

JOHN D. VANDERHOOF
Governor



C. J. KUIPER
State Engineer

DIVISION OF WATER RESOURCES

LEE R. ENEWOLD P. E.
IRRIGATION DIVISION ENGINEER
P. O. BOX 396
GLENWOOD SPRINGS, COLORADO 81601
PHONE: 945-5665

November 30, 1978

This annual report is hereby respectfully submitted to the State
Engineer of Colorado for the water year 1977-78.

A handwritten signature in black ink, reading 'Lee R. Enewold'. The signature is written in a cursive style with a large initial 'L' and 'E'.

Lee R. Enewold
Division Engineer

| | |
|------|---------------------------------|
| I | INTRODUCTORY STATEMENT |
| II | PERSONNEL |
| III | SNOW PACK |
| IV | PRECIPITATION - SUMMER |
| V | UNDERGROUND WATER |
| VI | TRANSMOUNTAIN DIVERSIONS |
| VII | RESERVOIR STORAGE |
| VIII | AGRICULTURE |
| IX | DAMS |
| X | WATER RIGHTS TABULATION |
| XI | REFEREE'S FINDINGS AND DECREES |
| XII | HYDROGRAPHER'S REPORT |
| XIII | ORGANIZATIONS |
| XIV | WATER COMMISSIONERS' SUMMARY |
| XV | DIVISION ENGINEER'S SUMMARY |
| XVI | RECOMMENDATIONS AND SUGGESTIONS |

INTRODUCTORY STATEMENT

Mr. Clarence J. Kuiper
 State Engineer
 Division of Water Resources
 1313 Sherman Street
 Denver, Colorado 80203

Re: Division Engineer's
 Annual Report

This annual report for Division No. 5 for the water year ending November 30, 1978, is as follows:

1. Introductory Statement.

- A. Division 5 consists of all the Colorado River Basin, including all of its tributaries from the Continental Divide through its course within the State of Colorado to the Utah State line, excluding only the Gunnison River drainage basin, but including the White River drainage, which is located in Division 6, only and expressly provided by law as under judiciary, decretal rule by the Water Judge presiding in the Division 5 Water Court.

The major tributaries of the Colorado River from it's headwaters to the state line are the North Fork of the Colorado, Willow Creek, Fraser River, Williams Fork, Troublesome Creek, Blue River, Muddy Creek, Eagle River, Roaring Fork, Divide Creek, Mamm Creek, Rifle Creek, Parachute Creek, Roan Creek, Plateau Creek and the Big Salt Wash.

The major population centers are:

| <u>Name</u> | <u>Stream</u> | <u>*Approx. Pop.</u> |
|--------------------------------------|-------------------------|------------------------|
| Carbondale | Roaring Fork | 4,600 |
| Glenwood Springs | Roaring Fork | 9,800 |
| Area surrounding Glenwood Springs | Roaring Fork | Includes sur. areas |
| New Castle | Colorado River | 1,000 |
| Silt | Colorado River | 1,300 |
| Rifle | Colorado River | 8,600 |
| Grand Valley | Colorado River | 2,000 |
| DeBeque | Colorado River | 1,000 |
| Collbran | Plateau Creek | 600 |
| Palisade | Colorado River | 1,600 |
| Grand Junction | Colorado River | 35,700 |
| Fruita | Colorado River | 5,000 |
| Grand Lake | Colorado River | 250 |
| Granby | Fraser-Colorado River | |
| Fraser-Winter Park | Fraser River | |
| Hot Sulphur Springs | Colorado River | |
| Kremmling | Colo. Muddy, Blue River | |
| Breckenridge | Blue River | |
| Frisco | Blue River | |
| Dillon | Blue River | |
| Minturn | Eagle River | |
| Vail | Eagle River | |
| Eagle | Eagle River | |
| Aspen | Roaring Fork | |
| Basalt | Roaring Fork | |

*1980

| <u>Counties</u> | <u>1977</u> | <u>1978</u> | <u>1979</u> | <u>1980</u> |
|-----------------|-------------|-------------|-------------|-------------|
| Eagle | 11,761 | 11,903 | 12,082 | 12,273 |
| Garfield | 18,597 | 19,290 | 20,148 | 21,127 |
| Grand | 8,203 | 8,582 | 9,006 | 9,461 |
| Mesa | 64,052 | 65,889 | 68,256 | 70,988 |
| Pitkin | 11,004 | 11,357 | 11,761 | 12,193 |
| Summit | 6,743 | 7,248 | 7,895 | 8,403 |

