

# STATE OF COLORADO

## Colorado Water Conservation Board

### Department of Natural Resources

1313 Sherman Street, Room 721  
Denver, Colorado 80203  
Phone: (303) 866-3441  
FAX: (303) 866-4474  
www.cwcb.state.co.us



May 24, 2006

John D'Antonio  
Upper Colorado River Commissioner  
130 South Capitol Street  
Concha Ortiz y Pino Building  
P.O. Box 25102  
Santa Fe, NM 87504-5102

By email and hardcopy

Re: Upper Colorado River Hydrologic Determination

Dear John:

As you know, Colorado, Wyoming and Utah have been working with New Mexico to develop a new hydrologic determination for the Colorado River ("HD"). This issue has particular importance to Colorado because the San Juan River basin originates in Colorado. Recently the Colorado Water Conservation Board ("CWCB") approved a resolution where it: 1) concurred in concept with a Hydrologic Determination that provides New Mexico with the contract water supply needed for the Navajo-Gallup Water Supply Project; 2) supported a vote in the affirmative for the resolution by Colorado's commissioner to the Upper Colorado River Commission ("UCRC"), as long as any changes to the resolution remain consistent with the concepts presented by the CWCB Staff and as suggested by the Southwestern Water Conservation District; and, 3) directed the CWCB staff to work with Colorado's San Juan River basin water interests to achieve, to the extent reasonably possible, the assurances and equitable future water development opportunities desired, including but not limited to, the requests made by the Southwestern Water Conservation District in its May 9, 2006 letter. We are writing to see if the State of New Mexico will: 1) support these changes to the proposed UCRC resolution; and 2) provide Colorado with some assurances regarding future development opportunities within Colorado. We recognize that time is critical as New Mexico hopes to secure UCRC support at the June 5, 2006 meeting. Thus, we would suggest a meeting by teleconference later this week or next week. In the alternative, we could meet with you in Jackson on Sunday night, prior to the UCRC meeting on June 5, 2006.

The suggested changes to the UCRC resolution should be self explanatory as they appear in redline format attached to the email of May 23, 2006, from Randy Seaholm, along with the addendum by Scott Balcomb also by email dated today. With regard to the assurances the State of Colorado would like to see, we have attached the letter from the Southwestern Water Conservation District so that you are aware of their concerns. In order to highlight the State of Colorado's concerns regarding these issues, we would like New Mexico to consider and respond to the following specifically identified issues:

1. San Juan River Basin Recovery Implementation Program ("SJRIP"). The State of Colorado has concerns that the additional depletions from the San Juan River basin as a result of Navajo Gallup Project ("NGP"), when evaluated against the SJRIP Flow Recommendations, may impair Colorado's ability to develop water in the San Juan River basin in Colorado. Thus, Colorado would like New Mexico to agree that the SJRIP provides the reasonable and prudent alternative ("RPA") to offset the impacts of water development in the San Juan River basin. Therefore, the flow recommendations are not to be used to impair any future water development that is consistent with the terms of the Upper Colorado River

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Water Supply Protection • Conservation and Drought Planning

Compact and New Mexico will support Colorado's development of additional depletions in the San Juan River basin that are consistent with the terms of the Upper Colorado River Compact utilizing the SJRIP to offset the depletive impacts of such development during section 7 consultations, federal permitting processes, and in other forums requested by the State of Colorado. Such an agreement would help assure that: 1) any additional depletions would utilize all the elements of the SJRIP as the RPA; 2) would not allow the SJRIP Flow Recommendations to control consultations or any permitting processes; and, 3) future depletions would be divided equitably between New Mexico and Colorado.

2. La Plata River-Long Hollow Reservoir Project. New Mexico recently reversed its opposition to the construction of the Long Hollow Reservoir in the La Plata River basin by sending a letter to the U.S. Corps of Engineers supporting the construction of the reservoir. Colorado greatly appreciates this reversal and the letter of support.

3. La Plata River Compact-There has been some confusion over how La Plata River basin water may be used under the La Plata River Compact. We believe that Articles II and V of that Compact imply that New Mexico cannot call for water that will be put to beneficial use outside of the La Plata basin. We would like to understand of New Mexico's position on this matter. We believe that a dialogue between our States and the District may help resolve this issue regarding compact administration.

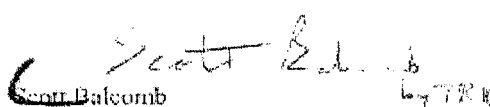
4. San Juan-Chama Project-The State of Colorado would like a written assurance from New Mexico that it will continue to support the Bureau of Reclamation's operation of the San-Juan Chama Project so that diversions occur as early in the year as practical.

5. Weather Modification-The State of Colorado requests that New Mexico support, through the 7-State process and otherwise, and will seek appropriations for, the weather modification water augmentation program within the San Juan River drainage.

Thank you for your attention to this matter. We look forward to hearing from you and hope that we can reach some resolution on these matters before the UCRC meets on June 5<sup>th</sup>.

Sincerely,

  
Rod Rubenach  
Director, CWCB

  
Scott Balcomb  
Colorado Commissioner, UCRC and  
Colorado River Basin

cc: CWCB Members  
Estevan Lopez  
Hal Simpson  
Barry Spear  
Fred Kroeger  
Lynn Herkenhoff

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#### By email and hardcopy

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Bill Owens  
Governor

Russell George  
Executive Director

Rod Kuharich  
CWCB Director

Rick Brown  
Acting Deputy  
Director

Compact and New Mexico will support Colorado's development of additional depletions in the San Juan River basin that are consistent with the terms of the Upper Colorado River Compact utilizing the SJRIP to offset the depletive impacts of such development during section 7 consultations, federal permitting processes, and in other forums requested by the State of Colorado. Such an agreement would help assure that: 1) any additional depletions would utilize all the elements of the SJRIP as the RPA; 2) would not allow the SJRIP Flow Recommendations to control consultations or any permitting processes; and, 3) future depletions would be divided equitably between New Mexico and Colorado.

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Thank you for your attention to this matter. We look forward to hearing from you and hope that we can reach some resolution on these matters before the UCRC meets on June 5<sup>th</sup>.

Sincerely,

Rod Kuharich  
Director, CWCB

Scott Balcomb  
Colorado Commissioner, UCRC and  
Colorado River Basin

cc: CWCB Members  
Estevan Lopez  
Hal Simpson  
Barry Spear  
Fred Kroeger  
Lynn Herkenhoff

May 9, 2006

Rod Kuharich, Director  
Colorado water Conservation Board  
1313 Sherman Street  
Denver, Colorado 80203

Re: Upper Colorado River Hydrologic Determination

Dear Rod:

The Southwestern Water Conservation District ("SWCD") submits this letter to the Colorado Water Conservation Board ("CWCB") in response to the State of New Mexico's request for CWCB's support of a new hydrologic determination for the Colorado River ("HD"). SWCD has no objection to CWCB supporting the New Mexico request if certain considerations are accepted by New Mexico in regard to the San Juan River basin.

Increasing the HD for the Upper Basin of the Colorado River would theoretically imply more water is available to all of the Upper Basin states under the Upper Colorado River Compact. If the current hydrologic determination of 6.0 MAF/yr is increased to 6.23 to 6.28 MAF/yr to assist New Mexico in meeting its intrastate water demands, all the Upper Basin states would benefit in water available from the Colorado River on a pro-rata basis under the Upper Colorado River Compact. Therefore, Colorado as a whole, would benefit in that it would "receive" more water under its 51.75 percent share of Upper Basin Colorado River water.

SWCD's concerns, however, arise from the fact that the water which would provide New Mexico its 11.25 percent share of Upper Basin Colorado River water from the increased HD, estimated to be an increase of approximately 29,800 AF, would all come from the San Juan River basin. This could directly impact the water users and water availability in the nine county area served by SWCD. Since the increase in HD is to benefit all Colorado west slope basins, it must not restrict water use in southwest Colorado. Therefore, SWCD requests that the CWCB consider intra-Colorado protection for the San Juan River basin, in the unlikely event of a call on the Colorado River, when it considers approval of an increased HD to benefit New Mexico using water from the San Juan River basin.

In addition, SWCD requests the CWCB ease the impact of an increased HD on the San Juan River basin by supporting the New Mexico request if New Mexico agrees to the following:

1. San Juan River Basin Recovery Implementation Program. It is most important that the CWCB support of the increased HD include protections for Colorado in the San Juan River Basin Recovery Implementation Program ("SJRIP"). SWCD understands that NM may use most, if not all, of its additional Upper Basin Compact allocation under the new HD for the Navajo Gallup Project ("NGP"), which will provide water to Gallup, New Mexico, the Navajo Nation lands in New Mexico and the Jicarilla-Apache Reservation. Although SWCD supports the NGP, the additional depletions from the San Juan River Basin as a result of NGP, when evaluated against the SJRIP Flow Recommendations, may impair Colorado's ability to develop water in the San Juan River basin in Colorado. While the SJRIP was implemented allow development, future recommendations might be used to impair that ability. SWCD, therefore, requests that the CWCB agree to an increase in the HD, only if protections are provided to southwest Colorado water users preventing the Flow Recommendations of the SJRIP from impairing such development.

The SJRIP Hydrologic Model presently indicates that any further depletions in the San Juan River basin will prevent the existing Flow Recommendations from being met. While SJRIP was designed to protect development, meeting the Flow Recommendations is not required to obtain a successful Section 7 Consultation for a new water project: it is one factor in considering whether the SJRIP is making sufficient progress to allow the new depletion. The existing Flow Recommendations are now under review. Preliminary analysis indicates that the amount of allowed depletions under the Flow Recommendation may increase. The Bureau of Reclamation and consultants for the Navajo BIA are developing the new Flow Recommendations for consideration by the Biology and Coordination Committees of the SJRIP. The protections SWCD would suggest in order that Southwest Colorado receive an appropriate share of any increases in the depletions allowed by the Flow Recommendation include:

A. Any additional depletions available under the Flow Recommendations should be divided equally between New Mexico and Colorado. For example, if New Mexico is allowed to deplete its entire increase under the HD within the Flow Recommendations then the same amount of additional depletions should be reserved for future use under Section 7 Consultations for projects in southwest Colorado, and

B. Consistent with the terms of the Upper Colorado River Compact, New Mexico must agree not to impair Colorado's development of additional depletions in the San Juan River Basin under the SJRIP, federal permitting, or in any other manner.

