



Colorado's Water Plan – Reuse White Paper

The Gap

Colorado faces a challenge in determining how to meet the future water demands of a rapidly growing population. Many stakeholders, with assistance from the State, have expended significant time and thought into how to solve this challenge – work remains ongoing and will continue into the future. Meeting our State's urban "gap" will require water providers to decrease demands, increase supply¹, and use supplies more effectively.

Our inability to control the climate, precipitation, or the decisions of all water actors should result in an immediate and long-term focus on fully optimizing supplies through reuse as allowed under Colorado law. In addition to reuse through exchanges, reuse projects in which water is physically captured and returned to distribution systems are rapidly becoming a preferable and viable option and are representative of the type of solution that is needed to manage our urban water supplies in an uncertain future.

The Colorado State Water Plan should acknowledge reuse as an attractive and viable alternative to be considered by all water users as alternative strategies are compared. Incentives to promote the full and effective utilization of reusable water supplies should be accompanied with regulatory and financial support.

The Goal

The Governor and the Colorado Water Conservation Board (CWCB) can provide critical leadership in the Colorado Water Plan by setting a **goal of promoting the full and effective reuse of municipal supplies and by initiating a reuse planning process** to determine the most effective way to achieve that goal. Reuse by individual communities is important, but regional and intergovernmental opportunities on a watershed basis are likely to provide the greatest value as partnerships share costs and infrastructure and increase flexibility in making water available when and where it's needed.

Evaluating reuse opportunities will be a complex undertaking. Given the importance of understanding and comparing supply alternatives for their ability to help meet the M&I "gap," developing a Colorado reuse plan should be a priority and targeted for completion by December 2015. This will require the state to quickly prioritize the development of a reuse plan, dedicating sufficient financial and staff resources, and acquiring consultant assistance. At the same time, Basin Implementation Plans should include an evaluation of reuse opportunities associated with all existing and potential supplies and projects (for example, for the IPPs in Table 2).

Other states' planning processes can provide useful examples to aid Colorado in moving forward. As the May 16th draft of Chapter 5.6.2 of the Colorado Water Plan notes, significant headway on reuse is being made in California as a result of statewide reuse goals and legislation. Oklahoma's Water for 2060

¹ Healthy, flowing rivers and streams are integral to sustaining the Colorado we all value. New supplies must be developed in ways that don't harm, and may enhance, streamflows.

legislation sets a goal of no additional fresh water use statewide in 2060 than in 2012 with that goal being achieved through conservation, efficiency and reuse. An Advisory Council is charged with recommending programs and incentives toward meeting those goals to the Governor and Legislature by late 2015. In Arizona the Governor appointed a Blue Ribbon Panel on water sustainability to improve the long term sustainability of Arizona's water supplies through increased conservation and recycling. The Panel initially focused on increasing reuse through detailed examinations of water quality, regulatory, infrastructure and public acceptance challenges

Reusable Supplies and Means of Reuse

Colorado's Appropriation Doctrine allows for specific water sources to be reused, though successive reuse of many return flows by downstream water users occurs regularly. Reusable supplies typically include most transbasin imports, the consumptive use portion of transferred water rights² (usually from agriculture), non-tributary groundwater, and native supplies with reuse decreed (typically newer rights).

Reuse may occur in a variety of ways. The exchange of reusable return flows with downstream water users is common and historically has been an effective means of reuse. However, as streamflows become fully appropriated, the ability to develop new exchanges is greatly limited. Lack of integrated delivery infrastructure also limits exchange opportunities. Direct reuse occurs when utilities capture reusable returns flows and return them to their water system for appropriate treatment and distribution, as in Denver Water's non-potable reclaimed water system³, for example. Indirect reuse occurs when return flows are routed through an "environmental barrier" (a stream or river) before being recaptured, treated appropriately, often blended with other supplies, and distributed. Recycled water can be used for potable uses or non-potable uses, such as irrigation and industrial processes. Colorado has potable indirect reuse projects in place with Aurora's Prairie Waters Project⁴ being perhaps the best known example of this. All direct use projects in the state are currently for non-potable uses only. However, indirect potable reuse is common, with municipalities throughout the state diverting upstream water providers' return flows. With proper treatment and monitoring – especially looking to the future – direct potable reuse is a highly likely approach to addressing the gap.

