

XI. Sustainability of the Confined Aquifer in this Overappropriated Basin

A. Statutory Direction Defines Sustainability

386. Protestors argued that this undefined and foreign term to Colorado water law, “sustainable,” is speculative and an inappropriate substitute for the traditional case-by-case evaluation of material injury to existing water rights. In opening statements, counsel for Protestors correctly identified the word “sustainable” as important to this case. Mr. Porzak argued:

Now the State and those seeking to lock up the basin claim all of this is justified to preserve the sustainability of the aquifer. That will be the important word that they will use. Your Honor, what is important is that they cannot define what this means....Furthermore, the evidence will prove that sustainability of the confined aquifer, indeed any aquifer, is a function of recharge equaling or exceeding withdrawals. It is not based on the maintenance of artesian pressure. Transcript (*Porzak*) Vol I. at 88-90.

387. Counsel correctly focused the Court’s attention on these issues. As the trial unfolded, it became obvious that the evaluation of the Rules and the authorizing legislation requires a careful evaluation of the General Assembly’s introduction of the word “sustainable” into the vocabulary of Colorado water law. That is not to suggest the word “sustainable” is unfamiliar. It is frequently used in contemporary technical literature concerning economic and environmental issues. It has also been used in academic publications in connection with the problems of overappropriation and “mining” in Colorado aquifers. In fact, Mr. Porzak’s co-counsel in this trial, Mr. Kinnear, was interviewed at length for the recent Law Review article, *Sustaining the Unsustainable: Development of the Denver Basin Aquifer*, 9 U. Denv. Water L.Review 121 (2005).

388. The Court rejects the narrow definition of “sustainable” Mr. Porzak suggested in his opening statement and that the Protestors argued throughout the trial. The Court concludes that the General Assembly used this term with the conscious intent to provide the State Engineer with a guiding principle for management of the aquifers in the San Luis Valley. The history of groundwater regulation in the San Luis Valley is summarized earlier in this opinion. Protestors have emphasized the fact that since the Supreme Court’s return of the 1975 proposed rules to the State Engineer for consideration of the reasonable-means-of-diversion doctrine in *Alamosa-La Jara Water Users Protective Ass’n. v. Gould*, 674 P.2d 914, 932 (1984), the State Engineer has not proposed revised or new rules for existing wells in the confined and unconfined aquifers. They argued that this failure to regulate existing wells is the source of the current state of the aquifers and should have been and should now be addressed. The Court agrees that the need to address all water uses in a constitutional manner is self-evident. The mandate for sustainability in SB 04-222 sets the framework for evaluation of existing as well as any new withdrawals as these issues are addressed.

389. At the time SB 04-222 was enacted, the General Assembly received a summary of the conclusions of the RGDSS Study of the aquifers and surface streams in the San Luis Valley. SB 04-222 is anchored in the understanding of the aquifers reflected in the RGDSS Study.

390. Section 37-92-501(2)(e), C.R.S., states: “All rules and regulations shall have as their objective the optimum use of the water consistent with preservation of the priority system of water rights.” The General Assembly determined that the circumstances in Water Division 3 required additional statutory direction.

...In regulating an aquifer or system of aquifers in Division 3, the state engineer shall apply the following principles:

- (I) Use of the confined and unconfined aquifers shall be regulated so as to maintain a sustainable water supply in each aquifer system, with due regard for the daily, seasonal, and long-term demand for underground water; Section 37-92-501(4)(a)(I), C.R.S.

391. This statutory principle is directly related to the overappropriated state of the aquifers. There is no question that the surface streams within Water Division 3 are overappropriated and have been overappropriated since at least the early 1900's. *Concerning the Water Application of Tres Rio Ranch*, 1991 CW 29 at 32-34; *Alamosa-La Jara Water Users Prot. Ass'n v. Gould*, 674 P.2d 914, 931 (Colo. 1983) at 918; *State Eng'r v. Bradley*, 53 P.3d 1165, 1167 (Colo. 2002). See earlier discussion and Findings in Part III D., p. 28, paragraph 85. See further discussion below in Part XIII C.

392. The evidence in this trial further demonstrated that the confined aquifer and the unconfined aquifer, individually and as an interconnected groundwater system, are currently in a state of overdraft or mining in which, over the long term, the average withdrawals exceed the average inflows. The unconfined aquifer and confined aquifer, individually and as a connected system, are therefore overappropriated because the existing use of groundwater by decreed or permitted wells exceeds the amount of inflow necessary to recharge or replenish the aquifers under all predictable circumstances. See e.g. State's Exhibit No. 11, Fig. 1; *Transcript (Schreüder) Vol. XI* at p. 2006, ln. 15 – p. 2007, ln. 1. These aquifers are also overappropriated because pumping of groundwater, depending upon the location of the well, can cause depletions to the overappropriated surface streams and injury to vested surface water rights. See State's Exhibit 11, *John Allen Calvert Davey C.R.C.P. 26(a)(2) Disclosure* at pp. 1 – 3; State's Exhibit 12, *Colo. R. Civ. P. Disclosure of Eric J. Harmon, P.E.*, at p. 5; State's Exhibit 13, *Colo. R. Civ. P. Disclosure of Dr. Kenneth W. Knox, Ph.D., P.E.*, at p. 3; State's Exhibit 16, *Colo. R. Civ. P. Disclosure of Hal D. Simpson, P.E.*, at p. 3; State's Exhibit 17, *Expert Opinions [of James E. Slattery, P.E.] in Case No. 2004CW24...* at pp. 3 – 4; State's Exhibit 19, *Colo. R. Civ. P. Disclosure of Steven E. Vandiver, P.E.*, at pp. 2 – 3.