PERSONNEL

| <u>Name</u> | <u>Position</u> | <u>District</u> | <u>Months Worked/ Budgeted</u> | <u>Mileage</u> |
|---------------------|---------------------|-----------------|------------------------------------|----------------|
| Enewold, Lee R. | Division Engineer | | Annual | 11,950 |
| Jackson, Arlen | H. B. 1042 | | Annual | 13,322 |
| Largent, Gary | Hydrographer | | Annual | |
| Dalton, Ruth | Admin. Clerk-Typist | | Annual | -0- |
| Anderson, George M. | Commissioner | 70 | 7 | 6,111 |
| Ball, John | Commissioner | 50 | 6 | 2,903 |
| Bieser, Robert | Deputy | 72 | 6 | 3,255 |
| Callicotte, Stephen | Commissioner | 38 | 9 | 5,090 |
| Gerry, Woodrow | Deputy | 72 | 7 | 5,945 |
| Hart, Daniel | Commissioner | 51 | Annual | 8,440 |
| Hill, Clifford | Deputy | 72 | 7 | 4,723 |
| Jackson, Arlen | Commissioner | HB 1042 | Annual | |
| Klocker, Marcus | Commissioner | 72 | Annual | 18,863 |
| Lemon, Jim | Commissioner | 39 | 9 | 9,479 |
| Nelson, Glen | Deputy | 45 | 6 | 1,622 |
| Pauley, Larry | Deputy | 38 | 5 | 3,626 |
| Rager, Cletus | Commissioner | 45 | 7 | 5,660 |
| Raine, Jack | Deputy | 72 | 9 | 6,280 |
| Reed, Miles | Deputy | 72 | 7 | 2,086 |
| Shelden, Jim | Commissioner | 52,53 | Annual | 12,005 |
| Wells, Wayne | Commissioner | 36,37 | Annual | 11,864 |
| Yeoman, Richard | Deputy | 45 | 3 | 2,424 |
| Hittle, Ray | Deputy | 72 | Hourly | 2,293 |

SNOW PACK

December and January brought good snow to the mountains. Excellent snowpack existed for this time of year.

The northern third of the state had excellent pack in February. The center portion of the state had near normal to slightly above, while lower third had below average snow.

April first snow surveys showed significant improvement in the snowpack for the southwest portions of Colorado. The Colorado River and tributaries were expected to flow 30% above normal.

In the Colorado River drainage the snowpack remained good to excellent through April. Sub-surface moisture in irrigated areas was reported as fair to good.

The accumulated winter snow kept the rivers active through much of the summer. However, August's consistent 90° temperatures depleted the stream flows and precipitated a "call" on the river from Shoshone and Grand Valley Project.

PRECIPITATION

normal.

Seasonal precipitation ranged from 110 to 160% of normal in the upper regions of the Colorado River and amounts decreased Southward. The Gunnison River drainage received 110 to 140% on the upper reaches and 70 to 90% downstream.

As of February first, Green Mountain had 336,000 acre feet in storage, which is 135% of normal. Lake Granby had 280,000 acre feet in storage, which is 145% of normal.

March precipitation on the Colorado River was 80 to 120% along the Continental Divide, increasing downstream. The Soil Conservation Service reported snowpack water equivalent amounts are generally 20 to 60% above normal throughout Colorado River basin.

Seasonal (October-April) precipitation was 110 to 140% of normal in the upper basins except some stations near Glenwood Springs which received as much as 180%.

The water year 1978 precipitation totals were, in general, above normal.

Seasonal inflows recorded at all reservoirs averaged well above normal.

UNDERGROUND WATER

Division 5

Wells Adjudicated In The
Water Court

| No. of Applications | Domestic | Commerical | Irrigation | Municipal | Other Use |
|---------------------|----------|------------|------------|-----------|-----------|
| | | | | | |
| 6 | 5 | | 1 | | 2 |
| 25 | 20 | 4 | 9 | 2 | 12 |
| 3 | 3 | | 1 | | |
| 1 | | | | | 1 |
| | | | | | |
| | | | | | |
| 10 | 3 | 1 | | | 6 |
| | | | | | |
| | | | | | |
| | | | | | |
| 2 | 1 | | 1 | | 1 |
| | | | | | |
| 47 | 32 | 5 | 12 | 2 | 22 |

