

ARKANSAS RIVER COMPACT ADMINISTRATION

Lamar, Colorado 81052

For Colorado

Chairman and Federal Representative

For Kansas

Rebecca Mitchell, Denver
Lane Malone, Holly
Scott Brazil, Vineland

James T. Rizzuto, Swink

David Barfield, Manhattan
Randy Hayzlett, Lakin
Hal Scheuerman, Deerfield

December 1, 2017

Mr. Lane Malone, Chairman
Mr. Hal Scheuerman, Member
Operations Committee
Arkansas River Compact Administration

Re: Compact Year 2017 Summary
Assistant Operations Secretary Report

Gentlemen,

In this report, I will provide my perspective as Assistant Operations Secretary on operations that have occurred over the past Compact Year (CY), including communications, Kansas Reservoir Call, the Pueblo Winter Water Storage Program (PWWSP), Pass-thru & Status Accounting, Water Issues Matrix, and Special Engineering Committee.

Communications

The Operations Secretary, Assistant Operations Secretary, and their respective staff have set a goal of open and frequent communications regarding Arkansas River operational issues to foster a positive, collaborative, and productive working relationship. We continue to work on achieving this goal.

The Operations and Assistant Operation Secretaries met once, on November 14th. I appreciate the committee's attendance at this meeting. This meeting included the following topics: prospects of a John Martin Reservoir spill, the Water Issue Matrix, and the delivery spreadsheet. Steve Witte and I also discussed recommending work priorities for the Special Engineering Committee. Lonnie Spady (CDWR) noted that the Consolidated Ditch ceased diversions and there was no need to review returns to the Purgatoire or Arkansas rivers.

We were also involved in a number of ARCA Special Engineering Committee meetings this year.

Additionally, the States have communicated on a regular basis. These communications included a variety of topics including John Martin Accounting System (JMAS) data updates, PWWSP operational issues, Offset Account operations, Kansas releases, and runoff conditions within the Arkansas River Basin. Issues were generally resolved as they arose.

John Martin Reservoir

I have provided a graphical representation of John Martin Reservoir (JMR) and the accounts contained within for CY2017. See Figure 1 at the end of this report. The maximum JMR end of day content occurred on June 27th with 265,939 AF in storage. The minimum JMR end of day content occurred on November 1, 2016 with 93,908 AF in storage.

Deliveries to Kansas

Kansas entered the irrigation season (April 1st) with approximately 35,600 AF in its Section II account. During CY2017, Kansas made one run that will be described briefly below.

A 600 cfs release from the Kansas Section II Account was started on June 15th. Kansas also made a concurrent release of 200 cfs from the Offset Account from June 26th to July 22nd. The Kansas Section II release rate varied throughout this run as irrigation demand changed and precipitation occurred. See Figure 2 for a graphic of this release at the end of this report. The release to Kansas ended the morning of August 3rd, or a run of approximately 50 days. The release spreadsheet accounting was exchanged and reviewed by both offices. The table below provides the basic information on this release.

Kansas II & Offset Account Release (6/15-8/3/2017)	
Kansas Section II Account release	40,928 AF
ESF Delivery Efficiency	100%
Section II Delivery	40,928 AF
Section II Delivery Transit Loss	0 AF
Offset Account released	
- consumable	10,000 AF
- nonconsumable	533 AF
Offset Account delivery efficiency	88.47%
Offset net delivery	9,319 AF
Offset consumable delivery	8,847 AF

Frontier Ditch Parshall flume: The Frontier Ditch Parshall flume (flume) was in submergence 21 of the 95 days they diverted. This became an issue since real-time flow information was not available for some of these days on the USGS website. On July 21st a conference call was held

to discuss the submergence issue. See memo from Bill Tyner dated August 18, 2017 attached for a summary of those discussions and the persons involved.

At the time the Frontier Ditch was found in submergence, we reviewed the flow conditions and found that diversion rates above 35 cfs caused the flume to go into submergence. Therefore the Garden City Field Office (KDA-DWR) directed the Frontier Ditch to keep diversions less than 35 cfs. There were instances when the Frontier Ditch automatic gate didn't properly adjust, and Frontier Ditch was directed to reduce the rate below the 35 cfs.

The submergence issue this summer was similar to 2006, when there were no readily apparent causes of the submergence. On June 29th, I reviewed the top portion of the ditch and noted high water surface levels throughout that section. I didn't find any checks in the ditch or other obstructions that would have caused these water surface levels. The water velocity in the ditch appeared to be slow in the section reviewed.

Based on my review and conversations with Steve Hines, I suspect the submergence was a ditch maintenance issue. Mr. Hines described spraying the ditch to burn and then being interrupted by rains. I believe that weeds were not completely removed from the ditch cross-section, slowing the water in the ditch. The slower water increased the water surface elevation, and above a certain flow, caused the flume to go into submergence.

During days when the Frontier Ditch flume was known to be in submergence, USGS would not post Frontier Ditch diversions to the internet in real-time. USGS staff agreed to calculate the daily mean flow for the previous day and email that value to those interested.

I asked that USGS provide the number of days that the Frontier Ditch flume was in submergence. Nathan Sullivan, USGS, provided that information for January 1, 2006 to August 18, 2017. See Table below. I added the total diversion days, the maximum mean daily flow, and the number of diversion days over 35 cfs. There are a few days each year where the flume is in submergence, with three (3) of the past twelve (12) years having more than 10% of the diversion days in submergence.

Water Year	Diversion days	Submergence		Maximum mean daily flow (cfs)	Days over 35 cfs
		Number of days	Percent of days		
2006	162	40	24.7%	41.0	27
2007	181	2	1.1%	34.5	0
2008	159	3	1.9%	36.3	14
2009	151	2	1.3%	36.1	6
2010	140	3	2.1%	35.6	7
2011	178	6	3.4%	27.2	0
2012	207	1	0.5%	27.9	0
2013	142	19	13.4%	35.1	2
2014	106	2	1.9%	29.6	0
2015	109	3	2.8%	41.1	6
2016	169	0	0.0%	36.5	15
2017*	95	21	22.1%	38.5	10

*2017 contains provisional data

During this discussion, it was also noted that this flume is structurally past its useful life. Steve Witte volunteered his staff to complete a preliminary evaluation of the flume. I provided LiDAR information for the area of the flume on July 25th. Division 2 staff completed a survey of the flume and nearby area on October 12th. Division 2 staff prepared a report which recommended replacing the flume and gave a preliminary estimate of \$24,000 to complete that work. The report will be presented to ARCA at its 2017 annual meeting.

Delivery Spreadsheet: During an in-depth review of the delivery spreadsheet, I found what appears to be an error in the calculation of the antecedent ten-day Stateline flow. This was discussed at the OS-AOS meeting on November 14th. The States have agreed to look at this delivery spreadsheet to determine if it is an error or not. While reviewing this, I would also like to look at another provision related to the determination of Stateline antecedent flows for releases that begin eleven (11) to twenty (20) days after a previous release. This was not the case this year with only one run of water to Kansas.

Pueblo Winter Water Storage Program

The States have committed to work on this issue and will build upon the work that has already been done. Pueblo Winter Water Storage Program (PWWSP) issues have held up approval of the Operations Secretary's annual reports since 2006.

Colorado and Kansas have visited the Consolidated Ditch to review water being returned to either the Purgatoire River above the Purgatoire River near Las Animas gage or at the tail end of the ditch to the Arkansas River below the USGS Arkansas River at Las Animas gage since November 2010. These visits have generally occurred in the days ahead of November 15th which is the beginning of the PWWSP.

On November 14, 2016, John Van Oort, Bill Tyner, and Lonnie Spady with Colorado Division 2 and Brandy Cole, Rachel Duran, and I visited the two returns just before the syphon under the Purgatoire River, the tail end of the Consolidated Ditch, and the seep return. We found that one of the returns was wet but not actively returning water and the second return nearest the syphon had not been recently used based on presence of branches laying in the bottom and general condition of the return. The seep return and tail end of the ditch were returning small amounts of water below the Arkansas River at Las Animas USGS gage. We discussed potential gaging of the wasteways to know whether or not these wasteways are being used around the November 1st to 14th period where the baseflow is being determined for the Arkansas River at Las Animas gage. Those discussions are continuing. Figure 3 below shows some information related to the operations during this period.

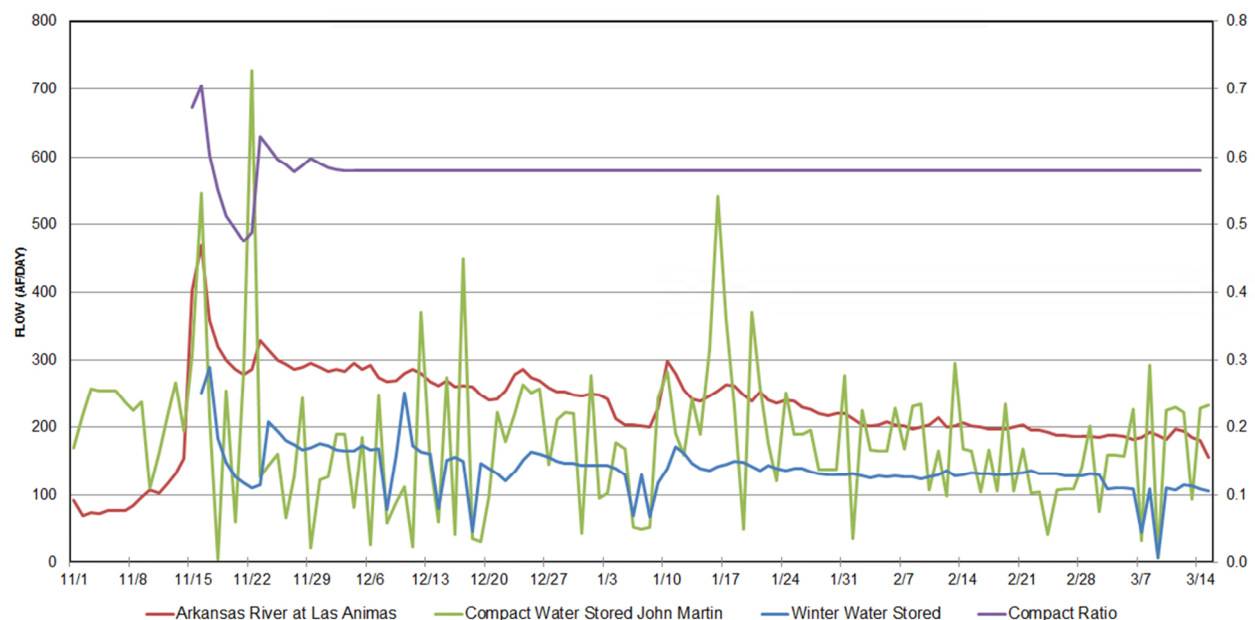


Figure 3 Arkansas River at Las Animas flows, Winter Water storage, and Compact Conservation storage for the period of November 1, 2016 to March 15, 2017 and the Compact ratio of the Arkansas River at Las Animas flows for the period of November 15, 2016 to March 14, 2017.

CY2018 PWWSP: The Consolidated Ditch was not visited this year as the Consolidated Ditch had ceased diversions on November 12th. During our November 14th meeting, Lonnie Spady, Division 2, showed pictures taken of the Consolidated Ditch. There were no concerns noted.

Pass-thru and Status Accounting

JMR daily inflow, storage, and outflow were tracked by the Garden City Field Office staff for CY2017. A pass thru spreadsheet was first provided to the Operations Secretary on November 15th for inclusion in the Operations Secretary's report. This spreadsheet tracks: the amount (AF) of river flows; JMAS (John Martin Accounting System) inflows and releases; JMR reservoir evaporation, storage, and releases.

The information in this spreadsheet was regularly updated and reviewed by the Garden City Field Office staff. The spreadsheet uses the tracked information to calculate:

- (1) gaged and ungaged inflows,
- (2) pass-thru, and
- (3) the reservoir "status."

The pass-thru represents that amount of JMR inflows which are not stored in any account and are released downstream. The reservoir "status" represents the difference between the amount considered stored in JMAS and the amount shown as stored in JMR by the Corps.

Water Issues Matrix

As previously reported in the past, this matrix is a joint work product of the States which is designed to track various disputed issues. These disputed issues are primarily concerned with JMR related operations and accounting, of which approximately half have been resolved through the efforts of this Committee and others. In the past year we have added two issues: Issue 45 related to a Colorado multipurpose account in John Martin Reservoir, and Issue 55 related to the allocation of waters not allocated by the Compact, if there is any. These issues are in the process of being developed.

The matrix currently has 38 issues, of which nine (9) are pending resolution, eight (8) have been removed or suspended, and twenty (20) have been resolved. The current versions of the matrix and issues summary table are attached.

Summary

I look forward to working with the Operations Secretary and his staff on these issues and the day-to-day operations of the Arkansas River.