How to Achieve the Goal

Fully optimizing reuse of municipal supplies will require a reuse plan, with at least three sub-elements that: (1) quantify opportunities; (2) evaluate all reuse options; and (3) chart a path forward. Public education and awareness will be critically important to gaining further support especially when compared to other strategies.

Develop a State Reuse Plan

Our water supplies are an extremely precious resource and we need to ensure we are efficient and effective in our use of them. Maximizing reuse potential will require creative, collaborative approaches that utilize shared infrastructure and foster institutional change. This effort will necessitate close

²Only the portion of a transferred water right that was historically consumed can be reused to ensure that historical return flows are maintained and that other water users are not injured.

³ <http://www.denverwater.org/WaterQuality/RecycledWater/>

⁴ <https://www.auroragov.org/LivingHere/Water/WaterSystem/PrairieWaters/index.htm>

coordination and a transparent partnership between state agencies, water providers, the reuse community, and the general public. The media will play a critical role in delivering appropriate messages and characterizations of all future water projects and programs, especially with the larger scale for reuse potential that will be considered going forward. A state planning process focused on developing a comprehensive understanding of reuse potential, obstacles, as well as the means to overcome those will move us towards our goal. Basin Implementation Plans can begin laying the groundwork by clearly identifying reusable supplies associated with existing and planned and potential supplies and projects.

Reuse opportunities should be evaluated alongside other potential supplies to identify coincident benefits as well as tradeoffs, costs, reliability, public concerns, and other issues. We should also evaluate how the state can facilitate and incentivize progress, for example, exploring various funding sources and regulatory reform to support reuse projects and education and communication necessary to achieve public acceptance.

Evaluate All Reuse Options

All means of reuse need to be considered and potable reuse needs to grow as a viable option, especially looking towards the future. Non-potable reuse is important in stretching supplies but insufficient demand, especially in the non-irrigation season, can constrain the development potential for outdoor water programs. Non-potable uses also require separate delivery infrastructure because water isn't treated to drinking water quality. This can be very expensive and is severely limited for application to existing developments where new infrastructure is required. When water is treated to potable quality, a tremendous benefit is that it can be delivered through one set of delivery infrastructure to all customers in all seasons and managed as one with other supplies. Whether direct or indirect potable reuse, such an approach requires intensive and effective monitoring to ensure public safety of drinking water supplies.

Regional reuse projects may provide the greatest value. Such projects could take many forms. A Colorado Reuse Plan could consider partnerships, such as WISE, or even the feasibility of a regional water supply institution. Shared infrastructure to maximize reuse yields should be evaluated, possibly including, but not limited to gravel pit regulating storage, reservoir peak carryover storage, regional pump back systems, and water treatment and distribution systems.

Accurately Quantify Opportunities

It's critical that reasonable and realistic projections be developed when quantifying the "gap" and potential reuse water supply project yields. A key element is that when water is reused to extinction through successive reuse one acre-foot of reusable supply has the potential to be extended to include an additional acre-foot of reuse.⁵ Additionally a long list of supplies *may* be reusable: new water from growth into existing re-usable supplies, transferred agricultural consumptive use from purchases and dedications of agricultural supplies (including the urbanization of agricultural lands), alternative agriculture transfers (ATMs), new transbasin diversions, non-tributary groundwater, and native supplies with decreed reuse. The CWCB Portfolio Tool, developed as part of the 2010 Statewide Water Supply Initiative (SWSI), identifies a variety of reuse Identified Projects and Processes (IPPs, Table 1). The Portfolio Tool also

⁵ Colorado Springs Utilities and the Pueblo Board of Water Works are examples of water providers that successfully realize one acre-foot of reuse for every acre-foot of reusable supply, doubling the effectiveness of these supplies.

includes numerous others IPPs that would have **additional** reuse potential (Table 2) as each is based at least in part on reusable supplies. When we consider reuse from these and existing supplies, it's clear that significant reuse opportunities exist, especially in the Arkansas and South Platte River Basins.