2. La Plata River. New Mexico recently reversed its opposition to the construction of the Long Hollow Reservoir in the La Plata River basin by sending a letter to the U.S. Corps of Engineers supporting the construction of the reservoir. This reversal

is appreciated by SWCD as Long Hollow Reservoir will greatly assist in ensuring deliveries of water to New Mexico required under the La Plata River Compact, while allowing supplemental irrigation use in Colorado by exchange. Further commitment from New Mexico with regard to the La Plata River, however, is vital to Southwest Colorado. In addition to support of the Long Hollow Reservoir, New Mexico must agree that Colorado does not have to deliver water to New Mexico under the La Plata River Compact that will be used to fulfill water demands outside the La Plata River basin.

3. San Juan-Chama Project. New Mexico shall support the continuation of diversions under the San-Juan Chama Project as early in the year as practical.

4. Weather Modification. New Mexico shall commit to providing reasonable financial support for weather modification operations in the San Juan River drainage.

SWCD encourages the CWCB to incorporate the above points in any recommendation to the Upper Colorado River Commission and/or the Bureau of Reclamation which endorses New Mexico's request to increase the HD for the Colorado River.

Thank you for your attention to this matter.

Sincerely,

Fred V. Kroeger, President


cc: John D'Antonio  
Scott Balcomb  
Don Schwindt  
Randy Seaholm





Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

**Whipple, John J., OSE**

**Fi:** Seaholm, Randy [Randy.Seaholm@state.co.us] **Sent:** Fri 5/19/2006 5:56 PM  
**To:** scott@balcombgreen.com; DOSTLER@uc.usbr.gov; jshiel@state.wy.us; Whipple, John J., OSE; robertking@utah.gov; Lopez, Estevan, OSE  
**Cc:** Kuharich, Rod; George, Russell; McAuliffe, Dan; Brown, Rick; McNulty, Frank; Shpall, Casey; Angel, Carol; Kowalski, Ted; ekuhn@crwcd.org; dmerritt@crwcd.gov; bspear@mbsslip.com  
**Subject:** Hydrologic Determination  
**Attachments:**  ColoradoRiver.Hydro.Determin.CWCB.ltr(Final).doc(36KB)

Below is the resolution of the Colorado Water Conservation Board that was unanimously passed at its May 16-17, 2006 meeting in Rocky Ford, Colorado. Also attached is the letter from the Southwestern Water Conservation District referenced in the resolution. Comments on the UCRC proposed resolution dealing with the Hydrologic Determination and the proposed HD report will follow shortly. In response to the letter from Southwest, we will suggest some ideas for discussion with New Mexico and that New Mexico consider how such might be memorialized and enforced. Please call me if you have any questions.

**Amended Recommendation as unanimously adopted by CWCB**

The Board concurs in concept with a Hydrologic Determination that provides New Mexico with the contract water supply needed for the Navajo-Gallup Water Supply Project and supports a vote in the affirmative for the attached resolution by Colorado's commissioner to the Upper Colorado River Compact Commissioner, as long as any changes to the resolution remain consistent with the concepts presented by staff and as suggested below by the Southwestern Water Conservation District.

The Board directs staff to work with Colorado's San Juan River basin water interests to achieve, to the extent reasonably possible, the assurances and equitable future water development opportunities desired, including but not limited to, the requests made by the Southwestern Water Conservation in its May 9, 2006 letter.

Randy Seaholm

Chief, Water Supply Protection

Colorado Water Conservation Board

1313 Sherman Street, Suite 721

Denver, Colorado 80203

303-866-3441

303-866-4474 FAX

OSE-1359

randy.seaholm@state.co.us

OSE-1360

May 9, 2006

Rod Kuharich, Director  
Colorado Water Conservation Board  
1313 Sherman Street  
Denver, Colorado 80203

Re: Upper Colorado River Hydrologic Determination

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SWCD encourages the CWCB to incorporate the above points in any recommendation to the Upper Colorado River Commission and/or the Bureau of Reclamation which endorses New Mexico's request to increase the HD for the Colorado River.

Thank you for your attention to this matter.

Sincerely,

Fred V. Kroeger, President

cc: John D'Antonio  
Scott Balcomb  
Don Schwindt  
Randy Seaholm



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### MEMORANDUM

**TO:** Colorado Water Conservation Board Members

**FROM:** Randy Seaholm *RS*  
Chief, Water Supply Protection

**DATE:** May 7, 2006

**SUBJECT:** Agenda Item 24, May 16-17, 2006 Board Meeting -  
Upper Colorado River Basin Hydrologic Determination

Bill Owens  
Governor

Russell George  
Executive Director

Rod Kuharich  
CWCB Director

Dan McAuliffe  
Deputy Director

### Background

The Navajo Nation and the State of New Mexico reached a Settlement Agreement on the Navajo Nation's Federal Reserved Water Right claims in January 2005. A key component of the Settlement Agreement was the construction of the Navajo-Gallup Water Supply Project. Depletions resulting from the Navajo-Gallup Water Supply Project chargeable to New Mexico's apportionment are estimated to be 29,482 AF and would result in New Mexico exceeding its Upper Colorado River Compact apportionment. New Mexico's apportionment (11.25%) under a 6.0 maf Upper Basin Hydrologic Determination (HD) is 669,375 AF. The construction of the Navajo-Gallup Water Supply Project would result in New Mexico exceeding its apportionment under a 6.0 maf HD by between 20,000 and 25,000 AF depending on assumptions made in computing consumptive uses. We would note that this overage in consumptive uses is based on the full development of Navajo Reservoir water supply contracts currently in-place and not on actual consumptive uses of water pursuant to those contracts that are now occurring. New Mexico's total consumptive use, considering Navajo contracts and all other uses, is approximately 470,000 AF. An important aspect of the Navajo Gallup Water Supply contract is that it would only extend through 2060.

When Public Law 87-483, which authorized the Navajo Indian Irrigation Project and the initial stage of the San Juan-Chama Project, was passed in 1962 it contained a provision in Section 11(a) thereof that reads in part as follows:

*"No long-term contract, except contracts for the benefit of the lands and for the purposes specified in sections 2 and 8 of this Act, shall be entered into for the delivery of water stored in Navajo Reservoir or of any other waters of the San Juan River and its tributaries, as aforesaid, until the Secretary has determined by hydrologic investigations that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in articles III and XIV of the Upper Colorado River Basin Compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts."*

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OSE-1364

does not necessarily change, but the annual evaporation calculation does allow for a shift in how the depletion occurs by allowing it to be used for human needs as opposed to being evaporated.

- It utilizes an updated future depletion schedule. Updating the depletion schedule to reflect the fact that development is not occurring at the rate anticipated allows the time a contract can reasonably be expected to be met to be extended.

New Mexico and the USBR after extensive analysis are proposing a HD of 5.76 maf exclusive of CRSP shared reservoir evaporation as shown in the attached model run. The yield to Upper Basin is 6.265 maf when shared CRSP evaporation of 505,400 AF is added to the 5.76 maf HD. The major model assumptions used are displayed in the upper right hand corner of the attached spreadsheet and are briefly summarized as follows:

- Active Powell, Flaming Gorge, Navajo and Aspinall Unit storage plus live storage in 60 other Upper Basin Reservoirs is used.
- Bank storage equal to 4% of live storage capacity is used.
- Sedimentation at the rate shown is deducted through 2060 to arrive at the adjusted storage amount for the model run.
- Lower Basin delivery is 8.25 maf if the natural flow at Lee Ferry exceeds or is equal to this amount, if the natural flow at Lee Ferry does not equal or exceed 8.25 maf (which situation occurs in 1934 and 1977), deliveries are limited to the amount available. The Lower Basin delivery under this assumption averages 8.20 maf, excluding spills, over the period 1906-2000 and 8.15 maf for the critical period. The cumulative shortage amount computed in the attached run is 3.54 maf and in total is less than the amount of the CRSP minimum power pool contents, thus the cumulative shortage or the shortage in any given year is to power and is not a curtailment of Upper Basin uses.

## Discussion

A HD of 5.76 maf exclusive of CRSP shared reservoir evaporation would allow the Navajo-Gallup Water Supply Project to proceed in accord with the Congressional requirements and the Navajo Settlement Agreement. The 5.76 maf HD means that New Mexico uses would occur within its compact apportionment and therefore likely would not be subject to the advance repayment provisions in Article IV(b) of the Upper Colorado River Compact. Rather New Mexico would simply absorb their proportionate share of any curtailments required under Upper Colorado River Compact.

In March 2005, the Board discussed the issue of whether or not the Settlement actually kept New Mexico within its compact apportionment under the 1988 HD. The Settlement agreements appeared to accomplish that goal. However, New Mexico was advancing a depletion schedule that assumed that 5% of the irrigated land is fallow at any given point in time. If this did not occur, New Mexico would rely on certain subordination clauses in the Settlement to remain within their compact apportionment. Accounting details on how that would be done have not yet been worked out. This apportionment concern was compounded by acknowledging that individual members of the Navajo Nation that have been allotted land by the U.S. are not bound by the Settlement and may have additional claims that would have to be "offset" by corresponding reductions in use by the Navajo Nation as a whole that are now required under the Settlement. The updated HD helps address these concerns.