Sincerely,



Kevin L. Salter, P.E.
Assistant Operations Secretary

Figure 1 Graphical representation of John Martin Accounts over CY2017

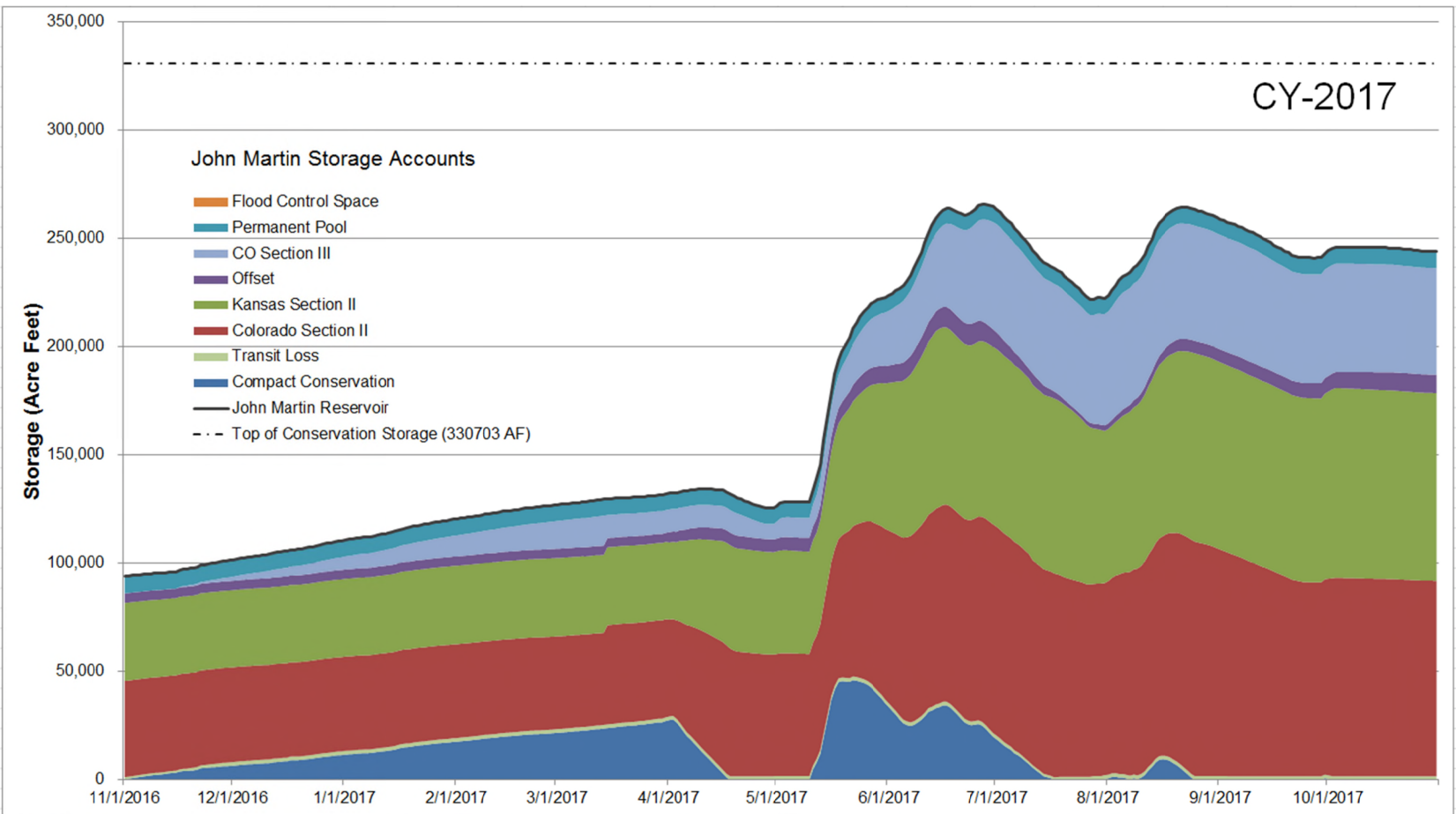
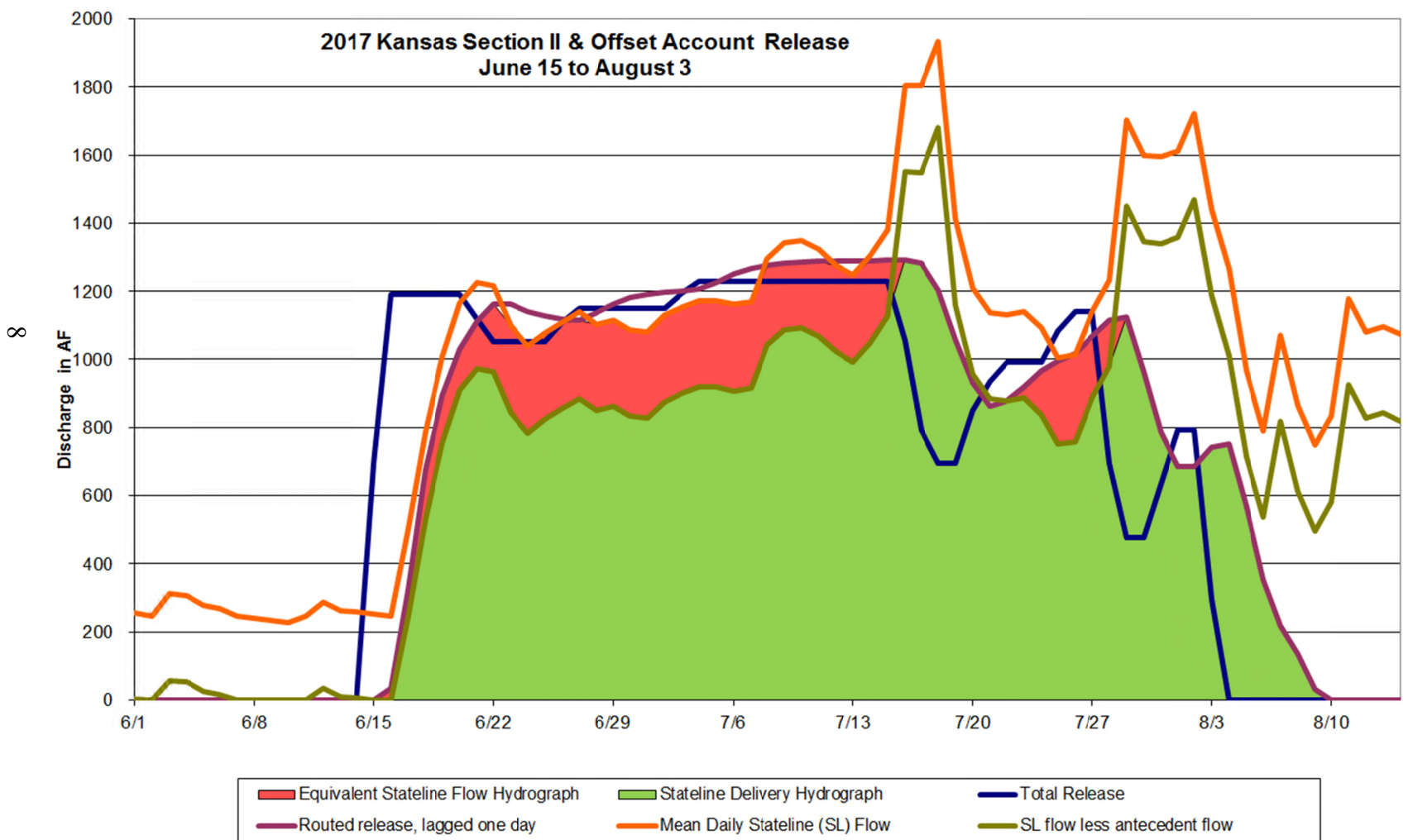


Figure 2 Hydrograph of the Kansas release at the Stateline (Section II)



Attachment 1

AOS Report

December 1, 2017

This page is intentionally left blank.



MEMORANDUM

TO: Steve Witte*, Division Engineer/Operations Secretary
Randy Hayzlett*, Kansas ARCA Representative
Kevin Salter*, Assistant Operations Secretary

FROM: Bill Tyner*, Assistant Division Engineer, Division 2

CC: David Barfield, Hal Scheuerman*, Lane Malone, Scott Brazil, Rebecca Mitchell,
Brent Newman, Joey Talbott, Brandy Cole, Nathan Sullivan, Lori Marintzer*
Mike Meyer, Collin Painter, John Van Oort*, Phil Reynolds, Lonnie Spady, and
Rebecca Nichols* (* indicates participated in July 21st phone discussion)

DATE: August 18, 2017

SUBJECT: Summary of Conference Call Regarding Frontier Ditch Stateline Flow Measurement Issues

INTRODUCTION AND SUMMARY

This memo is to document the telephone conversation and action items some of us discussed on July 21, 2017 regarding recent problems with submergence issues at the Frontier Ditch. The Frontier Ditch gage is one of two gages that comprise the Stateline flow. The other gage is the Arkansas River near Coolidge, KS. See Map Attached. The USGS maintains both of these gages.

The discussion initially started with submergence being associated with Frontier Parshall flume being beyond its useful life. Kevin and Lori (USGS) both noted that the submergence issue was not caused by the Parshall flume or checks placed in the ditch below that flume. They believe that the submergence issue is a ditch maintenance issue. Kevin related a conversation with Steve Hines, Frontier Ditch, in which Steve said that the ditch was sprayed to kill the weeds but before they burned, they received a significant amount of rain. When Frontier Ditch was able to burn, some areas had regrowth occurring. It is Kevin's belief that standing vegetation in areas along the bottom and possibly sides of the ditch was slowing the water and causing the Parshall flume to go into submergence above about 35 cfs. Kevin Salter noted in reviewing this memo that some submergence had occurred earlier in the year and at lower flows.

Randy Hayzlett commented that with the high amount of rain that western Kansas had received during the irrigation season in 2017 it was very difficult for ditch companies to stay ahead of vegetation overgrowth that impacts ditch carrying capacity. He believed that Frontier Ditch was attempting to remove obstructions that were causing the Frontier Ditch flume to submerge, but were having difficulty.

Lori noted for a Parshall flume of 6 feet, the flume is considered in submergence at 70%. When the



flume went into submergence, the USGS would block the real time discharge data from the web since the flow is then determined by using a submergence calculation to estimate daily values. She noted that it is not possible to provide corrected data on a real-time basis.

It should be noted that Colorado does not agree that this practice by the Kansas USGS allows the States to follow the provisions of the agreements by collecting the provisional fifteen-minute gage data, then determining if there is a relevant reason under the agreement(s) to rely on some other data. If the Kansas USGS is unwilling to allow the provisional fifteen-minute data to be distributed to the two States to allow the agreements to properly be operated, then a new solution should be sought at the 2017 ARCA Meeting.

The reason for Colorado's concern about this gage was that Kansas was in the middle of a Stateline delivery of water from John Martin Reservoir (June 15, 2017 through August 3, 2017). The Stateline measurements are fundamentally important to proper accounting of the crediting and transit loss associated with deliveries under agreements signed by the Colorado State Engineer and Kansas Chief Engineer (see agreements attached).

Kevin noted that the two crediting agreements were signed about a year apart and that their respective provisional data sections had different language. More specifically, the Section II agreement provided for the use of corrected data under certain circumstances. Kevin noted that problems with the Frontier Ditch measurement in July 2006 was probably the reason for this language. Kevin also noted that this year's situation was similar to July 2006 when the Frontier Ditch also went in submergence.

Kevin stated that the Frontier Ditch continues to divert with the instruction to hold to 35 cfs or less in order to keep the Parshall flume out of submergence. Kansas staff are closely monitoring the ditch diversions and have/will alert the Frontier Ditch (Steve and/or Stanley Hines) when diversions look like they might exceed 35 cfs. Even with this monitoring and notice, the Frontier Ditch did have another instance of submergence on July 27 and 28 (2017).

Lori did commit to providing a provisional submergence calculation for the prior day should the Frontier Ditch have submergence issues again. Such a submergence calculation was provided by email of July 28. See attached.

FRONTIER PARSHALL FLUME

Randy noted that at the 2016 Arkansas River Compact Administration Meeting in December of 2016, discussion occurred about replacing the Frontier Ditch flume. From the Engineering Committee's 2016 Summary and Action Items, the committee heard a request from Kevin for ARCA's funding assistance to replace the Frontier Ditch Parshall flume. The Committee requested more detailed information on construction and costs before considering this request.

During the July 21st conference call, we discussed whether the Kansas USGS staff or perhaps Kansas NRCS staff could evaluate the Frontier Ditch flume and make recommendations on replacement design

and costs. Kansas felt that neither agency would be able to perform that work by the next ARCA Meeting.

