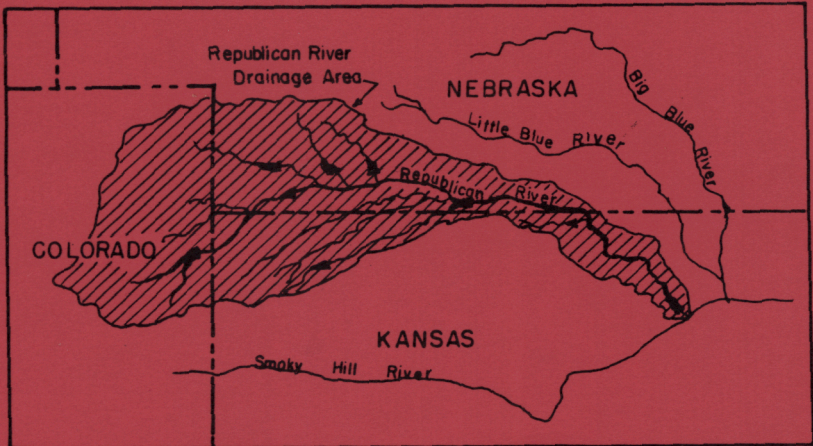


# REPUBLICAN RIVER COMPACT ADMINISTRATION

## TWENTY-EIGHTH ANNUAL REPORT

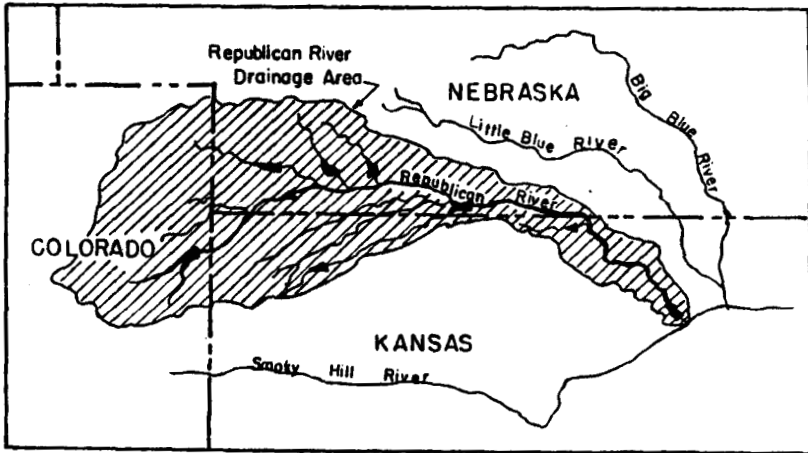


For The Year 1987

Kansas City, Kansas  
July 7, 1988

# REPUBLICAN RIVER COMPACT ADMINISTRATION

## TWENTY-EIGHTH ANNUAL REPORT



For The Year 1987

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Kansas City, Kansas

July 7, 1988

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## TWENTY-EIGHTH ANNUAL REPORT

### REPUBLICAN RIVER COMPACT ADMINISTRATION

In conformity with the Rules and Regulations of the Republican River Compact Administration, the Twenty-Eighth Annual report is submitted as follows:

1. Pursuant to Rule 12, as amended, this report covers the period from July 9, 1987 to July 7, 1988.
2. Members of the Republican River Compact Administration are the officials of each of the states who are charged with the duty of administering the public water supplies, and are as follows:

Jeris A. Danielson, State Engineer, Colorado

Michael Jess, Director, Department of Water Resources, Nebraska

David L. Pope, Chief Engineer-Director, Division of Water Resources, State Board of Agriculture, Kansas

3. The Twenty-Ninth Annual Meeting of the Administration was held on July 7, 1988, at Kansas City, Kansas. The minutes of the meeting are included in this report.
4. During the period covered by this report, one meeting of the Engineering committee was held. A report from that committee together with summary tabulations of the computed annual water supply and consumptive use for the 1987 water year in the Republican River Basin were presented and accepted by the Administration and are included in this report.
5. Reports were received from the Bureau of Reclamation and the U.S. Geological Survey on operation and administration of their projects in the basin of the Republican river.
6. Michael Jess, Nebraska member of the Administration, will serve as Chairman from July 1988 to July 1989.