DISCUSSION DRAFT – April 4, 2006

RESOLUTION OF THE  
UPPER COLORADO RIVER COMMISSION

Regarding the Availability of Water to Provide for a Navajo Reservoir  
Supply Contract for Navajo Nation Uses within the State of New Mexico

WHEREAS, the State of New Mexico has proposed the Navajo-Gallup Water Supply Project to provide a needed renewable water supply from the San Juan River for municipal and domestic uses for Indian and non-Indian communities located within New Mexico in both the Upper Basin and the Lower Basin; and

WHEREAS, the State of New Mexico and the Navajo Nation on April 19, 2005, executed the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (the “Settlement Agreement”), which is conditioned upon, among other things, the implementation of the Navajo Nation components of the Navajo-Gallup Water Supply Project within New Mexico; and

WHEREAS, the source of water supply for the proposed Navajo-Gallup Water Supply Project would be Navajo Reservoir and the San Juan River in New Mexico; and

WHEREAS, water from Navajo Reservoir and the San Juan River would be delivered to the proposed Navajo-Gallup Water Supply Project to meet the water demands of Navajo Nation communities in New Mexico through the proposed Settlement Contract between the United States, acting through the Secretary of the Interior, and the Navajo Nation (Appendix 4 to the Settlement Agreement); and

WHEREAS, Public Law 87-483 at section 11(a) requires that no new long-term contracts “... shall be entered into for the delivery of water stored in Navajo Reservoir or any other waters of the San Juan River and its tributaries, as aforesaid, until the Secretary has determined by hydrologic investigations that sufficient water to fulfill said contract is reasonably likely to be available for use in the State of New Mexico during the term thereof under the allocations made in articles III and XIV of the Upper Colorado River Basin compact, and has submitted such determination to the Congress of the United States and the Congress has approved such contracts”; and

WHEREAS, in furtherance of the Jicarilla Apache Tribe Water Rights Settlement Act of 1992, and the perpetual Navajo Reservoir water supply contract approved by said Act, the Secretary of the Interior pursuant to Public Law 87-483 on February 2, 1989, approved the report on “Hydrologic Determination, 1988, Water Availability from Navajo Reservoir and the Upper Colorado River Basin for Use in New Mexico” (the “1988 Hydrologic Determination”); and

provided for in Articles III(a) and III(b) of the Colorado River Compact and the entire Mexican Treaty delivery obligation; and

WHEREAS, the Upper Colorado River Commission anticipates that the Upper Division States will take all actions necessary to ensure that all Upper Basin States have access to their respective apportionments as specified in the Upper Colorado River Basin Compact; and

WHEREAS, the Upper Colorado River Commission on June 19, 2003, resolved that: (1) "the States of Colorado, New Mexico, Utah and Wyoming, support and to the extent necessary consent to the diversion of water from the Upper Basin for use in the Lower Basin solely within New Mexico via the proposed Navajo-Gallup Water Supply Project; provided, that any water so diverted by said project to the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III (a) of the Upper Colorado River Compact;" and (2) "the Upper Colorado River Commission supports such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project."

NOW, THEREFORE, BE IT RESOLVED by the Upper Colorado River Commission, that the Commission supports Congressional action to approve the Settlement Agreement, authorize the proposed Navajo-Gallup Water Supply Project, and approve the proposed Settlement Contract for the Navajo Nation's uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project.

BE IT FURTHER RESOLVED, that while the Upper Colorado River Commission does not endorse the study assumptions used by the Bureau of Reclamation in its \_\_\_\_\_, 2006, draft hydrologic determination, and specifically disagrees with the assumption of a minimum Upper Basin delivery of 8.25 million acre-feet annually at Lee Ferry, the Commission would support a determination by the Secretary of the Interior that at least \_\_\_\_\_ million acre-feet of water is available annually for use by the Upper Basin, exclusive of reservoir evaporation at Lake Powell, Flaming Gorge Reservoir and the Aspinall Unit reservoirs of the Colorado River Storage Project.

BE IT FURTHER RESOLVED, that the Upper Colorado River Commission would support a determination by the Secretary of the Interior that sufficient water is reasonably likely to be available to fulfill the proposed Settlement Contract for the Navajo Nation's uses in New Mexico from the Navajo Reservoir supply under the Navajo-Gallup Water Supply Project and the Navajo Indian Irrigation Project, in addition to existing Navajo Reservoir water supply contracts for other uses, without causing New Mexico to exceed its Upper Colorado River Basin Compact allocation.

BE IT FURTHER RESOLVED, that nothing in this Resolution, or resulting from the implementation of this Resolution, shall limit the right or ability of any Upper Basin

Upper Basin Yield Study - May 2, 2006, Draft

Study No. 18: Flows Adjusted, CRSP Active+Other UB Live Storage (same percent full), Constant 5.76 maf Upper Basin Use, LB Delivery lesser of 8.25 maf/Natural Flow

CY	CR Natural Flow at Lee Ferry (plus)	Total Carry-Over Storage (plus)	CRSP Carry-Over Storage	Lower Basin Delivery (minus)	10-Year Lower Basin Delivery	Upper Basin Use (minus)	Shared CRSP Evap (minus)	Net Available to Store (subtotal)	Spill to LC (minus)	Shortage (plus)	UC Basin Year-end Storage (equals)	CRSP Year-end Storage	Variables	
1906	18,550,021	29,530,030	24,847,704	8,250,000		5,760,000	749,290	33,320,761	3,790,731	0	29,530,030	24,847,704	Storage	30,167,576 af
1907	21,201,694	29,530,030	24,847,704	8,250,000		5,760,000	749,290	35,972,434	6,442,404	0	29,530,030	24,847,704	Sedimentation Rate (Active)	24,292 af/yr
1908	12,218,817	29,530,030	24,847,704	8,250,000		5,760,000	723,049	27,015,798	0	0	27,015,798	22,732,132	Bank Storage	4%
1909	22,356,301	27,015,798	22,732,132	8,250,000		5,760,000	723,049	34,639,050	5,109,020	0	29,530,030	24,847,704	Adjusted Storage (2060)	29,530,030 af
1910	14,650,616	29,530,030	24,847,704	8,250,000		5,760,000	748,168	29,422,479	0	0	29,422,479	24,757,206	UB Demand Level	5,760,000 af/yr
1911	15,499,729	29,422,479	24,757,206	8,250,000		5,760,000	748,168	30,164,040	634,010	0	29,530,030	24,847,704	LB Delivery	8,250,000 af/yr
1912	18,623,410	29,530,030	24,847,704	8,250,000		5,760,000	749,290	33,394,150	3,864,120	0	29,530,030	24,847,704		
1913	14,536,373	29,530,030	24,847,704	8,250,000		5,760,000	748,988	29,309,416	0	0	29,309,416	24,862,070		
1914	21,354,814	29,309,416	24,862,070	8,250,000		5,760,000	748,988	35,907,242	6,377,212	0	29,530,030	24,847,704		
1915	13,623,277	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	737,556	28,405,751	0	0	28,405,751	23,901,692		
1916	20,142,892	28,405,751	23,901,692	8,250,000	82,500,000	5,760,000	737,556	33,801,087	4,271,057	0	29,530,030	24,847,704	Results	
1917	22,942,804	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	37,713,544	8,183,514	0	29,530,030	24,847,704	Average CRSP Evap	505,440 af/yr
1918	15,865,939	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	30,636,679	1,106,649	0	29,530,030	24,847,704	Total Yield w/ CRSP evap	6,265,440 af/yr
1919	12,651,369	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	727,517	27,443,882	0	0	27,443,882	23,092,339	Shortage Years	Shortage
1920	22,287,632	27,443,882	23,092,339	8,250,000	82,500,000	5,760,000	727,517	34,993,998	5,463,967	0	29,530,030	24,847,704		
1921	22,526,781	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	37,297,521	7,767,491	0	29,530,030	24,847,704	1963	0 af
1922	18,447,198	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	33,217,938	3,687,908	0	29,530,030	24,847,704	1984	2,578,437 af
1923	19,024,046	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	33,794,786	4,264,756	0	29,530,030	24,847,704	1967	365,775 af
1924	13,877,798	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	740,185	28,657,643	0	0	28,657,643	24,113,644	1968	402,944 af
1925	14,430,701	28,657,643	24,113,644	8,250,000	82,500,000	5,760,000	727,874	28,350,470	0	0	28,350,470	23,855,177	1977	189,064 af
1926	15,213,731	28,350,470	23,855,177	8,250,000	82,500,000	5,760,000	729,616	28,824,585	0	0	28,824,585	24,254,115		
1927	19,539,212	28,824,585	24,254,115	8,250,000	82,500,000	5,760,000	741,927	33,611,870	4,081,839	0	29,530,030	24,847,704	NM allocation(w/o evap)	642,375 af/yr
1928	18,954,334	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	31,725,074	2,195,044	0	29,530,030	24,847,704		
1929	21,829,585	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	749,290	36,600,325	7,702,295	0	29,530,030	24,847,704	Note: NM allocation is exclusive of its portion of CRSP evaporation. Navajo evaporation would be primarily charged against NM's allocation. Shared CRSP evaporation is already removed from UC demands.	
1930	14,621,041	29,530,030	24,847,704	8,250,000	82,500,000	5,760,000	747,862	29,393,209	0	0	29,393,209	24,732,577		
1931	8,474,134	29,393,209	24,732,577	8,250,000	82,500,000	5,760,000	681,543	23,175,801	0	0	23,175,801	19,501,011		
1932	17,422,187	23,175,801	19,501,011	8,250,000	82,500,000	5,760,000	645,527	25,942,461	0	0	25,942,461	21,828,985		
1933	12,183,500	25,942,461	21,828,985	8,250,000	82,500,000	5,760,000	648,570	23,467,390	0	0	23,467,390	19,746,365		
1934	6,178,192	23,467,390	19,746,365	6,178,192	80,428,192	5,760,000	556,809	17,150,582	0	0	17,150,582	14,431,159	Total Upper Basin depletion, inc. CRSP evap:	
1935	12,630,349	17,150,582	14,431,159	8,250,000	80,428,192	5,760,000	471,559	15,299,372	0	0	15,299,372	12,873,480	1953-1977	6,027,216 af/yr
1936	14,648,873	15,299,372	12,873,480	8,250,000	80,428,192	5,760,000	454,165	15,484,080	0	0	15,484,080	13,028,901	1931-1977	6,146,719 af/yr
1937	14,306,056	15,484,080	13,028,901	8,250,000	80,428,192	5,760,000	454,440	15,325,696	0	0	15,325,696	12,895,630	1906-2000	6,265,440 af/yr
1938	18,148,319	15,325,696	12,895,630	8,250,000	80,428,192	5,760,000	490,856	18,973,159	0	0	18,973,159	15,964,746		
1939	11,164,059	18,973,159	15,964,746	8,250,000	80,428,192	5,760,000	494,065	15,633,154	0	0	15,633,154	13,154,337		
1940	9,931,657	15,633,154	13,154,337	8,250,000	80,428,192	5,760,000	412,335	11,142,476	0	0	11,142,476	9,375,708	Flow Adjustments:	
1941	20,116,678	11,142,476	9,375,708	8,250,000	80,428,192	5,760,000	424,768	16,824,385	0	0	16,824,385	14,156,685		
1942	17,225,136	16,824,385	14,156,685	8,250,000	80,428,192	5,760,000	512,281	19,527,241	0	0	19,527,241	16,430,972	1971	203,226 af
1943	13,731,401	19,527,241	16,430,972	8,250,000	80,428,192	5,760,000	532,030	18,716,612	0	0	18,716,612	15,748,878	1972	252,985 af
1944	15,369,422	18,716,612	15,748,878	8,250,000	82,500,000	5,760,000	532,203	19,543,831	0	0	19,543,831	16,444,931	1973	226,377 af
1945	14,140,528	19,543,831	16,444,931	8,250,000	82,500,000	5,760,000	536,599	19,137,760	0	0	19,137,760	16,103,248	1974	196,384 af
1946	11,095,453	19,137,760	16,103,248	8,250,000	82,500,000	5,760,000	496,756	15,726,457	0	0	15,726,457	13,232,846	1975	246,665 af
1947	16,439,486	15,726,457	13,232,846	8,250,000	82,500,000	5,760,000	481,484	17,674,459	0	0	17,674,459	14,871,970	1976	173,250 af
1948	15,139,294	17,674,459	14,871,970	8,250,000	82,500,000	5,760,000	508,287	18,295,456	0	0	18,295,456	15,394,501	1977	112,291 af
1949	16,933,584	18,295,456	15,394,501	8,250,000	82,500,000	5,760,000	539,659	20,679,381	0	0	20,679,381	17,400,427	1978	152,187 af
1950	13,140,416	20,679,381	17,400,427	8,250,000	82,500,000	5,760,000	549,727	19,260,070	0	0	19,260,070	16,206,164	1979	153,559 af
1951	12,505,894	19,260,070	16,206,164	8,250,000	82,500,000	5,760,000	513,852	17,242,112	0	0	17,242,112	14,508,177	1980	161,893 af
1952	20,805,422	17,242,112	14,508,177	8,250,000	82,500,000	5,760,000	557,892	23,479,642	0	0	23,479,642	19,756,675		
1953	11,165,419	23,479,642	19,756,675	8,250,000	82,500,000	5,760,000	587,176	20,047,885	0	0	20,047,885	16,869,062		
1954	8,496,102	20,047,885	16,869,062	8,250,000	82,500,000	5,760,000	488,709	14,045,278	0	0	14,045,278	11,818,238		
1955	9,413,908	14,045,278	11,818,238	8,250,000	82,500,000	5,760,000	374,184	9,075,002	0	0	9,075,002	7,636,056		
1956	11,426,874	9,075,002	7,636,056	8,250,000	82,500,000	5,760,000	292,298	6,199,578	0	0	6,199,578	5,216,564		
1957	21,500,963	6,199,578	5,216,564	8,250,000	82,500,000	5,760,000	336,954	13,353,588	0	0	13,353,588	11,236,222		
1958	15,862,511	13,353,588	11,236,222	8,250,000	82,500,000	5,760,000	426,504	14,779,594	0	0	14,779,594	12,436,120		
1959	9,598,169	14,779,594	12,436,120	8,250,000	82,500,000	5,760,000	391,257	9,976,506	0	0	9,976,506	8,394,616		
1960	11,524,160	9,976,506	8,394,616	8,250,000	82,500,000	5,760,000	311,927	7,178,740	0	0	7,178,740	6,040,466		
1961	10,010,259	7,178,740	6,040,466	8,250,000	82,500,000	5,760,000	238,491	2,940,507	0	0	2,940,507	2,474,258		
1962	17,377,609	2,940,507	2,474,258	8,250,000	82,500,000	5,760,000	227,035	6,081,081	0	0	6,081,081	5,116,856		
1963	8,840,900	6,081,081	5,116,856	8,250,000	82,500,000	5,760,000	203,737	708,245	0	0	708,245	595,944		
1964	10,863,586	708,245	595,944	8,250,000	82,500,000	5,760,000	140,268	-2,578,437	0	2,578,437	0	0		
1965	19,875,027	0	0	8,250,000	82,500,000	5,760,000	192,085	5,672,942	0	0	5,672,942	4,773,432		
1966	10,679,844	5,672,942	4,773,432	8,250,000	82,500,000	5,760,000	214,300	2,128,486	0	0	2,128,486	1,790,990		
1967	11,670,830	2,128,486	1,790,990	8,250,000	82,500,000	5,760,000	155,091	-365,775	0	365,775	0	0		
1968	13,739,932	0	0	8,250,000	82,500,000	5,760,000	132,876	-402,944	0	402,944	0	0		
1969	15,272,159	0	0	8,250,000	82,500,000	5,760,000	144,541	1,117,618	0	0	1,117,618	940,407		
1970	15,344,136	1,117,618	940,407	8,250,000	82,500,000	5,760,000	168,372	2,283,382	0	0	2,283,382	1,921,325		
1971	15,493,659	2,283,382	1,921,325	8,250,000										