TRANSMOUNTAIN DIVERSIONS



DIVISION OF WATER RESOURCES

DEPARTMENT OF NATURAL RESOURCES

IRRIGATION DIVISION ENGINEER
ROOM 208 8th AND 8th OFFICE BLDG.
GREELEY, COLORADO 80631
OFFICE: 352-8712 HOME: 484-3917

December 27, 1978

Mr. Lee R. Enewold, Division Engineer
Division of Water Resources
P.O. Box 396
Glenwood Springs, Colorado 81601

Dear Lee:

The following information on trans-mountain diversions is furnished for your information:

| | <u>ACRE FEET</u> |
|----------------------|------------------|
| Adams Tunnel | 262,700 |
| Grand River Ditch | 25,230 |
| Berthoud Ditch | 698 |
| Eureka Ditch | 20 |
| Moffat Tunnel | 81,650 |
| Williams Fork Tunnel | 4,890 |
| Roberts Tunnel | 132,500 |
| Vidler Tunnel | - |
| Hoosier Pass Ditch | 9,740 |
| Boreas Pass Ditch | 174 |

We have no information as yet on Vidler Tunnel.

Very truly yours,

James R. Clark
Division Engineer

JRC/HRC/rh

DIVISION OF WATER RESOURCES

DEPARTMENT OF NATURAL RESOURCES
 ROBERT W. JESSE
 IRRIGATION DIVISION ENGINEER
 1906 W. NORTHERN AVENUE
 PUEBLO, COLORADO 81004
 OFFICE: 542-3368 HOME: 545-2873

December 6, 1978

To: Lee R. Enewold

From: Jim Kasic *JK*

Here are the transmountain diversions to incorporate into your Division Engineers report as per your request.

If you need any other information, feel free to contact us.

| | <u>Boustead</u> | <u>Larkspur</u> | <u>Busk Ivanhoe</u> | <u>Twin Lakes</u> | <u>Columbine</u> | <u>Ewing</u> | <u>Wurtz</u> |
|---------|-----------------|-----------------|-------------------------|-------------------|------------------|--------------|--------------|
| Oct. 77 | 0 | | 40.44 | 120.48 | | 9.23 | |
| Nov. | | | 0 | 143.02 | | 0 | |
| Dec. | | | 0 | 40.1 | | | |
| Jan. 78 | | | 0 | 87.8 | | | |
| Feb. | | | 0 | 67.5 | | | |
| Mar. | 0 | | 0 | 122.1 | | | |
| Apr. | 29.9 | | 0 | 170.5 | 0 | 0 | 0 |
| May | 2417.20 | 0 | 176.7 | 2067.4 | 39.03 | 89.64 | 251.33 |
| June | 15129.0 | 24.44 | 2359.0 | 15151.0 | 761.5 | 398.8 | 1351.0 |
| July | 6785.0 | 7.93 | 1055.6 | 7146.0 | 196.2 | 121.5 | 296.1 |
| Aug. | 500.0 | 8.96 | 81.27 | 933.4 | 31.37 | 36.38 | 34.02 |
| Sept. | 0 | 0 | 14.72 | 329.8 | 0 | 0 | 0 |
| | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> | <hr/> |
| CFS | 24861.1 | 41.33 | 3727.73 | 26,379.0 | 1028.0 | 655.55 | 1932.45 |

JK/Lm

RESERVOIRS

Storage Report - Acre Feet
1977

| Act | Amount in Storage Acre Feet | | Actual Am't Diverted to Storage During Season | Delivered from Storage to Irrigation | Storage to Industrial Use | Storage to Municipal Use | Storage to Recreation Use | Stor to p667 |
|-----|--------------------------------|-------------------|---|--|---------------------------------|--------------------------------|---------------------------------|--------------------|
| | 11-1-76 | Maximum 10-31-77 | | | | | | |
| | 352,267 | 351,562 | 230,589 | 851 | 220,677 | 91,574 | 129,481 | 90 |
| | 27,040 | 26,915 | 3,994 | 172 | 3,340 | 31,311 | 542 | |
| | 91,065 | 93,675 | 91,065 | 1,878 | 2,000 | 732 | 91,065 | |
| | 5,470 | 18,391 | 4,787 | 13,593 | 0 | 0 | 13,593 | |
| | -0- | -0- | -0- | -0- | -0- | -0- | -0- | |
| | 3,250 | -0- | 501 | 2,939 | | | | |
| | 461,699 | July 1 346,351 | 269,199 | -0- | -0- | -0- | -0- | 192, |
| | 15 | 86 | -0- | 86 | | | | |
| | 562 | 1,471 | -0- | 1,471 | 988 | | 67 | |
| | -0- | -0- | -0- | -0- | -0- | -0- | -0- | |
| | 4,116 | 15,352 | 2,534 | 12,577 | 2,592 | | | |
| | 245,493 | 853,803 | 602,569 | 33,567 | 229,597 | 123,617 | 221,155 | 283, |