MINUTES  
29th ANNUAL MEETING  
REPUBLICAN RIVER COMPACT ADMINISTRATION

The meeting was called to order by Chairman David L. Pope at 8:30 a.m. on July 7, 1988, in the Kansas State Executive Offices in Overland Park, Kansas.

Those in attendance were:

<u>Name</u>	<u>Agency</u>	<u>Location</u>
David L. Pope	Kansas Commissioner	Topeka, Kansas
Jeris A. Danielson	Colorado Commissioner	Denver, Colorado
Michael Jess	Nebraska Commissioner	Lincoln, Nebraska
Hal Simpson	Engineer Advisor	Denver, Colorado
Jerry Hilmes	Engineer Advisor	Topeka, Kansas
Bob Bishop	Engineer Advisor	Lincoln, Nebraska
Ann Bleed	Dept. of Water Resources	Lincoln, Nebraska
James Bagley	Div. of Water Resources	Topeka, Kansas
Russ Oaklund	Dept. of Water Resources	Cambridge, Nebraska
Bob Kutz	U.S. Bureau of Reclamation	Grand Island, Nebraska
Dennis Allacher	U.S. Bureau of Reclamation	McCook, Nebraska
Alan Berryman	Div. of Water Resources	Denver, Colorado
Lee Rolfs	Div. of Water Resources	Topeka, Kansas
Wayland Anderson	Div. of Water Resources	Topeka, Kansas
Glenn B. Engel	U.S. Geological Survey	Lincoln, Nebraska

Chairman Pope asked for introductions of staff members and persons in the audience.

#### Approval of Minutes

A motion was made by Commissioner Pope and seconded by Commissioner Danielson that minutes of the 28th Annual Meeting as previously circulated and approved be adopted. Motion passed.

#### Report of Chairman

Chairman Pope reported on drought related and other water activities that occurred in Kansas during the year. Pope advised the Governor had created an interagency task force that would be monitoring and reacting to the drought situation both at the state level and in the agricultural sector.

The legislature approved additional money to fund the implementation of new projects under the Kansas State Water Plan. Some of the projects will include cleanup of pollution sites, add recreational facilities at some federal reservoirs and acquisition of storage space in Cedar Bluff Reservoir. There was an attempt to amend and strengthen the states chemigation law. The bill failed but was referred to an interim study committee.

Bills were passed to establish a state revolving fund for waste-water treatment and to establish a stream aquifer restoration program. The legislature also passed a bill making water use reports mandatory and provides the Chief Engineer with administrative fine authority.

Pope reported the Kansas River Assurance District is a reality and its purpose is to optimize the utilization of storage in tributary reservoirs in the Kansas River basin.

The upper part of the Republican River basin along Prairie Dog, Sappa and Beaver Creeks continued to remain closed to any new appropriations of surface and ground water. This policy has been in effect for approximately 5 years.

Three sites have been selected in Kansas under the Federal High Plains Recharge Program. None are in the Republican River basin.

#### Commissioner Report

Commissioner Danielson reported that Colorado was within its allocations under the Republican River Compact in each of the sub-basins located in the state. The State Engineers office has reinstated a groundwater monitoring program in eastern Colorado. Current measurements show the average decline was less than 1 foot in the Ogallala Formation in northeastern Colorado.

Colorado has three project sites that were selected for the High Plains Recharge Program. Two of the projects are in the Republican River basin. One is the Frenchman District demonstration project and the second is in the Plains District near Burlington, Colorado.

Danielson said there was no legislation of major importance this year affecting the Republican River basin in Colorado. A reassessment of alluvial

wells under the Republican River Compact with respect to which wells are reported as well as the amount of water used has been initiated.

