OFFICIAL

FIFTH ANNUAL REPORT

Republican River Compact Administration

For the Year 1964

TOPEKA, KANSAS

May 27, 1965

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REPUBLICAN RIVER COMPACT ADMINISTRATION

In conformity with the Rules and Regulations of the Republican River Compact Administration, the Fifth Annual Report of the Administration is submitted as follows:

1. Pursuant to Rule 12, as amended, this report covers the period from April 28, 1964, to May 27, 1965.

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, as follows:

   J. E. Whitten, State Engineer of Colorado
   (April 28, 1964 to March 1, 1965)
   A. Ralph Owens, Deputy State Engineer of Colorado
   (March 1, 1965 to May 27, 1965)
   Dan S. Jones, Jr., Director, Department of Water Resources, Nebraska
   R. V. Smrha, Chief Engineer, Division of Water Resources, State Board of Agriculture, Kansas

3. The Sixth Annual Meeting of the Administration was held on May 27, 1965, in the State Office Building, Topeka, Kansas. Minutes of that 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 a summary tabulation of the computation of virgin water supply for the 1964 water year and a summary tabulation of consumptive use for the 1964 water year were presented to and accepted by the Administration at the Sixth Annual Meeting. Copies of these presentations are included elsewhere in this report.

5. On May 27, 1965, Mr. Dan S. Jones, Jr., Nebraska Member of the Administration, was elected Chairman to serve until the next annual meeting of the Administration.

Respectfully submitted,

REPUBLICAN RIVER COMPACT ADMINISTRATION

By:

_____ Colorado Member

_____ Nebraska Member

_____ (Chairman)
Kansas Member

Minutes of the
Sixth Annual Meeting

Republican River Compact Administration

Topeka, Kansas - - May 27, 1965

The meeting was called to order by the Chairman, R. V. Smrha, at 10:00 a.m., in Room 1031-S, State Office Building, Topeka, Kansas.

The following were in attendance:

Dan S. Jones, Jr., Official Member, Lincoln, Nebraska
R. V. Smrha, Official Member, Topeka, Kansas
Clark E. Schnurr, Office of State Engineer, Denver, Colorado
M. E. Ball, Ass't. Director, Nebraska Department of Water Resources, Lincoln, Nebraska
Floyd LeFever, District Engineer, U. S. Geological Survey (S. W.) Lincoln, Nebraska
S. K. Jackson, Division Hydrologist, U. S. Geological Survey, Denver, Colorado
S. W. Fader, U. S. Geological Survey (G. W.) Lawrence, Kansas
Hal K. Hall, Ass't. District Engineer, U. S. Geological Survey (S. W.) Topeka, Kansas
Elroy C. Balke, Corps of Engineers, Kansas City, Missouri
Kenneth O. Kauffman, U. S. Bureau of Reclamation, McCook, Nebraska
Dee Messinger, U. S. Bureau of Reclamation, McCook, Nebraska
Winston Hedges, U. S. Bureau of Reclamation, McCook, Nebraska
H. L. Mackey, Division of Water Resources, Topeka, Kansas

The Chairman noted that the Rules and Regulations state that a regular annual meeting of the Administration shall be held during March or April and that such a meeting had been adjourned to this date so that the Engineering Committee might complete its assignments.

The Chairman stated that Mr. J. E. Whitten, Official Member for Colorado, had retired as of March 1, 1965. Mr. Schnurr explained that with a vacancy existing in the position of State Engineer, Mr. Ralph Owens, Deputy State Engineer, was acting as State Engineer and had designated Mr. Schnurr to represent Colorado at the annual meeting. A copy of the letter from Mr. Owens is attached to this minutes as Exhibit "A".

Approval of Minutes of Previous Meeting:

Mr. Jones noted that the minutes of the Fifth Annual Meeting had been previously approved by each member by correspondence and moved that they be approved as given in the Fourth Annual Report. The motion was seconded and unanimously passed.

Report of the Chairman:

A meeting to discuss a possible program for investigation of return flows in the Republican River Basin was held in Nebraska Hall, Lincoln, Nebraska, on September 10, 1964.