393. This understanding of the state of the aquifers is derived directly from the RGDSS Study and is fully supported by the RGDSS groundwater model. As noted in the earlier discussions, the RGDSS Study has not only increased our knowledge of the hydrogeology, it has altered some important earlier beliefs. Water in storage in the

confined aquifer is less than one-half of the 2 billion acre feet believed to be there in the 1970s, and the water quality of water below 3000 feet is poor. *Transcript (Harmon) Vol. III*, p. 530, ln. 21-25; p. 531, ln. 1-7. The phreatophytes have much deeper extinction depths than formerly believed, and are sensitive to salinity and other environmental influences as described by Dr. Cooper. See Findings above, Part VIII, p. 80, paragraph 242. The limitations of the Closed Basin Project are now clearer.

394. Because both the surface streams and the aquifer system in Water Division No. 3 are overappropriated, the Rules provide that there can be no new or increased withdrawals from the Confined Aquifer System without full augmentation because such new withdrawals will cause material injury to existing vested rights. This one-for-one requirement is justified, in part, by the provisions requiring sustainability of the aquifers in SB 04-222 and the Rules that carry forward the legislative mandate. It occurs in a context of uncertainty regarding the way the State Engineer will finally address existing wells.

B. Sustainability

395. The experts for both Proponents and Protestors agreed that the narrowest engineering definition of the term “sustainable” would be a condition where recharge of the aquifers equals or exceeds withdrawals. The evidence presented to this Court shows that the rate of withdrawals from the Basin has exceeded the rate of recharge over an extended period of time. In addition, Proponents have persuasively urged that the term “sustainable” in SB 04-222 must be understood to define a broader long-term objective with conservation and stewardship of the aquifers as goals. Dr. Knox, the Chief Deputy State Engineer, described the intent of the statute:

I'd define 'sustainability' as a prospective water management of natural resources, particularly in regard to groundwater aquifers, as a protection and management of the benefits enjoyed by current users, as well as exercising a form of stewardship to protect those benefits and uses for future generations.

Transcript (Knox), Vol. XV at 2883.

396. Dr. Knox unequivocally stated that in order to achieve sustainability, there will have to be a reduction in water use. This opinion is consistent with the views of the State Engineer and other experts such as Allen Davey and Steve Vandiver. It is supported by the organizations of water users who joined this case to support the adoption of these Rules even though it means they must reduce their withdrawals from the aquifers.

397. This broad understanding of the term “sustainability” gives context to and supports the legislative provisions for subdistricts to be formed by existing water users to control and reduce water use from all sources within Water Division 3. It also supports the adoption of separate rules requiring pumping meters on production wells in both aquifers and the statutory requirement for maintenance of artesian pressure within a prescribed range. The statutory language mandating sustainability (quoted above) is

followed by these additional provisions:

(II) Unconfined aquifers serve as valuable underground water storage reservoirs with water levels that fluctuate in response to climatic conditions, water supply, and water demands, and such fluctuations shall be allowed to continue;

(III) Fluctuations in the artesian pressure in the Confined Aquifer System have occurred and will continue to occur in response to climatic conditions, water supply, and water demands. Subject to subparagraph (IV) of this paragraph (a), such pressure fluctuations shall be allowed with the ranges that occurred during the period of 1978 through 2000. Artesian pressures shall be allowed to increase in periods of greater water supply and shall be allowed to decline in periods of lower water supply in much the same manner and within the same ranges of fluctuation as occurred during the period of 1978 through 2000, while maintaining average levels similar to those that occurred in 1978 through 2000.

(IV) Nothing in subparagraph (I) or (II) of this paragraph (a) shall be construed either to relieve wells from the obligation to replace injurious stream depletions in accordance with the rules adopted by the state engineer or to permit the expanded use of underground water; and

(V) Underground water use shall not unreasonably interfere with the state's ability to fulfill its obligations under the Rio Grande Compact, codified in article 66 of this title, with due regard for the right to accrue credits and debits under the compact.

(b) In adopting rules pursuant to paragraph (a) of this subsection (4), the state engineer shall:

(I) Recognize contractual arrangements among water users, water user associations, water conservancy districts, ground water management subdistricts, and the Rio Grande water conservation district, pursuant to which:

(A) Water is added to the stream system to assist in meeting the Rio Grande Compact delivery schedules or to replace depletions to stream flows resulting from the use of underground water; or

(B) Subject to subparagraphs (I), (II), and (III) of paragraph (a) of this subsection (4), injury to senior surface water rights resulting from the use of underground water is remedied by means other than providing water to replace stream depletions.

(II) Establish criteria for the beginning and end of the division 3 irrigation season for all irrigation water rights;

(III) Not recognize the reduction of water consumption by phreatophytes as a source of replacement water for new water uses or to replace existing depletions, or as a means to prevent injury from new water uses; and

(IV) Not require senior surface water right holders with reasonable means of surface diversions to rely on underground water to satisfy their appropriate water right.

(c) The state engineer shall not curtail underground water withdrawals from aquifers in division 3 that are included in a ground water management subdistrict created pursuant to section 37-45-120 or 37-48-108 if the withdrawals are made pursuant to a ground water management plan adopted by the subdistrict that meets the requirements of paragraphs (a) and (b) of this subsection (4). The state engineer shall publish notice of the approval of any ground water management plan in the same manner as provided for rules under paragraph (g) of subsection (2) of this section, and judicial review of such approval shall be pursuant to paragraph (a) of subsection (3) of this section. The water judge shall retain jurisdiction over the water management plan for the purpose of ensuring the plan is operated, and injury is prevented, in conformity with the terms of the court's decree approving the water management plan.

