1855	471	471	471	0	0	0
Hugh Butler	0	0	0	0	0	0	1963	1963	1963	0	0	0
Bonny	-1206	1377	-1206	0	13	0	0	0	0	0	0	0
Keith Sebelius	0	0	0	519	519	519	0	0	0	0	0	0
Enders	0	0	0	0	0	0	4723	4723	4723	0	0	0
Harlan	0	0	0	79	79	79	774	774	778	24	24	24
Harry Strunk	0	0	0	0	0	0	300	300	301	0	0	0
Swanson	17	17	17	0	0	0	275	275	275	0	0	0
Mainstem	-1946	-1950	-1946	835	763	-607	62085	62085	44552	2413	2413	2413
Total	17951	28078	17951	6420	7064	4942	186106	186106	167944	12475	12475	12475