Commissioner Jess reported that few water resource-related matters were passed by the Nebraska legislature this year. One significant bill that passed was the provision for locating a low-level radioactive waste disposal site in Nebraska. Nebraska, along with Kansas, Oklahoma, Arkansas and Louisiana are compact members for disposal of low level radioactive waste. On a 4 to 1 vote, Nebraska was selected as host state for the compacts' first site. Jess noted there had been no significant changes in rules and regulations for groundwater withdrawals in the Upper Republican Natural Resource District control area located in Chase, Perkins, and Dundy Counties.

A proposal to transport water from the South Platte River into Enders Reservoir for supplemental water to users in Nebraska was denied last year by Jess. Promoters of the project appealed the decision to the Nebraska Supreme Court and the Court upheld Jess's decision.

A study of the Red Willow Irrigation District showed that nearly all of the permitted acreage was being actively irrigated. Jess advised that the Nebraska Department of Water Resources would complete studies on several more districts on the actual irrigation of lands covered by water appropriations. Nebraska was chosen to have two ground water recharge demonstration projects under the High Plains Recharge program. Neither are in the Republican River Basin.



Russell Oakland, Division Engineer reported that due to unusually dry conditions most junior appropriators had been regulated or shut down much earlier than last season and senior irrigators were being regulated per their allowed permits.

#### Reports of Federal Agencies

Dennis Allacher of the Bureau reported on 1987 operations in the Republican River basin. Rainfall varied from 104% of normal at Hugh Butler Dam to 166% of normal at Keith Sebelius Lake. All the irrigation districts received project water for the 2nd consecutive year. At the start of 1988 irrigation releases, most of the reservoirs were slightly below levels of a year ago. Harlan County Reservoir was one foot higher and Lovewell about three feet lower than usual at this time of the year. 1988 precipitation through June varied from 52% of normal at Lovewell to 115% of normal at Bonny Dam.

At the end of June 1988, water levels in Enders, Harry Strunk and Lovewell were the lowest ever. Swanson was lowest since 1979, Hugh Butler and Harlan County the lowest since 1981.

Bob Kutz reported on Bureau activities in the basin. Inspections were performed at all the Republican River basin dams during the year. Kutz said the Bureau was hopeful that legislative authority will change current water contracts to a water supply contract whereby the user will pay only for water received. He also noted that a large number of Washington personnel were being transferred to Denver offices.

Action taken by the Bureau to start collecting a portion of O & M costs from the Kansas and Nebraska Bostwick Irrigation Districts has been appealed and currently is in litigation.

Glenn Engel of the U.S. Geological Survey presented an overview on the water monitoring programs that the USGS assists in funding in the basin. He indicated there were approximately 20 surface water stations and a large number of groundwater observation wells in which funding assistance is provided for under the federal program.

#### Report of Engineering Committee

Robert Bishop, chairman of the Engineering Committee, gave the engineering committee report which is included in the 28th Annual Report. The computed consumptive use for water year 1987 showed that in Kansas the consumptive use exceeded the adjusted allocations in Prairie Dog and Beaver Creek sub-basins. In Nebraska, consumptive use exceeded adjusted allocations in the Sappa, Medicine, Red Willow, Beaver and Driftwood Creek sub-basins. The computed Virgin Water Supply and Consumptive Use for the 1987 water year are shown in Exhibit B of the report. Other assignments given to the Committee (Exhibit A) were addressed and completed and are included as Exhibits C, D, and E.

Hal Simpson reported on available alluvial groundwater observation wells in the Beaver Creek sub-basin in Nebraska and Kansas. The Administration requested the information to determine if sufficient data are available to compute change in groundwater storage in the sub-basin. There are approximately 16 observation wells in the more than 100 mile reach of the stream, 4 in Nebraska and 12 in

Kansas. The Engineering Committee recommended one well per section would be needed to obtain reliable groundwater data to compute change in the groundwater storage.

Commissioner Jess moved the Engineering Committee Report be accepted. Danielson seconded. Motion Passed.