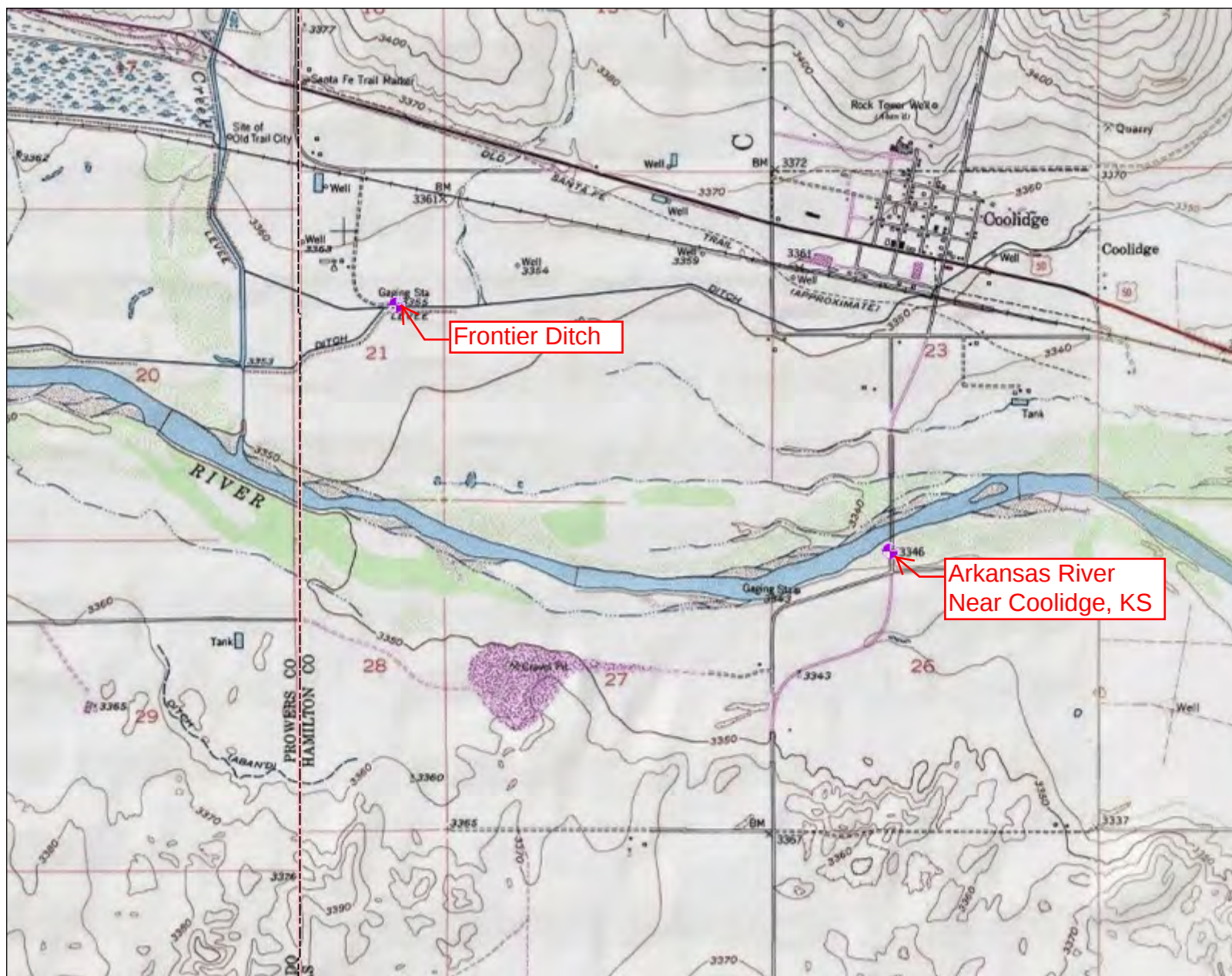
Steve Witte volunteered the Colorado Division 2 Hydrography Section to perform a preliminary evaluation of the flume working with Kevin Salter, the Frontier Ditch and Lori, (USGS). The Division 2 Hydrography staff are currently in the middle of design work on another basin project, however the work to evaluate the Frontier Ditch flume should be able to be performed during late September to early November in time to provide a preliminary report for review by both States prior to the 2017 ARCA meeting in Lamar, Colorado. Kevin agreed with this proposal and volunteered some LiDAR data recently acquired to help with the evaluation of conditions at the site. The LiDAR information for the area of the Frontier Flume was provided on July 25.



CDSS

Colorado's Decision Support Systems

Map Viewer



Legend

- Active Gage Diversion
- Active Gage Reservoir
- Active Gage Stream
- County

Location



Notes

4,677 0 2,339 4,677 Feet

1: 28,064



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Date Prepared: 8/8/2017 2:17:34 PM

AGREEMENT CONCERNING THE OFFSET ACCOUNT IN JOHN MARTIN
RESERVOIR FOR COLORADO PUMPING, DETERMINATION OF CREDITS
FOR DELIVERY OF WATER RELEASED FOR COLORADO PUMPING, AND
RELATED MATTERS

September 29, 2005

This Agreement is entered into by the State of Colorado and the State of Kansas (hereinafter referred to as “Colorado” and “Kansas”) in the interests of interstate comity to resolve accounting issues relating to the Offset Account in John Martin Reservoir for Colorado Pumping (hereinafter “Offset Account”). The crediting and implementation principles described herein will be applied to Offset Account deliveries and H-I Model input sets for the years 1997 through 2004 as well as future years.

Acceptance of this Agreement by Colorado and Kansas does not prejudice or constitute a waiver of their respective rights under the Arkansas River Compact, the April 24, 1980 Resolution Concerning an Operating Plan for John Martin Reservoir (as revised on May 10, 1984, and December 11, 1984), the March 17, 1997 Stipulation Re Offset Account in John Martin Reservoir in *Kansas v. Colorado*, No. 105 Original, or the Amended March 30, 1998 Resolution Concerning an Offset Account in John Martin Reservoir for Colorado Pumping.

Colorado and Kansas agree as follows:

1. Definitions: The following terms will be defined in this agreement as follows:

- A. **Colorado Consumable Subaccount** – a subaccount of the Offset Account into which fully consumable water, as determined by the Colorado State Engineer pursuant to Paragraphs 3 and 4 of the Offset Account Resolution, is delivered or transferred. This subaccount is further segmented into:
 - i. Colorado Upstream Consumable Subaccount
 - ii. Colorado Downstream Consumable Subaccount.
- B. **Colorado Upstream Subaccount** – a subaccount of the Offset Account for the storage of water with the purpose of replacing depletions to conservation storage inflows pursuant to Paragraph 6 of the Offset Account Resolution.
- C. **Consumable Portion of the Release** – the water released from the Kansas Consumable and Colorado Consumable subaccounts of the Offset Account. This would not include waters released from any other subaccounts of the Offset Account.
- D. **H-I Model** – the Hydrologic-Institutional Model developed jointly by the States to assist in the determination of Stateline depletions to usable streamflows.

- F. **Kansas Consumable Subaccount (KCS)** – a subaccount of the Offset Account for the storage of that part of the total account for which evaporation is charged to Kansas, pursuant to Paragraph 5B of the Offset Account resolution.
- G. **Kansas Storage Charge Subaccount** – a subaccount of the Offset Account for the storage of fully consumable water which is a prerequisite for Colorado or its water users to store water in the Offset Account as provided for in Paragraph 9 of the Offset Account Resolution.
- H. **Kansas Stateline Return Flow Subaccount** – a subaccount of the Offset Account for those Stateline return flows which, based on historic patterns, would have been delivered to the Stateline, but which are held in the Offset Account pursuant to Paragraph 4 of the Offset Account Resolution.
- I. **Muskingum method** – a routing method as described in the following reference: McCarthy, G.T., 1938: 'The Unit Hydrograph and Flood Routing', presented at conference of North Atlantic Division, U.S. Corps of Engineering, June 1938 (see also 'Engineering Construction - Flood Control', pp. 147-156, the Engineer School, Ft. Belvoir, VA, 1940).
- J. **Offset Account Resolution (OAR)** – the “Resolution concerning an Offset Account in John Martin Reservoir for Colorado Pumping as amended March 30, 1998,” or as it is subsequently amended.
- K. **Provisional data** -- streamflow and ditch diversion data collected on the day the administrative action is taken.
- L. **Reasonable Opportunity** – is the first day during the period of April 1st to June 30th when the mean Stateline daily flow is 100 cfs or greater for at least 15 days in the previous 30-day period, even if the 30 days precede April 1.
- M. **Stateline flow** – the flow of the waters of the Arkansas River as determined by gaging stations located at or near the Stateline, more specifically the combined flow as measured by USGS gaging stations: Frontier Ditch near Coolidge and the Arkansas River near Coolidge.
- N. **Stateline Return Flow Subaccount** – a subaccount of the Offset Account for water that will be required to maintain historical Stateline return flows pursuant to Paragraph 4 of the Offset Account resolution.
- O. **Stateline Return Flow Transit Loss Subaccount** – a subaccount of the Offset Account for the associated transit loss water needed to deliver historical Stateline return flows to the Stateline Pursuant to Paragraph 8 of the Offset Account Resolution.

2. Subaccounts currently approved for the Offset Account.

The Offset Account, as provided for by the **Offset Account Resolution (OAR)**, shall consist of the following subaccounts:

- A. Colorado Consumable Subaccounts (OAR Paragraphs 3 & 4)
 - i. Colorado Upstream Consumable Subaccount
 - ii. Colorado Downstream Consumable Subaccount
- B. Colorado Upstream (OAR Paragraph 6)

- C. Instate Return Flow to Colorado Ditches (OAR Paragraph 4)
 - i. Keesee Winter Return Flows
- D. Kansas Consumable (OAR Paragraph 5.B.)
- E. Kansas Storage Charge (OAR Paragraph 9)
- F. Kansas Stateline Return Flow (OAR Paragraph 4 & 5, 5 deals with the evaporation on Stateline Return Flows after Kansas has been noticed)
- G. Stateline Return Flow (OAR Paragraph 4)
- H. Stateline Return Flow Transit Loss (OAR Paragraph 8)

Additional subaccounts may be approved only by mutual agreement by both States. Notice of a proposed subaccount (including a detailed written description of the need and justification for the subaccount) must be given from one state to the other; and the response is due from the notified State within two weeks upon receipt.

3. Determination of Credits for the Delivery of Water Released from the Offset Account

The States agree to determine credits for the delivery of water released from the Offset Account on Kansas' demand based on measured **Stateline flow** in accordance with the criteria described below.

- A. Release accounting and stream flow data used in the evaluation of all deliveries will be as follows:
 - i. Accounting records of the Operations Secretary for Offset Account releases, including hourly records of gate changes identifying the beginning and end of releases.
 - ii. Provisional, hourly, and daily satellite data from pertinent gaging stations between John Martin Reservoir and the Stateline. Stateline deliveries for which Colorado will receive credit will be based on the mean daily **Stateline flow**.
 - iii. The United States Geological Survey (USGS) provides the State of Colorado with a data feed of shift-corrected discharge values on an hourly basis. The data provided is in a non-aggregated time step, typically 15-minute measurement intervals. Once data is loaded into the Colorado Division of Water Resources database, it is not updated with subsequent data from the USGS. Therefore, data used for water administration remains the same as during the time the water was administered. Colorado will daily extract 15 minute discharge data for the Arkansas River at Granada, the Frontier Ditch, and the Arkansas at Coolidge gages for the previous 24-hour period to update previously transmitted data and export this and previous data for the most recent 7-day period as a delimited text file to an ftp directory accessible by persons designated by the Colorado State Engineer or Kansas Chief Engineer. **Provisional data** shall be used for all the calculations described in this agreement. Colorado will provide and maintain the auto-executable program

to periodically update databases maintained in their respective offices with this data to ensure identical stream flow data sets to be used to evaluate deliveries of water from John Martin Reservoir to Kansas.

B. The antecedent flow during the Offset Account delivery will be determined as follows:

- i. Use the mean daily **Stateline flow** for the 10 full days preceding the date of delivery arrival, provided that the variability within the period does not depart from the 10-day average by more than 10%. The date of delivery arrival for the purpose of this Paragraph shall be two days after the initiation of the release with the first day of release being day zero. Days of **Stateline flow** which exceed 110% of the initial average will be removed until an average base flow with less than +/- 10% variability is achieved to remove interference caused by precipitation or the effect of Colorado ditch operations during the 10-day period. No more than two iterations of antecedent flow calculation will be performed and no fewer than 6 days out of the preceding 10-day period will be used in determining the antecedent flow except as provided in the following two paragraphs.
- ii. If an Offset Account release follows within 10 days of any other release from a Kansas account (including the Offset Account), the antecedent flow for the current Offset Account release shall be the same as the antecedent flow determined for the previous release using the same procedures as described above in Paragraph 3.B.i.
- iii. If the average flow for the 10-day period preceding the 10 days (i.e. days 11 through 20 prior to arrival of the release) used to determine antecedent flow is more than twice the computed antecedent flow computed above in Paragraph 3.B.i., the antecedent flow will be adjusted to be the average of: a) the antecedent flow as described above in Paragraph 3.B.i. and b) the hydrograph flow value using the **Muskingum method** described below in Paragraph 3.C. on the sixth day following the end of the release from John Martin Reservoir with the last day of the release being day zero.

C. For Offset Account releases occurring without consecutive Kansas Section II Account releases, the credit component of the Offset Account release at the Stateline for which Colorado will receive 100% credit as a replacement of depletions to usable Stateline flow will be determined as follows:

- i. The mean daily release from the Offset Account will be multiplied by 1.05.
- ii. These adjusted mean daily values will be routed to the Stateline using the **Muskingum method** with the following parameters: $K = 60$ hours, $x = 0.15$ and $t = 24$ hours.

- iii. The resulting Muskingum hydrograph will be lagged one day, in addition to the lag included within the Muskingum routing.
- iv. The Stateline delivery for the purpose of determining Offset credit will be determined as the lesser of: a) the **Stateline flow** less antecedent flow or b) the lagged Muskingum hydrograph.
- v. The Stateline delivery determination will end the sixth day following the end of the release from John Martin Reservoir with the last day of the release being day zero and with the delivery for the sixth day being prorated by the ratio of the number of hours of release in day zero divided by 24.
- vi. The Offset Account delivery efficiency will be the Stateline delivery determined in the manner described above divided by the total Offset Account release.
- vii. Under no circumstances shall more than 100% of the total volume released from the Offset Account over the entire period of the release be determined to be delivered under these procedures.
- viii. The credit for the **Consumable Portion of the Release** will be determined as the Offset Account delivery efficiency multiplied by the **Consumable Portion of the Release**.

