

AVAILABILITY OF WATER FOR OIL SHALE DEVELOPMENT

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Whenever in some circles I mention the need and availability of water for the development of oil shale, I am reminded by those interests that there are other minerals present in the oil shale in the Piceance Basin reputed by them to be of more value than the oil recoverable from the shale. Some one or more of these minerals are now imported into the United States, and their development in the Piceance Basin could reverse this situation. However, oil production from shale has been a subject of discussion for more than one-half a century, and for the purposes of this paper, use of water for development of any and all the minerals associated with oil shale, including oil shale, will be lumped generally though inaccurately in the term "water for oil shale."

As all of you know, for a good many years it was assumed that production of oil from shale would largely be on the Colorado River front, that is, the area north of and adjacent to the Colorado River generally from Rifle to DeBeque, Colorado. Subsequent investigations disclosed that apparently the richest and thickest shale beds lay in the Piceance Basin, not readily accessible to mining from the shale bluffs over the Colorado River. Some of these subsequent investigations disclosed the presence of the associated mineral sources. Necessarily this has caused some change in the area of interest in water supply.

The map that I have here shows generally the water sheds in the geographic area of the Colorado River Water Conservation District and the operating and proposed water development projects within that area. Those developments are either completed or proposed U. S. Bureau of Reclamation projects or developments proposed by the Colorado River Water Conservation District.

There are a great many water filings along the Colorado and White Rivers by persons or companies interested in shale oil and other development. Most of these along the Colorado River are pumping plant situations between Grand Valley and DeBeque, and most were filed with the realization that diversions could not be made as continuously as would be needed for a commercial plant

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unless storage incidental thereto was provided or acquired. Though the pattern of filings on White River is not identical, it is similar. Anyone can, of course, make a direct flow filing and some diversion would be permissible during peak runoff periods. But locating an adequate storage site at this late date, especially where sufficient water supplies would be available to store is another matter. It is in this area that the Bureau of Reclamation and the Colorado River Water Conservation District can be of assistance to the oil shale industry.

Referring then to the map, the three most obvious sources of storage or of water availability are Green Mountain Reservoir on the Blue River, Ruedi Reservoir on the Frying Pan River, and the proposed West Divide Project, the available industrial-municipal water being from the Crystal River.

Green Mountain Reservoir stores about 100,000 acre feet of water for such purposes and has heretofore delivered to the Colorado River a maximum of about 63,000 acre feet largely for perfected irrigation rights. Any contract for industrial uses from this reservoir would be subject to pre-emptive agricultural-domestic uses.

Ruedi Reservoir will provide in all about 100,000 acre feet of water. No division of that storage, however, has yet been made between replacement water for Frying Pan-Arkansas diversions out of priority and water for use on the Western Slope. Until this has been done, it is doubtful that effective contracts can be negotiated.

The Bureau of Reclamation has planned into the West Divide Project as now before Congress for authorization some 34,500 acre feet of high quality water and 43,000 acre feet of lower quality water delivered to most any point on the Colorado River. If the West Divide Project was now authorized and money for advance planning was made available, you could expect water deliveries from the project about ten years from now.

Additionally, in the Colorado River area, reservoir storage is available in the Una Reservoir, Toponas Reservoir, the Snowmass Project, and Wolcott Reservoir. There are other smaller reservoirs or replacement situations which could be developed.

On the White River the Bureau is about to complete the feasibility study and report on the proposed Yellow Jacket Reclamation Project. It is estimated that this project will make available approximately 55,000 acre feet of water for industrial and municipal purposes. Additionally, there is capacity as yet available from the proposed Rio Blanco Reservoir on the South Fork of White River, a part of the Flattops Project. On lower White River, Rangely Reservoir presents replacement possibilities, and there are other small storage or replacement situations available.

On the Yampa River there is at least one excellent source for water, the proposed Juniper Reservoir planned by the Bureau of Reclamation with some 770,000 acre feet of active capacity. Water from this reservoir will be deliverable to the confluence of Piceance Creek and White River.

The foregoing is a but limited inventory of the facilities presently available for storage or replacement purposes for an oil shale industry. There are several other facilities being developed by private industry, and there are other facilities planned by the District to furnish water for the industry presently under option.

Because of the competitive nature of the oil industry, the requirements of planned water developments exceed the water supply, and, as and if the industry develops much cooperation planning and use of facilities will emerge.

Let me again emphasize that storage during the limited period of high runoff is one important key to an adequate supply of water.

Having quickly examined some potential storage sites, let us now take a quick look at some of the other factors affecting the availability of water for storage and thus for use.

First among these factors though not standing alone is mother nature's participation in the form of snow. Little else can be said on this point, because even the United States Government cannot have much real effect on this.

Second is what I will generally call the law of the river. The law of the Colorado being what it is, the snow pack in our high mountains takes on deep significance. An example of this is the apparent annual average Lee Ferry delivery requirement of 7,500,000 acre feet of water. In general, the law of the river is composed of a combination of the doctrine of appropriation as expressed by our Colorado Constitution, our present as well as past water and adjudication statutes, the Colorado River Compact of 1922, the 1944 treaty with the United Mexican states, the Upper Colorado River Basin Compact of 1948, and court decisions applying or construing one or more of the foregoing, or applying equitable principles to the division and distribution of water. Pollution control is a new factor of law which much be considered, and conservation practices are playing an evermore important part.

Opinions differ as to the effect of various parts of this law of the river on the availability of water for use in Colorado. Opinions likewise differ as to where Colorado's entitlement can best be used and even as to what is to be considered the best use. It is sufficient, I think, to say that the law of the river must be considered when an investment in extensive water development is contemplated.

The third, and last, item on water availability I wish to discuss is the question of time. Almost everyone agrees that the quantity of water available

to Colorado for beneficial consumptive use is limited. Competition in the whole river basin, between the eastern and western slopes in Colorado, and in the Western Slope itself is keen. If others get the water to use first, the problems of getting a sufficient supply for oil shale development will be compounded. Delay in firming up supplies now can only lead to additional expense in the acquisition of water rights.

I have deliberately avoided estimates of quantities available let alone estimates of requirements. Such estimates depend upon answers to many questions I do not have. Much of what I have said has been said before, and the message I would give you is the message heretofore given you. Reasonably prompt and diligent action is necessary on the part of all of those parties interested in shale if adequate supplies of water are to be made available for an oil shale industry at a reasonable cost.