398. Clearly, the General Assembly has provided an overarching policy to the water court and the State Engineer to guide water regulation in the San Luis Valley and to achieve a “sustainable water supply” and thus ensure that there will be water for future generations. The Court is therefore persuaded that the Proponents’ view of the term “sustainable” is the meaning the General Assembly intended for the word.

399. Everyone agreed that 2002 was an extraordinary year in which snowpack and stream flows represented the lowest figures ever recorded. They further agreed that wells in both the confined and unconfined aquifers pumped more water than ever before. While the current average pumping in the San Luis Valley is around 640,000 acre feet, as indicated by the RGDSS Groundwater Model Water Budget in its monthly 1990-98 simulation (Exhibit RG -25; Exhibit 1, Executive Summary, Table 1.3.1), it is estimated that as much as 900,000 acre feet were pumped in 2002. (Recharge from all sources is estimated to be around 1,058,720 acre feet according to the same table.) Because pumping has not been metered in the past, these are estimates based upon the methodology described elsewhere. No one disputed that the increased pumping along with scant recharge lowered the water table drastically, as is illustrated in the various exhibits. State’s Exhibits 102 and 103 show the longer-term problem of decline illustrated by the stream flows. The long-term problem of overdraft in the confined aquifer, and more generally of both aquifers and surface streams, existed before 2002. The experience in year 2002 is important however. It illustrates how vulnerable this desert basin is to drought. It is reasonable in such a desert environment to talk about “maximum” or “optimum” utilization. It is also not only a reasonable, but also a wise step for the General Assembly to frame such a discussion in terms of “sustainability.”

C. Protestors' View of Sustainability Ignores the Statute and the RGDSS Study

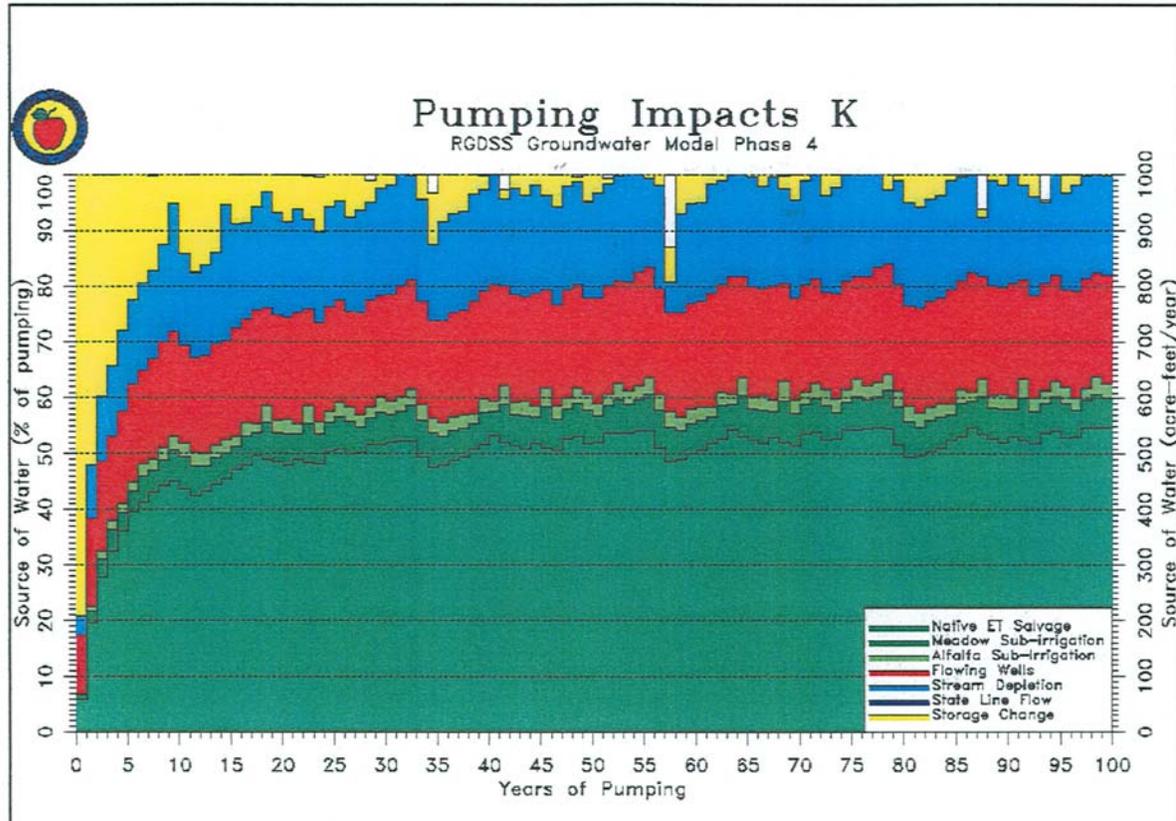
400. The Protestors argued that the current level of use of water from the Confined Aquifer System is sustainable and that additional withdrawals from the confined aquifer can be made without altering the sustainability of the aquifer, although they concede the water table will be lowered and storage reduced. Protestors' expert, William Hahn, P.G., defined the term "sustainable" as meaning a level of new pumping or well field withdrawals that can "operate in that fashion indefinitely." *Transcript (Hahn) Vol. XX* at p. 3623, ln. 13-18. In his deposition definition of "sustainable" acknowledged at the trial, he elaborated: "That the system, the aquifer system, would support the amount of stress more or less indefinitely, without I suppose, catastrophic consequences." *Transcript (Hahn) Vol. XX* at p. 3744, ln. 23-25; p. 3745 ln. 1-5. Similarly, Mr. Lytle testified that "sustainability is really looking at a system in a long-term view to determine if the given stresses on that system can be continued indefinitely...." *Transcript (Lytle) Vol. XXIII*, at p. 4255, ln. 25; p. 4256 ln. 1-5.