Utilities' water conservation plans, water master plans, and similar documents often provide useful provider-specific information, but a compilation of regional data is needed. Examining the Front Range Denver Metro region, the *1999 Metropolitan Water Supply Investigation*⁶ (MWSI) estimated future reusable return flows totaling 268,000 AFY, with plans by communities to reuse approximately 186,000 AFY through exchange, direct, and indirect reuse. However, the MWSI report is more than 15 years old so estimates must be updated to reflect current reuse supplies, plans, and potential. A 2012 report by Western Resource Advocates (WRA), Trout Unlimited, and the Colorado Environmental Coalition⁷ estimated municipal reuse in the Arkansas basin could increase to a total of 46,500 AFY and additional projects are currently being evaluated or developed.

Work needs to be done to update reuse IPPs. For example, the WISE (Water Infrastructure and Supply Efficiency) partnership needs to be clearly identified. This project would utilize Aurora Water's Prairie Waters Project infrastructure to also deliver reusable supplies to Denver and, when excess supplies are available, to ten Douglas County entities to help reduce their reliance on nonrenewable groundwater. WISE is estimated to provide up to 60,000 AFY on average at build out for South Metro entities and about 15,000 AFY of dry year supplies for Denver Water upon project completion.⁸ Similarly, the Colorado River Cooperative Agreement (CRCA), signed in the fall of 2013, states that "Denver Water will fully construct its recycled water system with the capacity to provide 17,500 acre-feet annually..." The CRCA includes 10,000 AFY of additional reuse or conservation by Denver Water and estimates that Denver Water's exchanges will increase by 21,700 AFY on average.

Facilitate Progress

The mention of water reuse often prompts a list of reasons why such projects are difficult to implement, but all new water supplies come with complex challenges. Rather than being deterred by such hurdles, we should instead determine what needs to be done to overcome them. Funding, technical assistance, political support and public acceptance will be essential.

A wealth of resources exists to aid in making progress. In Colorado we have *WateReuse Colorado* and the *RMSAWWA/RMWEA Joint Reuse Committee* (Rocky Mountain Section American Water Works Association/Rocky Mountain Water Environment Association). These include reuse professionals (utilities, consultants, researchers, and others), many of whom already have reuse programs in place. These same organizations also have national associations focused on increasing the viability and acceptability of water reuse. Tremendous resources are being invested in research in treatment technologies (much focused on potable reuse), energy use, cost benefit analyses, social research, and much more.

⁶ Hydrosphere Resource Consultants, 1999. Metropolitan Water Supply Investigation Final Report. To the Colorado Water Conservation Board. January, 1999.

⁷ Western Resource Advocates, et al., 2012. Filling the Gap: Meeting Future Urban Water Needs in the Arkansas Basin, March 2012. <http://westernresourceadvocates.org/water/fillingthegap/FillingTheGapArkansas-Final.pdf>

⁸ <http://www.denverwater.org/SupplyPlanning/WaterSupplyProjects/WISE/> accessed on April 17, 2014.

The State can help incentivize reuse projects by exploring funding options from the Water Supply Reserve Account, other CWCB funds, and/or the Colorado Water Resources and Power Development Authority to incorporate grant/loan combinations or lower interest rates for reuse projects. Bureau of Reclamation Title XVI and other reuse specific funding opportunities should also be investigated.

We can increase education and outreach to water providers, planners, the public, and others about the important role that reuse can and does play in meeting water needs in our state. Educating people about the hydrologic cycle, the strict regulatory environment in which recycled water treatment and use occurs, and the incidental potable reuse that takes place every day, will go a long way towards increasing acceptance of reuse, especially direct potable reuse.

In Conclusion

Strong leadership and state initiated reuse-specific planning is necessary to meet the goal of fully optimizing reuse potential. We must better understand reuse opportunities, develop political support, and pursue collaborative, creating thinking. Reuse is a valuable supply alternative, increasing yields from new and existing supplies, and is one of the most resilient water resources available to us, even under uncertain climate and hydrologic conditions.

It is recommended that more descriptive reuse projects and programs be identified by the Basin Roundtables and stakeholder groups so the concepts introduced in this White Paper can be considered by legislators and the interested public. Those concepts should be developed to a level where the primary infrastructure and operating conditions are represented along with an initial assessment of the environmental, social and economic attributes of the proposal. In that way, the reuse proposals can be more readily compared against other water supply approaches.

