DISTRICT COURT, WATER DIVISION NO. 3, COLORADO ALAMOSA COUNTY COURTHOUSE, 702 FOURTH STREET, ALAMOSA, COLORADO 81101 CONCERNING THE MATTER OF THE RULES GOVERNING NEW WITHDRAWALS OF GROUND WATER IN WATER DIVISION NO. 3 AFFECTING THE RATE OR DIRECTION OF MOVEMENT OF WATER IN THE CONFINED AQUIFER SYSTEM aka "CONFINED AQUIFER NEW USE RULES FOR DIVISION 3"	COURT USE ONLY Case No. **2004 CW 24**

FINDINGS OF FACT, CONCLUSIONS OF LAW, JUDGMENT AND DECREE

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I. Parties and Pretrial Proceedings

1. On June 30, 2004, the State Engineer, acting under sections 37-90-137 and 37-92-501, C.R.S. (2005), adopted *Rules Governing New Withdrawals of Ground Water in Water Division 3 Affecting the Rate or Direction of Movement of Water in the Confined Aquifer System* ("Rules"). (Joint Exhibit 1) On June 30, 2004, the Colorado State Engineer filed the Rules with the Water Clerk, Water Division No. 3. The Court accepted the Rules for filing, and this proceeding was assigned Case No. 2004 CW 24. The Rules are attached hereto as **Appendix A**. Also attached in two parts is **Appendix B**, a detailed map of Water Division 3 and admitted in evidence as State Exhibit 113.

2. Pursuant to section 37-92-501(2)(g) ,C.R.S. (2005), the proposed Rules were published in the counties in which the Confined aquifer is located. Notice of the Rules was published in the June 2004 resume for Water Division 3. See e.g. *Simpson v. Bijou Irr. Co.*, 69 P.3d 50, 71-72 (Colo. 2003) (describing publication and notice requirements for rulemaking by the State Engineer). *Order of Publication* (June 30, 2004). Full and proper notice was provided as required by law. See e.g. *Proof of Publication* (July 21, 2004); *Proof of Publication* (July 23, 2004); *Proof of Publication* (August 3, 2004); *Proof of Publication* (August 4, 2004); *Proof of Publication* (August 11, 2004).

3. Pursuant to section 37-92-501(3)(a), C.R.S. (2005), any person desiring to protest a proposed rule may do so in the same manner as provided in section 37-92-304, C.R.S. (2005) for the protest of a ruling of a referee. Sitting as the Water Judge for Water Division 3, this Court is designated to hear and dispose of all protests as promptly as possible. Section 37-92-501(3)(a), C.R.S. (2005).

4. This Court has jurisdiction to hear and determine protests to the Rules. Sections 37-92-203(1), 37-92-501(3)(a), C.R.S. (2005). Nine protests or statements of opposition to the Rules were filed, several of which supported the Rules. The Rio Grande Water Conservation District ("RGWCD"), the Rio Grande Water Users Association ("RGWUA"), and the Conejos Water Conservancy District ("CWCD") filed statements of opposition in support of the Rules. Section 37-92-304, C.R.S. (2005).

5. The Costilla County Water Conservancy District filed a statement of opposition that generally supported the Rules; however, the Costilla County Water Conservancy District did not actively participate in the litigation but instead only monitored the proceedings. *Protest and Pleading in Support*, filed by Costilla County Water Conservancy District (August 31, 2004); *Transcript* (November 8, 2004) at p. 48, ln. 8-9. The United States Bureau of Land Management filed a statement of opposition opposing the Rules, but also simply monitored the proceedings. *Protest of BLM* (August 26, 2004); *Transcript* (November 8, 2004) at p. 8, ln. 8. Farming Technology Corporation filed a statement of opposition, but withdrew the same prior to trial.

6. The San Luis Valley Water Co., LLC ("SLV Water Co."), the Colorado Association of Home Builders ("Home Builders") and Cotton Creek Circles, LLC

("Cotton Creek") filed protests or statements of opposition to the Rules. They will be collectively referred to as the "Protestors". Only protests filed by Cotton Creek Circles, LLC, San Luis Valley Water Co. and Colorado Association of Homebuilders ("Protestors") went to trial.

7. The State Engineer was represented by Assistant Attorneys General Peter J. Ampe and Eve W. MacDonald. The Rio Grande Water Conservation District was represented by David W. Robbins and Ingrid C. Barrier of Hill & Robbins, P.C.; The Rio Grande Water Users Association was represented by William A. Paddock of Carlson, Hammond & Paddock, LLC. The Conejos Water Conservancy District was represented by David L. Harrison of Moses, Wittemyer, Harrison & Woodruff, P.C. Collectively, these parties are referred to as the "Proponents." The Protestor Cotton Creek Circles, LLC, was represented by Glenn G. Porzak, Kevin Kinnear, and Steven J. Bushong of Porzak, Browning & Bushong, P.C. The Protestors San Luis Valley Water Company, LLC and Colorado Association of Home Builders were represented by Alan C. Hale and John G. Lubitz of Hale Freisen, P.C. The Costilla County Water Conservancy District was represented by John C. McClure of Eggleston & McClure, P.C. The United States Bureau of Land Management was represented by Thomas R. Graff. Neither the Costilla County Water Conservancy District nor United State Bureau of Land Management participated in the trial.

8. The Court held a pretrial conference on November 8, 2005, at which time all parties stipulated to the admission of the State Engineer's ("State's") Exhibits No. 1 through 37, including the electronic media that contained the version of the Rio Grande Decision Support System (hereinafter RGDSS) groundwater model and its various inputs used by the State Engineer, in part, to support the Rules. *First Trial Management Order* at paragraph 3 (December 4, 2005); *Transcript* (November 8, 2005) at p. 22, ln. 16 – p. 45, ln. 1. At the pretrial conference, counsel for SLV Water Co. and Home Builders withdrew their objection as to the jurisdiction of this Court over challenges to the constitutionality of SB 04-222 and the Rules. Counsel for Cotton Creek requested a pretrial hearing pursuant to C.R.E. 702 and *People v. Shreck,* 22 P.3d 68 (Colo. 2001), on the admissibility of the State's Rio Grande Decision Support System Groundwater Model ("RGDSS groundwater model") and a stay of proceedings pending resolution of constitutional issues. The Court orally accepted the withdrawal of the challenge to its jurisdiction, denied the motion for a *"Shreck"* hearing and a stay, and confirmed the oral rulings in a subsequently entered written order. *Order re: Water Court Jurisdiction, Protestors' Motion to Stay; Shreck Issues; Contact Person for Counsel* (November 14, 2005).

9. At the pretrial conference, counsel for the Protestors stipulated to the withdrawal of various other contentions contained in their protests and stipulated as to the components of the RGDSS groundwater model they would not contest. *First Trial Management Order*, paragraphs 1 and 2 (December 4, 2005); *Transcript* (November 8, 2005) at p. 17, ln. 23 – p. 21, ln. 16.

10. Prior to trial, various parties filed motions to determine questions of law and/or for partial summary judgment. See *Motion for Partial Summary Judgment or, in the*

Alternative, Determination of Questions of Constitutional Law, filed by the Proponents (June 10, 2005); *Motion for Determination of Questions of Law*, filed by the Protestors (November 1, 2005). After hearing argument on the various motions on December 12, 2005, the Court denied the motions. *Transcript* (December 12, 2005) at p. 131, ln. 8 – p. 132, ln. 3.

11. Prior to trial, the Protestors filed motions to exclude certain evidence. See *Motion in Limine to Exclude Recent Version of Model* (December 9, 2005); *Motion in Limine to Exclude Evidence Related to Land Subsidence* (January 20, 2006); *Protestors' Motion to Reconsider Order Denying Motion in Limine and Motion to Reconsider Order Denying Shreck Hearing* (January 19, 2006). After the motions were fully briefed, the Court denied the *Motion in Limine to Exclude Recent Version of Model*. *Order Denying Motion in Limine* (January 14, 2006). After argument on the first morning of trial, the Court denied the Protestors' *Motion to Reconsider* and their *Motion in Limine to Exclude Evidence Related to Land Subsidence*. *Transcript*, p. 18, ln. 24 – p. 21, ln. 15; p. 29, ln. 8 – p. 30, ln 10.

12. In accordance with Section 37-92-501(3)(a), the Court held a trial on protests to the Rules. This trial began on January 30, 2006, and proceeded for 26 full or partial trial days until the close of evidence on March 8, 2006. Closing arguments were held on March 24, 2006. The United States, BLM, and Costilla County Water Conservancy District appeared through counsel on the first day of trial, but did not otherwise participate. At trial, the Proponents presented a joint case in support of the Rules and the Protestors presented a joint case opposing the Rules. Counsel requested time to submit proposed orders to the Court and the Court received the proposed orders from the parties on June 2, 2006.

13. During their case-in-chief, Proponents presented testimony from 11 expert witnesses and two lay witnesses. The Proponents' expert witnesses were: Ray B. Bennett, P.E.; Charles M. Brendecke, Ph.D., P.E.; David J. Cooper, Ph.D.; John Allen Calvert Davey, P.E.; Eric J. Harmon, P.E.; Kenneth W. Knox, Ph.D., P.E.; Willem A. Schreüder, Ph.D.; James E. Slattery, P.E.; Hal D. Simpson, P.E.; Kirk R. Thompson, P.E.; and Steven E. Vandiver, P.E. Proponents' lay witnesses were Roy Helms and Ray Wright. The Protestors presented testimony from four expert witnesses and one lay witness. The Protestors' expert witnesses were: Bruce A. Lytle, P.E.; William F. Hahn, P.G.; Charles H. Norris, P.E.; and Michael McDonald. The Protestors' lay witness was Jeris Danielson. In rebuttal the Proponents presented expert testimony from Mr. Harmon, Dr. Schreüder, Mr. Davey, and Mr. Steven P. Larson.

14. The Court admitted 144 exhibits offered by the Proponents. Some of those exhibits contain multiple subparts. The Court admitted 114 exhibits offered by the Protestors and admitted two joint exhibits. All exhibits were received in digital format as well as paper.

15. The Court has adopted the general format of the Proponents' Proposed Order and incorporates much of its general language describing the history of the case and detailed description of the development of the RGDSS. The bulk of these facts are not at issue in

this case, but it is appropriate to describe the investigation and development of the entire RGDSS in some detail since it is the foundation for the groundwater model which is central to some of the disputed issues in the case. The Court likewise has adopted suggested language of Protestors in various instances where they give clarity to the issues and factual disputes. For the most part, the Court chooses its own words for the conclusions of law on the contested issues.

16. The Court wishes to begin with an acknowledgment of the wisdom of the General Assembly when it determined that decision support systems for our water basins should be developed. The information gathering and the integration and cooperation of the various disciplines to build the databases which are now in place and which will continue to accumulate information are an enormous step forward in understanding the hydrogeology of the Rio Grande Basin.

II. Summary of Ruling.

17. The Court begins with a short summary of some of the key findings and legal conclusions.

18. The hydrology and geology of the San Luis Valley (the "Valley") are highly complex, and the Valley has many features that are unique when compared to other river basins within the state.

19. The surface streams of the Valley are overappropriated.

20. The confined and unconfined aquifers are also overappropriated, and the current rates of withdrawal from these aquifers exceed their long-term rates of recharge, the result of which is a groundwater overdraft or groundwater mining of the entire aquifer system.

21. New or increased withdrawals from the Confined Aquifer System will exacerbate this overdraft of the confined aquifer and will cause out-of-priority depletions to surface streams that will cause material injury to vested surface water rights. In addition, new or increased withdrawals from the Confined Aquifer System will cause material injury to existing water rights in the confined and unconfined aquifers. Further, the Court finds that new or increased withdrawals from the Confined Aquifer System that are not properly augmented will cause additional stream flow depletions that will interfere with Colorado's ability to fulfill its obligations under the Rio Grande Compact.

22. The Court further finds that augmentation of depletions to the surface streams alone would be inadequate to prevent the injury that will be caused by new or increased withdrawals from the Confined Aquifer System.

23. The replacement required by the Rules is necessary to prevent injury to senior vested water rights and to comply with the standards and principles set forth in section 37-92-501(4), including maintaining a sustainable water supply in the confined and the

unconfined aquifers and avoiding unreasonable interference with Colorado's ability to fulfill its obligations under the Rio Grande Compact.

24. The RGDSS groundwater model is reasonably accurate and reliable and is sufficient for its intended uses under the Rules.

25. The provisions of SB 04-222 mandating sustainability of the aquifers in Division 3, and providing for a baseline period to measure artesian pressure as a means of measuring sustainability are supported by the evidence in this case.

26. The legislative mandate that reduction of water consumption by phreatophytes may not be recognized as a source of replacement water for new water uses or to replace existing depletions or as a means to prevent injury for new water uses, is supported by the evidence, and is fully within the authority of the General Assembly.

27. If *Fellhauer v. People,* 167 Colo. 320, 447 P.2d 986 (1968) opened the curtain on "the new drama of *maximum utilization* and how constitutionally that doctrine can be integrated into the law of *vested rights,*" the 1969 Water Right Determination and Administration Act would represent the "second act" of administration and creative augmentation. SB 04-222 begins the "third act" with a guiding principle that an optimum or maximum use must be sustainable.