401. In the Protestors' view, even if storage and artesian pressure are declining, it is not problematic because the artesian pressure stabilizes at the new levels. They pointed out that even after the increased pumping in the year 2002, artesian pressure and storage have stabilized, albeit at new lower levels. Similarly, they opined that significant new withdrawals which reduce artesian pressure and thus lower water tables further would be sustainable. Of course, they recognized that stabilizing artesian pressure at new lower levels is inconsistent with the provisions of the statute and Rules which mandate maintenance of artesian pressure. This led them to their opinion that "artesian pressure is not a measure of an aquifer's sustainability," Protestors' Exhibit P-1, Opinion 14; *Transcript (Lytle) Vol. XXIII* at p. 4258, ln. 12-17, and that "reduction of artesian pressure does not necessarily affect the sustainability of the aquifer." *Transcript (Lytle) Vol. XXIII* at p. 4328, ln. 19-21.

402. In simple terms, the Protestors' position is that even with continuing large new withdrawals from the confined aquifer, the aquifer will stabilize at a new level, albeit one below where it would be without the new withdrawals. They rely on the RGDSS groundwater model to support their view. Exhibit 24-A Appendix X-2 illustrates their point-of-view that while at first the new withdrawals would impact other water rights in a substantial way, over time the effect would be absorbed by other water uses, especially by taking water from phreatophytes.⁵⁵ This exhibit used the RGDSS groundwater model to predict the effect of withdrawals from 18 wells in multiple layers of the confined aquifer over time. Figure 2 from Exhibit 24, Appendix X-2, is representative of the exhibit and is reproduced below.

⁵⁵The Protestors' expert on computer modeling, Charles Norris, who contended that the RGDSS groundwater model was poorly calibrated and did not converge, nevertheless relied upon the RGDSS Groundwater Model Water Budget and the 1978-2000 data repeated over time for calibration purpose over time to conclude that additional withdrawals are sustainable. See Exhibit P-37; *Transcript (Norris) Vol. XXI* at p. 3976-77.

Figure 2 Water Budget Impacts



403. This reasoning would indicate that an indefinite succession of additional withdrawals could take place so long as the water levels restabilize and material injury to stream flows is augmented. The fact that artesian pressure would diminish or that non-irrigated plants would be adversely affected is immaterial to this analysis. In their analysis, Protestors gave no consideration to either environmental or economic factors. This view also ignores Mr. Harmon’s repudiation of the mistaken estimate of 2 billion acre feet in storage and his determination that the water quality is poor below the depth of 3000 feet. In fact, Protestors presented an exhibit depicting the San Luis Valley as one large reservoir or lake. Protestors’ Exhibit P-28. Significantly lowering the artesian pressure would obviously affect surface and groundwater rights and the Rio Grande Compact delivery. Protestors suggested that these issues could be addressed with augmentation and the use of the “reasonable-means-of diversion” doctrine. An example of how far this logic has been carried is found in AWDI’s position as summarized in *American Water Development, Inc. v. Rio Grande Water Conservation District*, 874 P.2d 352, 374 (1994):

AWDI's position was that any injury to the Closed Basin Project that might otherwise result from AWDI's proposed pumping should be addressed by requiring that the Project wells be deepened to produce water from the confined aquifer.⁵⁶

⁵⁶This Court rejected this argument and specifically found that it had considered both reasonable-means

It is no wonder that the General Assembly determined it should give guidance to the State Engineer in the form of a defining principle--sustainability.

404. The exhibit on the preceding page (Figure 2) does illustrate that a new withdrawal will result in a large initial drop in existing storage, but over time the water for the new withdrawal would mostly come from stream flow, flowing wells, crops and ET; although, continued reduction of storage is also predicted. Review of the other wells in the series depicted in Exhibit 24, appendix X-2, shows that the location of the wells will alter the mix of these elements substantially, as one would expect.

405. Protestors also sought to support their arguments on sustainability by pointing out State's Exhibit 1, Ch. 5, p. 6, Figure 5.2.1, *Global Predicted Change in Storage*, and results from the 1990-1998 steady-state RGDSS groundwater model. This exhibit is reproduced below on page 142.

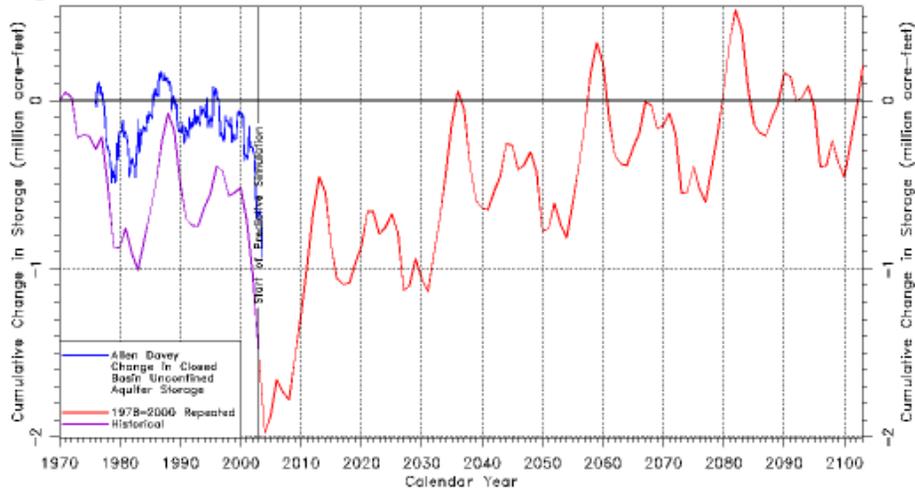
406. The Protestors claimed that State Exhibit 1, Figure 5.2.1 shows that the San Luis Valley's aquifers are not currently subject to withdrawals in excess of recharge over the long term. Figure 5.2.1 is a depiction of increasing groundwater levels in the unconfined aquifer based upon the assumption that the climate conditions that existed between 1978 and 2000 will repeat every 23 years. The Court finds that assumption to be without any basis in fact and finds that Exhibit 1, Figure 5.2.1 is not a reasonable projection of future conditions. See e.g. *Transcript (Schreüder) Vol. XII* at p. 2318, ln. 7 – 20; p. 2321, ln. 18 – p. 2322, ln. 2. Below is Exhibit 1, Figure 5.2.1 which depicts predicted changes in storage in the unconfined aquifer if the 1978-2000 recharge and withdrawals repeat. This document was created by the modelers as part of the calibration process for the model. It was not conceived to be any kind of predictive tool by those who created it.