Table 1: Reuse IPPs from the CWCB Portfolio Tool

Basin	Project	Yield (acre-feet/year)		
		Low	Medium	High
Arkansas	El Paso County Water Authority Reuse	2,500	2,500	2,500
Arkansas	Pueblo BWW Reuse Plan	21,000	25,000	30,000
Colorado	City of Aspen - Golf course reuse/West Aspen Reclaimed Project	540	540	540
Metro	City of Aurora - Prairie Waters	4,900	6,900	9,700
Metro	City of Thornton - Recapture and exchange with gravel lakes	1,000	1,200	1,500
Metro	City of Brighton - recapture and exchange	2,000	2,200	2,900
Metro	Town of Castle Rock - Reuse of existing firm yield	1,900	1,900	1,900
Metro	ECCV - Northern Project	3,700	3,900	4,500
Metro	City of Northglenn - Existing reuse plan	450	500	650
South Platte	Erie - Reclaimed water	3,700	3,800	4,300
South Platte	City of Longmont - Union pumpback	1,800	2,100	3,000
TOTAL		43,490	50,540	61,490

Table 2: IPPs with Reuse Potential from the CWCB Portfolio Tool

Basin	Project Type	Project	Yield (acre-feet/year)		
			Low	Medium	High
South Platte	Agricultural Transfers	Various Participants – NISP*	34,000	35,000	37,000
Arkansas	Firming Transbasin Rights	Pueblo BWW acquiring shares in Bessemer Ditch.	5,000	6,200	7,200
Arkansas	Agricultural Transfers	Eagle River Joint Use Project	5,500	5,500	5,500
Arkansas	Agricultural Transfers	Arkansas Valley Conduit	1,800	2,500	3,400
Arkansas	Agricultural Transfers	Other Arkansas Ag Transfer Projects - Upper Arkansas	3,600	3,600	3,600
Arkansas	Agricultural Transfers	Other Arkansas Firming Transbasin Projects - Upper Arkansas	3,600	3,600	3,600
Arkansas	Agricultural Transfers	Other Arkansas Ag Transfer Projects -Southwestern Arkansas	620	620	620
Colorado	Agricultural Transfers	Town of Silt - Last Chance Ditch change of use	160	160	160
Colorado	New Transbasin Project	Other Colorado Ag Transfer Projects - Eagle County	2100	3,000	4,600
Colorado	New Transbasin Project	Other Colorado Ag Transfer Projects - Mesa County	690	1,500	3,200
Gunnison	New Transbasin Project	Other Gunnison Ag Transfer Projects -Mesa County	370	430	550
Metro	Firming Transbasin Rights	City of Thornton - Northern Project	7,000	7,800	10,000
Metro	Firming Transbasin Rights	City of Brighton - Ag transfers (well aug), SPlatte & Beebe Draw Project	2,200	2,500	3,200
Metro	Agricultural Transfers	City of Aurora - Eagle River Project	3,200	4,500	6,300
Metro	Agricultural Transfers	Denver Water - Total Share of Moffat Collection System Project	8,700	10,000	14,000
Metro	Agricultural Transfers	City of Arvada - Moffat Collection System Project	1,400	1,800	2,200
Metro	Agricultural Transfers	City and County of Broomfield - Windy Gap Firming Project	3,500	3,800	4,800
Metro	Agricultural Transfers	Other Metro Ag Transfer Projects - Denver Metro	12,000	14,000	19,000
Metro	Agricultural Transfers	Other Metro Ag Transfer Projects - South Metro	5,100	7,100	9,600
Metro	Firming Transbasin Rights	City of Northglenn - Clear Creek ag rights	300	350	450
Metro	Agricultural Transfers	City of Arvada - Clear Creek ag rights	500	600	700
South Platte	Firming Transbasin Rights	City of Longmont - Water rights dedication policy	3,800	3,900	4,200
South Platte	Agricultural Transfers	City of Greeley - Acquisition of Poudre ag rights	9,000	9,000	9,000
South Platte	Firming Transbasin Rights	Various Participants - Windy Gap Firming Project	18,000	19,000	21,000
South Platte	Agricultural Transfers	Other South Platte Ag Transfer Projects - Northern	6,100	6,400	7,300