DIVISION SUMMARY - DIVISION NO. 5
 Storage Report - Acre Feet
 1978

| Storage t 10-31-72 | Actual Am't Diverted to Storage During Season | Delivered from Storage to Irrigation | Storage to Industrial Use | Storage to Municipal Use | Storage to Recreation Use | Storage to Projects |
|--------------------------|---|--|---------------------------------|--------------------------------|---------------------------------|---------------------------|
| 307,044 | 330,760 | 588 | 113 | 134,662 | 394,516 | |
| 42,483 | 43,998 | 1132 | 3340 | 38,983 | 39,999 | |
| 96,347 | 53,265 | 91281 | 0 | 730 | 105,456 | |
| 4,446 | 10,261 | 10,602 | 0 | 0 | 15,048 | |
| 3,000 | 0 | 0 | 0 | 0 | 3,000 | |
| 500 | 3,500 | 3,500 | 0 | 0 | 0 | |
| 150,000 | 180,000 | 3,944 | 58,694 | 3,000 | 330,000 | |
| 0 | 0 | 3 | 0 | 0 | 0 | |
| 6,160 | 1,780 | 1,616 | | 2,410 | 3,581 | |
| 0 | 0 | 0 | 0 | 0 | 0 | |
| 12,776 | 41,445 | 36,153 | 3,257 | 137 | 42,435 | |
| 622,756 | 665,000 | 66,666 | 65,404 | 179,922 | 934,035 | |

AGRICULTURE

as livestock and grazing. The major crop is hay, with 3/4 to 1 ton per acre. The grazing land in the area ranges in elevation from 4,500 to 12,000 feet. With this difference in elevation, there is a great difference in ability to produce forage for cattle and browse for wild game and sheep. Some sites can produce no more than 100 pounds of plant material per acre. Other sites in favorable years produce 4000 pounds per acre.

The Middle Park area crops are mostly barley, potatoes, corn and hay. Over the last twenty years the cropping patterns have changed in this area. Carbondale and Aspen used to be known for potatoes, and crops like strawberries were common around Glenwood Springs. Today this area is devoted to pasture and hayland, with minor acreages of cash crops.

The Lower Grand Valley area produces fruits and row crops. About 8,141 acres of fruit orchards - peaches, pears and apples.

In all three areas combined, the approximate yield of wheat and hay is 105,700 bushels and 310,258 tons. There are approximately 152,548 sheep and lambs, and 143,276 cattle and calves. Livestock is an important part of the agriculture industry. However, the total number has decreased. Cattle and sheep are often summered on land administered by the U. S. Forest Service and Bureau of Land Management.

In the past few years we have seen much farm land become residential areas. Due to the uncertainty of making a living on a farm or ranch and due to high taxes on farm land, many ranches and farms have fallen into the hands of subdividers.

The uncertainty of the weather on fruit orchards causes hardships on everyone. If the fruit growers have a short crop due to late frosts in the spring, the consumer has to pay more for the product.

Irrigation water is available for many farms in the three areas and new planned developments are underway to promote more irrigation water.

DAMS

District

No. of Stock Tanks

36
37
38
39
45
50
51
52
53
70
72

0
1
1
0
0
0
0
0
0
0
0

WATER RIGHTS TABULATIONS

WATER RIGHTS TABULATION

| | |
|---|-----|
| 1. Underground water rights | 59 |
| 2. Changes in water rights | 30 |
| 3. Water rights (absolute) | 173 |
| 4. Diligence (conditional) | 116 |
| 5. Water storage rights | 43 |
| 6. Applications received in water court | 401 |
| 7. Referee consultations | 401 |

REFEREE'S FINDINGS AND DECREES

HYDROGRAPHER'S REPORT

gaging measurements at the seven stations for which annual records were computed for publication in Water Resources Data for Colorado. Thirty six administrative measurements were made in addition to those above.

The 1978 water year records were recently submitted to the Chief Hydrographer for reviewing.