of-diversion and maximum utilization in approving the Closed Basin Project and in requiring the water be solely taken from the unconfined aquifer. The doctrine of *res judicata* (claim preclusion) precluded any review of the determinations made in Case No. W-3038, *In the Matter of the Application of Water Rights, Rio Grande Conservation District*. On appeal, the Supreme Court found that since AWDI had voluntarily withdrawn its tributary claim, it could not appeal the trial court findings and ruling on this issue.

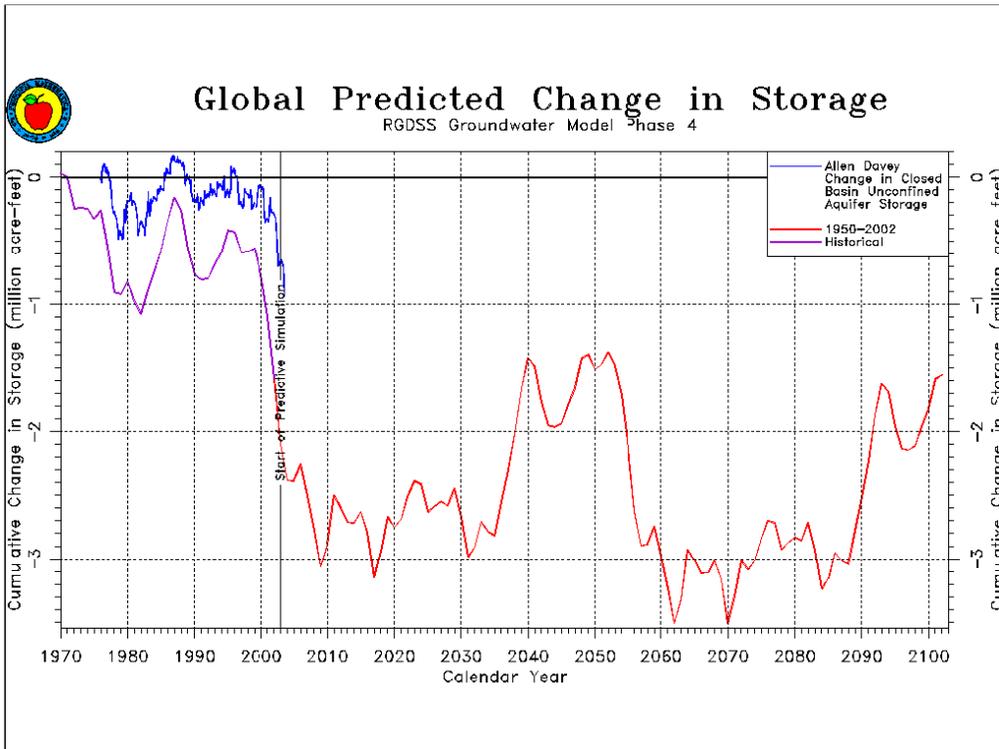


Global Predicted Change in Storage

RGDSS Groundwater Model Phase 4



407. In fact, the evidence establishes that the long-term hydrologic record for the Valley is considerably more varied than that which occurred during 1978 to 2000. The evidence also shows that by selecting different periods of hydrologic record one can make different predictions about what may or may not happen in the future. For example, State's Exhibit No. 11, Figure 1, below, includes the best available record of water levels in the unconfined aquifer since the 1950's, and it establishes a very different result for the change in storage in the unconfined aquifer based upon the complete record period from 1950-2002.



408. Neither the parties nor the Court are able to predict with certainty what climatic conditions will prevail in the San Luis Valley in the future. The only established facts are those that have already occurred. Utilization of the longest possible period is desirable taking into account changes that would affect the figures. Thus, the Court finds State's Exhibit 11, Figure 1 more reliable than Exhibit 1, Figure 5.2.1 as a tool for analyzing these issues.

409. Similarly, Exhibit 83 (reproduced at Part VIII C(5) page 87) illustrates changes in the unconfined aquifer storage which supports the conclusion that there is a decline in storage in the Basin over time as well as a dramatic change during the recent years of drought.

410. The evidence in this case is clear that for at least the last ten years, artesian pressures in the confined aquifer have been steadily declining, see e.g. State's Exhibits No. 81.1, 81.2, 81.3 and 81.4, and that over a longer time period there has been a declining trend in confined aquifer pressures. The recent drought has accelerated the overall rate of decline in artesian pressure but is not the sole cause of that decline. In many areas the artesian pressures have fallen outside of the range that existed between 1978 and 2000.