D. For combined releases of Offset Account and Kansas Section II Account water, the credit component for the Offset Account release at the Stateline for which Colorado will receive 100% credit as a replacement of depletions to usable **Stateline flow** and the Equivalent Stateline Flow (ESF) volume for determining transit losses associated with Kansas Section II Account release will be determined as follows:

- i. The mean daily release from the sum of the Offset Account and the Kansas Section II Account releases will be multiplied by 1.05.
- ii. These adjusted mean daily values will be routed to the Stateline using the **Muskingum method** with the following parameters: $K = 60$ hours, $x = 0.15$ and $t = 24$ hours.
- iii. The resulting Muskingum hydrograph will be lagged one day, in addition to the lag included within the Muskingum routing.
- iv. The Stateline delivery, for the purpose of determining Offset credit, will be determined as the lesser of: a) the **Stateline flow** less antecedent flow or b) the lagged Muskingum hydrograph.
- v. The Stateline delivery determination will end the sixth day following the end of the release from John Martin Reservoir with the last day of the release

being day zero and with the delivery for the sixth day being prorated by the ratio of the number of hours of release in day zero divided by 24.

- vi. The Offset Account delivery efficiency will be the Stateline delivery determined in the manner described above divided by the total of Offset Account and Kansas Section II Account releases.
- vii. The credit for the **Consumable Portion of the Release** will be determined as the Offset Account delivery efficiency multiplied by the **Consumable Portion of the Release**.
- viii. The ESF delivery will be determined as the lesser of: a) the **Stateline flow** or b) the lagged Muskingum hydrograph.
- ix. The ESF delivery determination will end the sixth day following the end of the release from John Martin Reservoir with the last day of the release being day zero and with the delivery for the sixth day being prorated by the ratio of the number of hours of release in day zero divided by 24.
- x. The ESF percentage will be calculated as the ESF delivery (determined using Sub-paragraphs 3.D.i through 3.D.iii and 3.D.viii through 3.D.ix) divided by the total of the releases from the Offset Account and Kansas Section II Account.
- xi. The volume of the Kansas Section II ESF is the total of the Kansas Section II releases multiplied by the ESF percentage.
- xii. If the ESF volume for the Kansas Section II Account delivery is less than the Kansas Section II Account volume released, the resulting transit loss will be replenished to the Kansas Section II Account.
- xiii. Under no circumstances shall more than 100% of the total of either the release from the Offset Account or the Kansas Section II Account over the entire period of the release be determined to be delivered for that account under these procedures.
- xiv. For the purposes of these determinations, the volume of multiple releases from the same account during the combined releases will be summed and treated as a single value.

4. Credit for evaporation from water stored in the “Kansas Consumable Subaccount” (KCS).

As provided in the **Offset Account Resolution (OAR)**, once Kansas has received a 30-day notice and evaporation is now being assigned to the KCS, Colorado may accumulate the evaporation for later credit as determined below in this Paragraph. Commencing April 1 of each year, the content of the KCS will be subject to the following accounting procedures and shall be used to establish evaporation eligible for credit from the KCS:

- A. During the period of April 1 through June 30, if Kansas does not call for water from the KCS, evaporation eligible for credit as a replacement of depletions to usable Stateline flows for water stored in the KCS will begin the day following a **Reasonable Opportunity** for Kansas to call for water. If a **Reasonable Opportunity** has occurred and Kansas has chosen not to call for water from the KCS, evaporation eligible for credit as a replacement of depletions to usable Stateline flows for all water stored in the KCS will continue until either Kansas calls for a release of water and exhausts the KCS, or until the succeeding April 1, whichever comes first. However, if Kansas chooses to call for water from the KCS, evaporation eligible for credit will commence on the date of release and will continue until either the KCS is exhausted, or until the succeeding April 1, whichever comes first.
- B. During the period of April 1 through June 30, if Kansas does not call for water from the KCS and there is no **Reasonable Opportunity** for Kansas to call for water, the evaporation eligible for credit as a replacement of depletions to usable Stateline flows for all water stored in the KCS will begin on July 1 and will continue until either Kansas calls for a release of water and exhausts the KCS, or until the succeeding April 1, whichever comes first.
- C. During the period of April 1 through June 30, if Kansas does call for water from the KCS, evaporation eligible for credit from additional water delivered to and stored in the KCS that is less than 3,500 acre-feet will be deferred until July 1 but will then continue until either Kansas calls for a release of water and exhausts the KCS, or until the succeeding April 1, whichever comes first.
- D. During the period of April 1 through June 30, if Kansas does call for water from the KCS, evaporation eligible for credit from additional water delivered to and stored in the KCS that is equal to or greater than 3,500 acre-feet will begin on the date the 3,500 acre-feet for the total volume was achieved and will continue until either Kansas calls for a release of water and exhausts the KCS, or until the succeeding April 1, whichever comes first.
- E. During the period of July 1 through September 30 evaporation eligible for credit for additional water delivered to and stored in the KCS from July 1 through September 30 will begin on the day water is delivered and stored in the KCS and will continue until either Kansas calls for a release of water and exhausts the KCS, or until the succeeding April 1, whichever comes first.
- F. Colorado shall receive no credit as a replacement of depletions to usable Stateline flows for evaporation from additional water delivered to and stored in the KCS during the period October 1 through March 31.
- G. Commencing April 1 of each succeeding year, the accounting and procedures as described in this Paragraph 4 shall be used to establish initial conditions for assigning evaporation eligible for credits from the KCS for that year.

- H. The evaporation credit component for offsetting usable depletions to Stateline flows will be computed by applying the Offset Account delivery efficiency for the next Offset Account release, as set forth in Paragraph 3 above, to the quantity of KCS evaporation eligible for credit. Colorado will not seek credit for the computed transit loss component of this water. Kansas Storage Charge water and the Kansas Stateline Return Flow water shall not be placed into the KCS, nor shall evaporation from these subaccounts be eligible for credit.

5. Assignment of Transit Losses

The **Consumable Portion of the Release** from the Offset Account that is not credited as a delivery at the Stateline, as determined in Paragraph 3 above, will be considered to be transit loss and a portion of that amount, as determined below, will be input into the **H-I Model** as a special water and assigned to reaches between John Martin Reservoir and the Stateline. The transit loss to the three reaches between stream gages below John Martin Reservoir (JMR to Lamar, Lamar to Granada, Granada to Stateline) will be determined in proportion to the percentages of transit loss determined using the Livingston Reach 6 factors with the antecedent flows at the stream gages at JMR, Lamar and Granada. However, if through the cooperative efforts of the States, an improved method of determining transit losses between John Martin Reservoir and the Stateline is devised, that method may be utilized through amendment of this agreement pursuant to Paragraph 11. In determining the portion of the transit loss that will be included in the **H-I Model**, the flows through the Granada gage will be used to assess Colorado's efforts to administer the released water past Colorado ditch headgates. The procedure to determine the amount of transit loss to be input into the **H-I Model** as a special water will be as follows:

- A. Upon a call for an Offset Account release from John Martin Reservoir, the flows will be evaluated for the prior ten-day period in a manner consistent with Sub-paragraph 3.B above for the Arkansas River below John Martin Reservoir, the Arkansas River at Lamar and the Arkansas River near Granada river gages to compute a target flow rate at the Granada gage computed as the Granada antecedent flow plus the Offset Account release rate less the transit loss based on Livingston Reach 6 factors. During the Offset Account release, Colorado will administer the release to attempt to maintain the target flow rate at the Granada gage. Changes in the Offset Account release rate will cause a change in the Granada gage target rate (based on the original calculation using the Livingston Reach 6 factors), computed by the new release rate multiplied by the original transit loss percentage plus the antecedent flow.
- B. At the conclusion of the release, the actual volume delivered through the Granada gage will be determined using mean daily flows from the **Provisional Data** for the Granada gage for the target evaluation period, which is from the date of the first day of release arrival at the Stateline through the day following the last full day of release at John Martin Reservoir. This value will be compared to the volume calculated using the delivery target flow rate at Granada multiplied by the number of days between release arrival at the Stateline and one day following the last full day of release at John Martin Reservoir. If the volume of actual delivery through the Granada gage for this period is

greater than or equal to the target volume delivery, 75% of the transit losses determined for the delivery will be input into the **H-I Model** as special water. See Table A below for a sample computation.

- C. If the volume of actual delivery through the Granada gage for the target evaluation period is less than the target volume delivery, the amount of the transit loss in the JMR to Lamar reach that is eligible for use as a transit loss input for the **H-I Model** is reduced by the ratio of the target transit loss in that reach derived using the Livingston Reach 6 factors to the actual transit loss in that reach calculated from the difference between the target flow rate at Granada and the actual delivery flow rate at Granada. The portion of the total delivery transit loss attributed to that reach is multiplied by this ratio to obtain the amount of the transit loss in the JMR to Lamar reach that is eligible for use as a transit loss input. The same computation is performed to determine the amount of the transit loss in the Lamar to Granada reach that is eligible for use as a transit loss input for the **H-I Model**. The transit loss eligible for input into the **H-I Model** in the Granada to Stateline reach is unchanged. Seventy-five percent of the transit loss determined for each of the three reaches will be input into the **H-I Model** as a special water. See Table A below for a sample computation for this case.

Table A: Sample computation for assignment of Transit Loss

Delivery Target Met							
	JMR	JMR to Lamar Reach	Lamar	Lamar to Granada Reach	Granada (Delivery Target)	Granada to Stateline Reach	Stateline
Flow Rates	250 cfs		237.5 cfs		225 cfs		200 cfs
Transit Losses		12.5 cfs		12.5 cfs		25 cfs	
% of total TL		25%		25%		50%	
CU Delivery Transit Loss							1000 ac-ft
Transit Loss by Reach		250 ac-ft		250 ac-ft		500 ac-ft	
75% of TL input as Special Water		187.5 ac-ft		187.5 ac-ft		375 ac-ft	750 ac-ft
Delivery Target Not Met							
	JMR	JMR to Lamar Reach	Lamar	Lamar to Granada Reach	Granada (Delivery Target)	Granada to Stateline Reach	Stateline
Flow Rates	250 cfs		237.5 cfs		225 cfs		200 cfs
Transit Losses		12.5 cfs		12.5 cfs		25 cfs	
% of total TL		25%		25%		50%	
CU Delivery Transit Loss							1000 ac-ft
Transit Loss by Reach		250 ac-ft		250 ac-ft		500 ac-ft	
Actual Delivery Rate					200 cfs		
Actual Transit Loss		25 cfs		25 cfs			
Adjusted Transit Loss		125 ac-ft		125 ac-ft		500 ac-ft	750 ac-ft
75% of Adjusted TL input as Special Water		93.75 ac-ft		93.75 ac-ft		375 ac-ft	562.5 ac-ft

6. Disposition of return flow water from Keesee Ditch, XY-Graham Canal, and Stubbs Ditch Section II accounts that is transferred into the Offset Account.

The procedure used to determine the timing and quantity of return flows is described herein. When Colorado transfers water from one of the subject Section II accounts to the Offset Account under the provisions of paragraph 4 of the **Offset Account Resolution**, the water transferred from the Section II account will be split into its consumptive use, in-state return flow and Stateline return flow components as described in Attachment A.

In-state return flows and the associated transit loss will be simulated in the **H-I Model** as a special water input, either as an input to the river in Reach 11 if return flows are actually released to the river, or as an input to individual Section II accounts of Colorado ditches, as actually occurs.

The consumptive use water, Stateline return flows and the associated transit loss and evaporation that is transferred to the Offset Account will be disposed of in accordance with the provisions of paragraphs 4, 5, and 8 of the **Offset Account Resolution**. The Stateline return flow will be simulated in the **H-I Model** as follows: (1) For return flows that remain in the Offset Account at the direction of the Kansas Chief Engineer, Stateline return flows will be simulated in the **H-I Model** by adding a special water equal to the return flow according to the schedules in Attachment A. Seventy-five percent of the transit loss water will be added to Reach 11. (2) For water transferred into the Kansas Section II account at the direction of the Kansas Chief Engineer, a special water input equal to the amount of the transfer will be made. (3) For Stateline return flows delivered to the river, a special water input equal to the amount of the release will be made to Reach 11, unless this water is delivered past the headgates of canals in Colorado, in which case it will be added to the reach to which it was delivered. In either case, seventy-five percent of the transit loss release will be input to Reach 11. Nothing in this subsection relating to the distribution of Stateline return flow or simulation of Stateline return flow in the **H-I Model** will affect the assignment of evaporation charges as set out in the **Offset Account Resolution**, paragraph 5.B.

7. Using H-I Model 10-year compliance results to determine additional amounts of water for delivery to the Offset Account by Colorado and to reset the status of Colorado's monthly accounting for the purpose of evaporation accounting under the provisions of the Offset Account Resolution.

To use the **H-I Model** to determine Compact compliance in accordance with the Special Master's recommendations in the Fourth Report, two steps are required. The first step is to run the **H-I Model** in both the historic and Compact modes to determine the accretions or depletions to usable Stateline flows for the previous 10-year period resulting from post-Compact well pumping and replacement sources represented in the **H-I Model**. The second step is to sum Colorado's Stateline delivery credits for fully consumable water delivered from the Offset Account to the Stateline for the previous 10-year period including any credits for evaporation from water stored in the KCS that Colorado is entitled to. The resulting quantities from these two steps are then used to calculate the final determination of accretions or depletions to usable

Stateline flows for the previous 10-year period. This final quantity is shown as Accretion A or Depletion A in Table B below.

In the monthly accounting performed by Colorado to replace well pumping depletions using the methods used to implement the Amended Use Rules, the credits that Colorado is entitled to as a result of deliveries from the **Colorado Consumable Subaccounts** to the Stateline are used to balance stream depletions that are calculated each month until these delivery credits are exhausted. These credits are shown as Accretion B in Table B below.

Analysis of the **H-I Model** runs used to determine Accretion A or Depletion A should be completed by mid-March of the year following the 10 calendar year period for which Compact compliance is being determined. Prior to the first full 10-year period, this accounting will be performed using years 1997 through 2005. When this analysis is completed, the actions summarized in the table below should be taken to reset the credit/depletion status of Colorado's monthly accounting.