#### Unfinished Business

Chairman Pope expressed concern on behalf of the State of Kansas about long term depletions that are occurring in the Republican River Basin; alternatives for effective administration under the Compact in the event water shortages occur; the methodology used in computing consumptive use, virgin water supply and adjusted allocations; and, how to deal with the present situation of consumptive uses exceeding adjusted allocations in a number of the compact sub-basins. Pope reviewed past discussions on these matters and expressed hope that the Administration would come to some conclusions on how to deal with these issues.

Pope said he would like the Administration recognize the basic philosophy of the Compact which in his opinion provides for a share of shortages and surpluses under Article III. Pope stated that he hoped an enforceable administrative procedure under Article IX could be developed that would insure each state an equitable portion of water to which it is entitled.

Commissioner Jess suggested that rather than trying today to vote on a motion or motions on the issues brought forth, that Kansas submit a written

proposal for review by the Administration. Jess indicated he was not prepared to vote on any proposals that might be offered at this moment in time.

Danielson agreed that Article IX gives the Administration power to develop procedures to properly administer the compact but felt the problem the commissioners were trying to solve was not specifically identified. Danielson said he would not encourage Kansas to spend time and resources developing a proposal or proposals until it was clear in his mind as to what issues need be resolved and cautioned against misinterpreting articles of the compact. Commissioner Danielson said he believes the compact gives Colorado the right to consume certain waters in the basin and finds nothing that infers sharing of shortages.

Pope suggested the procedure for computing virgin water supply include the change in groundwater storage and that adjusted allocations be based on the 28 year period of computed virgin water supply or on some period of running averages.

Danielson said he believes that the present procedure for computing adjusted allocations are in compliance with Article III of the compact but agreed the commissioners may wish to study alternatives suggested by Commissioner Pope.

Commissioners Jess and Danielson agreed to give full consideration to any proposal Kansas submits to the Administration concerning the last paragraph of Article III which deals with adjusted allocations. It was agreed any such

proposal should be submitted at least 2 months prior to the next annual meeting. Kansas agreed to submit a proposal. **No motion was made pertinent to this matter.**

New Business

Jess moved that the Engineering Committee be directed to revise computation formulae to more accurately reflect geographical locations of water use. This being where virgin water originates in a sub-basin and is consumed in another sub-basin. Danielson seconded. Nebraska and Colorado voted Yes, Kansas voted No. **Motion failed.**

Jess moved that the Engineering Committee take under advisement and study changes that may be needed in the computation formulae to more accurately reflect the consumptive use of water in the main stem of the Republican River in those cases where the virgin water supply originates in a tributary basin. The committee to present proposed new formulae and a set of sample computations. **Motion was approved.**

Jess moved that Kansas provide computed consumptive use and virgin water supply downstream of the stateline gaging station at Hardy, Nebraska on a permanent basis. Danielson seconded. Nebraska and Colorado voted Yes, Kansas No. **Motion failed.**

Jess moved that the 5 and 10 year computed running averages for virgin water supply and consumptive use be discontinued. Danielson suggested they be

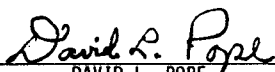
continued as there may be a need for these data if and when allocations are adjusted other than on an annual basis. Motion died for lack of second.

Danielson moved that commissioner Jess be designated chairman of the Administration for the next 2 year period 1988-1990. Motion was approved.


Ann Bleed of Nebraska and Alan Berryman, Colorado, were appointed to the Engineering Committee.

A tentative date of July 13, 1989, was set for the next annual meeting. A location will be named later.

The meeting adjourned at 1:30 p.m.