28. The RGDSS groundwater model was developed following proper protocols and procedures, that it is calibrated to a degree sufficient for its intended uses under the Rules, and that the inputs to said model are reasonably accurate and may be relied upon for purposes of the Rules. The model's accuracy for application to specific circumstances is properly subject to a rebuttable presumption that the version of the RGDSS groundwater model in use at the time an application for a plan for augmentation is filed, accurately determines the amount, time, and location of depletions and fluctuations in artesian pressures that would be caused by a new withdrawal of groundwater from the Confined Aquifer System in accordance with Rule 6.B.6.

29. The Court further finds that the Protestors have not met their burden of proof to demonstrate that the Rules should be disapproved. Even if the State Engineer had the burden to uphold the Rules, the Court finds that the State Engineer has met that burden. The Court finds that the Rules comply with the applicable statutory requirements for the adoption of such Rules, including Section 37-92-501, as amended by SB 04-222.

30. Our understanding of the San Luis Valley's hydrogeology is incomplete and therefore some findings, beliefs, assumption and conclusions will likely be brought into question over time and must all be open to re-examination utilizing the scientific method.

31. Finally, the Court concludes that the Rules and the provisions of HB 98-1011 and SB 04-222 do not violate the State or Federal Constitutions.

32. Therefore, the Court denies the protests filed to the Rules and approves the Rules as promulgated by the State Engineer, Joint Exhibit No. 1, which shall become effective upon entry of this decree.

III. Background

A. Protestors' Grounds for Opposing the Rules

33. Protestors challenged the constitutionality of the Rules and the laws on which they are based, HB 98-1011 ("HB 1011") and SB 04-222 ("SB 222"), on three grounds: (1) the Rules, HB 1011, and SB 222 prohibit the right to appropriate the water of the State contrary to Article XVI, sections 5 and 6 of the Colorado Constitution; (2) the Rules, HB 1011, and SB 222 violate Equal Protection provisions under Article II, section 25 of the Colorado Constitution and the Fourteenth Amendment of the United States Constitution; and (3) the Rules, HB 1011, and SB 222 are unconstitutionally vague in violation of due process requirements of the Colorado and United States Constitutions.

34. Specifically, Protestors argued that the State Engineer has not met its burden of proof and that HB 1011, SB 222, and the Rules are unconstitutional because they violate the constitutional right to appropriate the waters of the State to the extent that they prohibit diversions of water that do not cause material injury to vested rights.[1] They specifically challenged the provisions that automatically require that every new appropriation be offset by the retirement or change of an equivalent existing water right, (i.e., 100% augmentation), without regard to whether such new appropriations cause injury to a vested water right, and the provisions that relate to the treatment of evapotranspiration of groundwater (hereinafter "ET_g") of non-irrigated native vegetation. Cotton Creek also asserted that the Rules improperly assume the confined aquifer is overappropriated in the same manner as the unconfined aquifer and surface streams. *Cotton Creek Protest* at 3, paragraph 3.I.3.

35. Protestors claimed that HB 1011, SB 222 and the Rules violate the Equal Protection clause of Article II, section 25 of the Colorado Constitution and the Fourteenth Amendment of the United States Constitution by treating new appropriators from the confined aquifer differently than similarly situated appropriators – those from the unconfined, those from other tributary aquifers throughout Colorado, and those in the Closed Basin – without a rational basis for doing so.

36. Protestors asserted that the Rules improperly seek to maintain artesian pressure in a range and at an average that occurred during 1978-2000 without giving a valid legal basis for requiring that range or average be maintained. Protestors further claimed that to the extent the Rules rely upon SB 04-222, the Rules have either interpreted SB 04-222 in a way that is unlawful, unconstitutional, arbitrary and capricious or, alternatively, that SB 04-222 itself is unlawful and unconstitutional. *Id.*

37. Protestors also argued that HB 1011, SB 222, and the Rules are unconstitutionally vague in violation of due process requirements.

[1] References to "vested water rights" includes Colorado's obligation to meet its Rio Grande Compact delivery obligation.

38. SLV Water Co. and Home Builders stated that they were unsure whether this Court has jurisdiction to hear challenges to the constitutionality of the "underlying organic legislation;" but, if such jurisdiction existed, they incorporated their challenges into their protests. *SLV Water Co. Protest* at 2, paragraph 4; *Home Builders Statement* at 2, paragraph 4. At the Pre-Trial Conference, Counsel for SLV Water Co. and Home Builders withdrew their challenge to the Court's jurisdiction. However, even without that withdrawal the Court found it had jurisdiction and denied the challenge to the Court's jurisdiction. *Order re: Water Court Jurisdiction; Protestors' Motion to Stay; Shreck Issues; Contact Person for Counsel* at 1-2 (November 14, 2005). Further, the Court found that the evaluation and resolution of the remaining protests required the Court to hear and consider the evidence presented at trial.

39. In their expert report, entered into evidence as Protestors' Exhibit P-1, the Protestors raised the following supplemental bases for opposition to the Rules: (1) the RGDSS groundwater model is the primary tool being used by the State Engineer to support SB 04-222 and the Rules; (2) use of a groundwater model that does not converge is unacceptable for any predictive purposes; (3) the output from the RGDSS groundwater model does not represent reasonable, valid, or even physically possible results; (4) Rule 4.A.7 erroneously refers to the "RGDSS Ground Water Model" as being the program developed by the USGS commonly known as MODFLOW; (5) the RGDSS model is not sufficiently calibrated, nor has there been any sensitivity testing done to establish the RGDSS model as an appropriate tool for regulatory purposes; (6) the RGDSS groundwater model is not a valid functioning model and is not adequate to support either SB 04-222 or the Rules: (7) steady-state model simulations can provide a reliable evaluation of long-term sustainability of new groundwater development; (8) the specific study on which the legislature relied to enact SB 04-222, the RGDSS model, was not completed at the time that the law was enacted; (9) faulty technical data was provided to the legislature to support SB 04-222; (10) the legislative mandate related to maintaining a sustainable water supply in the unconfined aquifer is not addressed in the Rules; (11) SB 04-222 prohibits the development of new water from the confined aquifer; (12) there was no technical basis for the legislature's belief that there are "unique geologic and hydrogeologic conditions and the conjunctive-use practices prevailing in Division 3" that have been subsequently used by the State for prohibiting all further development of confined aquifer waters; (13) in adopting the Rules, the State Engineer, in Rule 5.A., recognizes uniqueness with respect to Division 3 for which there is no evidence or technical basis; (14) artesian pressure is not a measure of an aquifer's sustainability; (15) no pumping test or meter reading data have been provided to confirm that pumping actually increased 300,000 acre-feet during the period 2000-2002; (16) the Valley-wide water balance is the measure of the sustainability of an aquifer; (17) additional new water can be appropriated and pumped from the confined aquifer without affecting the sustainability of the system; (18) additional new water can be appropriated and pumped from the confined aquifer without affecting the Rio Grande Compact; (19) reducing artesian pressure in the confined aquifer does not result in the need for one-to-one augmentation; (20) pumping in the unconfined aquifer affects the artesian pressure in the confined aquifer, regardless of water being pumped from the confined aquifer; (21) the

Rio Grande Stream System is overappropriated, but that does not mean that the aquifer system is similarly overappropriated; (22) native vegetation does not have a vested water right; it is simply a component of the Valley's natural hydrologic balance; (23) the current version of the RGDSS groundwater model cannot be relied upon to predict ET_g due to the numerical instability of the model; (24) limited subsidence data available for the Valley are inconclusive related to any aquifer pumping; (25) there is no credible scientific evidence to demonstrate that irreversible subsidence is likely to occur if water levels are allowed to change outside the 1978-2000 artesian pressure level range; and (26) current scientific evidence, including the RGDSS groundwater model, does not support SB 04-222 or the Rules. The Court finds that the Protestors have not sustained these objections. To the extent necessary, the Court will address these contentions in these Findings of Fact.

40. At trial the Protestors argued that the absence of groundwater administration in the priority system in Water Division No. 3 was the reason for the decline in groundwater levels. They asserted that the withdrawals by existing well owners who have not been required to file augmentation plans (Protestor refers to these as "illegal, out-of-priority" diversions) prevents unappropriated water from being available for use by others. Protestors asserted, but did not introduce evidence, that requiring full augmentation of out-of-priority depletions by existing groundwater users would make more groundwater available for appropriation by others.

41. The Protestors also asserted that the State Engineer can lawfully regulate existing wells in the Valley by simply issuing cease and desist orders to wells causing out-of-priority stream depletions.

B. Overview of the Geology and Hydrology of the San Luis Valley

42. The San Luis Valley is located in south central Colorado, and includes portions of Alamosa, Conejos, Costilla, Rio Grande and Saguache Counties. The elevation of the Valley varies between 7,500 feet and 8,000 feet above sea level, it is approximately 90 miles from north to south and 50 miles from east to west, and the average annual precipitation is approximately 7.5 inches. The Valley is bounded on the west by the San Juan Mountains and on the east by the Sangre de Cristo Mountains. These two ranges meet at Poncha Pass to form the northern terminus of the Valley. The two ranges function as both geographic and geologic boundaries for the Valley. The Rio Grande and its tributaries, including the Closed Basin, drain approximately 8,000 square miles in Colorado. The major perennial streams in the San Luis Valley are the Rio Grande and its largest tributary, the Conejos River. The major tributaries of the Conejos River are the Rio San Antonio and the Rio Los Pinos. Besides the Conejos, major tributaries of the Rio Grande include the Alamosa River, La Jara Creek, and Trinchera Creek. Costilla Creek, located near the state line in Costilla County, has its confluence with the Rio Grande a few miles into New Mexico.

43. The geographic, geologic, and hydrologic features of the San Luis Valley have been generally described in previous water cases. See *Alamosa-La Jara v. Gould*, 674 P.2d 914, at 918-20 (Colo. 1983) and *American Water Development, Inc. v. City of*

Alamosa, 874 P.2d 352, 367 (Colo. 1994)("AWDI").

> The upper 6000 feet of fill below the valley surface consists of unconsolidated clay, silt, sand, and gravel, and interbedded lava flows . . . .Some of the underground water is in an unconfined aquifer system at shallow depths. Beneath the unconfined aquifer are relatively impermeable beds of clay and basalt and beneath these confining layers are substantial quantities of water which comprise the confined aquifer. The confining clay layer generally does not exist around the valley's perimeter, and the confined aquifer system is recharged from surface flow to the underground water system at the edges of the valley. Because the recharge areas are higher in elevation than the floor of the valley, the confined aquifer is under artesian pressure, resulting in the free flow of water from some artesian wells and springs at natural breaks in the confining layer. In some places, where the confining layer is less thick and more transmissive, water from the confined aquifer will leak upward through the confining clay layers into the unconfined aquifer. The unconfined aquifer is directly connected with the surface streams in some places. To varying degrees, the surface streams, the unconfined aquifer, and the confined aquifer are hydraulically connected.

Alamosa-La Jara Water Protective Ass'n. v. Gould, 674 P.2d 914, 917-918 (Colo. 1983).

44. These general statements were confirmed, and expanded with a far more comprehensive explanation of the geologic and hydrologic operation of the San Luis Valley by the Proponents' expert witnesses at trial. See e.g. *Transcript (Vandiver) Vol. I* at p.129, ln. 14 – p. 130, ln. 16. *Transcript (Harmon) Vol. II and III* at p. 210 – p. 548. The interconnection between unconfined aquifer, confined aquifer and surface streams of the Valley was not contested. See *American Water Development, Inc. v. City of Alamosa*, 874 P.2d 352, 367-368 (Colo. 1994) (upholding trial court's determination that water in confined aquifer was tributary beyond a reasonable doubt); See also State's Exhibit 19, *26(a)(2) Disclosure of Steven E. Vandiver, P.E,.* at 2; State's Exhibit 13, *26(a)(2) Disclosure of Kenneth W. Knox, Ph.D., P.E.*, at 2-3; State's Exhibit 16, *26(a)(2) Disclosure of Hal D. Simpson, P.E.*, at 3; *Transcript (Simpson) Vol. XVIII* at p. 3339, ln. 16 – 24.

45. The Rio Grande arises in the San Juan Mountains, enters the Valley on the west near Del Norte, flows east-southeast across the valley floor before turning south near Alamosa and flowing through a break in the San Luis Hills to the Colorado-New Mexico State line. It flows for 400 miles through New Mexico and then flows 1250 miles acting as the boundary between Texas and Mexico to its mouth in the Gulf of Mexico. The

other perennial major stream in the Valley, the Conejos River, rises in the Conejos Mountains in the southwestern portion of the Valley and flows northeasterly to join the Rio Grande at La Sauces. See generally *Transcript (Vandiver) Vol. I* at p. 125, ln. 16 – p. 130, ln. 15; State's Exhibit No. 113.

46. Besides these named perennial streams and rivers, many smaller creeks rise in the mountains on the west and east sides of the Valley. Many of these smaller creeks are perennial in their upper reaches, but lose water to the groundwater system at the valley edges and typically do not flow onto the valley floor except during high runoff periods. Many other small creeks are intermittent or ephemeral. *Transcript (Harmon) Vol. II* at p. 275.