ORGANIZATIONS

WATER COMMISSIONER'S SUMMARY

Direct Flow Diversions

1978

| Total Ditches Reported | Active | Inactive | Direct Diversions AC. Ft. | No. of Acres Irrigated | Ac. Ft. Per Acre | Industrial Use Diversions AC. Ft. | Municipal Use Diversions AC. Ft. | Recreation Use Diversions AC. Ft. | Trans. Mtn. Diversions AC. Ft. | Total Diversions AC. Ft. |
|---|---|----------|---------------------------|------------------------|------------------|-----------------------------------|----------------------------------|-----------------------------------|--------------------------------|--------------------------|
| 247 | 1 | 133 | 291,856 | 14,475 | 20.2 | 169,993 | 4860 | 461,883 | 161,339 | 461,883 |
| 212 | 10 | 156 | 165,589 | 17,581 | 9.4 | 0 | 4088 | 166,920 | 7,232 | 166,920 |
| 403 | 19 | 207 | 450,456 | 54,750 | 8.23 | 3,969 | 9800 | 52,243 | 79,426 | 650,018 |
| 123 | 5 | 141 | 110,427 | 16,633 | 6.64 | 0 | 436 | 1,010 | 0 | 111,873 |
| 125 | 0 | 219 | 83,954 | 33,297 | 2.46 | 0 | 400 | 7,000 | 0 | 83,954 |
| 78 | 0 | 94 | 43,422 | 19,000 | 2.26 | 0 | 1000 | 25,000 | 0 | 43,422 |
| 226 | 0 | 249 | 169,865 | 33,953 | 5.00 | 2,871 | 2396 | 300,000 | 517,602 | 687,467 |
| 130 | 0 | 32 | 49,516 | 9,172 | 5.4 | 0 | 0 | 25,600 | 0 | 49,516 |
| 294 | 104 | 104 | 129,233 | 42,258 | 3.06 | 367,385 | 3925 | 46,300 | 3 | 501,009 |
| 62 | 0 | 44 | *80,000 | 10,900 | 4.5 | 0 | 1000 | 10,000 | 0 | 80,000 |
| 208 | 00 | 133 | 1,153,945 | 104,764 | 11.01 | 529,600 | 5798 | 0 | 0 | 1,700,000 |
| 2108 | 134 | 1512 | 2,728,263 | 356,783 | 7.64 | 1,073,818 | 31,307 | 1,095,956 | 765,600 | 4,536,062 |
| 30,000 | *Includes Bluestone and Larkin in District 45 out of the Colorado River | | | | | | | | | |
| Water Available NU = Non Use | | | | | | | | | | |
| Transmountain Diversions: Designate either to | | | | | | | | | | |

Direct Flow Diversions
1978

| Direct Divisions 2-Ft. | No. of Acres Irrigated | Ac.Ft. Per Acre | Industrial Use Divisions Ac.Ft. | Municipal Use Divisions Ac.Ft. | Recreation Use Divisions Ac.Ft. | Trans Mtn. Divisions Ac.Ft. | Total Divisions Ac.Ft. | No. of Daily Ditch Ppts. | Deliv to C |
|--|------------------------|-----------------|---------------------------------|--------------------------------|---------------------------------|-----------------------------|------------------------|--------------------------|------------|
| 856 | 14,475 | 20.2 | 169,993 | 4860 | 461,883 | 161,339 | 461,883 | | |
| 589 | 17,581 | 9.4 | 0 | 4088 | 166,920 | 7,232 | 166,920 | | |
| 456 | 54,750 | 8.23 | 3,969 | 9800 | 52,243 | 79,426 | 650,018 | | |
| 427 | 16,633 | 6.64 | 0 | 436 | 1,010 | 0 | 111,873 | | |
| 954 | 33,297 | 2.46 | 0 | 400 | 7,000 | 0 | 83,954 | | |
| 422 | 19,000 | 2.26 | 0 | 1000 | 25,000 | 0 | 43,422 | | |
| 865 | 33,953 | 5.00 | 2,871 | 2396 | 300,000 | 517,602 | 687,467 | | |
| 516 | 9,172 | 5.4 | 0 | 0 | 25,600 | 0 | 49,516 | | |
| 233 | 42,258 | 3.06 | 367,385 | 3925 | 46,300 | 3 | 501,009 | | |
| 000 | 10,900 | 4.5 | 0 | 1000 | 10,000 | 0 | 80,000 | | |
| 3,945 | 104,764 | 11.01 | 529,600 | 5798 | 0 | 0 | 1,700,000 | | |
| 8,263 | 356,783 | 7.64 | 1,073,818 | 31,307 | 1,095,956 | 765,600 | 4,536,062 | | |
| estone and Larkin in District 45 out of the Colorado River | | | | | | | | | |
| J = Non Use | | | | | | | | | |
| Transmountain Divisions: Designate either to or from Division. | | | | | | | | | |