Upper Basin Yield Study - May 2, 2006, Draft  
Summary of Results

Study	Natural Flow Data	Upper Basin Use	Storage Capacity	Lower Basin Delivery (maf)	Period	Average Annual Upper Basin Use (maf)		Average Annual Shared CRSP (maf)		Total Annual Upper Basin Depletion, Inc. CRSP (maf)	Computed Annual Amounts of Shortage (maf)				Total Computed Shortage Amount (maf)	Percent Shortage over Period
						Use (maf)	Evap (maf)	Evap (maf)	1963		1964	1967	1968	1977		
1	CRSS	Constant Average	CRSP Active	8.25	1953-1977 1931-1977 1906-2000	5.66 5.65 5.65	0.26 0.37 0.49	5.91 6.02 6.14	0.00	1.17	3.17	0.07	0.29	3.43	8.13	5.8 3.1 1.5
2	CRSS	Constant Average	CRSP Active + Other UB	8.25	1953-1977 1931-1977 1906-2000	5.75 5.75 5.75	0.26 0.37 0.49	6.01 6.12 6.24	0.00	3.16	0.37	0.39	0.39	4.33	8.25	5.7 3.1 1.5
3	CRSS	Constant Average	CRSP Active + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.75 5.75 5.75	0.25 0.37 0.50	6.00 6.12 6.25	0.17	3.27	0.34	0.39	0.39	4.12	8.29	5.8 3.1 1.5
4	Adjusted CRSS	Constant Average	CRSP Active + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.55 5.55 5.55	0.32 0.42 0.53	5.87 5.97 6.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 0.0 0.0
5	Adjusted CRSS	Constant Average	CRSP Active + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.79 5.79 5.79	0.25 0.36 0.49	6.04 6.15 6.28	1.15	3.31	0.45	0.43	0.43	3.14	8.48	5.9 3.1 1.5
6	Adjusted CRSS	Variable	CRSP Active + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.37 5.47 5.79	0.35 0.45 0.54	5.72 5.92 6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 0.0 0.0
7	Adjusted CRSS	Shorted Supply (5.79 maf demand)	CRSP Active + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.57 5.60 5.66	0.29 0.40 0.52	5.86 6.00 6.18	0.00	0.00	0.00	0.00	0.00	1.36	1.36	1.0 0.5 0.3
8	Adjusted CRSS	Constant Average	CRSP Active + Other UB (same % full)	8.00	1953-1977 1931-1977 1906-2000	5.80 5.80 5.80	0.32 0.42 0.53	6.12 6.22 6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 0.0 0.0
9	Adjusted CRSS	Constant Average	CRSP Active + Other UB (same % full)	8.00	1953-1977 1931-1977 1906-2000	6.05 6.05 6.05	0.25 0.36 0.49	6.30 6.41 6.54	1.40	3.32	0.48	0.44	0.44	3.22	8.86	5.9 3.1 1.5
10	Adjusted CRSS	Constant Average	CRSP Live + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.72 5.72 5.72	0.21 0.34 0.46	5.93 6.06 6.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 0.0 0.0
11	Adjusted CRSS	Constant Average	CRSP Live + Other UB (same % full)	8.25	1953-1977 1931-1977 1906-2000	5.98 5.98 5.98	0.13 0.27 0.42	6.11 6.25 6.40	0.70	3.37	0.64	0.50	0.50	3.67	8.88	5.9 3.2 1.6
12	Adjusted CRSS	Constant Average	CRSP Live + Other UB (same % full)	8.00	1953-1977 1931-1977 1906-2000	5.97 5.97 5.97	0.21 0.34 0.46	6.18 6.31 6.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 0.0 0.0
13	Adjusted CRSS	Constant Average	CRSP Live + Other UB (same % full)	8.00	1953-1977 1931-1977 1906-2000	6.24 6.24 6.24	0.13 0.26 0.42	6.37 6.50 6.66	0.95	3.38	0.67	0.51	0.51	3.75	9.26	5.9 3.2 1.6

14	Adjusted CRSS Average	Constant CRSP Active + Other UB (same % full)	8.25	1953-1977	5.72	0.26	5.98	0.00	2.68	0.25	0.36	2.56	5.85	4.1
				1931-1977	5.72	0.38	6.10							2.2
				1906-2000	5.72	0.50	6.22							1.1
15	Adjusted CRSS Average	Constant CRSP Active + Other UB (same % full)	8.25	1953-1977	5.76	0.26	6.02	0.42	3.28	0.37	0.40	2.89	7.36	5.1
				1931-1977	5.76	0.37	6.13							2.7
				1906-2000	5.76	0.50	6.26							1.3
16	Adjusted CRSS Supply (5.76 maf demand)	Shorted CRSP Active + Other UB (same % full)	8.25	1953-1977	5.54	0.30	5.84	0.00	0.00	0.00	0.00	0.44	0.44	0.3
				1931-1977	5.57	0.41	5.98							0.2
				1906-2000	5.63	0.52	6.15							0.1
17	Adjusted CRSS Average	Constant CRSP Live + Other UB (same % full)	8.25	1953-1977	5.76	0.19	5.95	0.00	0.00	0.00	0.00	0.98	0.98	0.7
				1931-1977	5.76	0.32	6.08							0.4
				1906-2000	5.76	0.45	6.21							0.2
18	Adjusted CRSS Average	Constant CRSP Active + Other UB (same % full)	8.20	1953-1977	5.76	0.27	6.03	0.00	2.58	0.37	0.40	0.19	3.54	2.5
				1931-1977	5.76	0.39	6.15							1.3
				1906-2000	5.76	0.51	6.27							0.6