47. The upper 6000 feet below the San Luis Valley surface consists of unconsolidated clay, silt, sand, and gravel, and interbedded lava flows, containing what is now estimated to be less than 1 billion acre-feet of underground water. This water is contained in two aquifers having different hydrologic properties and generally acting as separate hydrologic units. Separating the aquifers is a group of relatively impermeable clay layers referred to as the blue clay or blue clay series. *Id. American Water Development, Inc.*, 874 P.2d at 367.

48. The upper aquifer, called the unconfined aquifer, consists of coarse materials with relatively high hydraulic conductivities, and is situated above the blue clays, which range in depth from 35 feet on the west side of the Valley to 125 feet on the east. Most of the irrigation wells in the Valley are completed in this aquifer. *Id.*

49. Water levels in the unconfined aquifer generally decline in the area where pumping is occurring for seasonal irrigation. These same water levels generally rise once seasonal irrigation ceases. The utilization of the unconfined aquifer as a reservoir is described below.

50. Beneath the unconfined aquifer are relatively low permeability blue clay layers. The confined aquifer is located between and below these blue clay layers and contains substantial quantities of water. *Alamosa-La Jara*, 674 P.2d at 917, and *American Water Development, Inc.*, 874 P.2d at 367. Although the confined and unconfined aquifers are hydrologically connected at various points, the extent of the hydraulic connection is limited by the low permeability blue clays and, because of this, water in the confined aquifer is maintained under artesian pressure. *Id.* The boundaries of the blue clay layers are depicted on numerous exhibits including the two part map, State Exhibit 113, attached hereto as Appendix B. See also, State Exhibit 77, below. *Transcript (Harmon) Vol. II* at p. 272.

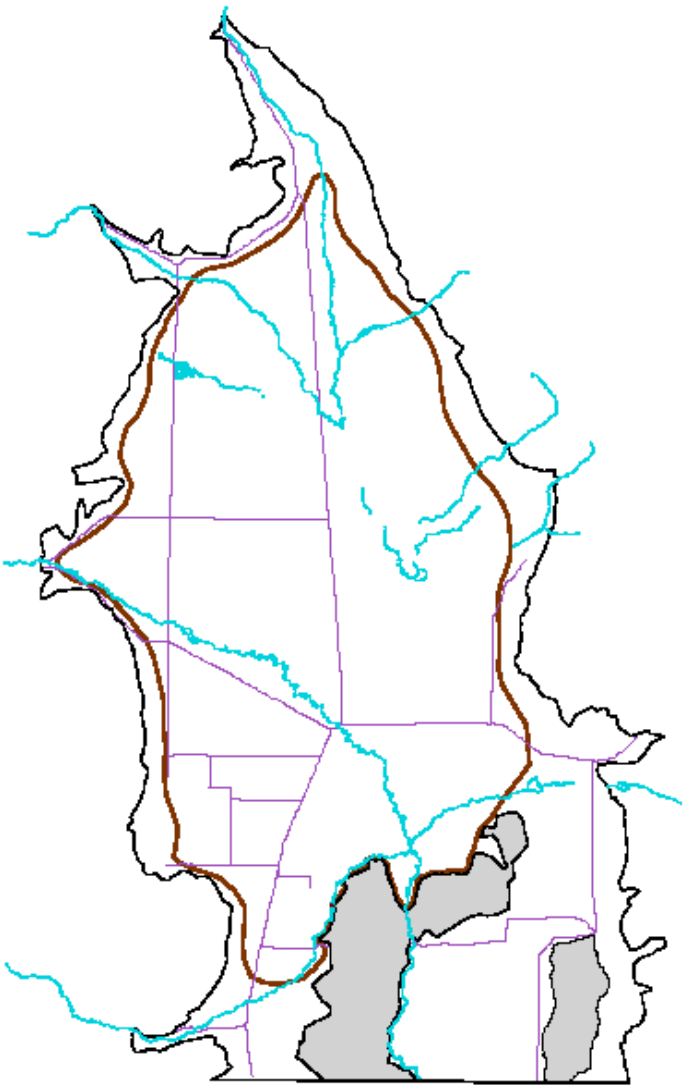


Figure 1: Approximate extent of confining clay layer in the San Luis Valley (brown line). The confined aquifer generally is inside this line. Note, well logs show that clay does exist in some areas outside this area, but the clays may not be continuous and confined conditions may or may not exist.

51. The blue clay layer generally does not exist around the edges of the Valley, and the Confined Aquifer System is recharged from surface flow to the underground water system at the mountainous edges of the Valley. *Id.* The artesian condition results from a recharge of the confined aquifer by waters entering the aquifer at higher elevations at the edges of the Valley and the limited permeability of the blue clays separating the two aquifers. *Id.*

52. Artesian pressure is also referred to as hydrostatic pressure. Section 37-90-103(3), C.R.S. (2005). "The hydrostatic pressure level of an aquifer at a particular location is the height to which water will rise in a well at that location. If the hydrostatic pressure level is at the top of the aquifer or below, the aquifer is not under artesian conditions." *Danielson v. Castle Meadows, Inc.*, 791 P.2d 1106, 1111 n.5 (Colo. 1990).

53. The evidence in this trial confirms the Supreme Court's conclusion that "In some places, where the blue clay layer is less thick and more transmissive, water from the confined aquifer will leak upward into the unconfined aquifer. The unconfined aquifer is directly connected with the surface streams in some places. To varying degrees, the surface streams, the unconfined aquifer, and the confined aquifer are hydraulically connected." *Alamosa-La Jara*, 674 P.2d at 917-18.

54. The complexity of these connections is described further below in the description of both the conceptual model in the RGDSS and in the development of the groundwater model.

55. The surface streams, the unconfined aquifer, and the confined aquifer are all tributary water. *Alamosa-La Jara*, 674 P.2d at 918. The confined aquifer, unconfined aquifer and surface streams in the San Luis Valley are all hydrologically connected in a complex way. *Transcript (Vandiver) Vol. I* at p.182.

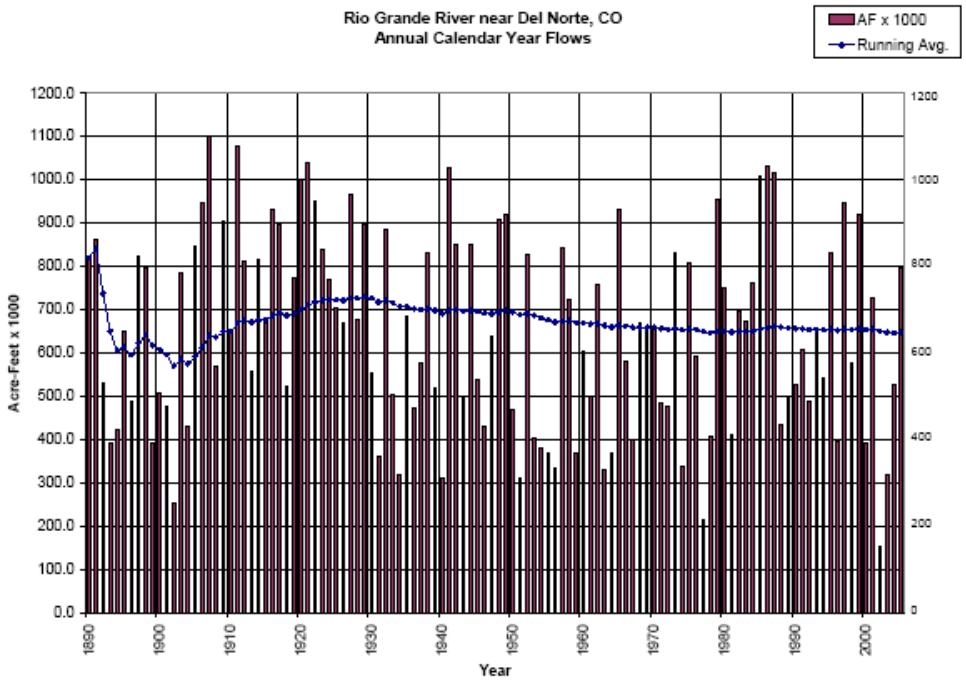
56. The Closed Basin refers to that portion of the unconfined aquifer that is separated from the Rio Grande by a hydraulic and a topographic divide. *Transcript (Vandiver) Vol. I* at p. 128, ln. 13 – 22; *Transcript (Davey) Vol. IV* at page 722. The Closed Basin is defined as "that part of the Rio Grande Basin in Colorado where streams drain into the San Luis Lakes and adjacent territory, and do not normally contribute to the flow of the Rio Grande." Rio Grande Compact, Art. I(d), codified in section 37-66-101, C.R.S. (2005). The Closed Basin has no natural outlet to the Rio Grande. The principal streams that flow into the Closed Basin from the west include La Garita Creek, Carnero Creek, and Saguache Creek. The streams that flow into the Closed Basin from the east (Sangre de Cristo Mountains) include, among others, Rito Alto Creek, San Isabel Creek, Crestone Creek, Sand Creek, Medano Creek, Big Spring Creek, and Little Spring Creek. San Luis Creek rises near Poncha Pass at the northern end of the Valley, and flows south to its terminus in the sump area of the Closed Basin near San Luis Lake. *Transcript (Vandiver) Vol. I,* p.128*; Transcript (Davey) Vol IV*.p. 722

57. Numerous ditch systems divert surface water from the Rio Grande to irrigate land in the Closed Basin. Return flow from irrigation and inflow from streams within the Closed Basin all flow toward the sump, the Basin's lowest point rather than returning to the Rio Grande. Historically much of this water was "lost" to evaporation and evapotranspiration by native plant species. *Alamosa-La Jara v. Gould*, 674 P.2d at 917-918 n.3 (1983).

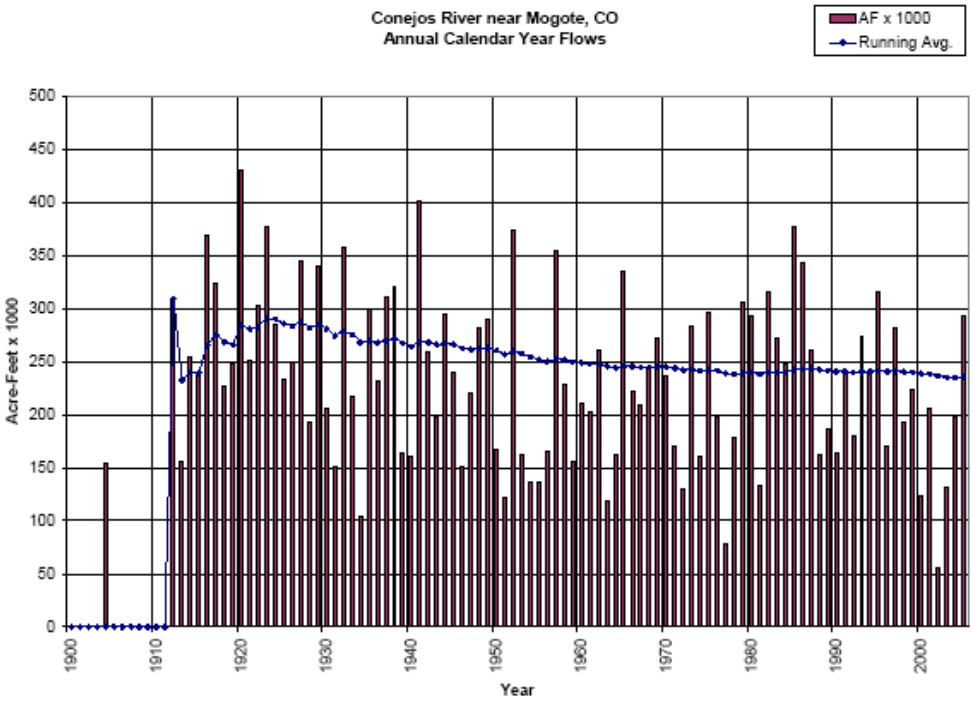
58. The idea of "reclaiming" shallow groundwater lost to evaporation and evapotranspiration in the Closed Basin and the delivery of that water to the Rio Grande

was conceived in the early 1900's. Both the temporary Rio Grande Compact of 1929, see 1929 Colo. Sess. Laws 548, 555, Arts.5-6, and Article III(4) of the Rio Grande Compact (the "Compact") specifically addresses the delivery of water from the Closed Basin to the Rio Grande. This is now accomplished by the Closed Basin Project, located in the eastern portion Closed Basin, which began operations in 1989. It diverts groundwater from the unconfined aquifer and delivers that water to the Rio Grande to assist the State of Colorado in meeting its obligations under the Compact. See *Closed Basin Landowners Ass'n v. Rio Grande Water Conservation Dist.*, 734 P.2d 627 (Colo. 1987) (describing the project). The Closed Basin Project's water right was originally decreed in this Court's Case No.W-3038, and the Court has taken judicial notice of the decrees for the Closed Basin Project in this proceeding. The project has disappointed water users both in respect to the amount of water it has produced and with regard to the quality of the water.