  
\_\_\_\_\_  
DAVID L. POPE  
KANSAS MEMBER (CHAIRMAN)

  
\_\_\_\_\_  
J. MICHAEL JESS  
NEBRASKA MEMBER

  
\_\_\_\_\_  
JERIS A. DANIELSON  
COLORADO MEMBER

REPORT OF THE ENGINEERING COMMITTEE  
to the  
REPUBLICAN RIVER COMPACT ADMINISTRATION  
FOR THE 1987 WATER YEAR

The Engineering Committee met in McCook, Nebraska, on May 4, 1988, to address the work assigned by the Compact Administration at the July 9, 1987, annual meeting. Those in attendance at the meeting were as follows:

Bob Bishop, Nebraska Department of Water Resources  
Russ Oaklund, Nebraska Department of Water Resources  
Gerry Hilmes, Kansas Division of Water Resources  
Alan Berryman, Colorado division of Water Resources  
Hal Simpson, Colorado Division of Water Resources

At this meeting, the Committee agreed that the chairmanship of the Committee should follow the rotation of the Compact Administration chairmanship. The Chairman for 1989 and 1990 will be Bob Bishop from Nebraska.

The committee also decided that it should have a rotating secretary to record the activities of the Committee. Hal Simpson will be the secretary for the next three years (1988-1990).

The Compact Administration gave five assignments to the Engineering Committee, one being the standard assignment of virgin flow computations,

consumptive use and adjustment of allocations. These assignments are shown on Exhibit A, attached.

#### Assignment 1

The Committee reviewed the computations of virgin water supply and consumptive use by basin for 1987 using the previously approved procedures. Exhibit B attached, includes Table 1, a summary of the results of the virgin water supply computations and adjusted allocation values. Table 2 is a summary of consumptive uses by each state from the main stem and sub-basins. Also attached and part of Exhibit B, are the computer prints of the detailed computations including five and ten-year averages. We recommend only Tables 1 and 2 be published in the annual report.

#### Assignment 2

Bishop provided a written report to the Committee evaluating allocations and usage when water diversions from a sub-basin are actually used on the lands in the valley of the main stem. His three-page report is attached and identified as Exhibit C.

The problem apparently arises from Nebraska's consistent overuse of allocations from Red Willow Creek and Medicine Creek. Bishop's report compares original virgin water supplies, original allocations, 28-year average virgin surface water supplies and 28-year average surface water uses for three sub-basins, Red Willow Creek, Medicine Creek and Frenchman River. The 28-year average consumptive uses by Nebraska are about  $\frac{1}{4}$  of its allocation from the Frenchman River largely because of an insufficient supply at the major project diversion site. Nebraska's 28-year average uses from Red Willow and Medicine



Creeks are about twice the amounts allocated because much of the actual use is in the valley of the main stem Republican but charged by formula to sub-basin use.

The Committee does not recommend a formula change at this time. Compact officials should be aware of reasons of this pattern of use. Changing formula would merely transfer the use from sub-basin to the main stem. In reality, it makes little difference provided Nebraska's overuse of an allocation does not interfere with another state's entitlement.

#### Assignment 3

Assignment 3 which dealt with the history of adjusting allocations was reviewed. Gerald Hilmes provided a written report of his review of the minutes of the annual meetings and the Engineering Committee reports. His report is attached and identified as Exhibit D.

#### Assignment 4

The committee was requested to provide the amount of consumptive use from the Republican River Basin in Kansas below the Hardy gaging station. Hilmes provided the value of 52,730 acre-feet for 1987. Details of his computation are provided in Exhibit E, attached.

#### Assignment 5

This assignment concerned the continued study of the Beaver Creek basin and the consideration of change in alluvial ground water storage upon virgin water supply. The number of observation wells in the Beaver Creek alluvium in Nebraska with long-term records is about five with a 50-mile reach. This is not

a sufficient density of wells to determine change in ground water storage. Likewise in Kansas, the number of observation wells with a long-term record is not adequate. The Committee agreed that an observation well network with a well density of one well per square mile would be necessary to estimate the change in ground water storage. These wells would be existing irrigation wells with measurements taken every year in January or February. The inclusion of change in ground water storage on the virgin water supply computation would improve the accuracy of the estimate of virgin water supply. This was discussed in detail in the Committee's report submitted to the Administration in 1987.

Hal Simpson reported that Colorado has been evaluating all wells near the alluvium to identify wells that are actually in alluvium. These wells will be field checked in the summer of 1988 to estimate the acres irrigated and crop types.