Notes:

- (1) The New Mexico Interstate Stream Commission staff prepared this table using the annual water balance spreadsheet and CRSP evaporation equations developed for the current yield study. The ISC and USBR jointly developed the spreadsheet and evaporation equations. The spreadsheets for each study and the CRSP evaporation correlations are attached.
- (2) The Upper Basin yields shown in Studies 1-7 and 10-11 assume a delivery of 8.25 maf per year to the Lower Basin at Lee Ferry. The yields can be increased by 0.1 maf for each 0.1 maf of decrease in the delivery at Lee Ferry as shown by Studies 8-9 and 12-13.
- (3) If CRSP live storage is used instead of CRSP active storage, either the Upper Basin demands can be increased or computed shortages can be reduced. Using CRSP live storage plus all other Upper Basin live storage, and also adjusting CRSS natural flows for 1971-1980 to natural flows that would have been computed if the historic irrigation depletions had been calculated using the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures for all crops consistent with 1981-2000 natural flows, a constant Upper Basin use of 5.72 maf/yr can be met without shortage (see Study 7). The evaporation amounts using CRSP live storage are less than the evaporation amounts using CRSP active storage due to storage draw downs below minimum power pools.
- (4) The 1988 Hydrologic Determination concluded that the yield to the Upper Basin with tolerable shortages is at least 6.0 maf per year over a 25-year, 7-month critical period, including CRSP evaporation. In the current Upper Basin yield study, the draw down in reservoir storage from full storage conditions begins at the end of 1930, and full storage conditions are kept at very low levels from about 1956-1981, and then recover by 1984. Increasing the average annual Upper Basin demand above the firm yield demand first results in the occurrence of computed shortage in 1977, and further increases in demand cause shortages to also be computed in the 1960s. Although the critical period may differ from the 1988 Hydrologic Determination, the most significant difference between the current and 1988 studies is that the current studies recognize that CRSP reservoir evaporation changes with reservoir storage. CRSP reservoir storage is maintained at significantly lower levels, on average, during the 1953-1977 period as compared to the 1931-1964 period, primarily because CRSP active storage is maintained at under 10 maf for most of twenty years beginning the early 1960s. CRSP active storage rarely dips below 10 maf for the remainder of the period of record. The average annual evaporation amounts shown in this table for different periods illustrate the effects of storage on evaporation. To account for this, the current yield study segregates CRSP reservoir evaporation from the Upper Basin demand.
- (5) Evaporation amounts include shared CRSP evaporation only. For the CRSP plus all other Upper Basin storage condition, inclusion of the existing Upper Basin storage capacity in the yield studies generally increases the yield by 0.1 maf. Thus, the evaporation amounts for the later storage condition in Study 2 were assumed to be the same as the evaporation amounts for the CRSP only storage condition in Study 1. Study 3 assumes that CRSP unit and other reservoirs are the same percent full, and the CRSP reservoir evaporation is computed accordingly. The results essentially are the same, and the latter assumption is used for the remaining studies. The CRSP reservoirs generally will operate in about the same manner as they have historically, although other Upper Basin reservoirs are generally upstream from CRSP reservoirs and therefore may fill first. This upstream storage effect may cause the CRSP evaporation amounts to be slightly overstated for the CRSP plus all other Upper Basin storage condition.
- (6) The 1988 Hydrologic Determination assumed that a total shortage of 6 percent overall for a 25-year, 7-month critical period was tolerable (with the shortage measured against the total Upper Basin depletion including shared CRSP reservoir evaporation). In this yield study, a 6 percent overall shortage limitation is applied for the worst 25-year period of reservoir draw down (with the shortage measured against the Upper Basin use exclusive of shared CRSP reservoir evaporation). CRSS natural flows for 1971-1980 are adjusted to reflect historic irrigation depletions recalculated using the modified Blaney-Criddle method with SCS effective precipitation and SCS recommended growth season start temperatures (consistent with 1981-2000 natural flows). Use of the water stored in CRSP minimum power pools to meet demands is not considered except in study 7. In 1977, the computed shortage of as much as about 3 maf under some scenarios would not actually materialize because Upper Basin uses in that year would be substantially lower than the average Upper Basin use demand as illustrated in studies 5 and 6. In below-average periods of runoff during which reservoir storage will be substantially drawn down, physical water supply shortages will cause Upper Basin uses to be less, on average, than the long-term average consumptive use by the Upper Basin states. Use of a constant Upper Basin consumptive use does not reflect, however, annual variations in consumptive uses caused by annual variations in water supply availability and physical water shortages in the Upper Basin. To this extent, the computed shortages are overstated as illustrated by studies 5 and 6. Also, if the yield studies were to include Upper Basin storage in excess of existing capacity as will be needed to fully develop the Upper Basin yield available for use by the states, either the computed yields could be increased or the computed shortages could be reduced (loss of existing storage capacity to sedimentation may be replaced).
- (7) Study 5 incorporates annual variations in Upper Basin consumptive uses about the long-term average consumptive use that result from annual variations in water supply and

physical shortages. The following is an excerpt from "Water Supplies of the Colorado River Available for Use by the States of the Upper Division and for Use from the Main Stem by the States of Arizona, California and Nevada in the Lower Basin," Part I - Text, Tiplon and Kaimbach, Inc., July 1965, page 15: "A depletion factor was used to modify the assumed basic depletions by the States of the upper division of the Colorado River Basin. The philosophy of the depletion factor is based on the fact that during periods of low water supply in the Upper Basin all projects in operation will not receive a full water supply. Most of them will not have reservoirs, and some that have reservoirs will not have water in some years to fill those reservoirs. No rational means have been derived for varying the estimated uses by the States of the upper division because of varying water supply. The means used by the U.S. Bureau of Reclamation in its past studies, which it is assumed it is still using, are based on the assumption that the uses would vary from the normal use in a particular year by one-half of the percent that the virgin flow at Lee Ferry in that particular year varies from a long-time average of virgin flow." Using this assumption, the sensitivity of the amount of computed shortages to possible annual variations in physical water supplies and actual uses in the Upper Basin is illustrated. Under this scenario, actual Upper Basin uses by the states exclusive of shared CRSP evaporation would average about 5.37 maf during 1953-1977, and 5.79 maf for the period of record, and except for physical water supply shortages in the Upper Basin, no other shortages are computed. Study 6 incorporates physical water supply shortages in the Upper Basin computed by the USBRC's CRSS model under development of up to 5.48 maf in the Upper Basin, exclusive of shared CRSP evaporation. Under this assumption, no use in excess of an average long-term demand of 5.79 maf/y is assumed, and the computed shortage in 1977 of about 1.5 maf is in addition to the CRSS physical shortages. The CRSS model understates actual use in above-average runoff years because it does not model variations in use above the average, and it also overstates actual use in below-average runoff years because it understates physical water supply shortages on tributaries to the mainstream rivers. Overall, the long-term average use under Studies 7 and 16 is understated.

(9) The following is a general summary of the results of this yield study:

	Minimum LB Delivery	Yield without Shortages (maf)	Yield with Shortages (maf)	
Maintain minimum power pools	8.25	5.55	5.79	Note: Yield defined as the amount of water available at Lee Ferry for use, on average, by the Upper Basin, exclusive of shared CRSP reservoir evaporation.
Use minimum power pools	8.25	5.72	5.98	Shortages defined as 6 percent or less overall shortage for any period of 25 consecutive years consistent with 1958 Hydrologic Determination.
	8.00	5.80	6.05	
	8.00	5.97	6.24	

(9) Assuming use of the minimum power pools and a minimum Lower Basin delivery of 8.25 maf, the firm annual yield is 5.72 maf. Study 14 indicates that if the minimum power pools are maintained and the Upper Basin use is 5.72 maf/y, there would be an overall shortage of about 4 percent for the period 1953-1977 (with annual shortages of about 2.6 maf in 1964 and 1977). Thus, about 70 percent of the overall shortage amount, and about 80 percent of the annual shortage amounts for 1964 and 1977, at Lee Ferry computed under Study 5 (maintain power pools, Upper Basin use of 5.79 maf, and 6 percent overall shortage) are caused by reduction of the power pools. An Upper Basin use of 5.76 maf/y would result in a 5 percent overall shortage for 1953-1977 assuming maintenance of the power pools (Study 15), and would result in a shortage in 1977 only of about 10 percent of the use that year after CRSS-modeled physical water supply shortages are considered (Study 16). Using the power pools, an Upper Basin use of 5.76 maf/y would result in a shortage in 1977 of about 1 maf (Study 17), which is less than the CRSS-modeled physical water supply shortage that year. The risk of shortages at Lee Ferry actually is less than computed in these studies because during years of below-average supply as occur during the critical period, the actual Upper Basin use will be less than the average.

(10) The Upper Colorado River Commission last approved depletion schedules for the Upper Division States for planning purposes in December 1999. The depletion schedules, dated January 2000, project that the total Upper Basin use exclusive of shared CRSP reservoir evaporation will average about 3,365 maf under 2060 development conditions. The January 2000 depletion schedule for New Mexico assumed its use would average about 619,000 af by 2060. New Mexico's current revisions to its depletion schedule indicate that its use would average about 642,000 af under full development, which compares to a New Mexico allocation of 642,400 af that is derived from an Upper Basin yield of 5.76 maf exclusive of shared CRSP reservoir evaporation. The increase in New Mexico's projected depletions is due to recalculation of irrigation depletions using the modified Blaney-Criddle method and minor adjustments for the Millip, the Navajo-Gallup Project and other uses. Adjusting the total Upper Basin depletion for the revised New Mexico depletions indicates that the total Upper Basin use will develop to about 5,388 maf, exclusive of CRSP reservoir evaporation, unless the other Upper Division States schedule increased development by 2060. Thus, total Upper Basin use through much, if not all, the next 54 years extending to 2060 may be anticipated to be below the firm yield of 5.55 maf computed assuming a minimum Lower Basin delivery of 8.25 maf and maintenance of the minimum power pools. The time required to develop the Upper Basin allocation reduces risk of shortage within the planning horizon. Study 18 assumes that the minimum Lower Basin delivery is 8.25 maf if the natural flow at Lee Ferry exceeds this amount, or is equal to the natural flow at Lee Ferry if it does not exceed 8.25 maf (which situation occurs in 1934 and 1977). The Lower Basin delivery under this assumption averages 8.20 maf, excluding spills, over the period 1906-2000 and 8.15 maf for the critical period. The cumulative shortage amount computed in Study 18 of 3.54 maf is less than the amount of CRSP minimum power pool contents.