59. The surface water supplies for the Valley are highly variable. Over the period of record on the Rio Grande, 1890 to 2005, at the Compact inflow index gage station near Del Norte, where the river first enters the Valley, the annual stream flows have ranged from a high of approximately 1,100,000 acre-feet in 1907 to a low of 160,000 acre-feet in 2002. State's Exhibit No. 103, Histograph: *Rio Grande River near Del Norte, CO*.



60. Similarly, the annual flows of the Conejos River measured at the Compact inflow index gage station near Mogote have ranged from a high of 425,000 acre-feet in 1920 to a low of approximately 55,000 acre-feet in 2002. State's Exhibit No. 102, Histograph, *Conejos River near Mogote, Colorado*.



61. State's Exhibits No. 102 and 103 indicate that stream flows vary significantly from year-to-year, but clearly both rivers have a decline in average stream flows at these two inflow index gage stations over the past fifty years. Climatological factors as well as human intervention must be considered to fully appreciate these trends. The demand for water from these streams by vested water rights exceeds the available supply in all but the wettest year.

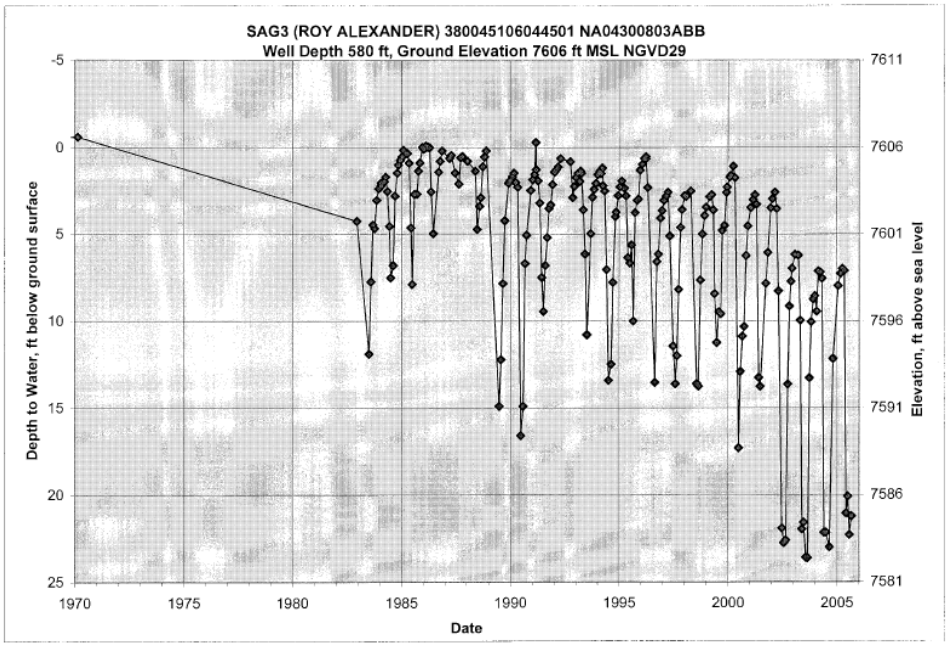
62. Pumping from the confined aquifer was identified as one of the causes of these stream declines by Phillip Emery in his study *Water in the San Luis Valley, South-Central Colorado in 1973.*[2] Emery did not observe a valley-wide trend toward lower artesian pressure in the 1960s but saw decline in the Alamosa area and northern Conejos County. It was sufficiently concerning that he pointed out the risk of subsidence if that trend were to continue.

[2] Phillip A. Emery, Robert J. Snipes, John M. Dumeyer, and John M. Klein, *Water in the San Luis Valley, South-Central Colorado in 1973,* USGS , Colorado Water Resources Circular 18, State Exhibit 86

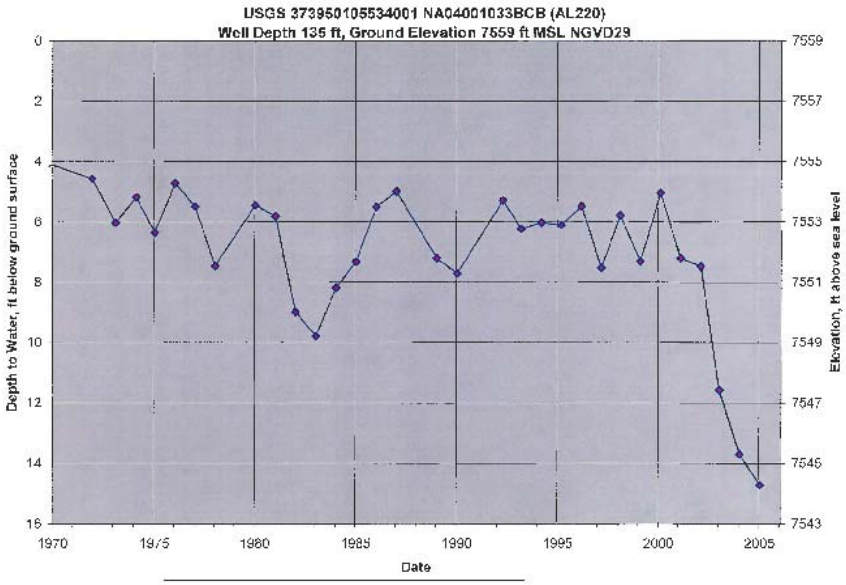
63. Steve Vandiver, who recently retired as division engineer after 25 years, stressed the fact that the downward trend evident in the histographs above is only part of the increasing water shortage. He described the severe drought of 2002 where runoff was merely 25% of normal and the Rio Grande peaked at 680 c.f.s. *Transcript, (Vandiver)Vol. I p. 167.* In 2002, over 500 domestic wells failed and required replacement and many high capacity confined aquifer wells had their casings collapse and break in the middle of the growing season requiring emergency well permits to try and save the crops. *Transcript, (Vandiver)Vol. I p. 168.* Perhaps even more concerning, he pointed out the period from 1999 through the current year is suggestive of a multi-year drought period. While 2005 was a year with excellent snowpack, the water did not reach the measuring stations at Del Norte and the state line because of sublimation from winds and three consecutive years of below normal runoff and effects of increased pumping. Consequently, the State Engineer had to curtail diversions on the Rio Grande by 40% and the Conejos by 50% in order to meet the requirements of the Rio Grande Compact. Water users, the State Engineer and the entire San Luis Valley are understandably apprehensive about the future. *Transcript, (Vandiver)Vol. I,* p. 172.

64. The artesian pressure head in the confined aquifer has also declined for many years. *Transcript (Davey) Vol. IV* at 749,769. The decline led to the imposition of the moratoriums on construction of new wells in the confined aquifer. The purpose of the moratoriums was "to preserve artesian head." *Transcript, (Vandiver)Vol. I,* p. 140. Artesian pressure was fairly stable for a period in the 1990s but began to decline again around 2000 and in 2002 declined precipitously. *Transcript (Davey) Vol. IV* at 751.

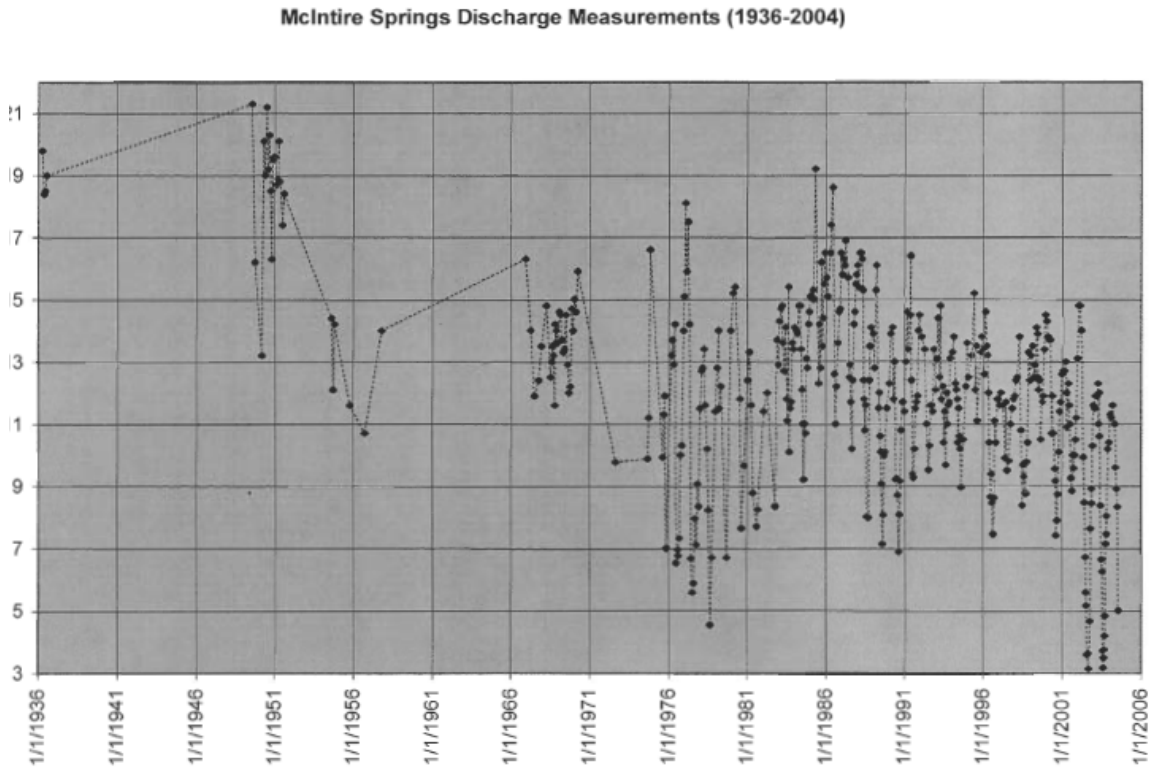
65. The dramatic effect of the record low snowpack and stream flow in 2002 has significantly worsened the condition of the confined aquifer. While many hydrographs were discussed in the trial and any one of them would illustrate this point, the Court selects two for illustration of the points described above. Exhibit 80.24 is a hydrograph of a confined well referred to as SAG3 or the Roy Alexander well. Its precise location in Saguache County can be found on Exhibit 84.1.



66. Exhibit 81.01 is typical example of the dramatic effect on the confined aquifer of the 2002 drought and the unprecedented pumping that year as described during the trial. This particular well is one of the USGS study wells and is located several miles north of Mosca, Colorado. It can also be located on Exhibit 84.1.



67. Finally, McIntyre Springs brings water from the confined aquifer directly into the Conejos River. Mr. Harrison refers to it as the "canary in the coal mine." The hydrograph of its flow is Exhibit 82. The importance of artesian pressure to the surface flow of the Conejos River is well documented and thus to the ability to meet the obligations of the Rio Grande and Conejos under the Rio Grande Compact is directly related to flow from this spring. The hydrograph below illustrates the decline in flow over time including a dramatic decline during the recent drought.



C. History of Irrigation Development in the San Luis Valley

68. During this trial there was a great deal of discussion of whether there is something "unique" about the San Luis Valley and what it means to have a "sustainable" water basin. Protestors argued repeatedly that the failure of the State Engineer to require existing wells in both the confined and unconfined aquifer to file augmentation plans is a key component in the overappropriation of water in the aquifers and invalidates the assumptions of the RGDSS. It is therefore desirable to examine the historical irrigation practices in the Valley and their influence on the Valley's current hydrologic conditions.

69. The earliest decreed water rights in the San Luis Valley are the acequia known as the People's Ditch built in 1852 in the vicinity of San Luis, Colorado, and a well in the Conejos area. See State's Exhibit No. 39, *Regional Planning - Part VI - The Rio Grande*

Joint Investigation in the Upper Rio Grand Basin in Colorado, New Mexico and Texas 1936-1937, Natural Resources Committee, February 1938 ("*Joint Investigation")* at page 66. See also *Transcript (Vandiver) Vol. I p. 133.* During the 1850s and early 1860s settlement in the Valley was largely confined to the southern part of the Valley on land near Culebra Creek, Costilla Creek and the Conejos River. *Id.* In 1866 and 1867 settlements were started on the Rio Grande, San Luis Creek, and Saguache Creek, followed shortly thereafter by farms served by ditches from Carnero Creek, La Garita Creek, La Jara Creek, and the Alamosa River. *Id.*[3]

70. The Colorado Supreme Court described this history briefly and found that the surface streams were overappropriated by 1900, a conclusion supported by the testimony in this case.

> The first appropriation from streams in the valley began in the 1850's on the Conejos River. The first appropriation on the Rio Grande mainstem was in 1866, and the most extensive development for irrigation purposes on both rivers was between 1880 and 1890. By 1900, the natural flow on all surface streams in the valley was over-appropriated. High spring runoff and low summer flows in the valley streams, coupled with years of severe drought, resulted in undependable water supplies for irrigation; thus farmers turned to reservoirs to supplement and regulate their water supply.

Alamosa-La Jara v. Gould, 674 P.2d at 918.