The next meeting will be the first Wednesday of May in 1989 (May 3) unless the Compact Administration assigns tasks that require additional meeting.

Respectfully Submitted,  
Engineering Committee

\_\_\_\_\_  
Robert F. Bishop, Chairman

  
\_\_\_\_\_  
Harold D. Simpson, Secretary

  
\_\_\_\_\_  
Gerald E. Himes

Assignments to the Engineering Committee

Republican River Compact

July 9, 1987

1. Compute the virgin water supply, consumptive use and adjusted allocations for the 1987 water year using previously approved procedures.
2. Evaluate how allocation's and usage will be affected in those cases where V.W.S. originates in a sub-basin and is consumed in another. Special attention should be given, but not restricted, to Red Willow and Medicine Creek drainage basins.
3. Research the issue as to how adjusted allocation computations were determined.
4. Provide calculated C.U. for the Main Stem Republican drainage basin in Kansas below the Hardy gaging station located near the Kansas - Nebraska state line.
5. Continue the study on Beaver Creek drainage basin to explore what data is available and needed for the inclusion of change in groundwater storage in virgin water supply computations. Assess how the inclusion of change in groundwater storage would affect the computed virgin water supply.

Engineering committees review of assignment No. 2.

Evaluate how allocations and usage will be affected in those cases where V.W.S. originates in a sub-basin and is consumed in another with special attention given but not restricted to Red Willow and Medicine Creek drainage Basins.

Reviewing past correspondence it is obvious that compact allocations were apportioned considering most of the water would be used for irrigation purposes, however, not to the extent other uses were not considered.

It is believed the allocations were based on three main factors: the original computed virgin water supply value, the number of irrigable acres along a particular stream (anticipated irrigation development), and crop water requirements to supplement precipitation. Since the average rainfall across the basin was 10 inches per year less at the west end of the basin than that at the east end, it was considered Colorado needed 2 acre-feet per acre of supplemental irrigation water to produce crops and Nebraska 1.5 acre-feet per acre and Kansas 1 acre-foot per acre.

A review of three sub-basins follows.

Red Willow Creek

Original V.W.S. 21,900 acre-feet

Original allocation 4,200 acre-feet

V.W.S. 28 year average s.w. 22,800 acre-feet

Average c.u. 28 years s.w. 7,200 acre-feet

With an allocation of 4,200 acre-feet it was probably anticipated that  $\frac{4,200}{1.5} = 2,800$  acres and would be developed for irrigation in the Red Willow Creek sub-basin. Presently there are about 6,300 acres irrigated from water

use charged to Red Willow Creek, however only 1,750 of those acres are located in the valley of the sub-basin and 4,550 of those acres are located east of the mouth of Red Willow Creek in the valley of the Republican main stem. That is the main reason for Nebraska's overuse of its allocation from Red Willow Creek. Perhaps this is a problem that can be corrected by a formula change.

#### Medicine Creek

Original V.W.S. 50,800 acre-feet

Original allocation 4,600 acre-feet

V.W.S. 28 year average s.w. 46,250 acre-feet

Average c.u. 28 years s.w. 10,550 acre-feet

The land developed for surface water irrigation is presently about 3,300 acres. An allocation of 1.5 acre-feet per acre makes the total original allocations appear reasonable for this sub-basin stream.

A couple of reasons for Nebraska's use in excess of the allocation from Medicine Creek is more ground water development and that the evaporation from Harry Strunk Lake (about 3,300 acre-feet annually) is charged to this sub-basin, whereas the storage water from the lake is used on project land located in the valley of Main Stem Republican.

#### Frenchman River

Original V.W.S. 98,500 acre-feet

Original allocation 52,800 acre-feet

V.W.S. 28 year average s.w. 83,320 acre-feet

Average c.u. 28 years s.w. 29,100 acre-feet

The present development for irrigation is 25,000 acres. Earlier, many more acres were developed for irrigation in the upper basin in Nebraska but abandoned. All of the developed land is within the sub-basin and adjacent sub-basins and unlike Red Willow Creek and Medicine Creek where little or no

lands along the main stem are irrigated from Frenchman River diversions. Nebraska would use more surface water from this stream if available at project diversion sites.