Attachments can contain viruses that may harm your computer. Attachments may not display correctly.

**Whipple, John J., OSE**

**From:** Whipple, John J., OSE  
**To:** scott@balcombgreen.com; rod.kuharich@state.co.us; harold.simpson@dwr.state.co.us; randy.seaholm@state.co.us  
**Cc:** dostler@uc.usbr.gov; dennisstrong@utah.gov; robertking@utah.gov; ptyrre@seo.wyo.gov; jshiel@seo.wyo.gov; Lopez, Estevan, O  
**Subject:** FW: hydro determination  
**Attachments:** [Navset.COresponse3.doc\(36KB\)](#)

**Sent:** Fri 4/21/2006 2:09 PM

Gentlemen:

John D'Antonio requested me to email to you for your consideration the attached document that provides New Mexico's response to Randy Seaholm's 17 email (below).

John Whipple

---

**From:** Seaholm, Randy [mailto:Randy.Seaholm@state.co.us]  
**Sent:** Mon 4/17/2006 9:22 AM  
**To:** Dave Trueman; Whipple, John J., OSE  
**Cc:** jshiel@seo.wyo.gov; Seaholm, Randy; Lopez, Estevan, OSE; Don Ostler; robertking@utah.gov; Balcomb, Scott (Balcomb, Scott); dmerritt@crwcd.gov; Kuhn, Eric (kuhn,eric); bspear@mbssl.com; Steve Harris (Steve Harris); Kuharich, Rod; Brown, R  
**Subject:** RE: hydro determination

D and John

Based on discussions that I have recently had with several representatives of Colorado's water users concerning the proposed hydrologic determination, I offer the following comments, which comments also include several requests for additional information. I want to be very clear that these are my thoughts at this point and are advanced for further discussion so that I can present them along with the proposed determination and any additional comments from others to my Board in May with the goal of having Colorado's Commissioner prepared to address the determination at the Upper Colorado River Commission in June.

1. It is our understanding that Jim Prairie's updated natural flows were used for the determination and we would like to verify that all his work was incorporated.
2. While we understand that the "shortages" shown are to represent a "tolerable shortage" of 6% over the 25-year period, we are concerned that the spreadsheet portrayal of "tolerable shortage" implies that it may be necessary for the Upper Basin to curtail uses in the four years identified. We believe this would not be the case and are of the opinion that the more appropriate way to portray the situation would be to reduce the releases to the lower basin. Towards this end we ask the following:
  - a) That the determination shows no upper basin shortages.
  - b) That during those years when the available water supply is not able to meet all the demands identified, releases to the lower basin are produced rather than showing a shortage to the upper basin. (We would like to see that during drought conditions the upper basin is already experiencing shortages naturally and therefore it is not necessary to show any additional shortages in the determination process. We also note that through water right administration some shortage likely occurs every year, but for purposes of the determination it is not necessary to identify such.)

http://...



c) When releases to the lower basin are reduced, it will become necessary to add a column showing the 10-year running average of deliveries to the lower basin.

d) We believe it would be helpful to also add a column showing when carryover storage plus inflow to Powell is less than 8.23 maf and thus make it easier to identify when Powell could not actually make releases of 8.23 maf to the lower basin. This would also help identify when Powell would drop below minimum power pool.

e) We would request that appropriate data (mainly evaporation) be incorporated in to the 602(a) storage computation to show how the 602(a) storage requirements would be impacted.

f) We are generally supportive of the following assumptions, but would reserve final judgment until after reviewing the results of the above.

\* Attempting to protect minimum power pool at Powell, FG, and Aspinall is acceptable while using live storage at other reservoirs.

\* It appears that by reducing reservoir evaporation to be more reflective of what may actually be experienced during the 25-year drought used in the determination is an adequate reduction to produce the increase in yield to meet New Mexico's desire of fitting the Gallup-Navajo project within their compact apportionment.

\* The use of net reservoir evaporation is appropriate.

The increase in hydrologic determination will have some minor impacts on Colorado's water users in the San Juan Basin (Most of the water in the San Juan originates in Colorado, therefore, New Mexico's gains in the San Juan come at the expense of Colorado's water users in the San Juan.). Therefore, we believe that water use accounting, at least among water users in the San Juan, be done on a uniform basis. Such accounting should include: 1) use of the modified Blaney-Criddle method, utilizing SCS effective precipitation, for determining crop consumptive uses, 2) no salvage by use determinations, 3) the proposed accounting of tributary groundwater and ephemeral streams is inconsistent with current consumptive use accounting practices and with water right administration in Colorado, therefore we believe such should be excluded from the proposal.

Again, I would note that these are my thoughts at present. I would appreciate further thoughts from others. I intend to present the proposal, the additional information, and comments from others to my Board for further consideration in May.

Randy Seaholm  
Chief, Water Supply Protection  
Colorado Water Conservation Board  
1313 Sherman Street, Suite 721  
Denver, Colorado 80203  
303-866-3441  
303-866-4474 FAX  
randy.seaholm@state.co.us

-----Original Message-----

From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]

Sent: Wednesday, February 15, 2006 11:42 AM

To: john.whipple@state.nm.us

Cc: jshiel@seo.wyo.gov; Seaholm, Randy; estevan.lopez@state.nm.us; Don

Ostler; robertking@utah.gov

Subject: Re: hydro determination

OSE-1377





MEMORANDUM  
April 21, 2006

To: Scott Balcomb  
Rod Kuharich  
Hal Simpson  
Randy Seaholm

From: John D'Antonio

Copy: Don Ostler  
Dennis Strong  
Robert King  
Patrick Tyrrell  
John Shields  
Estevan Lopez  
John Whipple

Subject: Response to Randy Seaholm's April 17, 2006, Email regarding the Update to the 1988 Hydrologic Determination

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1. The draft 2006 Hydrologic Determination uses the same CRSS natural flows at Lee Ferry as Reclamation uses in the Colorado River system flow and salt modeling for Colorado River operations and salinity analyses; except, that the natural flows for 1971-1980 will be revised to reflect recalculation of Upper Basin irrigation depletions using the modified Blaney-Criddle method with SCS effective precipitation.<sup>1</sup> The flow revisions are needed to: (1) reflect application of a standard methodology for computing natural flows so that the 1971-1980 natural flows are generally consistent with those for the rest of the period of record; and (2) evaluate water supply using the same method as proposed to evaluate future water demands. It is our understanding that Reclamation in the near future also will incorporate the revised Upper Basin irrigation depletions and natural flows for 1971-1980 into the flow and salt modeling for Colorado River operations and salinity analyses.

2. The 1988 Hydrologic Determination assumed the minimum objective release of 8.23 maf annually from Lake Powell, and used an assumption that a 6 percent overall shortage to the Upper Basin yield during a 25-year critical period is tolerable. The Upper Colorado River Commission via resolutions dated June 2, 1987, and October 22, 1987, supported the conclusion that the Upper Basin yield is at least 6.0 maf annually while also stating that: (1) the Commission does not endorse the projected Upper Basin depletions, study assumptions, or analytical methodologies set forth in the draft 1987 Hydrologic Determination; and (2) the Commission specifically disagrees with the

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<sup>1</sup> As of the date of this response, revisions to the natural flows at Lee Ferry for 1971-1980 are pending review by Reclamation.

assumption of a minimum Upper Basin delivery of 8.23 maf annually from Lake Powell. The draft 2006 Hydrologic Determination, consistent with the 1988 Hydrologic Determination, assumes the minimum objective release of 8.23 maf annually from Lake Powell, and uses a 6 percent tolerable basin-wide shortage over any period of 25 years computed as a percentage of the Upper Basin use excluding shared CRSP reservoir evaporation. New Mexico's draft Resolution regarding the availability of water for a Navajo Reservoir supply contract for Navajo Nation uses in New Mexico that was transmitted via email dated April 6, 2006, from Estevan Lopez to the Commission contains similar language that the Commission supports a determination that at least \_\_\_\_ maf annually is available for use by the Upper Basin states, excluding shared CRSP reservoir evaporation, while also stating that: (1) the Commission does not endorse the study assumptions used by Reclamation in the draft 2006 Hydrologic Determination; and (2) the Commission specifically disagrees with the assumption of a minimum Upper Basin delivery of 8.25 maf annually at Lee Ferry.<sup>2</sup>

The draft 2006 Hydrologic Determination explains that actual shortages measured at Lee Ferry will be less than the computed shortages because Upper Basin uses through a period of critical hydrology would be below average due to physical water supply shortages in the Upper Basin. However, the draft 2006 Hydrologic Determination will not include a determination or statement by the Department of the Interior as to how an actual shortage will be handled. If the Upper Basin challenges the 8.23 maf minimum objective release in the draft 2006 Hydrologic Determination, it is likely to upset the Seven Basin States agreement now under consideration. Further, an assumed reduction in the release from Lake Powell below the minimum objective release could result in a reduction in 602(a) storage. If the Secretary were to approve a deviation from the minimum objective release, it would be done through development of the annual operating plan with consultation with affected interests, and/or through adoption of coordinated reservoir operating criteria such as those proposed by the Seven Basin States via letter to the Secretary dated March 3, 2006. The outcomes of such annual operating plan consultations are unknown as there is no operational experience under such conditions, and the Seven Basin States proposal includes an agreement that adoption of the interim coordinated reservoir operating criteria proposed would not affect the determination of the amount of water available for development in the Upper Basin.

The States of Colorado, Utah and Wyoming previously indicated that the 2006 Hydrologic Determination should not show use of the minimum power pools of CRSP reservoirs to make deliveries to the Lower Basin or to prevent possible calls against Upper Basin uses under Article IV of the Upper Colorado River Basin Compact. The Commission will address how an actual shortage should be handled at the appropriate time.