DIVISION ENGINEER'S SUMMARY

ANNUAL SUMMARY - DIVISIONS

ACRE FEET (11-1-77 thru 10-31-78)

| Ditch Structures Reported # | Direct Diversions To Irrigation | Diversions To Storage | Storage To Irrigation | CURRENT YEAR Acres Irrigated | TRANS-MOUNTAIN | |
|-----------------------------|---------------------------------|-----------------------|-----------------------|------------------------------|----------------|---------------|
| | | | | | Div. to Div. | Export Import |
| 381 | 291,856 | 330,760 | 588 | 14,475 | 161,339 | |
| 378 | 165,589 | 43,998 | 1132 | 17,581 | 7,232 | |
| 629 | 450,456 | 53,265 | 9128 | 54,750 | 79,426 | |
| 269 | 110,427 | 10,261 | 10,602 | 16,633 | 0 | |
| 344 | 83,954 | 0 | 0 | 33,297 | 0 | |
| 172 | 43,422 | 3,500 | 3,500 | 19,000 | 0 | |
| 475 | 169,865 | 180,000 | 3,944 | 33,953 | 517,602 | |
| 162 | 49,516 | 0 | 3 | 9,172 | 0 | |
| 398 | 129,233 | 1,780 | 1616 | 42,258 | 3 | |
| 106 | 80,000 | 0 | 0 | 10,900 | 0 | |
| 440 | 1,153,945 | 41,445 | 36,153 | 104,764 | 0 | |
| 3754 | 2,728,263 | 665,000 | 66,666 | 356,783 | 765,600 | |

| MUNICIPAL | | INDUSTRIAL | | | RECREATION | | ACTUAL STORAGE | | # Degree Applications | # Water Applicat |
|------------|------------------|-------------------|-----------------------|-------------|--------------------------|-------------------------|----------------|--|-----------------------|------------------|
| To Storage | Storage Releases | Direct Diversions | Diversions To Storage | Hydro-Power | Storage - Wildlife Parks | For Year All Reservoirs | | | | |
| 134,662 | | 169,993 | 113 | 169,993 | 394,516 | 330,760 | | | | |
| 38,983 | | 0 | 3340 | 0 | 39,999 | 43,998 | | | | |
| 730 | | 3,969 | 0 | 0 | 105,456 | 53,265 | | | | |
| 0 | | 0 | 0 | 0 | 15,048 | 10,261 | | | | |
| 0 | | 0 | 0 | 0 | 3,000 | 0 | | | | |
| 0 | | 0 | 0 | 33,260 | 0 | 3,500 | | | | |
| 3,000 | | 2,871 | 58,694 | 0 | 230,000 | 180,000 | | | | |
| 0 | | 0 | 0 | 0 | 0 | 0 | | | | |
| 2,410 | | 367,385 | 0 | 367,385 | 3,581 | 1,780 | | | | |
| 0 | | 0 | 0 | 0 | 0 | 0 | | | | |
| 137 | | 529,600 | 3,257 | 529,600 | 42,435 | 41,445 | | | | |
| 179,922 | | 1,073,818 | 65,404 | 1,100,238 | 934,035 | 665,000 | | | | |

RECOMMENDATIONS AND SUGGESTIONS



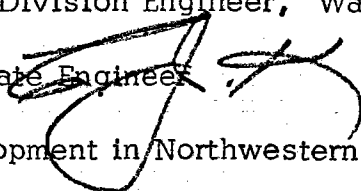
DIVISION OF WATER RESOURCES

Department of Natural Resources
1313 Sherman Street - Room 818
Denver, Colorado 80203
Administration (303) 839-3581
Ground Water (303) 839-3587

November 27, 1978

MEMORANDUM

TO: Lee R. Enewold, Division Engineer, Water Division No. 5 ✓
Wesley Signs, Division Engineer, Water Division No. 6

FROM: C. J. Kuiper, State Engineer 

SUBJECT: Oil Shale Development in Northwestern Colorado

Enclosed please find copies of tables and maps from a report by the University of Wisconsin entitled Oil Shale Development in Northwestern Colorado: Water And Related Land Impacts.