We think their logic for the allocations were reasonable, however, the development and use is not as they anticipated particularly in the sub-basins. Where a sub-basin is entirely located in one state, we consider excess use over the allocation is not a problem provided that states total use from the main stem is within the limits of the main stem allocation.

The compact has provisions for adjusting allocations if the future virgin water supply became greater or less than the original computed supply, however, there is no provisions for adjusting allocations based on perfected uses of water or if development was not as originally anticipated.

Robert F. Bishop

REPUBLICAN RIVER COMPACT ADMINISTRATION  
A HISTORY  
OF  
ADJUSTED ALLOCATION COMPUTATION

1. First mention of adjusting allocations was made by Kansas Commissioner, R.V. Smrha as shown in the Minutes of November 19, 1959 meeting. Smrha stated that the values given in Article III are fixed and that the virgin water supply would have to be determined year by year and then compared with Article III values to adjust the allocations in that proportion. He also stated that the manner in which the values of computed virgin water supplies would be applied remains to be determined. It might be annually, ten-year moving averages, etc., or the annual figure might be used over a five-year period and then adjusted.
  
2. The Minutes of the Fifth Annual Meeting, April 27, 1964, (Fourth Annual Report) show that the Administration assigned the Engineering Committee to adjust allocations as set forth in the Compact for all years since 1959 on an annual and five-year basis and when further records are available on a ten-year basis. This appears to be the first adjusted allocation assignment given to the Engineering Committee.
  
3. The Report of the Engineering Committee dated May 27, 1965 (Fifth Annual Report) shows that the committee computed adjusted allocations on an annual basis for 1959 through 1964 water year and on a five-year average

basis for 1959 through 1963 and 1960 through 1964.

The adjustments were made according to Article III of the compact which states "Should the future computed virgin water supply of any source vary more than (10) ten per cent from the virgin water supply as hereinabove set forth, the allocations hereinafter made from such source shall be increased or decreased in the relative proportions that the future computed virgin water supply of such source bears to the computed virgin water supply used herein".

4. At the Seventh Annual Meeting of the Compact Administration, (April 7, 1966) the Engineering committee was assigned to "Compute adjusted allocations on annual, 5-year and average annual basis". The Engineering Committee Report dated June 19, 1967 shows that adjusted allocations were computed for the 1966 water year and on a 5 year average basis 1962 thru 1966.
5. The adjusted allocations were continued on an annual and a 5 year average basis thru water year 1967. Beginning with water year 1968, adjusted allocations were computed on an annual basis, a 5 year running average and a 10 year running average. This is the procedure that is currently being used to compute adjusted allocations.

Gerald E. Hilmes  
July 16, 1987



ANNUAL CONSUMPTIVE USE  
 WATER YEAR 1987  
 MAIN STEM OF THE REPUBLICAN RIVER BASIN IN KANSAS

<u>Annual Consumptive Use equals:</u>	<u>Acre Feet</u>
the diversions of White Rock Creek water by the Courtland Canal;	19,100
plus, the other diversions of surface water below the gaging station near Hardy;	13,490
plus, diversions from groundwater below the gaging station near Hardy;	20,910
minus, the return flows from White Rock Creek water diverted by the Courtland Canal;	-8,600
minus, the return flows from other surface water diversions below the gaging station near Hardy;	-3,390
minus, the return flows from groundwater diversions below the gaging station near Hardy;	-6,140
plus, the net evaporation from Lovewell Reservoir chargeable to White Rock Creek water;	-910
plus, the net evaporation from Milford Reservoir.	<u>+18,270</u>
Total Consumptive use	52,730
 Milford Reservoir Nonflood Release Available for downstream use	 248,460