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<sup>2</sup> New Mexico's draft Resolution leaves blank the amount of water available for use by the Upper Basin, pending final review by Reclamation of the natural flows at Lee Ferry for 1971-1980. New Mexico anticipates that the draft 2006 Hydrologic Determination will conclude that at least 5.77 maf/yr, on average, is available for use by the Upper Basin, excluding shared CRSP reservoir evaporation.

3. Engineering staff of the Upper Division States as early as October 2005 agreed with the segregation of shared CRSP reservoir evaporation from Upper Basin use and the representation of shared CRSP reservoir evaporation fluctuating with CRSP reservoir storage levels in the current update of the 1988 Hydrologic Determination. The draft yield study spreadsheets since then have shown the annual variability in shared CRSP reservoir evaporation while maintaining constant Upper Basin uses and the minimum objective releases from Lake Powell.

The determination of 602(a) storage in Lake Powell is independent of the 1988 Hydrologic Determination and the 2006 Hydrologic Determination. The reservoir evaporation used in the 602(a) storage algorithm should reflect the expected shared CRSP reservoir evaporation that would occur during the period used in the algorithm as CRSP reservoir storage is drawn down from the 602(a) storage level to the minimum active storage level. When CRSP reservoir storage is above or below average, reservoir evaporation will be above or below average, respectively. Thus, evaporation for the first part of the draw down period could be greater than average, while evaporation for the second part of the draw down period could be less than average. The average CRSP reservoir evaporation for the period of draw down used in the algorithm should be similar to the long-term average shared CRSP reservoir evaporation when development in the Upper Basin approaches the Upper Basin yield and the 602(a) storage needed to protect that development approaches CRSP reservoir capacity.

4. Article III(a) of the Upper Colorado River Basin Compact makes an apportionment of water to New Mexico from the Upper Basin, and Article XIV of the compact sets forth the allocation of the waters of the San Juan River and its tributaries as between Colorado and New Mexico. The extent to which water might be shared during future droughts pursuant to Article XIV of the compact is dependent upon unspecified future water development in the San Juan River Basin in Colorado and cannot be determined at this time. Nevertheless, New Mexico cannot obtain its Upper Basin water from any source other than the San Juan River Basin. The Upper Colorado River Commission by Resolution dated June 19, 2003, stated support for such Congressional action as may be necessary to authorize the Navajo-Gallup Water Supply Project. The San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement, dated April 19, 2005, provides the Navajo Nation with rights to receive, divert and use water from the San Juan River under the project for municipal, industrial and domestic uses. The Settlement Agreement also provides that project uses are subject to administration as necessary for New Mexico to meet its compact obligations.

The proposed agreement of the Seven Basin States transmitted to the Secretary via letter dated March 3, 2006, would provide that each of the Seven Basin States supports the other states' rights to develop their compact apportionments. Colorado via email dated January 17, 2006, from Hal Simpson, Colorado State Engineer, to me stated that if I sent a letter by February 1, 2006, supporting Long Hollow Reservoir in the La Plata River drainage of the San Juan River Basin in Colorado, Colorado will support the update to the 1988 Hydrologic Determination. The Long Hollow Reservoir project will physically use

Juan River stream flow gages. Also, the baseline depletions tables associated with the environmental compliance activities include scattered stockpond evaporation and livestock depletions in New Mexico that are reduced by 50 percent of the on-site uses to reflect their impact on San Juan River flows after salvage of losses on ephemeral tributaries. Further, the State of Colorado and the Bureau of Reclamation, in cooperation with the San Juan River Basin Recovery Implementation Program, currently are revising the models to use natural flows and irrigation depletions in New Mexico computed using crop consumptive uses calculated with the original Blaney-Criddle method. Reclamation's Colorado River System Consumptive Uses and Losses reports beginning 1981 also have included for irrigation uses in New Mexico other than NIIP crop consumptive uses calculated using the original Blaney-Criddle method with USBR effective precipitation. In addition, past Consumptive Uses and Losses reports did not include incidental depletions on certain return flows in the ephemeral tributaries in New Mexico. New Mexico has evaluated channel conveyance losses on Four Corners Power Plant discharges into the Chaco River, and has provided to Reclamation for use in the modeling revised historic depletions of San Juan River flows by the power plant that include the conveyance losses. If losses on return flows to ephemeral tributaries, such as from the NIIP and the Four Corners Power Plant, are to be accounted in the future as depletions incident to the uses, consistency demands that reductions in losses on the same ephemeral tributaries as a result of other uses should be considered in accounting depletions measured at Lee Ferry as required by Article VI of the compact.

New Mexico will use its best judgment to estimate its anticipated future depletions for inclusion in its depletions schedule, just as the other Upper Division States use their best judgment to estimate their future anticipated depletions for their depletions schedules. Each state will determine the amounts of depletion that are appropriate for particular uses within their state. Colorado, Utah and Wyoming are not agreeing to any particular depletion estimate in New Mexico's Upper Basin depletions schedule, nor will New Mexico be agreeing to any particular depletion estimate in the other states' depletions schedules. The Commission's Engineering Advisors in their March 30 conference call agreed that New Mexico in its Upper Basin depletions schedule will not explicitly note how the depletion amounts were derived or that some depletions may be estimates of depletions of San Juan River flows that differ from on-site consumptive uses due to salvage of losses on ephemeral tributaries, delayed impacts of ground water uses, or use of non-tributary ground water.

**Whipple, John J., OSE**

**From:** Seaholm, Randy [Randy.Seaholm@state.co.us]  
 - Dave Trueman; Whipple, John J., OSE  
**Sent:** Mon 4/17/2006 9:22 AM  
**Cc:** jshiel@seo.wyo.gov; Seaholm, Randy; Lopez, Estevan, OSE; Don Ostler; robertking@utah.gov; Balcomb, Scott (Balcomb, Scott); dmerritt@crwcd.gov; Kuhn, Eric (kuhn,eric); bspear@mbssl.com; Steve Harris (Steve Harris); Kuharich, Rod; Brown, Rick; George, Russell; McNulty, Frank; Kowalski, Ted; Shpall, Casey; Angel, Carol  
**Subject:** RE: hydro determination  
**Attachments:**

Dave and John

Based on discussions that I have recently had with several representatives of Colorado's water users concerning the proposed hydrologic determination, I offer the following comments, which comments also include several requests for additional information. I want to be very clear that these are my thoughts at this point and are advanced for further discussion so that I can present them along with the proposed determination and any additional comments from others to my Board in May with the goal of having Colorado's Commissioner prepared to address the determination at the Upper Colorado River Commission in June.

1. It is our understanding that Jim Prairie's updated natural flows were used for the determination and we would like to verify that all his work was incorporated.
2. While we understand that the "shortages" shown are to represent a "tolerable shortage" of 6% over the 25-year period, we are concerned that the spreadsheet portrayal of "tolerable shortage" implies that it may be necessary for the Upper Basin to curtail uses in the four years identified. We believe this would not be the case and are of the opinion that the more appropriate way to portray the situation would be to reduce the releases to the lower basin. Towards this end we ask the following:
  - a) That the determination shows no upper basin shortages.
  - b) That during those years when the available water supply is not able to meet all the demands identified, releases to the lower basin be reduced rather than showing a shortage to the upper basin. (We would observe that during drought conditions the upper basin is already experiencing shortages naturally and therefore it is not necessary to impose any additional shortages in the determination process. We also would note that through water right administration some shortage likely occurs every year, but for purposes of the determination it is not necessary to identify such.)
  - c) When releases to the lower basin are reduced, it will become necessary to add a column showing the 10-year running average of deliveries to the lower basin.
  - d) We believe it would be helpful to also add a column showing when carryover storage plus inflow to Powell is less than 8.23 maf and thus make it easier to identify when Powell could not actually make releases of 8.23 maf to the lower basin. This would also help identify when Powell would drop below minimum power pool.
  - e) We would request that appropriate data (mainly evaporation) be incorporated in to the 602(a) storage computation to show how the 602(a) storage requirements would be impacted.
  - f) We are generally supportive of the following assumptions, but we reserve final judgment until after reviewing the results of the above.

\* Attempting to protect minimum power pool at Powell, FG, and Aspinall is acceptable while using live storage at other reservoirs.

\* It appears that by reducing reservoir evaporation to

OSE-1384



be more reflective of what may actually be experienced during the 25-year drought used in the determination is an adequate reduction to provide the increase in yield to meet New Mexico's desire of fitting the Gallup-Navajo project within their compact apportionment.

\* The use of net reservoir evaporation is appropriate.

The increase in hydrologic determination will have some minor impacts on Colorado's water users in the San Juan Basin (Most of the water in the San Juan originates in Colorado, therefore, New Mexico's gains in the San Juan come at the expense of Colorado's water users in the San Juan.). Therefore, we believe that water use accounting, at least among water users in the San Juan, be done on a uniform basis. Such accounting should include: 1) use of the modified Blaney-Criddle method, utilizing SCS effective precipitation, for determining crop consumptive uses, 2) no salvage by use determinations, 3) the proposed accounting of tributary groundwater and ephemeral streams is inconsistent with current consumptive use accounting practices and with water right administration in Colorado, therefore we believe such should be excluded from the proposal.

Again, I would note that these are my thoughts at present. I would appreciate further thoughts from others. I intend to present the proposal, the additional information, and comments from others to my Board for further consideration in May.