411. The Court finds that the better evidence in the record, based upon a longer and more representative hydrologic period, establishes that withdrawals from the Confined Aquifer System exceed the recharge to that aquifer system and that without an increase in recharge or a decrease in withdrawal, the Confined Aquifer System will continue in its current state of overdraft, and the overall decline in artesian pressures will continue. See *Transcript (Slattery) Vol. VIII at 1483*.

412. It was surprising to the Court that anyone could seriously suggest using any 23-year period for making long-term predictions, let alone as a basis for new appropriations of water. The water users in the entire Rio Grande Basin struggle every year to live with the overstated estimations which were the basis of the Rio Grande Compact. Good people made the best estimates they could on the basis of limited historical information. Here, 1978-2000 was a period chosen by the General Assembly as a benchmark for sustainability because they believed it was a period of stability in the balance between input and output which supported existing vested water rights and the environment. That is a reasonable legislative benchmark for that purpose. But for the Court or for engineers to take that period out of context of all the other data available to determine long-term sustainability using State's Exhibit 1, Ch. 5, p. 6, Figure 5.2.1, is bad science and judicial folly. That is not to say this Court views Exhibit 11, Figure 1 as the last word on this subject. It must be subjected to review and scrutiny on a regular basis adding in the new data as it accrues. Attention should also be paid to developments in related fields such as climatology and paleohydrology which may inform the effort.⁵⁷

413. The Court finds that none of these exhibits contains an analysis of the sustainability of the Confined Aquifer System, and none of these exhibits remotely

⁵⁷ For example, see Gregory J. Hobbs, Jr., *The Role of Climate on the Water Institutions of the Western Americas*, presented at International Water History Association, Paris, France, December 2005.

demonstrate that the Confined Aquifer System currently is sustainable. For the reasons previously discussed, the 1990-1998 steady-state RGDSS groundwater model cannot reliably be used to make such a prediction.

414. State's Exhibit No. 24 was prepared for the State Engineer's consideration while developing the Rules. Its purpose was to illustrate the fact that small annual withdrawals from the Confined Aquifer System at 18 different locations throughout the San Luis Valley would all cause depletions to surface streams and to the aquifer system. *Transcript (Schreüder) Vol. XI* at p. 2033, ln. 9 – p. 2038, ln. 18; *Transcript (Simpson) Vol. XVII* at p. 3196, ln. 1 – 20.

415. The exhibit thus illustrates the overappropriated nature of the Confined Aquifer System and the need to augment new or increased withdrawals. State's Exhibit No. 24, however, does not reflect the current levels of withdrawals from the Confined Aquifer System, does not show the cumulative effect of new or increased withdrawals and existing withdrawals, and does not cover a sufficiently long period of the hydrologic record to support any meaningful conclusions about the sustainability of the Confined Aquifer System. See *Transcript (Schreüder) Vol. XI* at p. 2064, ln. 12 – p. 2065, ln. 4; *Vol. XII* at p. 2323, ln. 19 – p. 2324, ln. 6. State's Exhibit No. 24 is thus not a sufficient or reliable basis upon which to draw conclusions about the long-term sustainability of the Confined Aquifer System and was never intended to do so.

416. Protestors' experts, Mr. Hahn, Mr. Lytle, and Mr. Norris, did agree with the Proponents' experts that additional withdrawals will reduce the artesian pressure and that no plan of augmentation to streams will alter that fact. Thus, their definition of "sustainable" is not reconcilable with statutory mandate for sustainability and maintenance of artesian pressure in the range which occurred between 1978-2000. Their definition of "sustainable" really means that the artesian pressure will stabilize at a new lower level. This is not what SB 04-222 mandates.

417. Protestors support rules and regulations requiring an analysis of every well to determine if it individually causes material injury to senior water rights and requiring a plan of augmentation for such injury. The legislation leaves this path open for the State Engineer but offers water users in the Rio Grande Basin the opportunity to work together to protect senior water rights by collective actions to reduce water use in general via the formation of subdistricts (along with the State Engineer's adoption of these Rules and the rules for mandatory pump meters.) In creating the RGDSS and its groundwater model, the General Assembly and the State Engineer are taking logical steps to build the kind of reliable database and model with which to more accurately predict and understand the relationships between the aquifers and the surface streams and to evaluate the actual impact of existing and proposed future withdrawals. As the State Engineer gathers the actual pumping data resulting from the Rules requiring each well to have a meter, the understanding of existing water use will obviously improve significantly. In turn, putting real numbers as opposed to estimates into the RGDSS groundwater model will improve the model.

418. Protestors also criticized the RGDSS groundwater model because it is based upon existing water uses which they view as unregulated and, in the view of Protestors, are out

of priority. The modelers unapologetically explained the model is designed to reflect the real world as it exists. As the model is more able to accurately represent the world as it exists, it certainly will be possible to pose new problems to the model in which certain assumptions are changed in order to administer water or as part of the effort to evaluate material injury to senior surface and groundwater rights from junior wells.