EXHIBIT B

Table 1

1987 Computed Annual Virgin Water Supply and  
Original and Annual Adjusted Allocations

Sub-basin and the Original Compact Virgin Water Supply	Computed Annual Virgin Water Supply Republican River Basin 1987 (Acre Feet)				Comparison of Original Compact Allocations and 1987 Adjusted Allocation (Acre Feet)							
	Ground Water	Surface Water	Total Basin	Colorado Compact Alloc.	Colorado Adj. Alloc.	Kansas Compact Alloc.	Kansas Adj. Alloc.	Nebraska Compact Alloc.	Nebraska Adj. Alloc.	Total Basin Compact Alloc.	Total Basin Adj. Alloc.	
Prairie Dog Cr.	27600	17630	11710	23400			12600	12600	2100	2100	14700	14700
Sappa Cr.	21400	23330	8350	31680			9800	10020	3800	10020	17600	26040
Beaver Cr.	16500	20250	1330	21580	3300	4320	6400	3270	6700	8760	16400	21450
Medicine Cr.	50300	9560	22580	42140					4600	3820	4600	3820
Red Willow Cr.	21300	5790	17440	23230					4200	4200	4200	4200
Driftwood Cr.	7300	1800	2410	4210			500	290	1200	590	1700	990
Frenchman Rv.	38500	34620	58460	93080					52800	52800	52800	52800
South Fork of the Republican Rv.	57200	12140	22570	34810	25400	15470	23000	14010	800	490	49200	29970
Rock Cr.	11000	100	8360	8460					4400	3550	4400	3550
Buffalo Cr.	7890	550	5170	5720					2600	1390	2600	1390
Arikaree Rv.	13510	5080	4990	10070	15400	7920	1000	510	3300	1700	19700	10130
H.F. Republican Rv in Colorado	44700	380	38540	38920	10000	8710			11000	9580	21000	18290
H.F. and Main Stem of Republican Rv. incl. Blackwood Cr. in Nebraska*	94500	83110	291270	374630			138000	270320	132000	259710	270000	530030
TOTALS	479900	214400	503230	717630	54100	36420	130300	319120	234500	362140	476200	717630

\* Main Stem 87,700  
Blackwood Creek 6,800

Table 2

1987 Computed Consumptive Use within the  
Republican River Basin (Acre Feet)

Sub-basin	Colorado			Kansas			Nebraska			Total Basin		
	Ground Water	Sur face Water	Total	Ground Water	Sur face Water	Total	Ground Water	Sur face Water	Total	Ground Water	Sur face Water	Total
Prairie Dog Cr.				17690	3460	21150	1030	160	1190	18720	3620	22340
Sappa Cr.				7570	130	7700	16720	780	17500	24290	910	25200
Beaver Cr.	0	0	0	10150	60	10210	10100	160	10260	20250	220	20470
Medicine Cr.							10370	3120	13490	10270	3120	13490
Red Willow Cr.							5790	7890	13680	5790	7890	13680
Driftwood Cr.				0	0	0	1300	0	1300	1500	0	1300
Frenchman Rv.							34620	17130	51750	34620	17130	51750
South Fork of the Republican Rv.	2530	6790	9310	9610	130	9840	0	0	0	12140	7910	19150
Rock Cr.							100	100	200	100	100	200
Buffalo Cr.							550	720	1270	550	720	1270
Arikaree Rv.	4060	0	4060	150	0	150	770	0	770	5080	0	5080
N.F. Republican Rv in Colorado	380	3890	4270				0	3020	3020	380	6910	7290
N.F. and Main Stem of Republican Rv. incl. Blackwood Cr. in Nebraska*				100	35920	36020	80210	80540	160750	26020	116460	196770
<b>TOTALS</b>	<b>6970</b>	<b>10670</b>	<b>17640</b>	<b>45270</b>	<b>29900</b>	<b>35170</b>	<b>162060</b>	<b>113620</b>	<b>275680</b>	<b>214460</b>	<b>164090</b>	<b>379490</b>

\* Evaporation from Harlan County Reservoir -- Kansas 49 percent 5420 Acre Feet  
Nebraska 51 percent 6630 Acre Feet