71. After the railroad reached the Valley in about 1879, in 1882 the era of large irrigation canal building on the Rio Grande began and continued for some ten years. *Joint Investigation in the Upper Rio Grand Basin in Colorado, New Mexico and Texas 1936-1937.* This time period saw the construction of many large canals including the Rio Grande Canal, the Farmers' Union Canal, the Monte Vista Canal, the Prairie Ditch, the Valley Canal, and the Costilla Ditch. *Id*. Accompanying the canal building was a rapid increase in the amount of land under irrigation. *Id.* In 1880 there were 131,475 acres under irrigation in the Valley; in 1892 there were 398,305 irrigated acres; by 1929 that number reached a maximum of 736,477 irrigated acres, which then declined to about 699,000 acres in 1935. *Id*. at 69. In 1998 there were some 613,000 acres under irrigation in the Valley. State's Exhibit No. 6, *RGDSS Final Memorandum Irrigated Lands Assessment, Task 1*, Table 6, p. 36.

72. Because the Rio Grande has a relatively short period of high flows, crop demands for water continue long after the peak flows have passed. Water users sought to construct reservoirs to store a portion of the high flows for later use. The development of reservoir storage in the headwaters of the streams in the Valley was hindered by a series of embargos on the use of federal lands for reservoir construction. The first embargo was

[3] The oldest water right on the entire Rio Grande del Norte (or Rio Bravo del Norte as it is known in México) is the Ysleta Acequia in El Paso which has an adjudication date of 1680. See: http://www.tsha.utexas.edu/handbook/online/articles/AA/ruasg.html

imposed in 1896 while the United States was negotiating a treaty on the Rio Grande with the Republic of Mexico. An embargo was re-imposed during the negotiation of the Compact between the States of Colorado, New Mexico and Texas. *Joint Investigation* at pp. 67-68; *Alamosa-La Jara v Gould*, 674 P.2d at 918 (Colo. 1983).

73. Without adequate reservoir storage, water users turned to the use of the unconfined aquifer as a storage reservoir through the practice of subirrigation. This helped solve the water supply timing problem that otherwise only could be addressed with surface water storage, although it created a number of other problems. With respect to the practice of subirrigation, this Court[4] has previously found:

> [T]his unique mode of irrigation was highly efficient from the point of view of the water users. It eliminated many capital and labor costs. *Most importantly, subirrigation allowed water users to make parallel their water supply and the actual demands of growing crops.* The necessity for achieving parallel timing stems from the fact that the Rio Grande is a typical western stream in that it has a relatively short period of high flow. Crop demands, however, continue long after the peak flows have passed and water available for direct flow diversion is then less than sufficient. Because the practice of subirrigation maintained an underground water reservoir after the peak flows had passed, water was available to the crops for an extended period, thus circumventing the water supply timing problems inherent in a western surface irrigation system. . . .

Findings of Fact, Conclusions of Law, Judgment and Decree, Case No. W-3979 at page 6. (Emphasis supplied)

74. Subirrigation by flooding was once very common in many parts of the Valley, particularly in the Closed Basin area north of the Rio Grande. The *Joint Investigation* at 67 notes: Subirrigation was

> [c]laimed to be essential to the successful growth of crops under the soil and water-supply conditions which prevail. By it the ground water is built up to within 1 to 3 feet of the surface and water is then allowed to run slowly through small ditches spaced about 8 rods apart. Water from these ditches seeps outward, supplying moisture to the plants. *This method really constitutes in part a substitution of*

[4]During this opinion, there are numerous references to other opinions of "this" water court. Robert W. Ogburn served as water judge of Division 3 (and as district judge and then Chief Judge of the 12th Judicial District) from July 14, 1976, to the date of his retirement on January 14, 2003 He authored most of these opinions.

> *underground storage for "headwater" or stream storage in an effort to adjust the water supply to the irrigation demand.*
>
> It results, however, in overdiversion during the spring run-off, in unduly high water tables, and in excessive evaporation and transpiration losses.

Id. (Emphasis supplied).

75. In the Closed Basin area, the effect of this practice essentially was to create an "artificial" aquifer:

> With continued large diversions from Rio Grande to the porous and shallow soils in the closed basin, the underground basin had filled rapidly; the water table had risen from depths ranging from 40 feet on the east to 100 feet on the west to a position practically at the surface on the east, bordering the sump, and to a level within 10 to 15 feet of the surface on the west.

Id. See also State's Exhibit No. 40, Powell, William, J., *Ground-Water Resources of the San Luis Valley, Colorado* 1958 ("*Powell*"), at pp. 56-57. Much, but not all, of the water in the unconfined aquifer of the Closed Basin results from diversions from the Rio Grande.

76. The practice of subirrigation was not without its drawbacks or its critics. As reported in the *Joint Investigation*:

> A serious condition soon complicated the situation. It was brought about by the rise in ground-water levels to such an extent that lands in the lower parts of the valley were becoming seeped.
>
> * * * *
>
> The rise in ground water and the seeping of lower lands soon began to force abandonment of acreages along the eastern side of the closed basin, with concomitant substitution of lands farther west. This gradual process of abandonment at the east and extension westward . . . .until it reached the extreme west side of the valley, while the broad stretch of once-occupied lands to the eastward was left to revert to its natural state, badly damaged, however, by alkali.
>
> Drainage to reclaim seeped lands in various parts of the valley began about 1911 and by 1921 eight drainage systems serving about 90,000 acres had been constructed.

> Of these, the Sylvestre, Gibson and Rio Grande are in the closed basin and the Parma, Carmel, McLean, Monte Vista Town, and Norton are in the southwest area. Drainage of the western area in the closed basin has developed waters which have aided in a progressive reoccupation of part of the neighboring lands to the eastward, but large areas between the present irrigated area and the old eastern boundary are still open for reclamation by irrigation and drainage, the only basic requirement being an available water supply.

Joint Investigation at p. 67; see also State's Exhibit No. 38, Siebenthal, C.E., *Geology and Water Resources of the San Luis Valley, Colorado*, 1910 ("*Siebenthal*") at pp. 27-29 .

77. Subirrigation is no longer practiced widely in the San Luis Valley. As explained by this Court in the decrees in Cases No. W-3979 and W-3980:

> 19. A combination of factors has worked to render subirrigation no longer a feasible method of irrigation. An extended period of low water years, the attendant imposition of curtailments on diversions from the Rio Grande in aid of assuring compliance with the Rio Grande Compact, and the development of pumps to extract huge quantities of ground water were all factors contributing to a lowering of the ground water table in the Closed Basin area. Such a lowered water table in turn eliminates the possibility for subirrigation.
>
> 20. The increased use of wells drilled into the underground aquifers became an important part of the economy of the Closed Basin. While subirrigation was still feasible, the essentially artificial aquifer created by that irrigation practice in which the water table level was quite near to the ground surface assured that irrigation water could be pumped from that shallow aquifer quite economically. This pumping itself, however, worked at cross purposes with the method of subirrigation because subbing depends on holding the water table near the ground surface and pumping from the shallow aquifers tends to lower the water table. See Powell at pages 57 and 63; Siebenthal at page 30.
>
> * * * *
>
> 22. The advent of center pivot sprinklers once again changed the irrigation practices in the Closed Basin. Sprinkler irrigation has increased the yield of crops and

> represents a more efficient use of water with reduced waste. Water for the sprinklers is most efficiently supplied from wells in the underground aquifers but, because these aquifers are not maintained by natural recharge, continuation of pumping is necessarily dependent upon artificial recharge. See Powell at pages 51-52. Just as they have in the past, [San Luis Valley Irrigation District] landowners have imported water into the Closed Basin from the Rio Grande and used it to recharge the underground aquifers, in effect using these aquifers as storage facilities. The stored water is then extracted from the aquifers by means of wells which supply the sprinklers.

Finding of Fact, Conclusions of Law, Judgment and Decree, Case W-3980 at 6-7.

78. While the earliest use of center pivot sprinkler systems occurred in the Closed Basin area north of the Rio Grande, center pivot sprinklers are now used throughout the Valley. State's Exhibit No. 6 at p. 38, Fig. 8, 13 and 14. And while many center pivot irrigation systems are supplied only from groundwater, the practice of artificially recharging the unconfined aquifer with surface water is what sustains the groundwater supply in many parts of the Valley. In addition, some farmers use both surface water and groundwater to their sprinkler systems for irrigation of their crops. *Id.* The evidence establishes that it is not uncommon, particularly south of the Rio Grande, to deliver surface water to center pivot sprinklers and to use groundwater to supplement the surface water supply in times of shortage. The testimony of Roy Helms illustrated the use of both surface and groundwater through sprinklers in this manner. See *Transcript (Helms), Vol. VI, pages 1169-1184.* The evidence also establishes that surface water used for flood irrigation is also supplemented with groundwater in times of shortage. And, as established both by the evidence in this case and by the prior decrees of this Court in Cases No. W-3979, W-3980, 1995 CW 45, and 1995 CW 46 (judicially noticed in this case), there long has been a practice of using surface water to recharge or replenish the unconfined aquifer to provide a water supply for wells dependent upon that aquifer. The testimony of Ray Wright detailed his varied use of water over time including all the practices described above. *Transcript (Wright) Vol VII page 1270-74.* These practices of conjunctive use of surface water and groundwater are common in much of the San Luis Valley, with groundwater recharge being practiced most extensively in the Closed Basin area north of the Rio Grande.

79. Kirk Thompson detailed the growing sophistication in farming techniques during the transition from flood irrigation to high impact sprinklers to low impact sprinklers. He explained how the size of the drip on a low impact sprinkler may need to be adjusted dependent upon soil type and the use of catchments areas within a field to obtain maximum benefit from the water applied. He described breaking down a field into grids to ensure the application of the right amount of each fertilizer, herbicide or insecticide throughout the field. From the increased remote control over sprinkler water applications to the use of field equipment which allows variable rate application of changing formulas for chemicals dynamically as applied, we see that water users have a level of

sophistication that is fully utilizing satellite imagery, studies of evapotranspiration, weather data and Geographic Information Systems.

80. As of 1998, 44.5 percent of the irrigated lands in the Valley, or 272,700 acres, were served by center pivot sprinklers. State's Exhibit No. 6, *RGDSS Final Memorandum, Irrigated Lands Assessment, Task 1* at p. 38. The remaining 55.5 percent were flood irrigated. *Id.* Of the total irrigated lands, 54.8 percent, or some 335,747 acres are served with both surface water and groundwater; 36.8 percent, or 225,424 acres, are supplied solely with surface water; and approximately 7.9 percent, or some 48,406 acres, are supplied with groundwater only. *Id*. at p. 39, Fig. 12, 13 and 14. Thus, more than half of the Valley's farms conjunctively use both surface water and groundwater to meet their crop's irrigation requirements.

D. Rio Grande Compact

81. The use of surface waters of Water Division No. 3 is limited by the Rio Grande Compact. The Colorado Supreme Court has summarized the history and purposes of the Compact, and the prior litigation concerning the Compact between the States of Colorado, New Mexico and Texas as follows:

> In 1896, complaints and claims for damages from the Republic of Mexico led the United States Department of Interior to deny permission for the utilization of federal land in the construction of most reservoirs planned for the valley. The dispute with Mexico was resolved by treaty in 1906, 34 Stat. 2953 (1906), but the next year, the United States Supreme Court, in *Kansas v. Colorado,* 206 U.S. 46, 27 S.Ct. 655, 51 L.Ed. 956 (1907), articulated the doctrine of equitable apportionment, opening the door for the assertion of justiciable rights to Rio Grande water by the states of New Mexico and Texas.
>
> To avoid litigation, Colorado, New Mexico, and Texas began in 1923 to make efforts towards a negotiated apportionment of Rio Grande water. Negotiators from the three states signed a permanent compact in 1938. The compact . . . obligates Colorado to deliver water in the Rio Grande at the New Mexico border based upon two schedules tying delivery obligations to levels of inflow, as measured at upstream gauges on the Rio Grande mainstem and the Conejos River, to which is added the flow of the Los Pinos and San Antonio rivers (tributaries of the Conejos) measured near Ortiz, New Mexico. The amount of required discharge varies according to natural supply. In low water years, small deliveries are required; in high water years, large deliveries are required. The compact fixes Colorado's overall obligation in the equitable interstate

> apportionment of the Rio Grande at a level intended to protect water use as it existed from 1928-1937 (the compact study period). In recognition that variations from predicted performance for each river would occur in the future because of the sequencing of wet and dry years, variable runoff patterns, and new depletions, the compact allows accumulated debits up to 100,000 acre-feet. *See* Article VI of the compact.
>
> Beginning in 1952, Colorado accumulated debits in excess of 100,000 acre-feet. Colorado water officials did not curtail surface appropriations to satisfy the compact, and by the end of 1965, Colorado's accrued debit was 939,900 acre-feet. In 1966, Texas and New Mexico brought an original proceeding before the United States Supreme Court seeking repayment by Colorado of the accrued debit. The three states filed a motion for continuance, stipulating that the litigation would be stayed if Colorado met its delivery obligation on an annual basis, without an allowance for accumulated debits, and used all available administrative and legal powers, including curtailment of diversions, to assure annual compliance. This motion was granted by the United States Supreme Court. *Texas v. Colorado,* 391 U.S. 901, 88 S.Ct. 1649, 20 L.Ed.2d 416 (1968).
>
> Governed by the stipulation, the state engineer is required to administer the Conejos River and Rio Grande mainstem on the basis of projected annual runoff. Since 1968, when the state engineer began enforcing the stipulation, water users on both the Conejos and Rio Grande have experienced substantial curtailments of their diversions.