419. Protestors also argued at times that the State Engineer must evaluate the sustainability of the Confined Aquifer System in the context of a “useful life” for that aquifer. The Court emphatically rejects this argument. To discuss the establishment of a so-called “useful life” for the Confined Aquifer System would frame sustainability in terms of continued mining of the aquifer until the resource is exhausted or it is no longer economically feasible to extract groundwater. See *Transcript (Simpson) Vol. XVII* at p. 3222, ln.12 - 20. Section 37-92-501(4)(a)(I), C.R.S., directs the State Engineer to regulate the use of the Confined Aquifer System so as to maintain a sustainable supply with due regard for the daily, seasonal and long-term demand for groundwater. A sustainable supply certainly requires that inflows and outflows be balanced over the long term. See *Transcript (Simpson) Vol. XVII* at p. 3180, ln. 3 - 20. Even Protestors’ expert, William Hahn, rejected the notion that the aquifer be mined. He stated, “I would never suggest -- and I doubt that any of us have suggested -- that you would pump that all out, but it’s [the confined aquifer] a buffer. It’s a reservoir that can be taken advantage of.” *Transcript (Hahn) Vol. XX*, p. 3743, ln. 12-16. The General Assembly agrees that the confined aquifer is a buffer; and in order to take advantage of it, the General Assembly has determined that ensuring a sustainable water supply requires that artesian pressures be maintained in the range that existed during the period 1978-2000. See section 37-92-501(4)(a)(III), C.R.S. Thus, quite apart from the material injury that would be caused to existing surface and groundwater rights as a result of mining of the Confined Aquifer System, mining itself is inconsistent with maintaining a sustainable supply. The General Assembly well understands the difference between water management of an overappropriated tributary water basin such as the Rio Grande and the principles applicable to mining of “non-tributary groundwater” in designated groundwater basins.

420. One of the Protestors’ experts, William Hahn, was cross-examined at length concerning his view of a sustainable aquifer. After discussing the evidence supporting and contradicting his views, he gave this Court some advice. He stated, “I recommend to the Court that it take into consideration all of the evidence.” *Transcript (Hahn) Vol. XX*, p. 3744, ln. 4-5. The Court appreciated that advice and has tried to follow it. The evidence presented to the Court over the course of this trial establishes the overappropriated nature of the confined and unconfined aquifers and that new withdrawals from the overappropriated Confined Aquifer System will simply exacerbate the existing overdraft. As the former Division Engineer, Steve Vandiver, bluntly put it, “Any expansion of use under today’s condition, will injure vested water rights.” *Transcript (Vandiver) Vol. VI* at 1237. The lowering of the artesian pressure and groundwater levels caused by new or increased withdrawals will reduce the amount of water available to other users in the confined aquifer, the unconfined aquifer, and the surface streams. The Court finds that the increased stream losses will increase the burden on Colorado to meet its obligations under the Compact by impairing the ability of the stream system to efficiently deliver water to the state line. The increased stream losses

will require increased curtailment of senior surface water rights to meet the requirements of the Compact. And the reduction of artesian pressure and lower water levels in the confined aquifer increases the potential for irreversible aquitard compaction and land subsidence in the San Luis Valley.

D. One-for-One Replacement and Sustainability

421. The Rules require a one-for-one replacement for all new withdrawals affecting the rate or direction of movement of water in the Confined Aquifer System. This is undoubtedly the most difficult provision of the Rules for anyone considering a new appropriation. The Court finds this requirement to be reasonable and appropriate at this time and under the present circumstances. In an overappropriated stream or water source, the law requires that all injurious new depletions be replaced. *Transcript (Simpson) Vol. XVII* at p. 3211, ln. 17 - p. 3212, ln. 4; p. 3212, ln. 8 - p. 3213, ln. 17; see also *City of Aurora v. Simpson*, 105 P.3d 595, 607 (Colo. 2005) (requiring replacement of 100% of withdrawals because the applicant could not prove either that its proposed depletions would not be injurious to holders of vested rights or that its injurious depletions are less than its withdrawals.) See also *Cache LaPoudre Water Users Ass'n v. Glacier View Meadows*, 191 Colo. 53, 62, 550 P.2d 288, 294 (1976) ("water is available for appropriation if the diversion thereof does not injure holders of vested rights.")

422. Withdrawals of water from the confined aquifer are a 100% depletion to that aquifer unless the water is re-injected or otherwise directly recharged to the confined aquifer. The lengthy cross-examination of James Slattery on this subject underscored the complexity of the Rio Grande Basin and the need to take into consideration this complexity in analyzing the effect of a withdrawal from either of the aquifers in this division. The effect of new withdrawals is cumulatively devastating to the pressure in the aquifer. New withdrawals for irrigation, municipal, industrial or out-of-basin use cause a 100% depletion of that water to the confined aquifer because typically the return flows go to either surface streams or the unconfined aquifer. *Transcript (Slattery) Vol. IX* at p. 1675, ln. 20 – p. 1676, ln. 2. Since that aquifer is overappropriated all of the time, the Rules appropriately require full replacement of all such depletions.

E. SB 04-222 Does Address Sustainability and Existing Wells

423. As noted earlier, Protestors argued that the Confined Aquifer System would be sustainable and that new appropriations could be allowed if current users withdrawing water from that aquifer were required to augment their out-of-priority depletions to surface streams. They pointed out that other water divisions have already required the integration of wells and surface water rights under the framework of the Water Right Determination and Administration Act. This was the directive of the Supreme Court to the State Engineer in *Alamosa-La Jara Water Users Protection Ass'n v. Gould*, 674 P.2d 914, 929 (Colo. 1984). The Protestors did not attempt to show whether, where, or how much water would be made available to surface streams if the existing users were to augment their "out-of-priority" depletions to the surface streams. Protestors did not provide any evidence to demonstrate that this requirement alone would result in decreased pumping from the confined aquifer by existing users. The State Engineer Harold Simpson, testified that requiring augmentation of surface stream depletions would

not cause a reduction in well pumping, and that the very purpose of augmentation plans is to allow the continuation of pumping so long as depletions to surface streams are replaced. *Transcript (Simpson) Vol. XVIII* at p. 3196, ln. 23 – p. 3197, ln. 1.