Table B: Actions to reset the credit/depletion status of Colorado's monthly accounting

Results of the H-I Model analysis for the most current 10 year compliance period	Monthly Accounting Status at the end of December of the last year of the 10 year compliance period	Reset Action for Accretion B (Monthly Accounting Status for the beginning of the current calendar year)
IF	AND IF	THEN
Accretion A	Accretion B > 0 (Credits are used in monthly accounting before any further water is transferred to the KCS)	Reset to Accretion A (Credits are used in monthly accounting before any further water is transferred to the KCS)
Accretion A	Accretion B = 0 (Water is transferred to the KCS after monthly accounting)	Reset to Accretion A (Move KCS back to Colorado CU sub account for Jan-Mar of current year. Credits are used in monthly accounting before any further water is transferred to the KCS)
Depletion A	Accretion B = 0 (Water is transferred to the KCS after monthly accounting)	Place CU water = Depletion A into the Offset Account (Water is transferred to the KCS after monthly accounting)
Depletion A	Accretion B > 0 (Credits are used in monthly accounting before any further water is transferred to the KCS)	Reset Accretion B = 0 Place CU water = Depletion A into the Offset Account (Water is transferred to the KCS after monthly accounting)

8. New accounting procedures or calculations developed through collaborative efforts, including improved methodology to determine transit losses between John Martin Reservoir and the Colorado-Kansas Stateline, may be implemented or substituted with existing procedures or calculations upon modification of this agreement pursuant to Paragraph 11.

9. Colorado will employ best water administrative practices and enforcement activities to assure the timely delivery of Offset Account releases from John Martin Reservoir to the Colorado-Kansas Stateline in order to maximize delivery of such water to the Stateline.

10. If Kansas calls for more than 10,000 AF from the **Colorado Consumable** and/or **Kansas Consumable Subaccounts** during the period of November 1 to March 31 in any consecutive three years period, the transit losses on that part of the releases exceeding 10,000 AF, will be input into the **H-I Model** as special waters in the following April using the procedures provided for in Paragraph 5.

11. The States may agree to modify this Agreement, or any portion thereof, provided any amendment is not inconsistent with the Compact and the decisions of the Court in this case. Either State may seek modification of this Agreement by giving notice to the other State's Chief or State Engineer in writing. The States will cooperate in a good-faith effort to resolve issues raised by the proposed modification. The States may modify this Agreement only by mutual agreement or, if the States are unable to agree on a proposed modification to this Agreement, a State may submit the matter to the dispute resolution process included in the final decree in this case, including binding arbitration.

The States also agree to review this Agreement and the **Offset Account Resolution** every five years to determine whether the provisions can be improved in the interest of continuing interstate comity and effective water management. The first review shall occur five years from the effective date of this Agreement.

OPERATIONAL GUIDELINES

Although not mandatory, to enhance the efficient and timely delivery of water released from the Offset Account, the States also agree to the following guidelines:

1. Kansas should avoid calling for releases from the Offset Account during the period November 1 through March 31. Exceptions may be made whenever stream conditions are favorable for a release and the water is needed in Kansas, or when a spill is expected.
2. When antecedent flow is 100 cfs, or less, Kansas will call for releases from the Offset Account at a flow rate of at least 250 cfs and for a minimum of 7 days, although Kansas may reduce or terminate a release from the Offset Account if a precipitation event diminishes the demand for water in Kansas. Further, Kansas may request a release from

the Offset Account of shorter duration than 7 days if it is made in conjunction with a consecutive release from the Kansas Section II Account.

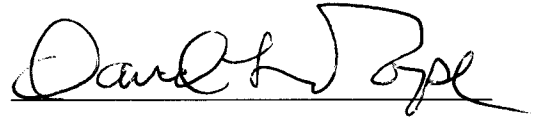
3. Unless Kansas specifies otherwise, releases from Offset subaccounts will be made in the following order:
 - A. Kansas Consumable Subaccount
 - B. Kansas Storage Charge Subaccount
 - C. Kansas Stateline Return Flows Subaccount
 - D. Colorado Consumable Subaccount
 - E. Stateline Return Flow Subaccount and Stateline Return Flow Transit Loss Subaccount
4. Kansas will use its best efforts to maximize the efficiency of Offset Account deliveries, including but not limited to, the release of Kansas Storage Charge water in conjunction with water released from other subaccounts.

JOINTLY APPROVED: 9-30-05



Hal D. Simpson

Colorado State Engineer



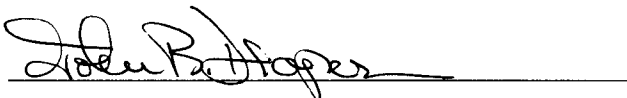
David L. Pope

Kansas Chief Engineer



David W. Robbins

Special Assistant to the Colorado Attorney General



John B. Draper

Special Assistant to the Kansas Attorney General

Attachment A

Timing of Stateline Return Flows

In determining the monthly timing of the releases needed to generate equivalent Stateline Return Flows resulting from the transfer of Section II water from the Keesee, XY-Graham and Sisson Stubbs Accounts into the Offset Account, a percentage of the return flow that would occur for each calendar month is used which is independent of when the delivery of Section II water is made to the Offset Account. The monthly return flow percentages are determined using a delivery schedule to all ditches based on the record of actual deliveries and the determination of the demand for Section II water for each month during the irrigation season. The following three tables provide the Stateline Return Flow schedules for each of the three Section II accounts.

Keesee Average Monthly Response (%)

Month	Reach 11	Reach 12	Reach 13
Jan	0.7277	14.4701	2.4729
Feb	0.6397	10.5869	1.7301
Mar	0.5441	7.7693	1.2423
Apr			
May			
Jun			
Jul			
Aug			
Sep			
Oct			
Nov	0.7747	28.5648	6.0282
Dec	0.7944	19.9629	3.6920
Total	3.4805	81.3541	15.1654

XY-Graham Average Monthly Response (%)

Month	Reach 15	Reach 16	Reach 17	Reach 18
Jan	0.1621	1.3203	2.9592	0.1707
Feb	0.1533	1.1543	2.5478	0.1505
Mar	0.1453	1.0292	2.2195	0.1328
Apr	0.1301	2.6078	5.3561	0.1086
May	0.1335	3.6277	7.0891	0.1134
Jun	0.1569	4.1302	8.1189	0.1518
Jul	0.1723	4.4509	8.8509	0.1843
Aug	0.1881	3.8384	7.7097	0.2163
Sep	0.1953	3.0393	6.3288	0.2333
Oct	0.1877	2.6140	5.5987	0.2246
Nov	0.1809	1.9738	4.3039	0.2114
Dec	0.1733	1.5592	3.5015	0.1941
Total	1.9788	31.3452	64.5842	2.0918

Stubbs Average Monthly Response (%)

Month	Reach 17	Reach 18	Reach 21
Jan	0.2386	2.2571	0.0162
Feb	0.1911	1.7464	0.0179
Mar	0.1536	1.3881	0.0192
Apr	0.0795	8.3885	0.0191
May	0.062	13.248	0.0185
Jun	0.1473	15.2972	0.0172
Jul	0.2303	16.3472	0.0153
Aug	0.3187	13.3833	0.0137
Sep	0.3786	9.5142	0.0125
Oct	0.3657	7.507	0.0122
Nov	0.3339	4.832	0.013
Dec	0.2943	3.1081	0.0143
Total	2.7936	97.0171	0.1891

Quantities of Return Flows, Stateline and In-state

To obtain the quantities of water that would be used as special water inputs to the H-I Model for Stateline Return Flows or In-state Return Flows, the following procedure would be used. The table below shows the allocation into various types of water of the water transferred from the subject Section II accounts. The Stateline return flow would be placed in the Stateline Return Flow Subaccount and transferred to the Kansas Stateline Return Flow Subaccount or released to the river using the schedules determined above with the Stateline return flow quantity in the table below. The transit loss associated with the Stateline return flow would be placed in the Stateline Return Flow Transit Loss Subaccount. Finally, the consumptive use water would be placed in the Colorado Consumable Subaccount.

Breakdown of Transferred Section II Water (%)

Water Type	Keesee	XY-Graham	Stubbs
To Ft. Bent	3.0		
To Amity	14.7		
To Lamar	8.3		
To Buffalo		1.4	
To Stateline	9.7	37.7	35.9
Trans Loss	0.5	3.2	5.0
Rtn Flow	9.2	34.5	30.9
CU Water	64.3	60.9	64.1
Total	100	100	100

**Agreement on Determination of Transit Loss under the provisions of Section II E (4) of
the Resolution Concerning an Operating Plan for
John Martin Reservoir
October 2006
Revised December 2006**

Whereas: CRS 37-80-102 provides that the Colorado State Engineer shall be the executive officer in charge of supervising the work of all division engineers and K.S.A. 82a-706e provides that the Kansas Chief Engineer may establish field offices and appoint water commissioners as agents and,

Whereas: the Resolution Concerning an Operating Plan for John Martin Reservoir adopted by the Arkansas River Compact Administration (ARCA) on April 24, 1980 as subsequently revised (the 1980 Operating Plan) Section II.E(4) states, "Releases of Kansas account water shall be measured at the Stateline as provided in Compact Article V E (3) allowing appropriate arrival times. If transit losses occur, those losses shall be determined by the Colorado Division Engineer and a representative of the Kansas Division of Water Resources and shall be replenished from the Kansas transit loss account. In the event that such losses at the end of the delivery are greater than the total in the Kansas transit loss account, then the deficit shall be made up from the next available transfers of other water under Subsection III D." and,

Whereas: the States have previously disputed the meaning of Section II.E(4) of the 1980 Operating Plan with respect to the appropriate operation of the Kansas Transit Loss Account and the determination of transit losses and,

Whereas: on September 30, 2005, the States signed the Agreement Concerning the Offset Account in John Martin Reservoir for Colorado Pumping, Determination of Credits for Delivery of Water Released for Colorado Pumping, and Related Matters (Offset Account Crediting Agreement) which includes a procedure to determine the **Equivalent Stateline flow (ESF)** delivery for determining transit losses associated with **Kansas Section II Account** deliveries that may occur as a result of combined releases of Offset Account and **Kansas Section II Account** water,

Now, **Therefore**, the undersigned Colorado State Engineer and Kansas Chief Engineer do agree to determine **Transit Loss** associated with the release of the **Kansas Section II Account** water on Kansas' demand based on measured Stateline flow in accordance with the criteria describe below and direct their subordinates and agents as follows:

A. Definitions

- i. **Equivalent Stateline flow or ESF** is the flow at the Stateline during **Kansas Section II Account** delivery equivalent to Kansas call from John Martin Reservoir as measured by the methods described in this agreement.
- ii. **Kansas Section II Account** is the Account in John Martin Reservoir established under Subsection II.D of the 1980 Operating Plan.

- iii. **Transit Loss** is the difference between the water volume released from the **Kansas Section II Account** and the volume of **ESF** as measured by the methods described in this agreement.
- iv. **Kansas Transit Loss Account** is the Account in John Martin Reservoir established under Subsection II.E(4) of the 1980 Operating Plan.
- v. **Livingston method** is a method for computing transit loss on the Arkansas River as described in USGS Water Resources Investigation 78-75 (September 1978) or future revised method as approved by ARCA.
- vi. **Muskingum method** is a routing method as described in the following reference: McCarthy, G.T., 1938: 'The Unit Hydrograph and Flood Routing', presented at conference of North Atlantic Division, U.S. Corps of Engineering, June 1938 (see also 'Engineering Construction - Flood Control', pp. 147-156, the Engineer School, Ft. Belvoir, VA, 1940).
- vii. **Predicted Transit Loss** is the percent of transit loss computed using the **Livingston method** using Reach 6 factors or as provided in a revised method approved by ARCA and the antecedent stream flow method as described below in Paragraph G between John Martin Reservoir and the Stateline.

B. Accounting and stream flow data used in the evaluation of **Kansas Section II Account Transit Loss** will be as follows:

- i. Accounting records of the Operations Secretary for **Kansas Section II Account** releases, including hourly records of gate changes identifying the beginning and end of releases.
- ii. Provisional, hourly, and daily satellite data from pertinent gaging stations between John Martin Reservoir and the Stateline. Stateline deliveries for which Colorado will receive credit will be based on the mean daily **Stateline flow**.
- iii. The United States Geological Survey (USGS) provides the State of Colorado with a data feed of shift-corrected discharge values on an hourly basis. The data provided is in a non-aggregated time step, typically 15-minute measurement intervals. Once data is loaded into the Colorado Division of Water Resources database, it is not updated with subsequent data from the USGS. Therefore, data used for water administration remains the same as during the time the water was administered. Colorado will daily extract 15 minute discharge data for the Arkansas River at Granada, the Frontier Ditch, and the Arkansas at Coolidge gages for the previous 24-hour period to update previously transmitted data and export this and previous data for the most recent 7-day period as a delimited text file to an ftp directory accessible by persons designated by the Colorado State Engineer and the Kansas Chief Engineer. **Provisional data** shall be used for all the calculations described in this agreement. Corrections for data omission, erroneous hourly measurements

or mechanical errors discovered in a timely manner and not due to merely a shift change made by USGS following a subsequent measurement should be included in the provisional data. Colorado will provide and maintain the auto-executable program to periodically update databases maintained in their respective offices with this data to ensure identical stream flow data sets to be used to evaluate deliveries of water from John Martin Reservoir to Kansas.