Alamosa-La Jara, at 918-919 (footnotes omitted), see also *Transcript (Simpson) Vol. XVII* at p. 3162, ln. 11 – p. 3163 ln. 5; *The Rio Grande Compact of 1938;* 5 Water Law Review 1 (2001).

82. The *Joint Investigation* describes the history as follows:

> In the early 1890's water shortages began to occur along the Rio Grande in Mesilla and El Paso Valleys and people near Juarez, across the river from El Paso, complained to the Mexican Government. The latter filed a claim for damages against the United States, alleging that the water shortages were due to increasing diversions from the river in Colorado and New Mexico. The United States

> Department of State then instituted an investigation of the situation through the International Boundary Commission, and the outcome was the "embargo" of 1896 and the Mexican Treaty of 1906. The "embargo" was an order by the Secretary of the Interior of the United States which prevented further irrigation development of any magnitude in the Rio Grande Basin in Colorado and New Mexico through suspension of all applications for rights-of-way across public lands in those States for use of Rio Grande water. With some modification in 1907, this embargo remained in effect until May 1925, when it was lifted. Under the terms of the Mexican Treaty, the United States guaranteed to Mexico, in return for relinquishment of all claims for damages, an annual delivery in perpetuity in the Rio Grande at the head of the Mexican Canal near El Paso, of 60,000 acre-feet of water.
>
> Both to insure fulfillment of the Mexican Treaty and to develop a reclamation project in the Elephant Butte-Fort Quitman section, the United States provided for construction of the Elephant Butte Reservoir by the Bureau of Reclamation. This reservoir, with an original capacity of 2,639,000 acre-feet, together with other initial works for the Rio Grande Project, was completed in 1916.
>
> The embargo was opposed in Colorado, since even by 1896 the irrigated lands in the San Luis Valley used all the available natural flow of Rio Grande and its tributaries in that valley. Storage appeared necessary not only for further development but even to maintain existing developments. But storage of any magnitude was impossible under the embargo. The effort of Colorado to secure permission to build reservoirs thus began early, and has continued to date.

Joint Investigation at 19 (page 8 in original text numbering) Exhibit 39.

83. The methodology for division of the water between the states is described by this Court in its earlier opinion in 1991 CW 29, *Concerning the Water Application of Tres Rios Ranch:*

> Thus, the Engineer-Advisors and the Compact Commissioner explicitly recognized that the river was over-appropriated. Accordingly, they constructed a plan aimed at preserving established levels of development within each of the river segments, by limiting allowable stream depletions to those that had prevailed in each segment during the ten-year compact Study Period from 1928 through 1937.

> This plan was based on an engineering method called inflow-outflow analysis. For the Compact Study Period, the Engineers determined inflow at certain upstream gauging stations on both the Rio Grande mainstem and the Conejos River and its two tributaries. By comparing the measured inflow above the principal diversions with outflow below the principal diversions, the Engineers were able to identify consistent relationships between Conejos inflow and outflow at the river's mouth and between Rio Grande mainstem inflow and outflow. These consistent relationships were plotted as smooth curves on a graph. By reference to these curves, the amounts set forth in the two tables in Article III of the Compact were fixed. By this inflow-outflow method, the Engineers sought to tie Colorado's delivery obligations to the amount of indexed inflow. The expected outflows, subject to minor adjustments, became the delivery obligations, with the difference between inflow and outflow being the allowable depletion on the Rio Grande and the Conejos River in Colorado. It is important to recognize that as the amount of inflow increases, the amount of required outflow increases as well. Thus, large river flows do not mean there is a corresponding increase in allowable depletions in Colorado. Instead, Colorado must deliver as outflow an ever-increasing percentage of the additional inflow until the point at which all added inflow must be delivered as outflow.

84. The Rio Grande Compact provided for the accumulation of debits and credits for under or over-delivery by Colorado and New Mexico in the form of storage at the Elephant Butte Reservoir[5] in New Mexico. The Compact also provided for erasure of debts for under-delivery in the event the reservoir actually spilled or had a hypothetical spill as defined by the Compact. The engineers at the time believed there would be a spill every three years. *Transcript (Vandiver) Vol. I* at p. 155, Ln. 11-15. In 1985 Project Storage (as defined in Art. I(k) of the Compact) spilled at the Elephant Butte Reservoir for only the second time and Colorado's very significant accrued debit was eliminated. Rio Grande Compact Arts III(k), VI; *Transcript (Vandiver) Vol. I* at p. 155, Ln. 3-15.[6] The stayed United States Supreme Court litigation was dismissed and since that time Colorado has been free from the limitations of the stipulation and once again has had the ability to accrue credits and debits within the limitations of the Compact. See Rio Grande Compact, Art. VI. The Compact contains separate delivery schedules for the Rio Grande and the Conejos River. To meet the Compact obligations, the Division Engineer must curtail diversions of surface water rights, including water rights that pre-date the Compact. New or increased withdrawals from the Confined Aquifer System will increase stream losses, which, in turn, will require increased curtailment of surface water

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[5] Construction information on the Elephant Butte Reservoir is found at: http://www.usbr.gov/dataweb/html/riogrande.html

[6] Steve Vandiver testified that Elephant Butte has "spilled" only seven times. The first time was 1942. It did not spill again until 1985. *Transcript (Vandiver) Vol. I* at p. 155, ln. 3-15; *Application of Tres Rios Ranch, 91CW9* at p. 22. The Annual Reports of the Compact Commission indicate the actual years of spill were 1942, 1985, 1986, 1987, 1988, 1994 and 1995.

rights to comply with the Compact delivery obligations. *Transcript (Vandiver) Vol. I* at p. 188, ln. 25 - p. 189, ln. 25.

85. As early as 1870, water users in México, New Mexico and Texas were complaining about insufficient surface water and pointing the finger at the Colorado water users. The resulting 1896 study is entitled "A Study of the use of water for irrigation on the Rio Grande del Norte above Fort Quitman, Texas," in Proceedings of the International Boundary Commission. In this report, W.W. Follett specifically found that the Rio Grande and tributaries in Colorado were fully appropriated in1890. That finding has been echoed in every study before the Court, the testimony of all the experts, and is undisputed. The only time when there is a "free river" on the Rio Grande occurs when the Elephant Butte Reservoir spills making flood water available and not subject to call for either existing water rights or the Compact. *Transcript (Vandiver) Vol. I* at p. 184-5. Since the completion of the reservoir in 1916, this has only occurred seven times. See footnotes 5 and 6. Surface water is available for appropriation by new water rights only in years with high stream flows, when all existing surface water rights are satisfied, and when Colorado cannot accrue additional annual credits under the Compact. *Application of Tres Rios Ranch*, Case No. 1991 CW 29, Decree at p. 32-34; *Transcript (Simpson) Vol. XVII* at p. 3206, ln. 17 – p. 3207, ln. 13. Colorado has never reached its maximum annual credit limit under the Compact. See *Transcript (Simpson) Vol. XVII* at p. 3206, ln. 17 – p. 3207, ln. 13.

E. Groundwater Development in the San Luis Valley

86. Groundwater development in the Valley began with the discovery of the confined aquifer in 1887. By 1891 there were estimated to be 2,000 flowing artesian wells in the Valley. By 1904 there were 3,234 flowing wells in the Valley; and by 1916 there was estimated to be 5,000 flowing wells in the Valley. *Id.* That number increased to 6,074 flowing wells by 1936 and increased to an estimated 7,500 flowing wells by 1958. See State Exhibit 40, William J. Powell, *Groundwater Resources of the San Luis Valley,* at 26-27.

87. Significant development of the groundwater from the unconfined aquifer for irrigation did not begin until the 1930's. *Id*. at 56. While the first irrigation well in the unconfined aquifer was constructed in 1903, there was little or no further development of the unconfined aquifer for irrigation purposes for the next 25 years. *Id* at 57. The number of wells withdrawing water from the unconfined aquifer increased from 176 in 1936 to approximately 1,300 wells in 1952, *Id*. and is several times that number today.

88. Well construction in both the confined and the unconfined aquifers continued until 1972 when the State Engineer imposed a moratorium on the issuance of well permits for new appropriations of groundwater from the confined aquifer and from the unconfined aquifer outside of the Closed Basin. *Transcript (Simpson) Vol. XVII* at p. 3180, ln. 23 – 3181, ln. 5. In 1981 the State Engineer imposed a moratorium on the issuance of well permits for new appropriations from the unconfined aquifer in the Closed Basin, effectively ending new appropriations of groundwater in the Valley. *Transcript (Simpson) Vol. XVII* at p. 3181, ln. 6 – 13. In 2003, the State Engineer issued

Policy No. 2003-3, in which the State Engineer declined to issue permits to deepen existing wells, to drill supplemental wells, or to drill alternate points of diversion for wells, without the applicant first obtaining a judicial confirmation of the absence of material injury. *Transcript (Simpson) Vol. XVII* at p. 3181 ln. 14 – 21. The purpose of this policy was to prevent enlarged use of groundwater rights.

89. The majority of the groundwater use in the Valley is for irrigation; only a comparatively small amount is used for commercial, domestic or municipal use. In 1997 the annual municipal pumping was about 7,477 acre-feet and in 1998 the estimated pumping for domestic purposes was 530 acre-feet. State's Exhibit 1, *Rio Grande Decision Support System Phase 4 Ground Water Model Documentation (Preliminary Draft)* ("RGDSS Groundwater Model Documentation"), App. D *Pumping Data* 4, 10 (August 2004). In contrast, in 1998 an estimated 628,000 acre-feet were pumped for irrigation purposes. *Id.*

IV. History of Groundwater Regulation in Water Division No. 3

90. The Protestors in this case were highly critical of the failure of the State Engineer to prevent what they term "out-of-priority" pumping. In particular they asked why the State Engineer had not required plans of augmentation under the 1969 Water Rights and Adjudication Act for wells in the San Luis Valley as originally proposed in the 1975 Rules. Indeed, the Protestors challenged the validity of the groundwater model and the RGDSS in general for not addressing "out-of-priority" pumping. Proponents, including the State Engineer, vigorously disputed this characterization of the existing pumping from adjudicated wells as "out-of-priority" and emphasized the efforts taken by the State Engineer and the water users to optimize the utilization of water in the Rio Grande Basin. To give context to what the State Engineer did and did not do in Water Division 3, a short review of general administration in the State is appropriate.

91. "Administration" of water rights in this State has occurred in some sense since the Adjudication Acts of 1879 and 1881. The legislature modified and expanded the provisions of these Acts in 1891, 1899, 1903 and 1919.[7] The general law of adjudication was recodified in the Adjudication Act of 1943.[8] However, administration of wells was not included in the legislation. In 1951, the Colorado Supreme Court found there is a presumption that all groundwater which finds "its way to the stream in the watershed of which it lies, is tributary thereto, and subject to appropriation as part of the waters of the stream."[9] In 1957, the legislature established a Ground Water Commission, and required registration of existing wells with the State Engineer, as well as requiring an application to the State Engineer for a new well permit. None of these Acts did anything to bring

[7] See generally, Gregory J. Hobbs, Jr. , Colorado's 1969 Adjudication and Administration Act: Settling In, 3 U.Denv.Water L.R 1

[8] Act of Apr. 19, 1943, ch. 190, § 3, 1943 Sess. Laws 613

[9] *Safranek v. Town of Limon*, 228 P.2d 975, 977 (Colo. 1951)

about integration of groundwater and surface water rights. Given the number of wells drilled in the San Luis Valley from 1890 to 1960 (and certainly elsewhere in the state), there was bound to come a reckoning. The Supreme Court decision in *City of Colorado Springs v. Bender,* 366 P.2d 552 (Colo. 1961) pointed out the lack of legislative guidance or provision for joint administration of tributary groundwater. *Bender* involved two wells on a tributary aquifer. It is frequently cited as the source of the doctrine that water users must use reasonable means of diversion. Factually, it held that a junior right might be required to bear the expense of a nearby senior well user deepening his well. *Bender* stimulated some legislative response in the form of the 1965 Groundwater Management Act which focused on "groundwater mining in areas with little surface water."[10]

92. Finally, in 1969, the legislature acted to address the issues surrounding tributary groundwater. As summarized by Justice Hobbs,

> Three activities precipitated the 1969 Act. First, the state engineer began to regulate tributary groundwater wells on a case-by-case basis. Second, the legislature directed the Natural Resources Department to conduct an investigation of the interrelationship of groundwater and surface water and recommend legislation.[11] Third, in a contested groundwater case involving state engineer well regulation in the Arkansas River Basin, the Colorado Supreme Court urged the state engineer to take a more comprehensive approach by adopting regulations. Exclaimed Justice Groves: "It is implicit in these constitutional provisions that, along with *vested rights*, there shall be *maximum utilization* of the water of this state. As administration of water approaches its second century the curtain is opening upon the new drama of *maximum utilization* and how constitutionally that doctrine can be integrated into the law of *vested rights.*"[12] Thus, the court ratified the General Assembly's recognition of the necessity to integrate the use, adjudication, and administration of tributary groundwater and surface water. The very next year the legislature took the starring role with the adoption of the 1969 Act.[13]

93. The 1969 Act reorganized the water divisions. It also provided a framework for adjudication of both surface and tributary groundwater rights. It also provided for plans of augmentation and exchanges and replacement water. The details of the Act are described in detail by Justice Hobbs in the previously quoted article.