424. The Protestors have also argued that the State Engineer can address and should address out-of-priority depletions by existing uses of groundwater in the San Luis Valley simply by issuance of cease and desist orders to each such well. This, they contended, would make the Confined Aquifer System sustainable. The Court finds that this seemingly simple “solution” requiring a well-by-well analysis by the State Engineer, is fraught with the legal problems first identified in *Fellhauer v. People*, 167 Colo. 320, 447 P.2d 986 (1968); and is at variance with the approach to groundwater regulation for the San Luis Valley contained in section 37-92-501(4), C.R.S.

425. Withdrawals from different wells have different effects on stream flows and affect different streams and other wells in differing amounts. The State Engineer explained that to order the curtailment on a well-by-well basis, he must comply with the provisions of section 37-92-502(2)(a), C.R.S., and make the evaluations required by that section for each individual well. He testified that making this type of well-by-well analysis for the 5,000 or more large capacity wells in the Valley would require more resources than are currently available to his office.

426. The Court has outlined elsewhere the steps taken by the State Engineer and water users since the *Alamosa-La Jara* decision including the efforts the State Engineer took to prevent any increase in use by existing wells. The State Engineer testified that regulation of existing wells should be accomplished either through the groundwater management subdistricts or through generally applicable groundwater regulations adopted pursuant to section 37-92-501(2) and (4), C.R.S. The Court finds that it would be very difficult, if not impossible, to administer wells within Water Division No. 3 without such Rules. *Transcript (Simpson) Vol. XVII* at p. 3184, ln. 1 – p. 3185, ln. 1. Further, the Court finds that as of the passage of HB 98-1011, the General Assembly intended that the State Engineer not promulgate rules until the “specific study” required by HB 98-1011 was completed. The State Engineer was to promulgate rules applicable to new uses from the Confined Aquifer System as the first set of rules after the completion of the study. House Bill 98-1011, section 1 (section 37-90-102(3)(a), C.R.S.), section 2 (section 37-90-137(12)(b)(I), C.R.S.)

427. With respect to regulation of existing groundwater use in the San Luis Valley, the State Engineer testified that the standards for such regulation were those contained in section 37-92-501(2), C.R.S., as supplemented by SB 04-222. He proposed rules for the measurement of groundwater withdrawals that were approved by this Court while this case has been under advisement. He testified that efforts were underway in the Valley to form the groundwater management subdistricts contemplated by section 37-92-502(4)(c), C.R.S., and that he was going to give groundwater users in the Valley an opportunity to form those subdistricts rather than preempting their formation by adopting groundwater rules for the existing wells. He went on to testify that if the groundwater users failed to form those subdistricts or the subdistricts failed to prepare groundwater management plans that comply with the requirements of section 37-92-501(4), C.R.S., then he would adopt regulations governing groundwater withdrawals by existing wells.

428. The Court finds and concludes that the State Engineer’s current approach to regulation of existing groundwater uses is reasonable and in accordance with the statutory priorities given to him. *Fellhauer v. People* precludes the ad hoc well-by-well approach advocated by the Protestors.

F. Sustainability Clarifies Optimum Use

429. The mandate to be vigilant in protecting our natural resources and managing them wisely is found in many Colorado statutes. The provisions of SB 04-222 mandating sustainable use of the aquifers are reasonably related to this purpose. The word “sustainable” has widespread use in environmental and economic circles worldwide. Indeed, institutions worldwide are engaging in “sustainability science” to develop frameworks for “analyzing the vulnerability of human-environmental systems.”⁵⁸ As put by one author recently, “The essence of sustainable development is simply this: to provide for the fundamental needs of humankind without doing violence to the natural system of life on earth.”⁵⁹ Or, as another author puts it, “Meeting fundamental human needs while preserving the life-support system of planet Earth is the essence of sustainable development.”⁶⁰ The General Assembly has never been characterized as an environmental advocacy group, but our legislators are very cognizant that we, in the San Luis Valley, live in a desert where conservation and planning are a necessity.

430. The directive by the General Assembly in section 37-92-501(4)(a)(I) that: “Use of the confined and unconfined aquifers shall be regulated so as to maintain a sustainable water supply in each aquifer system” should be viewed as the next step in the General Assembly’s response to the *Fellhauer* case. The plain meaning of this sentence addresses the constitutional limitations of the doctrine of “maximum” or “optimum” utilization. By defining the level of artesian pressure that must be maintained, the General Assembly implicitly establishes a measuring stick for evaluation of a reasonable-means-of diversion, the amount of “uplift” to which senior surface rights are entitled, and balances the economic and environmental factors, all of which the Supreme Court has indicated are appropriate factors in the equation that courts and the General Assembly must consider. See *Alamosa-La Jara Water Users Protection Ass’n v. Gould*, 674 P.2d 914, 929 (Colo. 1984).

431. The General Assembly purposefully elected to introduce the term “sustainable” into the vocabulary of Colorado water law by adding SB 04-222 to the Water Rights Determination and Administration Act of 1969. The Court concludes in doing so that the General Assembly’s requirement for sustainability adds to and clarifies our understanding of the doctrine of maximum or optimum utilization. Section 37-92-501(2)(e) states, “All

⁵⁸ Science, Environment and Development Group, Harvard College 2003, *Science and Technology for Sustainable Development*, Proceedings of the National Academy of Sciences of the United States; available online at <http://sust.harvard.edu>

⁵⁹ Martens, P. 2006 *Sustainability: Science or Fiction?* Sustainability: Science, Practice & Policy (2)(1)35-41. <http://ejournal.nbii.org/archives/vol2iss1/communityessay.martens.html>

⁶⁰ Kates, Robert W. et al., 2001 *Sustainability Science*, Science Vol. 292 641-42.

rules and regulations shall have as their objective the optimum use of water consistent with preservation of the priority system of water rights.” The General Assembly has now added a defining limitation to this principle for Water Division 3.