C. For **Kansas Section II Account** releases occurring without consecutive Offset Account releases, the **ESF** delivery for determining transit losses associated with **Kansas Section II Account** deliveries will be determined as follows:

- i. The mean daily release from the **Kansas Section II Account** release will be multiplied by 1.05.
- ii. These adjusted mean daily values will be routed to the Stateline using the **Muskingum method** with the following parameters: $K = 60$ hours, $x = 0.15$ and $t=24$ hours.
- iii. The resulting Muskingum hydrograph will be lagged one day, in addition to the lag included within the Muskingum routing.
- iv. The **ESF** delivery for the purpose of determining **Transit Loss** will be determined as the lesser of: a) the **Stateline flow** or b) the lagged Muskingum hydrograph.
- v. The **ESF** delivery determination will end the sixth day following the end of the release from the reservoir with the last day of the release being day zero and with the delivery for the sixth day being prorated by the ratio of the number of hours of release in day zero divided by 24.
- vi. The **ESF** percentage will be calculated as the **ESF** delivery (determined using Sub-paragraphs C.i through C.v) divided by the total of the release from **Kansas Section II Account**.
- vii. The volume of the **Kansas Section II Account ESF** is the total of the **Kansas Section II Account** release multiplied by the **ESF** percentage.
- viii. If the **ESF** volume for the **Kansas Section II Account** delivery is less than the **Kansas Section II Account** volume released, the resulting difference is **Transit Loss** which will be replenished to the **Kansas Section II Account**.
- ix. Under no circumstances shall more than 100% of the total volume from the **Kansas Section II Account** release be determined to be delivered under these procedures.

D. For combined releases of Offset Account and **Kansas Section II Account** water, the credit component for the Offset Account release at the Stateline for which Colorado will receive 100% credit as a replacement of depletions to usable **Stateline flow** and the **ESF** volume for determining transit losses associated with **Kansas Section II Account** release will be determined as provided in Paragraph 3.D. of the Offset Account Crediting Agreement. Transit losses for releases from the Offset Account shall not be replenished from the **Kansas Transit Loss Account**.

- E. The **Kansas Transit Loss Account** may be released concurrently with the **Kansas Section II Account** release. The concurrent release may occur under the following conditions unless other terms are agreed to by the Colorado Division Engineer and a representative of the Kansas Division of Water Resources:
- i. When antecedent flows at Stateline are less than 150 cubic feet per second and shall be at a rate and quantity determined by the Division Engineer upon consultation with a representative of the Kansas Division of Water Resources;
 - ii. For antecedent flows at Stateline greater than 150 cubic feet per second, not to exceed 5% of the **Kansas Section II Account** release rate or the **Predicted Transit Loss** as determined by the **Livingston method**, whichever is greater, and terminated on the third day from the beginning of the Kansas Section II Account release (with the day zero the beginning day of such release);
 - iii. For antecedent flows at Stateline greater than 150 cubic feet per second, when a subsequent increase in the Kansas release of at least 50 cfs occurs, an additional transit loss account release may be directed by the Division Engineer, not to exceed an amount equal to the increase in release rate times the **Predicted Transit Loss** as determined by the **Livingston method** at the beginning of the release and will be terminated on the third day from the beginning of the Kansas Section II Account release change.
- F. If a **Transit Loss** is determined by the above procedures, any **Kansas Transit Loss Account** water remaining in the account at the end of the **Kansas Section II Account** release will be used to replenish the **Kansas Section II Account**. In the event that transit losses at the end of the delivery are greater than the total in the **Kansas Transit Loss Account**, then the deficit shall be made up from the next available transfers of other water under Subsection III.D of the 1980 Operating Plan.
- G. For the purposes of determining **Predicted Transit Loss** using the **Livingston method** with Reach 6 factors or the revised method approved by ARCA on Kansas Section II releases, the antecedent flow for the three reaches below John Martin Reservoir will be determined as follows:
- i. Use the mean daily flow for the 10 full days preceding the date of delivery arrival, provided that the variability within the period does not depart from the 10-day average by more than 10%. The date of delivery arrival for the purpose of this paragraph shall be:
 - a. Lamar: use the day that the release is initiated as day zero.
 - b. Granada: one day after the initiation of the release with the first day of release being day zero.

- c. Stateline: two days after the initiation of the release with the first day of release being day zero.
 - d. Days of mean daily flow which exceed 110% of the initial average, will be removed until an average base flow with less than +/- 10% variability is achieved to remove interference caused by precipitation or the effect of Colorado ditch operation during the 10-day period. No more than two iterations of antecedent flow calculation will be performed and no fewer than 6 days out of the preceding 10-day period will be used in determining the antecedent flow except as provided in the following two paragraphs.
- ii. If a Kansas **Section II Account** release follows within 10 days of any other release from a Kansas account (including the Offset Account), the antecedent flow for the current **Kansas Section II Account** release shall be the same as antecedent flows determined for the previous release using the procedures as described above in Paragraph G.i.
 - iii. If the average flow for the 10-day period preceding the 10 days (i.e. days 11 through 20 prior to arrival of the release) used to determine antecedent flow is more than twice the computed antecedent flow computed above in Paragraph G.i., the antecedent flow will be adjusted to be the average of: a) the antecedent flow as described above in Paragraph G.i. and b) the hydrograph flow value using the **Muskingum method** described above in Paragraph C. on the sixth day following the end of the release from John Martin Reservoir with the last day of the release being day zero.
- H. Acceptance of this Agreement by Colorado and Kansas does not prejudice or constitute a waiver of their respective rights under the Arkansas River Compact, the April 24, 1980 Resolution Concerning an Operating Plan for John Martin Reservoir (as revised on May 10, 1984, and December 11, 1984), the March 17, 1997 Stipulation Re Offset Account in John Martin Reservoir in *Kansas v. Colorado*, No. 105 Original, or the Amended March 30, 1998 Resolution Concerning an Offset Account in John Martin Reservoir for Colorado Pumping.
- I. This Agreement is subject to the continued existence of the 1980 Operating Plan. Should the 1980 Operating Plan be terminated as provided in that Plan, this Agreement shall be null and void.

JOINTLY APPROVED ON December 11, 2006:



Hal D. Simpson
Colorado State Engineer



David L. Pope
Kansas Chief Engineer



Tyner - DNR, Bill <bill.tyner@state.co.us>

Frontier submergence calculation for July 27

1 message

Marintzer, Lori <lshill@usgs.gov>

Fri, Jul 28, 2017 at 8:14 AM

To: Bill Tyner <bill.tyner@state.co.us>, John VanOort <john.vanoort@state.co.us>, Brandy Cole <Brandy.Cole@kda.ks.gov>, Kevin Salter <kevin.salter@kda.ks.gov>, Mike Meyer <mike.meyer@kda.ks.gov>, Nathan D Sullivan <nsulliva@usgs.gov>, brokenbarh@yahoo.com, Rebecca Nichols - DNR <rebecca.nichols@state.co.us>

The Frontier Ditch went into submergence in excess of 70% for a time yesterday. The discharge for that period has been blocked from the web page. The **provisional** estimated daily discharge for July 27 is 36.8 cfs.

Lori Marintzer

Hydrologic Technician

USGS, WRD

Hays, Kansas

[785-760-4419](tel:785-760-4419)

On Thu, Jul 20, 2017 at 11:34 AM, Marintzer, Lori <lshill@usgs.gov> wrote:

Late yesterday afternoon the Frontier Ditch went into submergence in excess of 70%. The discharge data on the web has been turned off. The corrected discharge as of 0800 hours this morning was 36 cfs.

When the submergence falls below 70% the discharge will be turned back on.

Thank you,

Lori

Lori Marintzer

Hydrologic Technician

USGS, WRD

Hays, Kansas

[785-760-4419](tel:785-760-4419)

Attachment 2

AOS Report

December 1, 2017

This page is intentionally left blank.

Water Issues Matrix

Pending JMR Accounting Issues	3
10 – Resolved.....	3
11 – Removed.....	3
12 – Suspended -- Consideration of new sources for permanent pool water – remaining Muddy Creek Storage Right / Keesee (<i>See Issue 14 for current proposal</i>)	3
13 – Removed.....	3
14 – Consideration of new sources for permanent pool water – Highland Canal	4
20 – Resolved.....	5
21 – Resolved.....	5
22 – Criteria for determining Section III storage under the Pueblo Winter Water Storage Program (PWWSP).....	5
23 – Resolved --Reporting of Winter Water vs. Winter Compact storage split calculation	6
24 – Incorporated into Issue 60 – Utilization of “Summer storage season” as defined by the 1980 Operating Plan.....	7
25 – Criteria for Summer storage event trigger – Section II. B 1	7
26 – Removed -- Section II limitations on use made of account water to irrigation only	7
27 – Resolved -- First reference to Section II in Section III (A)	7
30 – Resolved.....	7
31 – Resolved.....	7
32 – Resolved.....	7
33 – Resolved -- Transit loss on reservoir-to-reservoir deliveries.....	7
40 – Resolved.....	7
41 – Resolved.....	7
42 – Resolved.....	7
43 – Resolved.....	7
44 – Suspended -- City of Lamar regulating account	8
45 – Colorado Multipurpose Account	8
50 – Commencement of a spill event.....	9
51 – Resolved.....	9
52 – Criteria for exercise of Post-Compact Rights including Upstream Storage	10
53 – Adjusted JMR inflows during times of spill.....	11
54 – Resolved.....	11
55 – Allocation of waters, if any, not covered by the Arkansas River Compact between Colorado and Kansas.....	11
60 – Section II(C) (2) compliance (Agreement B)	12
61 – Resolved.....	13
62 – Resolved.....	13
63 – Removed.....	13
64 – Resolved.....	13
65 – Removed.....	13
66 – Resolved.....	13
67 – Resolved.....	13
70 – Suspended -- Trinidad Reservoir: Passing of inflows exceeding 1,000 cfs.....	13

Notes on Water Issues Matrix.....	14
Resolutions.....	14
Versions	15

Pending JMR Accounting Issues

10 – Resolved -- Permanent Pool evaporation charges calculated by pro rata volume vs. incremental area
11 – Removed -- Transfer of Account water to Permanent Pool during flood control operations in JMR

12 – Suspended -- Consideration of new sources for permanent pool water – remaining Muddy Creek Storage Right / Keesee (See Issue 14 for current proposal)	
<i>ARCA Committee</i>	Engineering
<i>Issue Category & Priority</i> ¹	B – 8
<i>Legal</i> ² – <i>Policy</i> ³ – <i>Technical</i> ⁴	Policy
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
<i>ARCA Committee or other general comment(s)</i>	
Related to transfer of the remaining Muddy Creek Storage Right proposal: ▪ In June 2012, Grady McNeill suggested that they would bring a proposal to transfer the remaining 8,425 AF to the JMR permanent pool ▪ In October 2012, Grady McNeill forwarded a proposed resolution to transfer the remaining portion ▪ On 14 November 2012, CO Div 2, John Tonko, and KS DWR staff visited the Muddy Creek Reservoir, Muddy Creek and Rule Creek gage sites ▪ December 2012: xxx Related to the Keesee proposal: ▪ LAWMA made a conceptual proposal at the December 2005 ARCA Annual Meeting ▪ LAWMA provided additional detail for this proposal in February 2007 ▪ Informal discussion between Kansas, LAWMA and Colorado ▪ A timeline for discussion between Kansas & LAWMA was established at 2007 ARCA Annual meeting. ▪ David Barfield letter (26 December 2007) ▪ Matt Heimerich letter (January 7, 2008) ▪ David Barfield provided a list of discussion items (email Jan 18, 2008) ▪ Discussion between Barfield & Heimerich on proposal (call Feb 5, 2008) ▪ Email from Matt (Feb 5, 2008) to Colorado team / Barfield agreed to provide a list of LAWMA Colorado Water Rights for use as a source for the permanent pool ▪ LAWMA withdraws its request by letter dated (letter July 1, 2008) ▪ LAWMA has an obligation to provide a source of water for the JMR Permanent Pool, so this issue remains active ▪ David Barfield provides to Matt Heimerich principles that would guide Kansas evaluation (letter dated Nov 25, 2008)	

13 – Removed -- 1980 Operating Plan's Restriction on use of Section III related to Perm Pool

¹ Categories: **A** – capable of resolution; **B** – may need to be addressed by an ARCA Committee other than Operations; and **C** – staffs have taken this issue as far as they can. The priority based on two groupings “A” issues and “B & C” issues. From memos dated 5 Feb 2004 and 19 August 2004 (Witte & Rude)

² **Legal** is defined as an issue that is not resolvable at this time or within ARCA

³ **Policy** is defined as an issue that needs to have input or guidance from either Operations Committee or ARCA

⁴ **Technical** is defined as an issue that can be resolved by the respective State staffs