94. Following the adoption of the 1969 Act, in 1972 the State Engineer imposed a moratorium on new wells in the confined aquifer in the San Luis Valley and in the unconfined aquifer outside the Closed Basin as already noted. In 1975 the State Engineer promulgated combined Rules for Compact administration and groundwater regulations in the San Luis Valley. Those Rules were litigated in this Court and twice appealed to the Colorado Supreme Court. *Alamosa-La Jara, supra*; *Kuiper v. Gould,* 583 P.2d 910

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[10] Gregory J. Hobbs, Jr., Colorado's 1969 Adjudication and Administration Act: Settling In, 3 U.Denv.Water L.R 1, at 12.

[11] *See* Act of Apr. 19, 1967, ch. 175, § 1, 1967 Colo. Sess. Laws 249, 249-50.
[12] *Fellhauer v. People,* 447 P.2d 986, 994 (Colo. 1968) (emphasis in original).
[13] *See* Robert F. Welborn, *Two Colorado Water Crises*, 1 U. DENV. WATER L. REV. 307, 308-11 (1998).

(1978). The 1975 groundwater Rules required the phasing out of all groundwater diversions unless the groundwater user submitted proof that the well was operating under a decreed plan of augmentation or had a decree as an alternate point of diversion, or that the groundwater appropriation could occur without impairing the right of senior appropriators. *Alamosa-La Jara v. Gould* at 919. A lengthy trial was held on the 1975 Rules during which the State Engineer stipulated with certain objectors that the proposed groundwater Rules, if approved, would not apply to wells withdrawing groundwater from the unconfined aquifer of the Closed Basin. *Transcript (Simpson) Vol. XVII* at p. 3170, ln. 23 – p. 3171, ln. 7.

95. The water court approved the Compact Rules but disapproved the 1975 groundwater Rules. *Alamosa-La Jara* at 920. An appeal was taken to the Colorado Supreme Court, and the Court approved the Compact Rules but remanded the groundwater Rules for reconsideration by the State Engineer. *Id.* at 935-936. The State Engineer was directed to consider whether the reasonable-means-of-diversion doctrine provided a method of achieving maximum utilization of water--a consideration which the State Engineer erroneously believed was foreclosed when promulgating those Rules. *Id.* at 935

96. The Court also stated:

> [T]hat the policy of maximum utilization does not require a single-minded endeavor to squeeze every drop of water from the valley's aquifers. Section 37-92-501(2)(e) makes clear that the objective of "maximum use" administration is "optimum use." Optimum use can only be achieved with proper regard for all significant factors, including environmental and economic concerns.

(Citations and footnote omitted) *Id.* at 935.

97. After the remand, the State Engineer did not promulgate new groundwater regulations for existing groundwater uses in the Valley. The various water interests had expended enormous resources during the first Rules case. More positively, the State Engineer and the various and competing water interests had also engaged in a great deal of discussion about the problems of overappropriation over the years the *Alamosa-La Jara* case was litigated and appealed. Indeed, while the Rules proposed in 1975 were being litigated, many parallel events were occurring. Colorado had accumulated an enormous debt to New Mexico and Texas under the terms of the Rio Grande Compact due to under-delivery of water to the state line. As testified to by Steve Vandiver, the division engineer necessarily was focused on the Compact administration with his limited staff. The longstanding dream of a drainage project to bring water back to the Rio Grande from the sump in the Closed Basin was becoming a reality fulfilling a desire first expressed in the 1920's. The decree for the Closed Basin Project entered in 1980 optimistically promised enormous relief to the senior surface rights regarding the Rio Grande Compact obligation. Even while users on the Rio Grande and Conejos disputed the way the Rio Grande Compact obligation should be allocated between them, they

negotiated with one another and the State Engineer because many of the water users and the State Engineer understood that overappropriation of all aquifers and surface streams was a critical issue that would not go away. In 1981, the State Engineer extended the moratorium on new wells to the unconfined aquifer in the Closed Basin.

98. The Supreme Court opinion in *Alamosa-La Jara v. Gould*, *supra* was issued in 1983 and modified in 1984.

99. Although the State Engineer did not re-promulgate Rules to regulate existing groundwater withdrawals in the Valley following the decision in *Alamosa-La Jara v. Gould*, the Division Engineer has administered wells from both the confined and unconfined aquifers to ensure that all groundwater users comply with the restrictions of their well permits and/or their groundwater rights' decrees. *Transcript (Vandiver) Vol. I* at p. 197, ln. 9 – 12; *Vol. VII* at p. 1258, ln. 15 – p. 1262, ln. 10. The water users and State Engineer also took many other steps to address the issue of overappropriation of both aquifers, protection of senior surface rights and the obligation under the Rio Grande Compact.

A. Closed Basin Project, the Resolution Allocating the Yield of the Closed Basin Project, the "60/40 Agreement" and Exchange and Substitution Decrees

100. The Closed Basin Project is a federal reclamation project which was constructed in the sump area of the San Luis Valley by the Bureau of Reclamation. The project is designed to "salvage" shallow groundwater from the sump area of the Closed Basin and to deliver that water to the Rio Grande. See generally *Closed Basin Landowners Ass'n v. Rio Grande Water Conservation District*, 734 P.2d 627 (Colo. 1987); and *Memorandum and Order of Partial Summary Judgment, Application of Water American Water Development, Inc., 86 CW 46, Water Div.3.* The project was sponsored by the Rio Grande Water Conservation District pursuant to section 37-48-105, C.R.S., and the Project is administered by the Rio Grande Water Conservation District. The decree approving the Project was signed by this Court in Case No, W-3038, authorizing diversion of up to 117,000 acre-feet annually for Project priorities and the other authorized uses. The first priority is to meet the Article III delivery obligations of the Rio Grande Compact. Up to 600,000 acre feet of water in any consecutive ten-year period can be made available under the first priority for this purpose. The second priority is delivery of water to the wildlife areas in the San Luis Valley and the third priority is for sale for use for irrigation. The Closed Basin Project consists of 110 wells[14] completed into the unconfined aquifer which pump water into a ditch for conveyance to water users and to meet Colorado's obligations under the Rio Grand River Compact. Water is also conveyed by ditch from outside the Closed Basin Project area into the sump area. The project discharges water into the Rio Grande above its confluence with Trinchera Creek. Water has been available from the Project since 1988. The annual yield from the Closed

[14] The number of wells is currently 192 according to the Findings of Fact, Conclusions of Law, Judgment, and Ruling of the Referee dated April 28, 2003, which this Water Court incorporated into the decree dated May 29, 2003, in 2002 CW 04.

Basin Project has not lived up to expectations. Still, 43,520 acre-feet have been applied to beneficial use per the decree and the rights to this are now absolute.[15] The Rio Grande Water Conservation District voluntarily relinquished 32,000 acre-feet of its conditional decree based upon the RGDSS and in particular the work of Mr. Harmon discussed much in this opinion. Once setoffs for poor water quality are factored in, the Project has consistently produced less than 50 percent of its original conditional decreed amount. In 2002 it produced approximately 14,000 acre-feet, or approximately 13% of the projected yield. *Transcript* (*H. Simpson,*) *Vol. XVIII.* 3325-26,

101. After the *Alamosa-La Jara* decision water user groups in the Valley began discussing alternatives to continued litigation as a means to address the impact of well pumping on surface streams in the Valley. At that same time the Closed Basin Project ("Project") was under construction and promised to provide an additional supply of water to the Rio Grande that was to be used, *inter alia*, to assist Colorado in meeting its annual delivery obligations under the Compact. See section104(b)(l) of the Reclamation Project Authorization Act of 1972, Public Law 92-514, 86 Stat. 964; *Closed Basin Landowners v Rio Grande Water Con. Dist.*, 734 P.2d 627 (Colo. 1987) (describing Project). Neither the federal legislation authorizing the Project nor the decree for the Project obtained by the Rio Grande Water Conservation District in Case No. W-3038, allocated the Project's production between the Rio Grande and Conejos River.

102. In 1985, the Conejos Water Conservancy District, the Rio Grande Water Users Association, the San Luis Valley Water Conservancy District, the Alamosa-La Jara Water Conservancy District, and the Rio Grande Water Conservation District entered into an Agreement known as the *Resolution Regarding the Allocation of the Yield of the Closed Basin Project* ("60/40 Agreement"). Protestors' Exhibit No. P-80. The Conejos Water Conservancy District, the Rio Grande Water Users Association, the San Luis Valley Water Conservancy District, and the Alamosa-La Jara Water Conservancy District all adopted substantially identical resolutions asking the Rio Grande Water Conservation District to allocate the yield of the Project between the Rio Grande and the Conejos River and the District did so. The District's resolution, the 60/40 Agreement, is intended to address, at least in part, the problem of stream depletions caused by the then existing levels of production by wells in the Valley. The allocation of the water between the two rivers mirrors the way in which the Rio Grande Compact allocates separate delivery obligations between the rivers. The agreement over-optimistically contemplated that the Project would provide not less than 250,000 acre-feet of additional water over any ten-year period once phase 4 of the Project was in operation.

103. The understandings and goals of the 60/40 Agreement, as described therein, include, *inter alia,* (1) reducing the burden of curtailment of surface water rights to meet the obligations of the Compact which threatened "the economic stability of the San Luis Valley by reducing the total agricultural production within the Rio Grande Water Conservation District;" (2) avoid the threat to "the economic stability of the San Luis Valley" presented by a further reduction of total irrigated acreage within the Rio Grande

[15] See decrees in W-3038 (April 21, 1980), 1984 CW 28 (March 16, 1987), 1988 CW 16 (December 9, 1988), 1994 CW 59 (January 12, 1996) and 2002 CW 04 (May 29, 2003).

Water Conservation District from well regulation; (3) use of the Project water to reduce the curtailment of surface diversions that would otherwise be required by the Compact while at the same time reducing claims of stream depletion from well pumping; and (4) to reduce the burdens of curtailment of surface diversions which are currently required to meet the delivery obligations of the Compact; (5) to restore higher levels of surface diversions within the District; and (6) to relieve well users within the District from claims that the operation of wells has reduced the discharges of the Rio Grande and Conejos River. The parties sought to accomplish this by making a permanent allocation between the two river systems of that portion of the yield of the Project that is subject to section 104(b)(l) of the Reclamation Project Authorization Act of 1972.

104. The allocation resolution contemplated that the usable yield from the Project would be divided, as nearly as possible, on a 60/40 basis between the Rio Grande and the Conejos River. It further contemplated that the water so allocated would be beneficially used by exchange. Protestors' Exhibit No. P-80 at 4. Use of this water by exchange is generally physically possible given the place of delivery of the Project water to the Rio Grande and the manner of administration of the Compact. The Project delivers water to the Rio Grande downstream of Alamosa and upstream of both the confluence between the Rio Grande and the Conejos River and Trinchera Creek. State's Exhibit No. 113; Decree (Closed Basin Project), A*pplication of Rio Grande Water Conservation District,* W-3038. Essentially all of the surface water rights on the Rio Grande divert upstream from the outfall of the Project, see *Application of Tres Rios Ranch, 1991 CW 29* at 24; *Alamosa-La Jara* at 923. The water needed to meet the Rio Grande's separate Compact delivery obligation is curtailed from the upstream ditches and is carried in the Rio Grande to the Colorado-New Mexico State line. Thus, water delivered by the Project can physically serve as a substitute supply for water that would otherwise have to be curtailed away from upstream senior water rights to satisfy the Rio Grande's Compact obligation. The use of the Project water to help meet the Rio Grande's Compact obligation has the effect of making more water available for diversion by the upstream water users.

105. The exchange can be physically operated for the benefit of the Conejos River in much the same manner. The Conejos River's compact delivery obligation is measured at the La Sauses gage, located on the Conejos River at its confluence with the Rio Grande. See *Alamosa-La Jara* at 939; Rio Grande Compact, Art. III. Project water delivered in the Rio Grande for the benefit of the Conejos can be substituted for the Compact deliveries otherwise required from the Conejos River, thereby making additional water available for upstream diversion.

