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To: Senate Conservation Committee

Subject: Conclusions and Recommendation regarding the Fatal Flaws of the Gila River Diversion Preferred Alternative as Described in the draft Preliminary Engineering Report Released by the ISC in January 2014

I have reviewed the New Mexico Interstate Stream Commission's (ISC's) current proposal to develop and export Gila River water. I have spent many days studying the January 2014 Draft Preliminary Engineering Report (draft PER). I drove to Cliff and Gila, New Mexico, last weekend to walk into, inspect, and measure the proposed diversion dam site in a remote, roadless area within the Gila National Forest and to look at the sand and gravel arroyos where the ISC proposes to build off-stream reservoirs to store diverted Gila River water. I have researched important features of the proposal and identified numerous serious errors and omissions in the ISC's analysis. The draft Preliminary Engineering Report may be the worst I have ever reviewed.

The ISC Gila River diversion plans are fatally flawed and incredibly expensive. The ISC is either withholding or hasn't performed essential analyses that if competently performed and publicly released would show its plan won't work and would cost much more than the low ball cost estimate.

My motivation to review the draft PER and related ISC slide shows and consultant reports and to present this testimony to the Senate Conservation Committee today is to prevent the terrible mistake that would result from attempting to implement the Gila River diversion "preferred alternative."

I am uniquely qualified to conduct this review and provide you with my professional conclusions. All of my work is pro bono. I am a recently retired licensed professional water engineer at the end of 40-year successful career. I earned Bachelor of Science in Electrical Engineering and Master of Science in Civil Engineering (Water) degrees from New Mexico State University. I have worked as a water resources modeler, electrical and mechanical systems maintenance engineer, water and wastewater systems operations and maintenance manager, water resources planner, Director of the New Mexico Interstate Stream Commission from 1997 to 2002, and since 2002 as a consulting engineer and expert. From 2004 to 2012 I served as a key member of the management and engineering team that implemented Santa Fe's successful diversion from the Rio Grande for drinking water. Importantly, I am extensively familiar with the Gila River, including its behavior during floods.

We now know the historical failure of three prior technically superior methods proposed by the ISC to develop New Mexico's allocation of Gila River water as authorized by federal law in the 1960s have ensured the failure of the ISC's current effort to develop the fourth best way. This fourth best way simply won't work. It can't work. The ISC has exhausted its workable options. The better ways (from an engineering perspective), Hooker Dam and its successor concept, Conner Dam, each would have created a main stem reservoir in a Gila River canyon to store the water and settle the sediment. Both proposals were feasible from an engineering perspective but both failed due to their environmental and social impacts and monetary costs that no one was willing to pay for the small resulting increased Southwestern New Mexico water supply. A third proposal to store Gila River water, not in a reservoir behind a dam on the river but in a tributary canyon, also failed.

In 2004, the New Mexico Interstate Stream Commission (ISC) was federally authorized and liberally funded through the efforts of Senator Pete V. Domenici to come up with the fourth best way. The ISC released its first specific but very incomplete proposal in stages during January 2014. The version that I reviewed was last modified on January 24, 2014. The draft PER preferred alternative concept for diversion and storage fails for engineering reasons caused by sediment that cannot be removed from the water with a diversion system that uses gravity as its sole source of energy.

Sediment is the certain fatal flaw. It will plug the pipelines. Sediment can be removed if the water is first settled or pumped through a centrifuge before it is introduced into pipelines. The ISC's project manager and I agree that pumping is not feasible and settling is impossible without pumping. Inability to obtain the required federal approvals and permits is likely another likely unsolvable problem, as is the inability or unwillingness to pay the huge costs.

The untimely draft PER fails to deal with the realities of diversion of water and the very high sediment loads of the Gila River during floods and very rare sustained high flows, the only times that New Mexico can legally divert its water. Diversion would occur only a few days each year, and perhaps not at all in dry years.

Gila River floods characteristically are huge but brief. Gila River flood peaks routinely are 10 times the normal peaks on the Rio Grande anywhere in the New Mexico. Although the draft PER illustrates (but fails to analyze and justify) design features to passively exclude gravel and debris, medium and fine sand and silt will flow with the water right through the simple gravel and debris screen. The sediment that will flow through the simple, fragile screen is about 75% of the total mass of sediment suspended in the river flow. Sand and silt will fill and plug the project's huge tunnel and nine-foot diameter buried pipelines, which will be full of water but which will not flow at all the vast majority of the time. These pipelines are higher on both ends.