14 – Consideration of new sources for permanent pool water – Highland Canal	
ARCA Committee	Engineering
Issue Category & Priority	B – 8
Legal – Policy – Technical	Policy
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
	Of these three reasons [provided in the Barfield letter of December 4, 2015], only the first is substantive. 1. Condition 2 of Appendix A.4 to the Final Decree entered in <u>Kansas v. Colorado</u>, U.S.C. No. 105 Original as amended June 2009 contains several exceptions to the obligation <u>to deliver water to the Offset Account to replace their depletions to usable Stateline flow. In consideration of the substantial Compact delivery credit it is apparent that this objective has been more than satisfied. “Accordingly, to the extent Keesee and/or Highland water rights are not needed to replace depletions to usable Stateline flow</u> LAWMA shall not be required to deliver these water rights to the Offset Account.” 2. Colorado rejects the suggestion that resolution of Kansas’ concerns related LAWMA decree is a precondition to approval of additional sources for the Permanent Pool. 3. The 2015 CPW Highland proposal acknowledges the need for an additional change of the Highland water rights and such a change will undoubtedly occur, but it makes little sense for anyone to assume the expense of a water court change case without some assurance that the change, once decreed, can be effected.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
<i>ARCA Committee or other general comment(s)</i>	
Issues related to Highland Canal proposal: ▪ LAWMA made a conceptual proposal at the December 2014 ARCA Annual Meeting ▪ Colorado Parks & Wildlife provided a proposal to use Highland Canal via email of 11 November 2015 from Brett Ackerman ▪ The United States Army Corps of Engineers issued a letter in support of a proposal dated December 2, 2015 ▪ Referred to the Special Engineering Committee at the 2015 ARCA Annual meeting ○ Discussed at meetings of the SEC and technical experts during 2016 ○ JMR perm pool spreadsheet model was developed to aid in evaluation of perm pool operations under improved water supply conditions ○ A temporary agreement was signed on 3/23/2017 and will expire on March 31, 2018	

20 – Resolved -- Winter Water Account of convenience

21 – Resolved -- Timely distribution of Section III storage charge during Pueblo Winter Water Storage Program (PWWSP)

22 – Criteria for determining Section III storage under the Pueblo Winter Water Storage Program (PWWSP)

<i>ARCA Committee</i>	Operations
<i>Issue Category & Priority</i>	A – 4
<i>Legal – Policy – Technical</i>	Legal 1 st / Technical 2 nd
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
The criterion used by Colorado fails to adhere to what was established under the 1980 Operating Plan, specifically: “The Amity may store such water as it could otherwise divert from the Arkansas River for storage in the Great Plains Reservoir system ...” (Section III.A.) and for the Fort Lyon and Las Animas Consolidated they may deliver water under the PWWSP but “the delivery cannot include water that otherwise would have accumulated in conservation storage” (Sections III.B. and C.).	The criteria used to divide inflow to JMR into conservation storage/Section III is not provided in the 1980 Operating Plan, but has been continuously used. Since KS did not prove PWWSP caused injury, CO is reluctant to change.

<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
ARCA should establish criteria for determining the water available for Section III storage in JMR to protect inflows to conservation storage. Water delivered to JMR under the PWWSP should not include water that otherwise would have accumulated in conservation storage. In 2007, a snowpack covered SE Colorado that would have prevented direct irrigation. This snowpack may have impacted off-channel storage as well. In 2008, 2009, & 2010, drops in flow between November 14th and 15th on the Purgatoire River near Las Animas appear to be related to the Las Animas Consolidated operations were noted. In reviewing the flow history of this gage site, there appears to be other occurrences prior to 2008. In response to noting the flow drops, the Las Animas Consolidated was visited with Division 2 staff in Nov 2010. We didn't observe any significant returns to the Purgatoire above the USGS gage, nor did we note any other significant returns to the Ark River below the Ark River at Las Animas gage. Additional visits with Colorado Div 2 staff in November, 2011 & 2013 have occurred: we found returns below the Ark @ Las Animas gage consistent with irrigation operations and the wasteway above the Purgatoire River at Las Animas gage not being used during our visits. In November 2011, Salter developed a spreadsheet to gage impacts of changes to the Ark @ Las Animas split between the Compact and PWWSP. In November 2012, we scheduled a visit to the Consolidated but didn't visit given the hydrologic conditions, dry Purgatoire River at the USGS gage and no water being used east of the highway as noted as we traveled to the breached Muddy Creek Reservoir site. {In November 2015 Colorado reported diversions in excess of irrigation requirements by the Las Animas Consolidated and proposed corresponding adjustment to base flows corresponding to estimated returns. – language provided by Steve Witte on 2/19/2016} In October 2016, Colorado provided the first draft documenting procedures/guidelines for the split ratio between Compact Storage and the PWWSP	Kansas has identified this issue as a justification for withholding approval of the annual Reports of the Operations Secretary. As a possible means of resolving this issue, Colorado has proposed documentation of procedures to be used to allocate inflow to John Martin Reservoir between conservation storage and Section III storage each year, including adjustments necessary to address foreseeable contingencies. However, progress on the completion of such documentation has been hampered by the fact that Kansas has not indicated whether this effort might be considered as a sufficient basis for resolution of the issue or worthy of justifying approval of future reports of the Operations Secretary.
<i>ARCA Committee or other general comment(s)</i>	
The Operation Secretary and the Assistant Operation Secretary should continue to work on this issue (10 May 2002).	

24 – Incorporated into Issue 60 – Utilization of “Summer storage season” as defined by the 1980 Operating Plan

25 – Criteria for Summer storage event trigger – Section II. B 1	
ARCA Committee	Operations Committee
Issue Category & Priority	na
Legal – Policy – Technical	technical
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
ARCA needs to address Section II. B (1) with respect to determination of “existing irrigation requirements” for ditches that no longer engage in irrigation. Also the criteria related to how the 1,000 AF over then existing irrigation requirements is applied.	Colorado law defines the extent of a water right based on historical use. Water rights submitted for adjudication of changed uses must meet standard of non-injury to other water users. This issue may be resolved by striking the word “irrigation” from the phrase quoted at left. The 1980 Operating Resolution should also be amended to add the words “per day” to follow “1000 AF”, to resolve the second concern
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
In general, this appears to be primarily a technical issue and we need to discuss the mechanics of how to quantify the “then existing irrigation requirements.” This issue does have some relationship with Issue 26	See February 27, 2007 position paper drafted for the Special Engineering Committee by Steve Witte. Steve has updated this position paper, but may not have distributed.
<i>ARCA Committee or other general comment(s)</i>	

26 – Removed -- Section II limitations on use made of account water to irrigation only

27 – Resolved -- First reference to Section II in Section III (A)
--

30 – Resolved -- Determination of transit loss under Section II(E)(4)
--

31 – Resolved -- Sections II (E)(4) and III (D) are unclear as to where transfers to make up deficits should be made

32 – Resolved -- How should transit loss account be used?
--

33 – Resolved -- Transit loss on reservoir-to-reservoir deliveries

40 – Resolved -- Exchange of daily reservoir status accounting

41 – Resolved -- Non-reporting of Section II(C)(1) determinations
--

42 – Resolved -- Summer season interruption of transfers from conservation storage to accounts

43 – Resolved -- Winter storage period interruption of transfers from summer conservation storage to accounts
--

44 – Suspended -- City of Lamar regulating account	
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
[Kansas is considering conditions that would allow the temporary regulation storage]	City of Lamar requested a permanent account at December 2006 meeting of ARCA. Matter referred to the Engineering Committee.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
The City of Lamar should propose an account in JMR to allow for the re-regulation of flows from other releases. Consideration should be given to conditions contained in the minutes of 1989 ARCA Annual meeting and Kansas comments from ARCA Special Meeting May 2002.	An engineering proposal describing proposed operations was provided to the Engineering Committee in December 2007. It is suggested that this matter should be tabled indefinitely as the concept of a multipurpose Colorado account is explored. (See Matrix Issue #45 below)
<i>ARCA Committee or other general comment(s)</i>	
▪ 2006: City of Lamar renewed their request at the December 2006 ARCA Annual Meeting / ARCA referred to Engineering Committee / ▪ 2007: engineering report provided in December 2007 ▪ 2008: Colorado and Kansas provided comments on the City of Lamar's proposal in Dec 2008. This issue appeared to be dropped after these comments. ▪ 2013: With the river conditions experienced this year, the City through their attorney contacted Kansas about using a temporary account in John Martin Reservoir. Kansas is considering conditions that would allow the temporary regulation storage.	

45 – Colorado Multipurpose Account	
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
Kansas is reviewing the Phase I report provided by Jack Goble, LAVWCD, by email of November 03, 2017.	Colorado would like to engage in a dialogue with Kansas regarding creation of an account in John Martin which could be utilized by various entities for a variety of purposes with appropriate conditions to protect Kansas' interests and which recognizes the potential benefits to both states.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
<i>ARCA Committee or other general comment(s)</i>	
▪ Jack Goble, LAVWCD, provided an initial (Phase I) report by email on November 03, 2017	

50 – Commencement of a spill event	
ARCA Committee	Full ARCA
Issue Category & Priority	C – 6a
Legal – Policy – Technical	Policy
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
The language places the event on the physical operation of the projects control structure and not on the elevation of the water surface or some other trigger. Colorado's timing of spill accounting is not suggested in the governing language.	Compact Article IV C (3) provides that the conservation pool will be operated for the benefit of water users in CO and KS...as provided by the Compact. See also, Art. IV C (2).
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
Rely on the physical operations of the project control structure to govern the loss of account water. No change to the language is required, unless clarifying language is desired.	Kansas' position ignores Corps of Engineers exclusive authority to determine flood control releases when JMR surface elevation rises into flood pool space. Contrary to express language of 1980 Operating Plan, water does not "spill physically over the project's spillway" during flood operations. Flood releases are normally made through the outlet works.
<i>ARCA Committee or other general comment(s)</i>	
OS recommendation 12/08/03: amend Section II G of 1980 Operating Resolution to clarify criteria defining the commencement of spill.	
Operations recommended moving this issue to Full ARCA. (14 December 2004)	
Moved to Special Engineering Committee pursuant ARCA 2005-01.	
51 – Resolved -- Spilling accounts	

52 – Criteria for exercise of Post-Compact Rights including Upstream Storage	
<i>ARCA Committee</i>	Administrative & Legal
<i>Issue Category & Priority</i>	B - 10
<i>Legal – Policy – Technical</i>	Legal
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
Upstream storage is not in priority until Section II accounts is completely spilled.	Compact not intended to impede use of water by either state if no material depletion of useable quantity or availability results under the compact. Apportionment of water not allocated by the Arkansas River Compact may be negotiated by ARCA. Colorado believes that it is important to expand the scope of discussion beyond just the criteria that can be used to justify storage in existing reservoirs, but also to include the exercise of other Post-Compact uses of water.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
Discontinue the practice until authorized by resolution of ARCA.	See earlier exchange of letters between Mr. Simpson and Mr. Pope on this issue. There seems to be agreement by both states that one necessary condition is that John Martin Reservoir must be spilling. Previously, Colorado also imposed an additional condition that water must be physically flowing unused past Garden City, KS before post-Compact reservoirs in Colorado were allowed to store. This two pronged rubric has also been applied with respect to post-1985 uses in Appendix J. 2 to the final decree in KS v CO. However, in light of the level of un-replaced municipal and irrigation pumping depletions that continue to occur from the alluvial aquifer of Hamilton and western Kearney counties and published average water level declines from the High Plains aquifer underlying the Arkansas River in eastern Kearney and western Finney counties which exceeded 15 ft during the period 2000-2005, it is asserted that Kansas' post-Compact well uses are creating circumstances that will have an adverse impact on Colorado's entitlement to exercise its post-Compact water rights if both of these conditions are satisfied before post-Compact uses in Colorado are allowed.
<i>ARCA Committee or other general comment(s)</i>	
OS recommendation 12/08/03: Operations Committee should refer this issue to the Administrative and Legal Committee.	
Operations Committee transferred this issue to the Administrative and Legal Committee by memo dated 8 October 2004.	

53 – Adjusted JMR inflows during times of spill	
<i>ARCA Committee</i>	ARCA
<i>Issue Category & Priority</i>	C – 6c
<i>Legal – Policy – Technical</i>	Policy*
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
The 1980 Operating Plan does not provide for these adjustments. *Only can be resolved if 52 is resolved	Adjustments to inflow are necessary to account for the effect of post-compact upstream storage during the period that JMR is spilling.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
Discontinue the practice until authorized by resolution of ARCA.	Inappropriate accounting related to conservation storage balances jeopardizes entitlements afforded by Compact Article V (f)
<i>ARCA Committee or other general comment(s)</i>	
OS recommendation 12/08/03: Operations Committee should table this matter until issue #52 is resolved.	
Operations recommended moving this issue to Full ARCA. (14 December 2004)	
Moved to Special Engineering Committee pursuant ARCA 2005-01.	

54 – Resolved -- Section II spill volume during summer storage season

55 – Allocation of waters, if any, not covered by the Arkansas River Compact between Colorado and Kansas	
<i>ARCA Committee</i>	
<i>Issue Category & Priority</i>	
<i>Legal – Policy – Technical</i>	
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
<i>ARCA Committee or other general comment(s)</i>	

60 – Section II(C) (2) compliance (Agreement B)	
ARCA Committee	Administrative & Legal
Issue Category & Priority	B – 9
Legal – Policy – Technical	Legal
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
District 67 priority calls under pre-JMR conditions are to occur when conservation storage is exhausted into accounts. Colorado does not comply with this requirement of the 1980 Operating Plan. Summer storage season: The 1980 Operating Plan defines the "Summer storage season shall be the period of time commencing at the first exhaustion of conservation storage and continuing to and including the next succeeding October 31."	Agreement B is a separate document, not part of the 1980 Operating Plan, whereby Colorado water right owners agreed to subordinate certain aspects of their entitlement to enforce the priority of their water rights and is entirely consistent with administration of the priority system in Colorado. This issue is not properly before the Operations Committee. Summer storage season: Colorado agrees that Kansas has accurately stated the definition of "Summer Storage Season" as defined in Section I. B of the 1980 Operating Plan.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
Operate according to the 1980 Operating Plan as written or propose changes to the plan for consideration by the administration. Summer storage season: The 1998 Operations Secretary's Annual Report notes that the Operations Secretary deviate from ...[Kevin, I don't think this is an accurate statement as I went back and checked and couldn't find any such statement. Rephrase? – Steve Witte on 2/19/2016]	Agreement B has been deemed to be necessary to maintain the respective benefits of JMR between Colorado water rights above and below JMR granted under the Compact. It is not inconsistent with the Compact, the 1980 Operating Plan, or administration by Colorado of its priority system. In consideration that Kansas has complained that Colorado has defined summer stored water in Agreement B differently than water stored during the "Summer Storage Season" as defined in the 1980 Operating Resolution (See Matrix Issue #24 above) and the accounting of the Operations Secretary which included information resulting from that inconsistent definition, that practice was discontinued after the Annual Report of the Operations Secretary for Compact Year 2001. Summer storage season: This is an aspect of Kansas' complaint regarding Agreement B (Issue # 60), not a separate issue and therefore should be consolidated with that issue and this issue should be removed.
<i>ARCA Committee or other general comment(s)</i>	
OS recommendation 12/08/03: Committee should refer this matter to the Administrative and Legal Committee with a recommendation that no further consideration be given to this issue. Operations Committee transferred this issue to the Administrative and Legal Committee by memo dated 8 October 2004. Moved to Special Engineering Committee pursuant ARCA 2005-01.	