Those in attendance at the meeting were:

M. E. Ball, Ass't. Director, Department of Water Resources, Lincoln, Nebraska
C. F. Kaech, District Engineer (G. W.), U. S. Geological Survey, Lincoln, Nebraska
F. F. LeFever, District Engineer (S. W.), U. S. Geological Survey, Lincoln, Nebraska
S. K. Jackson, Division Hydrologist, U. S. Geological Survey, Denver, Colorado
A. R. Owens, Deputy State Engineer, Denver, Colorado
R. V. Smrha, Chief Engineer, Division of Water Resources, Topeka, Kansas
E. C. Reed, Director, Conservation and Survey Division, Lincoln, Nebraska
H. L. Mackey, Engineer, Division of Water Resources, Topeka, Kansas

The Republican River Compact is based on computed virgin water supply which in turn is allocated to the states involved. The Compact makes provision for adjustment of allocations when computed annual virgin water supply varies by more than 10 per cent from the amounts set forth in the Compact.

The Engineering Committee has been computing annual virgin water supply and consumptive use within the Republican Basin. The computation of virgin water supply is dependent on several items one of which is return flow from irrigated areas. It has been found return flows are a significant quantity. The Committee has been using U. S. Bureau of Reclamation estimates of return flows for each major irrigated area in the basin based on the Platte River study of the 1930's. For annual virgin water supply computations, the Committee needs a relatively long-term study that would provide factual data on the quantity of return flows and the timing of those returns to the river.

Mr. LeFever presented a possible program for a complete budget-type study in the Trenton-Cambridge reach of the Republican River. A preliminary cost estimate of $222,400 for a 5-year study did not include costs to acquire data on evapo-transpiration. The elimination of certain items such as test drilling and quality of water information from the program would reduce the estimated cost to about $123,000.

Such a program could produce data that would improve the computations of annual virgin water supply. It is believed that the Administration should consider a program that could be adopted as a goal and each State then could determine what it might do toward fulfilling the objectives of such a program.

Mr. Jackson was asked to present to the Administration at the 1965 Annual Meeting a proposed program that would serve this purpose together with possible methods of financing.

Reports of Official Members or Representatives:

Mr. Jones and Mr. Schnurr had no reports to make.

Unfinished Business:

Mr. Jackson stated that since the meeting in Lincoln, Nebraska, on September 10, 1964, the U. S. Geological Survey had given considerable thought to a possible program to determine return flows but no satisfactory solution to the problem had been found. He suggested that perhaps additional data could be collected through present cooperative programs that might be of benefit, although he questioned such information would fulfill the needs of the Engineering Committee. The Geological Survey had concluded the problem was of a local nature in the Republican River Basin and results would not be generally applicable elsewhere and that the costs of a detailed study would not be compensatory with possible results.

Mr. LeFever discussed a proposed program in the reach from Trenton and Palisades to Cambridge that was concerned primarily with the improvement of records at existing gaging stations, the collection of stream-flow data from presently ungaged areas through the use of partial record stations, and the collection of additional precipitation records in the valley. Such a program, to be financed by Federal-State Cooperative programs, was estimated to cost about $91,000 over a five-year period. He pointed out that certain factors such as well pumpage, evapo-transpiration, ground water storage and soil moisture were difficult to obtain for a complete study. He felt that the program as outlined would certainly improve results but it was doubtful that all needed answers would be provided. Mr. LeFever suggested that certain phases of the program such as installation of partial record stations and the relocation of the gaging stations on Driftwood, Blackwood and Red Willow Creeks should be started soon.

The Administration accepted the report of Mr. LeFever to be used as a guide by each State in the implementation of other programs.

Mr. Hedges stated that the Bureau of Reclamation has initiated a program to accurately measure all inflow and outflow from an area of 500 acres in the Driftwood Canal area. The Administration instructed the Engineering Committee to study the information from that study to see if it might be utilized.

New Business:

Mr. M. E. Ball, Chairman of the Engineering Committee, presented a report to the Administration. A copy of that report is attached as Exhibit "B" to these minutes. Accompanying that report were tabulations (1) the computed virgin water supply and (2) the computed annual consumptive use for the 1964 water year attached as Exhibits "C" and "D" respectively.

In discussing the Report of the Engineering Committee, Mr. Ball stated there have been questions raised regarding the inclusion of pumping by wells in the alluvium in the virgin flow computations. He further stated that the Committee had recognized that the effect upon stream flow is related to the distance of a particular well from the stream but has disregarded this factor in past computations and the Committee felt that further study should be made on this matter.

Referring to the section of the Engineering Report that called attention to the differences in computed evaporation by pan and mass transfer methods, Mr. Balke commented that the differences merely indicated more information was needed to improve procedures. He said that monthly evaporation based on the Class "A" pan will be available for sometime into the future and suggested the Engineering Committee continue its use in computing reservoir net evaporation.