The diversion structure as presented in the draft PER is wholly inadequate. The river at flood is extremely powerful and violent, carrying cobbles and boulders and huge trees downstream. The only question in my mind is whether the river would destroy the diversion structure and its fragile screen before the river buried the structure in sediment and cobbles or would bury it first. Even if the diversion dam were to be adequately designed to survive and function, the sediment cannot be removed from the water. The certain result is solidly plugged pipelines from which sediment removal will be hugely

expensive at best. I believe such removal of settled sand and silt would be practically impossible.

Even if the pipelines could convey flood flows to the storage reservoirs, most of the water would be lost to evaporation and infiltration because the proposed storage reservoirs are located in the sandy bottoms of multiple arroyos. These arroyos run through coarse, unconsolidated sand and gravel hills next to the river. ISC's so-called reservoir sites are unsuitable for the efficient storage of water. The draft PER ignores water losses due to infiltration even though a consulting geologist's report included in Appendix B emphasizes on page 2 that infiltration will be greater than evaporation.

The draft PER includes a pipeline with multiple large pump stations to lift water over the continental divide to Silver City and Deming. The PER says the project would cost \$350 million and the Bureau of Reclamation says \$440 million. Both cost estimates are incomplete and not credible. As examples, the electric energy bill to pump water from the storage reservoirs over the continental divide to Silver City and Deming would be many times greater than the entire operations and maintenance budget included in the cost estimate. The draft PER indicates a single employee working 10 hours per week could operate and maintain the entire system. Those are glaring examples of the absence of credibility.

In fact, nothing about the ISC's untimely conceptual proposal for diversion, conveyance, storage, and export of Gila River water is complete or credible or possible to successfully implement: not the ability or cost or time to secure the required permits to build the project, not the overstated amount of water legally and physically available for diversion, not the ability to deal with sediment entrained in the diverted water, not the project's reliable water yield after supply shortages and large losses due to evaporation and infiltration from shallow arroyo-bottom reservoirs, not the low-ball project cost estimate to develop and export water from the Gila River Basin by pumping 1,700 vertical feet over the continental divide to Silver City and Deming (neither of which would use the water to increase their drinking water supply), and not the ability and willingness of any entity to pay the hugely expensive yet understated project costs.

The ISC has orally and in its most recent unsubstantiated public slide shows indicated that the project's usable water yield could provide additional water to downstream endangered fish during dry times, and provide a supplemental irrigation supply during dry times, and pipe large amounts of water to Deming and Silver City all of the time. Yet the ISC has not documented its analysis of the legally and physically available and divertible amount of water in the Gila River, nor the expected project yield after reservoir losses, nor an allocation of that yield to the competing uses. The ISC's indications are misleading at best. There is no way enough water would result to supply all of these uses. These ISC indications are not credible in face of the available facts and remain unsupported by any publicly available documentation.

The ISC has refused to release its model of the expected water supply amounts and has not put forward anything but misleading graphs and simple cartoons of its modeling results. No model, no documentation, no results of modeling, no conservatism in any assumptions, no competent analysis. Nothing anybody can depend on. Nothing of reliable substance.

I emphasize that it's not my job to articulate, analyze, and document the essential and important questions and answers that remain apparently unasked and that are publicly unanswered today, 10 years after the authorization. The ISC, whose job it is, has not done it, not publicly for review.

It's my choice to step forward to try to stop this terrible mistake and the certain waste of treasure without benefit that the ISC's attempt to further develop and implement the draft PER preferred alternative would cause. The State of New Mexico has much higher priority water needs that should be met with its limited funds rather than continuing down this path that I assert surely will fail and which even the low-ball cost estimate shows is hugely expensive.

I recommend that instead the Senate Conservation Committee pass SB89, directing that the remaining funding secured for New Mexico by Senator Domenici first be expended, as provided by law, to implement stakeholder proposals for non-diversion alternatives that certainly will increase the available water supply, including water conservation, watershed restoration, wastewater reuse, and irrigation efficiency improvements.

I am happy to explain my critique and conclusions in detail. A detailed technical outline of my critique is available. I have presented this critique to the State Engineer and the Interstate Stream Engineer. I have requested the State Engineer and the Interstate Stream Engineer make arrangements to give me time on the agenda of the ISC's April meeting to present a letter report and respond to any questions staff or the commission may have.

Sincerely,

/s/

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Attachment