61 – Resolved – Retroactive adjustments of accounting for prior years if accounting methods are revised
62 – Resolved -- OS Report status for 1994 through 2006
63 – Removed -- Status of Assistant Operations Secretary Reports: 1998, 1999, 2000, 2001 & 2002
64 – Resolved -- Assistant Operations Secretary Reports: purpose and timeliness
65 – Removed -- Consider Moving Date of Annual Meetings to January or February
66 – Resolved -- Need for definite process for introducing and resolving operational issues
67 – Resolved -- When issues are resolved, is it in the form of separate resolutions and /or revisions to the 1980 Operating Plan?

70 – Suspended -- Trinidad Reservoir: Passing of inflows exceeding 1,000 cfs	
<i>ARCA Committee</i>	Operations
<i>Issue Category & Priority</i>	
<i>Legal – Policy – Technical</i>	
<i>Kansas Staff Position</i>	<i>Colorado Staff Position</i>
Releases exceeding 1,000 cfs should be passed as soon as possible, up to the channel capacity called for.	December 3, 1999 letter from Hal Simpson to USBR includes revised ‘Criteria for Temporary Detention and Subsequent Release of Flood Flows Below Flood Control Capacity...’ recognizes a 3000 cfs ‘non-damaging flow’ constraint directed by the Corps of Engineers by letter dated April 16, 1993. By letter dated January 12, 2011, the Corps requested the Colorado State Engineer to continue to use this criteria.
<i>Kansas Staff Comments</i>	<i>Colorado Staff Comments</i>
Inflows to Trinidad Reservoir exceeded 1,000 cfs on two separate occasions in August 2004. Those releases should have been passed through the reservoir and may have triggered a summer storage event at John Martin Reservoir. This issue should remain on the matrix until the ability to pass flows above 1,000 cfs is confirmed using the secondary gage. The concern is related to impacts to Compact conservation storage and/or downstream water users if flows above 1,000 cfs cannot be passed through Trinidad Reservoir.	The Water Commissioner requested that the release of these inflows be made: beginning at 1,000 cfs on Friday afternoon, August 6, 2004. He requested that the release be increased to 1,500 cfs on Saturday afternoon. The Corps rating curve for a downstream gage had a maximum release of 1,000 cfs. There is no controversy at issue between the states. Furthermore, ARCA has no authority to determine the non-damaging flow below Trinidad Reservoir. Therefore, this matter should be removed from the matrix.
<i>ARCA Committee or other general comment(s)</i>	
A letter was received from the Corps, dated 1 Nov 2004. This letter explains the events in August and steps that have been and will be taken to assure these releases will be passed in the future. Moved to Special Engineering Committee pursuant ARCA 2005-01. Channel capacity study for the Purgatoire River below Trinidad Reservoir through Trinidad, Colorado, has been undertaken in 2008. The key findings of the final report are listed in the January 12, 2011 letter cited above.	

Notes on Water Issues Matrix

Resolutions:

- ❖ ARCA Adopted Resolution 2006-01 (John Martin Reservoir Permanent Pool Evaporation Method) on 12 Dec 2006 based on ARCA Special Engineering Committee Recommendation A
- ❖ ARCA Adopted Resolution 2006-02 (Winter Water and District 67 Winter Water Storage Charge Holding Accounts in John Martin Reservoir) on 12 Dec 2006 based on ARCA Special Engineering Committee Recommendation B
- ❖ ARCA Adopted Resolution 2006- 03 (Transfer of Conservation Storage to Section II Accounts
- ❖ under the 1980 Operating Plan) on 12 Dec 2006 based on ARCA Special Engineering Committee Recommendation C
- ❖ ARCA Adopted Resolution 2006-04 (Section II Account Spill Volume) on 12 Dec 2006 based on ARCA Special Engineering Committee Recommendation D
- ❖ For Issues #31 and 32, ARCA Special Engineering Committee Recommendation E addresses clarification of the 1980 Operating Plan for these two issues.
- ❖ City of Lamar was expected to submit at the May (?) ARCA meeting a resolution for a regulating account in JMR.
 - Colorado indicated that this issue has been tabled indefinitely
 - LAWMA & DOW made presentation at December 2005 ARCA Annual Meeting
 - December 2006 ARCA referred renewed request to Engineering Committee
- ❖ [may need to update this section with ARCA resolutions and ARCA SEC recommendations that have resolved or otherwise dealt with matrix issues]
- ❖ Issues 27 & 33 resolved by ARCA Resolutions 2016-01 (ARCA SEC Recommendation H) & 2016-02, respectfully
- ❖

Versions	Modification Date	Description of Modification(s)
		Issues #32 & 67 were added 24 October 2003 at a meeting between State staffs
2002issues_table09b.doc	14 June 2004	Incorporate changes suggested by Steve Witte as transmitted by email dated 21 Jan 2004. Change issue status based on Joint categorization document dated 5 Feb 2004; made formatting and grammatical changes.
2005issues_table09c.doc	19 August 2004 12 Nov 2004 19 April 2005	-- Add a Trinidad Issues category. Specifically, Issue #70, the passing of inflows exceeding 1,000 cfs. -- Show Issue 52 & 60 as being transferred to the Admin & Legal Committee. -- add Issue #13 & 24 (19 April 2005), make formatting changes to table, adjust according to 19August 2004 Joint Prioritization memo, rename columns combining Legal, Policy & Technical and adding ARCA Committee and issue categorization
2005issues_table09d_letter.doc	20 April 2005	-- Changed format to 8-1/2 by 11 inch and reorganize sections -- Add actions taken at ARCA CY2004 Annual meeting
2006issues_table09d_letter.doc	11 December 2006	-- Add actions proposed by the ARCA Special Engineering Committee (created by ARCA Resolution 2005-01) on Issues 10, 20, 21, 30, 32, 42, 43 & 54.
2006issues_table10a_letter.doc	18 December 2006	-- Add ARCA actions taken at the 2006 ARCA Annual meeting -- Remove issues resolved by ARCA accepting Special Engineering Committee recommendations
2006issues_table10b_letter.doc	19 December 2006	-- Steve Witte offered suggestions for modifications in conference call with Kevin Salter on this date.
2007issues_table10bb_letter.doc	11 April 2007	-- working draft -- added Issue #25 & 26 according to the Operations Committee instructions -- added ARCA Resolutions information -- added ARCA Special Engineering Committee Recommendations on 31 & 32
2007issues_table10c.doc	1 December 2007	-- added Table of Contents -- modified according to 19 Nov OS-AOS meeting
2008issues_table10d.doc 2008issues_table10e.doc	1 December 2008	-- updated issues / Recommendation G / added City of Lamar / removed resolved issue(s)
2009issues_table11a.doc	22 December 2008	-- added reservoir-to-reservoir delivery issue -- updated issues / ARCA resolution adopting Recommendation G
2010issues_table11c.doc	17 September 2010	-- added Issue 27 (Section III.A language) -- updated Issue 33 positions & comments
2011issues_table11d.doc	25 November 2011	-- update 22 & 33 language
2012issues_table11d.doc	26 November 2012	-- update 12 language
2013issues_table11d.docx	14 November 2013	-- Modify language related to Kansas' positions on several pending issues

Versions	<i>Modification Date</i>	<i>Description of Modification(s)</i>
2013issues_table11d-3.docx		-- Colorado modified language in 14, 22, 26, 27, 33, 44, 45, 52, & 70 -- Issue 45 added to matrix
2013issues_table11e.docx	7 December 2016	
2016issues_table 12a.docx	12 November 2017	-- Removed issues resolved by ARCA resolution and incorporated Issue #24 into Issue #60 -- Added Issue #55
Created an associated separate document with the documentation related to those issues resolved, removed, and template		

Water Issues Matrix Summary Table

Version Date : 12/01/2017

Issue #	Description	April 2005	Pending	Suspended	Removed	Resolved	ARCA Resolution	Comment
38	Totals	32	9	3	5	20		
10	Permanent Pool evaporation charges calculated by pro rata volume vs. incremental area	X				X	2006-01	Special Engineering Committee Recommendation A
11	Transfer of Account water to Permanent Pool during flood control operations in JMR	X			X			
12	Consideration of new sources for permanent pool water	X		X				In 2012, CDOW has proposed using the remaining portion of the Muddy Creek storage rights
13	1980 Operating Plan's Restriction on use of Section III related to Perm Pool	X			X			Steve Witte will review this to determine if it is still an issue.
14	Consideration of new sources for permanent pool water -- Highland Canal	X	X				2017-01	Temporary agreement for 2017
20	Winter Water Account of convenience	X				X	2006-02	Special Engineering Committee Recommendation B
21	Timely distribution of Section III storage charge during Pueblo Winter Water Storage Program (PWWSP)	X				X	2006-02	Special Engineering Committee Recommendation B
22	Criteria for determining Section III storage under the Pueblo Winter Water Storage Program (PWWSP)	X	X					
23	Reporting of Winter Water vs. Winter Compact storage split calculation	X				X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
24	Utilization of "Summer storage season" as defined by the 1980 Operating Plan	X						Incorporated this issue into #60
25	Criteria for Summer storage event trigger -- Section II.B 1		X					Placed on matrix in April 2007
26	Section II limitations on use made of account water to irrigation only				X			Placed on matrix in April 2007 / not currently before the Special Engineering Committee
27	First reference to Section II in Section III A appears to be inappropriate					X	2016-01	Special Engineering Committee Recommendation H
30	Determination of transit loss under Section II(E)(4)	X				X		Resolved pursuant to an Agreement between State & Chief Engineers (December 2006).

Water Issues Matrix Summary Table

Version Date : 12/01/2017

Issue #	Description	April 2005	Pending	Suspended	Removed	Resolved	ARCA Resolution	Comment
31	Sections II (E)(4) and III (D) are unclear as to where transfers to make up deficits should be made	X				X	2007-05	Subject of Special Engineering Committee Recommendation E to be considered at the 2007 ARCA Annual meeting.
32	How should transit loss account be used?	X				X	2007-05	Subject of Special Engineering Committee Recommendation E to be considered at the 2007 ARCA Annual meeting.
33	Transit Loss on Reservoir-to-reservoir deliveries (e.g., deliveries of transmountain water to permanent pool)					X	2016-02	
40	Exchange of daily reservoir status accounting	X				X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
41	Non-reporting of Section II(C)(1) determinations	X				X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
42	Summer season interruption of transfers from conservation storage to accounts	X				X	2006-03	Special Engineering Committee Recommendation C
43	Winter storage period interruption of transfers from summer conservation storage to accounts	X				X	2006-03	Special Engineering Committee Recommendation C
44	City of Lamar regulating account	X		X				City of Lamar requested consideration in 2013 / Kansas considering
45	Colorado Multipurpose Account		X					
50	Commencement of a spill event	X	X					
51	Spilling accounts	X				X	2007-06	Subject of Special Engineering Committee Recommendation F to be considered at the 2007 ARCA Annual meeting.
52	Criteria for exercise of Post-Compact Rights including Upstream Storage	X	X					
53	Adjusted JMR inflows during times of spill	X	X					
54	Section II spill volume during summer storage season	X				X	2006-04	Special Engineering Committee Recommendation D
55	Allocation of waters, if any, not covered by the Arkansas River Compact between Colorado and Kansas		X					Added November 2017

Water Issues Matrix Summary Table

Version Date : 12/01/2017

Issue #	Description	April 2005	Pending	Suspended	Removed	Resolved	ARCA Resolution	Comment
60	Section II(C)(2) compliance (Agreement B)	X	X					
61	Retroactive adjustments of accounting for prior years if accounting methods are revised	X				X	2008-03	Special Engineering Committee Recommendation G
62	OS Report status for 1994 through 2006	X				X	2008-03	Special Engineering Committee Recommendation G
63	Status of Assistant Operations Secretary Reports: 1998, 1999, 2000, 2001 & 2002	X			X			
64	Assistant Operations Secretary Reports: purpose and timeliness	X				X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
65	Consider Moving Date of Annual Meetings to January or February	X			X			Moved from removed to resolved in recognition of By-laws change (Sept 2011) which allows meeting date changes
66	Need for definite process for introducing and resolving operational issues	X				X		See Joint Recommendations as transmitted by Operations Committee letter dated 19 August 2004.
67	When issues are resolved, is it in the form of separate resolutions and /or revisions to the 1980 Operating Plan?	X				X		Process has been established to address resolution of issues as they were resolved.
70	Trinidad Reservoir: Passing of inflows exceeding 1,000 cfs	X		X				