The Engineering Committee stated they had agreed, for the present, on procedures to prorate evaporation losses from Harlan County and Lovewell Reservoir and a method to compute inflow into Lovewell Reservoir, however, the Committee believed further study was needed before a method of adjusting allocations was adopted by the Administration. The Committee also felt that it would be premature to publish at this time the results of the computations on adjusted allocations.

On motion of Mr. Jones, the Administration accepted the report of the Engineering Committee with the understanding that only the results of the computations for the virgin water supply and consumptive use, 1964 water year, be published in the annual report.

The Administration agreed that assignments to the Engineering Committee would include continuation of present assignments plus the investigation of depletions by wells in the alluvium and the effect of well distance from a stream on those depletions. It was suggested the Committee also confer with the Bureau of Reclamation and Geological Survey on consumptive use studies those agencies have been making.

Mr. Kauffman suggested the Administration should consider whether Kansas is entitled to water from storage in Bonny Reservoir in order to answer questions of water users along the South Fork Republican River. He also said that the feasibility report on the Beaver Creek project has been completed and will be presented for comments in the fall of 1965. The report shows a future use exceeding the Compact allocation and a decision will have to be made by the Administration in this regard. Mr. Kauffman also reported that the study of supplying municipal water from Harlan County Reservoir for the cities of Phillipsburg, Kensington and Smith Center has been completed. Smith Center has indicated it will develop another source of supply while the other two cities haven't indicated whether they are interested or not. The report on the Scandia Unit is nearly finished and contemplates providing some water supply to the city of Belleville. A detailed study of the Scandia Unit will follow in about a year. The Chairman stated that these matters involved principles more than just the Compact and when more detailed information is available a meeting might be held with the Bureau of Reclamation to discuss them.

Mr. Jones, Official Member from Nebraska, was elected Chairman of the Administration to serve until the next annual meeting.

Adjournment:

The Sixth Annual Meeting of the Administration was adjourned at 3:15 p.m.

R. V. Smrha, Chairman

Exhibit "A"

J. E. WHITTEN
State Engineer

A. RALPH OWENS
Deputy

JOHN A. LOVE, Governor

L. T. BURGESS
Chief Hydrographer

GLEN B. ROGERS
Office Engineer

OFFICE OF THE STATE ENGINEER
232 STATE SERVICES BUILDING
1525 SHERMAN STREET
DENVER 3, COLORADO

May 25, 1965

Zip Code - 80203

Mr. R. V. Smrha, Chairman
Republican River Compact Administration
1026-S State Office Building
Topeka, Kansas

Dear Mr. Smrha:

This letter will constitute authorization for Mr. Clark E. Schnurr to act for the State of Colorado on all matters coming before the meeting of the Republican River Compact Administration in Topeka, Kansas, May 27, 1965.

Very truly yours,

A. Ralph Owens
Deputy State Engineer

/L

Report of the Engineering Committee

Republican River Compact Administration

May 27, 1965

The Republican River Compact Administration in its annual meeting held April 27, 1964, summarized the future work assignments for the Engineering Committee as follows:

1. Virgin water supply computations for 1964;

2. Consumptive use computations for 1964;

3. Continue method for computing inflow to Lovewell Reservoir from White Rock Creek;

4. Continue study of proration of evaporation losses.

In addition it was agreed by the administration that a new assignment to the Engineering Committee would be to adjust allocations as set forth in the Compact for all years since 1959 on an annual and a five-year basis, and when future records are available on a ten-year basis.

The Engineering Committee at its 11th meeting held April 20-21, 1965, studied the above assignments and the Secretary, by letter of May 5, 1965, submitted the following exhibits to the members of the Compact administration for review prior to the annual meeting.

1. Virgin water supply computations, 1964 water year;

2. Computation of inflow to Lovewell Reservoir, 1964 water year;

3. Computed operations of Lovewell Reservoir, 1964 water year;

4. Tabulation of computed consumptive use, 1964 water year;

5. Adjusted allocations on an annual basis for 1959 through 1964 water year; and,

6. Adjusted allocations on a five-year average basis for 1959 through 1963 and 1960 through 1964.

The virgin flow formulas and the consumptive use formulas, presented in previous reports of the committee were used without change in the preparation of the above data. The committee agreed that the computed adjusted allocations would be presented for discussion to the administration at its annual meeting without written recommendations.

