

Ralph E. Clark III
519 East Georgia Ave.
Gunnison, Colorado 81230

CARP - Colorado Aqueduct Return Project
February 2002

- Recent discussions about how to meet future water needs in Colorado brought up CARP (the Colorado Aqueduct Return Project). CARP would return 280,000 or more acre-feet of water annually for use again in Colorado - but only after this water has first flowed down through its basin of origin, been used and reused, doing all that it does in stream and out of stream. CARP was offered as a last resort for Colorado - something undertaken only after other alternatives to providing water for the Front Range are exhausted.

CARP was initially designed as an alternative to three proposals for traditional transmountain diversion from the headwaters of the Gunnison Basin. Such traditional proposals divert and remove water from a basin's upper headwaters leaving behind many social, economic, and environmental problems. The intent of CARP is to avoid imposing this sacrifice upon a basin of origin for the benefit another places. In Colorado's future, CARP would then make much more economic, environmental, social, legal, and practical sense than yet another traditional transmountain diversion from the headwaters.

CARP returns water by a 10 foot diameter pipeline starting at the Colorado - Utah state line. The pipeline ends beneath the Continental Divide. The route generally follows the I-70 corridor. From beneath the Continental Divide, returned water could be sent down the Arkansas or the Colorado or the South Platte, or some combination of these major river basins. Water returned by CARP is water Colorado remains entitled to consume under the Colorado River Compact. CARP in 2002 would cost about \$2.5 billion or about \$9,000 per acre-foot of capacity. The water returned would cost about \$800 per acre-foot or close to \$2.50 per 1,000 gallons.

I offered the design for CARP in 1988 but I do not have a financial stake in this project. I do, however, have strong opinions about whether, when, and how CARP should happen. First, CARP should be a last resort. Its concept isn't something new. Instead, the concept behind CARP has been proposed and done elsewhere. Many lessons and good ideas are offered by those efforts. All are greatly appreciated. For example, about twenty years ago Exxon Corp designed a water pipeline system from the Missouri River to western Colorado for oil shale development. It would have delivered about 1 million acre-feet a year. A report published last August described a project to send 4 million acre-feet a year through a 30 foot diameter pipeline from the shores of Hudson Bay in Canada about 2,100 miles southwestward to the Colorado River Basin states. How to build CARP is not difficult. Why to build CARP requires much more study.

Among major considerations in CARP's design is the need for flexibility. Delivering returned water to the top of three major river basins allows flexibility in how much, when, and where this water can go to meet needs. Greater use can then be made of existing reservoir capacity and other water facilities in those basins. Keeping reservoirs "topped up" with returned water can enhance recreation, instream flows, and provide greater security in the water supplies during droughts. CARP allows for inevitable changes in assumptions about where and when water is needed across much of Colorado. Given its purpose, scale, flexibility, and breadth of geographic scope, CARP should only be undertaken as a state project - by the Colorado Water Conservation Board or a new state authority.

A low broad-crest weir supports the diversion of water for CARP from the Colorado River while allowing passage of native fish and boaters. CARP does not require a new dam. A weir could fit with the designation of the river and surrounding area. It would not change temperature and chemical conditions of water flow at the site or exacerbate flooding. How much water is diverted can be adjusted for river conditions. Diversion for about 280,000 acre-feet a year could be kept below less than half the recorded minimum flow. However, the site at the state line offers the largest available water catchment area. This reduces vulnerability to drought, climate changes, and natural variation of water conditions more evident far upstream in the sub-basins of the Colorado River. Water returned by CARP could enhance instream flows in some locations. Finally, because CARP does not need a new dam and its route follows along highway corridors, it would impose a smaller "footprint" than many traditional transmountain diversions.

Water diverted from the Colorado River at the state line is generally of better quality than water downstream that is diverted to California and Arizona. Water returned by CARP would first be filtered through a designed wetlands. The returned water would also often be of better quality than water in the headwater streams which receive it. Knowing that water flowing first down through its basin of origin might then be returned by CARP should encourage much more attention to maintaining water quality in many of Colorado's streams.

Paying off the money borrowed to finance CARP would be the largest operational cost component of the water returned by CARP. However, this cost could be greatly reduced if those who would directly benefit or receive the water actually pay in advance, for example by a "tap-fee" of \$4,000 to \$5,000 for each dwelling unit equivalent at the time approval is given for a land use change allowing new development. Tap-fees often exceed \$10,000 but are paid at the time of construction, sometimes years later. Cost for the energy to pump water returned by CARP is assumed as equal to, or greater than, energy costs of similar large scale projects. Overall, water returned by CARP appears to cost less than water from other large traditional transmountain diversion proposals.

Discussions about CARP should address some cautions. What happens if CARP is built and a cheaper source of a water supply appears? Who would have to pay off the debt for constructing CARP? The demand for heavily subsidized water supplies is almost unlimited. However, pricing water at its real cost promotes conservation. Another cheaper alternative is obtaining water from opportunities for improving irrigation efficiency. Very often irrigators also can then obtain higher crop production. Other less costly alternatives for meeting future water needs along the Front Range of Colorado appear to be water supply coordination, water recycling, and perhaps conjunctive use programs.

Another caution is that present costs for supplying water to new development are likely to promote the use of new technologies. For example, in-house water recycling systems appeared in the late 1980's. They were complicated to operate. Now in-house water purification by distillation can be combined with operation of a household fuel cell. As the system generates electricity, the released high temperature water vapor can distill household waste water for reuse. Material left behind is cooked and sterilized for disposal. Then remaining heat goes on to warm or cool household space and water. Application of this and other technologies from the space program can allow a household to become independent of traditional piped water supplies and sewage treatment. Household water supply could be simply kept topped up with soft drinks and fruit juice.

CARP would be a big project but not something new. Study is needed on why to undertake CARP, not how. Particular attention should be given to what CARP would mean as a state project. What new policies are needed so that beneficiaries pay the real cost of water they receive? What can make it easier to re-allocate both water and costs from time to time to realize the flexibility of CARP? What lessons from places such as South Park can be learned and applied so as not to leave behind problems when agricultural diversions are shut off and the water is sent downstream? As water becomes more valuable and used and reused in many more ways, what are ways to avoid water "gaming and speculation"? What can lead to watershed planning which is much broader in perspectives and more inclusive of all interests? Can water in streams be both committed to CARP and also to providing more than a "minimum" stream flow? Could this enable restoration of economic values associated with natural services and also restore and sustain the natural hydrograph or flow regime of streams within Colorado?

CARP is offered as a best last resort. If new transmountain diversion must be in Colorado's future, then do it from the state line - not the headwaters. However, CARP certainly should not yet be a goal in Colorado's future. For more details about CARP's design, please contact me. Also any comments, corrections, and suggestions are very much appreciated.

Ralph E. Clark III
Ralph Clark