Mr. Scott Mernitz from Harris Sherman's office requested that we review this report, especially in regard to the comments on water rights by the different oil companies. I am sending you both complete copies of the appendixes since some of the tabulations include both the White River and the main stem of the Colorado River. I was not aware that the University of Wisconsin had done this much research or that the plans for the various oil companies were that far advanced.

Please review these various tabulations and comment on them pointing out as much detail as you are aware of on each individual item. The Department is interested primarily in the effect on agricultural water rights. Any interest that the oil companies may have other than that shown on the tabulation should be included in the review.

If you have any questions, please give me a call.

CJK:lkc
Attachments

DIVISION OF WATER RESOURCES

LEE R. ENEWOLD P. E.
IRRIGATION DIVISION ENGINEER
P. O. BOX 396
GLENWOOD SPRINGS, COLORADO 81601
PHONE: 945-5665

TO: C. J. Kuiper, State Engineer

FROM: Lee R. Enewold, Division Engineer, Water Division No. 5

SUBJECT: Oil Shale Development in Northwestern Colorado

Pursuant to your memorandum of November 27, 1978, I have reviewed the material subject: "Oil Shale Development in Western Colorado", along with the attachments. Before we get into the detail of the study and report as made by the University of Wisconsin, let us look at the broad picture and present some general ideas.

The appendix K1 through K12 is by and large a fairly accurate inventory of water rights held by the various oil companies. A fast check of our water data computer printout shows that the bulk of the water rights are inventoried. However, we do not record ownership in the water data bank. Therefore, the K appendix is a useful information guide; thus I will refrain from "nit picking" the flaws of the appendix unless you would like a revised list pointing out errors.

From the various water interests held by the oil companies, we could conclude that they were in competition with each other. I believe the oil companies are very much aware of what each is doing and cooperate with one another even down to the River Basin Studies: ie "Corsim". In fact, their interlock and joint ventures make it hard to tell just how the water rights will be developed.

Now let us take a quick look at the priority dates and dates of initiation for "conditional" water rights held by the oil companies. Most of these water rights date back only 12 years or year 1966. This date does not give the oil companies a viable priority as far as the Colorado River is concerned. Further, most of the water rights held are "conditional", creating a certain gamble when perfected. In fact, agriculture would benefit the most from conditional water rights development by the oil companies.

Before we can answer the water questions posed, certain assumptions must be made. Most of the water requirement assumptions are based on conjecture, and with this they race wildly ahead and come up with some absurd requirements for water. Water requirements change with the process used. One known process actually produces water as a by-product. At any rate, the water requirements for those processes using water are not that great. I quote from a speech by Fred L. Hartley, Union Oil, November 2, 1978 entitled "Shale Oil" -

"A great deal has been written about the limitation available water will place on shale oil development. Actually, water requirements are quite modest compared to those for other operations. While water usage would vary for different processes, Union's upflow process would require from one to two barrels of water for each barrel of crude shale oil produced. By comparison, in a conventional thermal electric power generating plant, ten barrels of water are required for each barrel of oil, or it's coal equivalent, converted to electricity. Manufacturing synthetic

barrels of crude shale oil popularly offered as a limit on the size of the industry is based on today's technology. The technology will improve with the commercialization experience and the upper limit on shale oil production may well be of much greater than two million barrels per day. In any case, it can make a major contribution to meeting the nation's energy requirements".

Union Oil has the strongest position of all the oil companies when it comes to water. For many years Union has moved forward by acquiring water rights and perfecting them through the water courts. Their water rights are senior rights acquired by the purchase of farm land and transfer of the historic consumptive use to a newly built pumping plant at Grand Valley. Union also has reservoir sites and final plans for building them. All this plus a model plant that works!

A question which has been asked since 1915 - Will oil shale be developed and how soon? As a fuel, crude shale oil is intermediate between coal and petroleum in its chemical composition. "Among the unknowns facing the industry today are the technological constraints on the size of future plants and the total production possible. These will be determined not only by engineering technology but also by constraints placed on development by environmental limits and the availability of water". Also the price and availability of crude oil on the world market.

In conclusion, I would say that the production of oil shale will not have an adverse effect on agricultural water rights. Development of junior water rights, owned by the oil company, would store and spread the peak flows over a period of time, thus enhancing agriculture on the Western Slope.