Up to the present time the Engineering Committee has used evaporation data furnished by the U. S. Corps of Engineers for each of the reservoirs in the basin. The evaporation data used was computed from the information furnished from the Class "A" pan. Beginning in April, 1964, the Corps of Engineers has also provided on the Monthly Operation Data Sheet for each reservoir the gross evaporation as computed by the mass transfer method. Preliminary results by this method for Bonny, Lovewell, and Harlan County Reservoirs gave evaporation ranging from 2% to 70% greater on a monthly basis, and averaged 33% greater for the six-month record available for 1964. The committee agreed to withhold any decision as to which evaporation records should be used in the virgin flow computations until after meeting with representatives of the Corps of Engineers and the Bureau of Reclamation for the purpose of discussing the two methods of computation and until a firm recommendation for change could be made to the administration. It was agreed to suggest to the Compact administration that the mass transfer method of computing evaporation should be investigated further.

Discussions with Mr. E. C. Balke of the Corps of Engineers as a basis for the virgin flow studies for the year 1963 disclosed that the U. S. Geological Survey in cooperation with the Corps of Engineers has made detailed studies at Kanopolis Reservoir and that these studies showed no essential difference between evaporation data as computed using the mass transfer method and as computed from the Class "A" pan. These studies at Kanopolis were carried on with close control. The difference between the two methods referred to above may be due to application of formulas without adequate data at each reservoir for all factors needed to compute the evaporation using the mass transfer method.

The Engineering Committee, from its initiation, has been faced with the difficulty of determining the effect of pumping of ground water from wells on stream flow. Consequently, the committee early in its deliberation, agreed to limit consideration of the effect of pumping from wells to the valley alluvium. Recently, however, comments have been made by both federal and state ground water representatives that wells pumping from alluvium by lowering the ground water table may be creating conditions where there is less depletion by pumping than by natural vegetation prior to development. The committee has also from the beginning recognized that even for the valley wells that the effect upon stream flow is related to the distance of the particular well from the stream bank, but due to the complexity of computing this effect for each well, the committee has disregarded this factor. The Engineering Committee agrees that these problems should be pursued further by consultation with ground water representatives of both state and federal agencies.

The 11th meeting of the Engineering Committee was attended only by the members of the Committee. Mr. Roy Burgess, the member of the committee from Colorado, retired from his position in March of this year and Mr. C. E. Schnurr, appointed by Colorado to replace Mr. Burgess, was present at the meeting.

Respectfully submitted,

M. E. Ball

M. E. Ball, Chairman

Harris L Mackey
Kansas

Clark E. Schnurr
Colorado

Exhibit "C"

Computed Annual Virgin Water Supply
Republican River Basin

Drainage Basin	Compact Ac. Ft.	1964 W.Y. Ac. Ft.
Prairie Dog Creek	27,600	16,190
Sappa Creek	21,400	31,930
Beaver Creek	16,500	26,230
Medicine Creek	50,800	50,410
Red Willow Creek	21,900	15,730
Driftwood Creek	7,300	3,110
Frenchman Creek	98,500	119,130
South Fork of the Republican River	57,200	33,670
Rock Creek	11,000	10,320
Buffalo Creek	7,890	4,950
Arikaree River	19,610	10,620
North Fork of the Republican River	44,700	47,130
Main Stem of the Republican plus Blackwood Creek	*94,500	118,500
Totals	478,900	487,920

*Main Stem	87,700
Blackwood Creek	6,800

Exhibit "D"

Computed Annual Consumptive Use

Republican River Basin

1963-64 Water Year

Acre-Feet

Drainage Basin	Colorado	Kansas	Nebraska	Total
Prairie Dog Creek	-	11,030	0	11,030
Sappa Creek	-	3,420	9,360	12,780
Beaver Creek	0	3,880	7,100	10,980
Medicine Creek	-	-	8,500	8,500
Red Willow Creek	-	-	10,520	10,520
Driftwood Creek	-	0	560	560
Frenchman Creek	-	-	48,570	48,570
South Fork of the Republican River	11,700	1,910	0	13,610
Rock Creek	-	-	290	290
Buffalo Creek	-	-	690	690
Arikaree River	0	0	0	0
North Fork of the Republican River	6,670	-	6,080	12,750
Main Stem of the Republican River	-	67,200	154,570	221,770
TOTALS	18,370	87,440	246,240	352,050