106. This Court has previously discussed this agreement, its relationship to the Closed Basin Project and the Memorandum of Understanding entered into in January, 1991, between the State Engineer, the Conejos Water Conservancy District, and the Rio Grande Water Users Association. *Application of Tres Rios Ranch* at 25-27; see also *Transcript (Simpson) Vol. XVII* at p. 3185, ln. 9 – p. 3186, ln. 1. In *Tres Rios,* this Court described the Closed Basin Project and 60-40 Agreement as follows:

> The history of the Project (Closed Basin Project) and its authorizing legislation make clear that Priority One water was not intended to be used,

> either directly or indirectly, as a source of water for new appropriations. Instead up to 600,000 acre-feet of water in any consecutive ten-year period can be made available under Priority One to assist existing users on the Rio Grande and the Conejos River to meet the rivers' respective obligations under Article II of the Compact. Any new use of water made possible by the project are to come from water delivered under Priority Three and purchased by contract. Consistent with the Project's purposes, in January 1985, the District adopted a resolution allocating the Priority One Water between existing users on the Rio Grande and the Conejos River. Pursuant to that agreement, the then existing users on the Rio Grande are generally entitled to the use of sixty percent of the Priority One water annually, and the then existing users on the Conejos River are generally entitled to the use of forty percent of the Priority One water annually.

Tres Rios, at 25-26.

107. Both the Conejos Water Conservancy District and the Rio Grande Water Users Association have obtained decrees approving plans of substitution and exchange confirming the use of Project water in the manner contemplated by the 60/40 Agreement. During the course of the trial, the Court was asked to take, and did take, judicial notice of these decrees. The decree obtained by the Conejos Water Conservancy District was entered in this Court's Case No. 1990 CW 47, and the decree obtained by the Rio Grande Water Users Association was entered in this Court's Case No.1990 CW 45. These decrees were unopposed at the time of trial. The water court's Findings of Fact and Conclusion of Law detail the way in which the 60/40 Agreement benefits the senior water rights and the policy of optimum utilization.

108. In addition, in 1995 the Rio Grande Water Conservation District, pursuant to section 37-48-113, C.R.S., filed a petition with the District Court for Alamosa County seeking judicial examination and confirmation of the 60/40 Agreement. A decree confirming that agreement was entered in Case No. 1995 CV 51. The district court was asked to take and has taken judicial notice of this decree under the above statute which provides for review of contracts entered into by the conservation district.

109. In exchange for this permanent allocation of Project water, the Conejos Water Conservancy District, the Rio Grande Water Users Association, the San Luis Valley Water Conservancy District, and the Alamosa-La Jara Water Conservancy District waived all claims against all existing wells located within the boundaries of the Rio Grande Water Conservation District for alleged effects on the flows of the Rio Grande, Conejos River, Alamosa River, and La Jara Creek resulting from the existing levels of attained production and use of those wells. The agreement defines "existing levels of production and use" to generally refer to the levels of diversion and beneficial use of groundwater attained during the period 1981-1985. In the case of municipal or quasi-municipal wells, their levels of attained use and production are to be measured by the wells' permitted and/or decreed capacity.

110. The 60/40 Agreement contains a number of other terms addressing administration of the agreement, the right to terminate the agreement under certain conditions, and an agreement by the parties that the agreement will terminate if legal proceedings are commenced and prosecuted to completion that require well users within the Rio Grande Water Conservation District to provide augmentation or replacement water to surface streams, in addition to that provided by the agreement, for well depletions caused by existing levels of production and use, generally referring to the levels of diversion and beneficial use attained during the period 1981-1985.

111. The Closed Basin Project began actual delivery of water in 1988. Subsequent to the 60/40 Agreement the State Engineer has taken no action to regulate historical use of existing wells, but the State Engineer has opposed any form of expansion of use or appropriation. Beginning in 1972, the State Engineer's Office has had in place moratoriums on the issuance of new well permits for new appropriations of groundwater in the confined aquifer and in the unconfined outside the Closed Basin. In 1982, the State Engineer expanded the moratorium to include new well permits from either aquifer throughout the Valley. The only exception to these moratoriums was the issuance of exempt well permits pursuant to section 37-92-602, C.R.S. (2005). Thus, the 60/40 Agreement was intended and the State Engineer has regarded the agreement as providing replacement water for existing wells' level of use attained between 1981-1985.

112. The drought of 2002, combined with a reduction in the Closed Basin Project's yield due to bio-fouling of production wells, renewed the concern of Valley water users over well depletions to both the aquifer systems and the surface streams. This concern is evidenced by their support for SB 04-222 (codified in section 37-92-501(4), C.R.S.) In testimony before the House Agriculture Committee on April 28, 2004, Mr. Paddock, on behalf of the Rio Grande Water Users Association, described the 60/40 Agreement and the fact that the decline in yield of the Closed Basin Project together with the drought showed that the 60/40 Agreement was not a complete solution to groundwater problems in the Valley, and that other measures would be required to address groundwater overdraft and to protect senior vested water rights from injury caused by groundwater pumping. Similar testimony was given before the Senate Agriculture Committee on April 8, 2004, describing the use of the 60/40 Agreement in lieu of groundwater regulation in the Valley. This testimony acknowledged that this agreement has proved to be an incomplete solution to the groundwater problems of the Valley.

113. The Protestord asserted that the 60/40 Agreement amounts to a "selective subordination." The Court understands a selective subordination to occur when a senior water right agrees not to exercise its priority against some, but not all, junior water rights. However, because there has been a moratorium on new appropriations from the confined aquifer since 1972 and a moratorium on new appropriations from the unconfined aquifer since 1981, there are no new junior groundwater appropriations to which the 60/40 agreement would not apply. In addition, the agreement does not purport to subordinate senior water rights to junior water rights. *Transcript (Simpson) Vol. XVII* at p. 3186, ln. 2 – p. 3190, ln 8. Rather, in exchange for the continued delivery of Closed Basin Project water that surface water rights can use by exchange to replace stream depletions, certain water user groups agreed to waive claims of injury from wells so long as the

agreement remained in effect. The 60/40 Agreement can terminate if groundwater regulations require that more replacement be provided than that provided under the agreement. Finally, since the imposition of the moratorium in 1972 any new appropriation from the confined aquifer would require a decreed plan for augmentation because there is no unappropriated water. For these reasons, the Court finds that the 60/40 Agreement is not a "selective subordination."

B. Effects of Confined Aquifer Groundwater Pumping

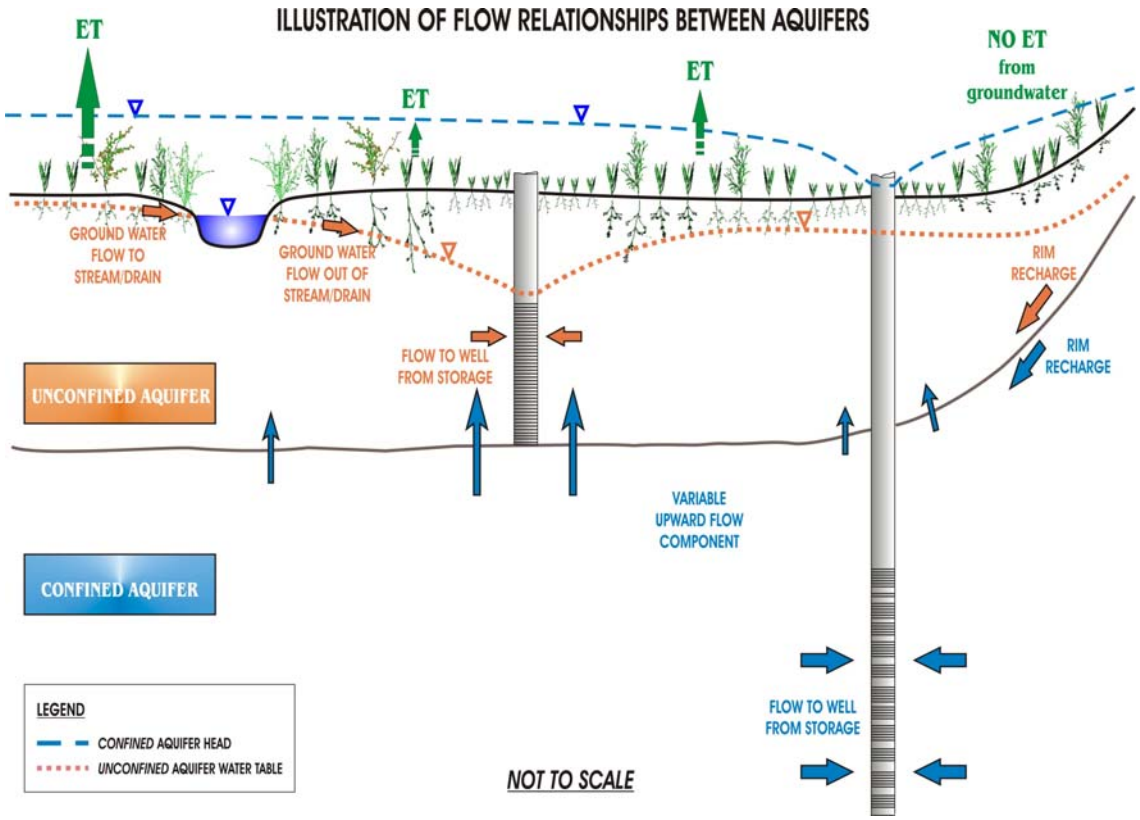
114. It is uncontested that pumping from the unconfined aquifer and confined aquifer depletes surface streams.[16] State's Exhibit No. 11, *John Allen Calvert Davey C.R.C.P. 26(a)(2) Disclosure* at pp. 3 - 5; State's Exhibit No. 13, *Colo. R. Civ. P. 26(a)(2) Disclosure of Dr. Kenneth W. Knox, Ph.D., P.E.,* at pp. 2 – 3; State's Exhibit No. 16, *Colo. R. Civ. P. 26(a)(2) Disclosure of Hal D. Simpson, P.E.,* at pp. 5 – 6, State's Exhibit No. 19, *Colo. R .Civ. P. 26(a)(2) Disclosure of Steven E. Vandiver, P.E.,* at pp. 4 - 5. The evidence establishes that withdrawals from the aquifers do not necessarily result in a one-to-one impact on stream flows, *Transcript (Simpson) Vol. XVIII* at p. 3345, ln. 21 – 24; and that groundwater withdrawal in different regions of the Valley will have differing impacts on surface streams.

115. Pumping from the confined aquifer can cause stream depletions in several ways. First, in some areas the confined aquifer directly discharges to surface streams through springs or groundwater inflow. Russell Springs and McIntyre Springs are examples of spring discharge. Russell Springs discharges into Russell Lakes. McIntyre Springs, which is located near the Conejos River west of Manassa, Colorado, discharges into the Conejos River. The discharge from both Russell Springs and McIntyre Springs has declined over the period of record and that reduction in discharge appears to be attributable, in large part, to the reduction in artesian head in the confined aquifer. State Exhibit 82, reproduced on p. 17 above; State's Exhibit 21, *McIntyre Measurements*; State's Exhibit 11, *John Allen Calvert Davey C.R.C.P. 26(a)(2) Disclosure* at pp. 1, 6, 47 – 56; *Transcript (Slattery) Vol. IX* at p. 1683, ln. 19 – p. 1684, ln. 14. The primary reason for declining artesian pressure is that present levels of withdrawals from the confined aquifer exceed the long-term recharge to that aquifer.

116. Withdrawals from the confined aquifer also affect stream flows indirectly through the unconfined aquifer. As explained in more detail below, the confined aquifer and the unconfined aquifer are separated by geologic strata known as the blue clay series. The blue clay acts as an aquitard between the two aquifers, allowing some water to leak upward from the confined aquifer to the unconfined aquifer. When the artesian pressure in the confined aquifer is reduced, the amount of upward leakage is also reduced. Therefore, reduction in artesian pressure reduces the amount of water entering the unconfined aquifer from the confined aquifer, thereby reducing the water supply in the

[16] Since the Rules only address new or increased withdrawals from the Confined Aquifer System, the Proponents did not need to present specific evidence on the location and extent of depletions to surface streams caused by existing groundwater use.

unconfined aquifer. This, in turn, can reduce the flow of surface streams. Protestors' Exhibit P-29, below, gives an excellent general view of the relationships of the aquifers, streams and rim recharge.



117. Declines in artesian pressure in the confined aquifer may also reduce stream flow by causing increased leakage from perennial streams that flow across the "recharge zone." As explained in more detail below, the recharge zone is the area near the edge of the Valley where the blue clay series does not exist. As perennial streams enter the Valley from the surrounding mountains, water can leak downward from the stream into the aquifer or can flow from the aquifer into the stream. Reducing the artesian pressure in the confined aquifer can reduce the groundwater levels in the recharge zone and thereby increase the leakage from those streams, which reduces the surface streamflow. See generally *Transcript (* Harmon)Vol XXV, p 4820, ln. 24-p.822. ln 23.

118. The Protestors argued that reduction in the confined aquifer head does not result in increased leakage in the recharge zones from the so-called rim-inflow streams. The Court agrees with this only to the extent that this opinion applies to non-perennial streams that typically do not reach the Valley's floor. The Court finds, however, that a lowering of artesian pressure in the confined aquifer will reduce the amount of the leakage from these rim streams that would otherwise reach the unconfined aquifer. This, in turn, can

adversely affect water supplies and water rights in that aquifer and may also reduce stream flows on the Valley floor as illustrated in the State's Exhibit 126 (below). *Transcript (Harmon) Vol. XXV* at p. 4815, ln. 9 - p. 4821, ln. 20; State's Exhibit 127, pp 1-3.