A handwritten signature in black ink, appearing to read "Lee G. Enness". The signature is written in a cursive style with a large, prominent initial "L".

UNITED STATES
DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Division of Irrigation
Fort Collins, Colorado
May 14, 1953

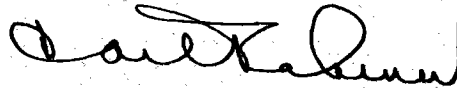
COLO. AGR. EXP. STA.

Dr. S. S. Wheeler, Director
Colorado Agricultural Experiment Station
Campus

Dear Dr. Wheeler:

I am enclosing a copy of the reprint of Bulletin 386,
Parshall Flumes of Large Size. This bulletin was reprinted
because of the demand for information regarding the con-
struction and operation of large flumes. As an economy
measure, reprinting was done by the Multigraph Service
of the College. It is not so good as a printing-press
job, but I think that it takes care of the problem of
providing the information needed.

Very truly yours,



CARL ROHNER, SENIOR
IRRIGATION ENGINEER

CR:lk

Enclosure

1978
ANNUAL SUMMARY - DIVISIONS
ACRE FEET (1-1-77 thru 10-31-79)

Division 12

| PI | Ditch Structures Reported # | IRRIGATION | | | | Storage To Irrigation | CURRENT YEAR Acres Irrigated | TRANS-MOUNTAIN Div. to Div. Export | Impact |
|----|-----------------------------|---------------------------------|-----------------------|-----------------------|-----------------|-----------------------|------------------------------|------------------------------------|--------|
| | | Direct Diversions To Irrigation | Diversions To Storage | Storage To Irrigation | Acres Irrigated | | | | |
| | 381 | 291,856 | 330,760 | 588 | 14,475 | 161,339 | | | |
| | 378 | 165,589 | 43,998 | 1132 | 17,581 | 7,232 | | | |
| | 629 | 450,456 | 53,265 | 9128 | 54,750 | 79,426 | | | |
| | 269 | 110,427 | 10,261 | 10,602 | 16,633 | 0 | | | |
| | 344 | 83,954 | 0 | 0 | 33,297 | 0 | | | |
| | 172 | 43,422 | 3,500 | 3,500 | 19,000 | 0 | | | |
| | 475 | 169,865 | 180,000 | 3,944 | 33,953 | 517,602 | | | |
| | 162 | 49,516 | 0 | 3 | 9,172 | 0 | | | |
| | 398 | 129,233 | 1,780 | 1616 | 42,258 | 3 | | | |
| | 106 | 80,000 | 0 | 0 | 10,900 | 0 | | | |
| | 440 | 1,153,945 | 41,445 | 36,153 | 104,764 | 0 | | | |
| | 3754 | 2,728,263 | 665,000 | 66,666 | 356,783 | 765,600 | | | |

| MUNICIPAL | Diversions To Storage | Storage Releases | INDUSTRIAL | | | | RECREATION | | ACTUAL STORAGE | | # Decree Applications | # Waste Applic |
|-----------|-----------------------|------------------|-------------------|-----------------------|-------------|--------------------------|-------------------------|--|----------------|--|-----------------------|----------------|
| | | | Direct Diversions | Diversions To Storage | Hydro-Power | Storage - Wildlife Parks | For Year All Reservoirs | | | | | |
| | 134,662 | | 169,993 | 113 | 169,993 | 394,516 | 330,760 | | | | | |
| | 38,983 | | 0 | 3340 | 0 | 39,999 | 43,998 | | | | | |
| | 730 | | 3,969 | 0 | 0 | 105,456 | 53,265 | | | | | |
| | 0 | | 0 | 0 | 0 | 15,048 | 10,261 | | | | | |
| | 0 | | 0 | 0 | 0 | 3,000 | 0 | | | | | |
| | 0 | | 0 | 0 | 33,260 | 0 | 3,500 | | | | | |
| | 3,000 | | 2,871 | 58,694 | 0 | 230,000 | 180,000 | | | | | |
| | 0 | | 0 | 0 | 0 | 0 | 0 | | | | | |
| | 2,410 | | 367,385 | 0 | 367,385 | 3,581 | 1,780 | | | | | |
| | 0 | | 0 | 0 | 0 | 0 | 0 | | | | | |
| | 137 | | 529,600 | 3,257 | 529,600 | 42,435 | 41,445 | | | | | |
| | 179,922 | | 1,073,818 | 65,404 | 1,100,238 | 934,035 | 665,000 | | | | | |