Randy Seaholm  
Chief, Water Supply Protection  
Colorado Water Conservation Board  
1310 Sherman Street, Suite 721  
Denver, Colorado 80203  
303-866-3441  
303-866-4474 FAX  
randy.seaholm@state.co.us

-----Original Message-----

From: Dave Trueman [mailto:DTRUEMAN@uc.usbr.gov]  
Sent: Wednesday, February 15, 2006 11:42 AM  
To: john.whipple@state.nm.us  
Cc: jshiel@seo.wyo.gov; Seaholm, Randy; estevan.lopez@state.nm.us; Don Ostler; robertking@utah.gov  
Subject: Re: hydro determination

John, I've run a comparison of the HD model against CRSS and found it quite accurate. I'll share the results as soon as I can pull the info together later this week. - Dave

>>> "Whipple, John J., OSE" <john.whipple@state.nm.us> 2/14/2006 1:31:34 PM >>>

Dave:

Attached are two versions of HD\_v9. The summary in JW\_v2 looks at impacts of different storage and use assumptions with the HD\_v9 CRSP evaporation assumption (evap with CRSP+Other storage is the same as evap with CRSP storage only). The summary in JW\_v3 includes impacts for a range of storage, use and shortage combinations that might be considered sellable at this time considering Upper Basin and Lower Basin interests, and includes also a sensitivity analysis assuming CRSP and non-CRSP relative storage is the same in terms of percent of capacity. Based on JW\_v2 and JW\_v3, would the USBR determine that water is available for

OSE-1385

the Upper Basin states to use at least 5.75 maf, on average excluding CRSP shared reservoir evaporation, with the computed shortages indicated (less than 6 percent overall shortage for a critical period as per the 1966 HD), provided that the Upper Colorado River Commission would not object to the determination? The total Upper Basin depletion would be about 6.0 maf during the most critical period (similar to the critical-period yield of the 1988 HD). Do you need to refine the analysis by using CRSS with monthly time steps to check this determination or is the annual spreadsheet analysis sufficient? Your prompt response will be greatly appreciated.

John, Robert, Randy:

Can your states support a determination of at least 5.75 maf for use by the Upper Basin states with the shortages indicated?

All:

Can you support higher amounts of use with greater shortages that might be considered tolerable? You can experiment with the spreadsheets for various combinations of use and shortages.

New Mexico anticipates transmitting by the end of February for your consideration a package proposal for resolving hydrologic determination issues, including both supply and depletion schedule issues.

John

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OSE-1386



# INTERSTATE STREAM COMMISSION

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## facsimile transmittal

**To: Scott Balcom**

**Fax: (970) 945-8902**

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**From: John Whipple for John D'Antonio, Jr. P.E.**

**Date: March 24, 2006**

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**Re: Response to Colorado's Concerns regarding New Mexico's Draft Proposal to  
Update the 1988 Hydrologic Determination**

**Pages: 8**

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ف Urgent

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Memorandum  
March 24, 2006

To: Scott Balcomb  
From: John D'Antonio  
Subject: Response to Colorado's Concerns regarding New Mexico's Draft Proposal to Update the 1988 Hydrologic Determination

Your March 10, 2006, email message to Estevan Lopez and myself stated several concerns that Colorado has regarding the Proposed Hydrologic Determination that New Mexico transmitted to Colorado, Utah and Wyoming via my letter dated March 3, 2006. You subsequently requested that New Mexico provide a written response to Colorado's concerns. This memorandum constitutes New Mexico's response.

1. Where does Arizona "fit" in this? The project was originally intended to run to Window Rock in the lower basin. Are we therefore "forced" to determine how Arizona will provide a water supply as well as New Mexico?

The Navajo-Gallup Water Supply Project still is being planned to deliver 6,410 acre-feet of water for municipal and domestic uses in Arizona in and around Window Rock. The State of Arizona has not yet identified how it will supply the project uses in its state. Once Arizona identifies or proposes how it wishes to supply its project uses, the Upper Colorado River Commission can take a position on Arizona's proposal.

The draft legislation to authorize the San Juan River Basin in New Mexico Navajo Nation Water Rights Settlement Agreement (Settlement Agreement) provides that the project pipelines, storage tanks and treatment facilities be sized to accommodate the delivery of water by the project to the Window Rock, Arizona, area, but also provides several conditions precedent for the delivery and use of water from the project in Arizona. Section 104(g) of the draft Settlement Act (Appendix 3 to the Settlement Agreement) provides:

"(g) CONDITIONS PRECEDENT FOR USES IN ARIZONA. – Delivery of water by the Navajo-Gallup Water Supply Project to Navajo Nation communities within the State of Arizona authorized by subsection (b)(2) of this section shall not commence unless and until the following conditions are met:

- (1) an accounting of the use of the water within the apportionments of Colorado River System water made to the State of Arizona through compact, statute or court decree has been determined and resolved;
- (2) the Secretary has determined by hydrologic investigations that sufficient water is reasonably likely to be available under the apportionments of Colorado River System water made to the State of Arizona to fulfill a contract

for such delivery of water and has transmitted such determination to Congress; and

(3) Congress has approved a water delivery contract between the Navajo Nation and the United States to provide for such delivery of water via the Project.”

The Resolution of the Upper Colorado River Commission Regarding the Use and Accounting of Upper Basin Water Supplied to the Lower Basin in New Mexico by the Proposed Navajo-Gallup Water Supply Project, dated June 17, 2003, resolves New Mexico’s use of its Upper Basin apportionment in the Lower Basin in New Mexico for its project uses and an accounting of said uses under New Mexico’s Upper Basin apportionment. The State of Arizona could work with the Commission on a similar resolution to resolve and account project uses in Arizona. New Mexico’s settlement with the Navajo Nation is not contingent upon the implementation of the Arizona portion of the Navajo-Gallup Project.

2. We know and understand New Mexico’s urgency in promoting this project, but isn’t the timing less than ideal? Raising the hydrologic determination issue at this time would appear to give Arizona grounds to be hesitant to continue on the agreement we’ve all worked so hard to consummate. Colorado’s assessment of Arizona’s position is that they do not need much more to tip them away from the agreement. Is there any way we can delay this until the agreement is signed?

The Seven Basin States’ Preliminary Proposal Regarding Colorado River Interim Operations transmitted to the Secretary via letter dated February 3, 2006, provides that the coordinated operation of Lakes Powell and Mead as proposed in Section 2 therein is not to adversely affect the yield for development available in the Upper Basin. The transmittal letter states that the Seven Basin States’ recommendation is designed to provide input for the Department’s consideration as it develops additional operational and water accounting procedures to, among other things, allow the continued development and use of the Colorado River resource in both the Upper and Lower Basins. The Draft Agreement also transmitted by the letter, at Paragraph 15, further states: “The Parties hereby affirm the entitlement and right of each State under such existing law to use and develop the water of the Colorado River System.” These provisions are of utmost importance to New Mexico.

New Mexico believes that the timing for the update of the hydrologic determination is appropriate from the standpoints of: (1) confirming the Lower Basin’s support for the right of the Upper Basin to develop; (2) providing New Mexico’s Congressional delegation certainty of water supply in order to move forward with the settlement legislation; and (3) resolving long-standing water accounting and depletion schedule issues within the Upper Basin. As you are aware, the Upper Colorado River Commission has scheduled a meeting May 3, 2006, to consider action regarding an updated hydrologic determination. The Commission’s engineering advisors also are planning to discuss technical matters

related to New Mexico's March 3, 2006, Proposed Hydrologic Determination prior to the Commission meeting. Depending on the outcome of the technical discussions and Commission action, the Bureau of Reclamation could move forward with preparation of a draft hydrologic determination update beginning May 2006. New Mexico does not know when Reclamation might be ready to release a draft hydrologic determination update for review by the states.

3. Assuming the pipeline actually goes to Window Rock, and Arizona refuses to "allocate" some of its mainstem water to this project, are we then forced to deal with the tributary issue?

No. The Arizona Water Settlements Act of 2005 allocated 6,410 acre-feet of Colorado River mainstem water from the Central Arizona Project for use by the Navajo Nation. The Navajo Nation has discussed with New Mexico the possibility of using this allocation to source Navajo-Gallup Water Supply Project uses in Arizona. New Mexico has advised the Navajo Nation that diversion of Lower Basin mainstem water from an Upper Basin tributary is contrary to the model established by section 303(d) of the 1968 Colorado River Basin Project Act (Public Law 90-537) and the Resolution of the Upper Colorado River Commission Regarding the Use and Accounting of Upper Basin Water Supplied to the Lower Basin in New Mexico by the Proposed Navajo-Gallup Water Supply Project, dated June 17, 2003. The 1968 Act requires that if a diversion of water from the Colorado River System above Lee Ferry is made to supply a use at a thermal generating plant in Arizona within either the Upper Basin or the Lower Basin, such consumptive use of water shall be a part of the consumptive use apportioned to the State of Arizona by Article III(a) of the Upper Colorado River Basin Compact. The Resolution, consistent with the Act, provides that any water diverted from the San Juan River by the Navajo-Gallup Water Supply Project to supply uses in the Lower Basin portion of New Mexico, being a depletion of water at Lee Ferry, shall be a part of the consumptive use apportionment made to the State of New Mexico by Article III(a) of the compact. See also the answer to 1 above.

4. One basis on which the proposed hydrologic determination derives more water is for the Upper Basin to accept a slightly increased shortage. However, the second indented paragraph under "Allocation" paragraph 1 provides as follows: "Therefore, should the computed shortages occur, the UCRC and the USBR could decide to address much of the shortage through use of the power pools as well as by use curtailments in the upper basin or reduced releases to the lower basin." We are concerned about this sentence in its context for a number of reasons:
  - A. The USBR can't decide to do anything in the upper basin especially curtailed use.
  - B. Is this really an indirect way of suggesting that the other upper basin states should be willing to accept shortages in the power pools and use curtailments to provide for Navajo-Gallup?
  - C. With our shortage agreement in place, I don't think reduced releases to the lower basin is a realistic possibility.

The subject sentence was included in the draft Proposed Hydrologic Determination for the information of the Upper Division States. The sentence will be deleted and not included in the proposal offered to the Bureau of Reclamation.

Like the 1988 Hydrologic Determination, the March 3, 2006, Proposed Hydrologic Determination was derived assuming use of the Long-Range Operating Criteria for Coordinated Operations of Lakes Powell and Mead. The Proposed Hydrologic Determination did not rely on the Seven Basin States' Preliminary Proposal Regarding Colorado River Interim Operations transmitted to the Secretary via letter dated February 3, 2006, which interim operations would be in effect only through 2025 at the latest unless extended by agreement of the Seven Basin States. This is consistent with the provision in the February 3, 2006, Seven Basin States submittal to the Secretary that the Preliminary Proposal Regarding Colorado River Interim Operations is not to adversely affect the yield for development available in the Upper Basin. This provision was placed in the agreement at New Mexico's insistence.

The Proposed Hydrologic Determination also did not assume any more computed shortage in the Upper Basin than the amount of shortage deemed tolerable by the 1988 Hydrologic Determination. The 1988 Hydrologic Determination assumed that an overall computed shortage of 6 percent over the critical period is tolerable, with the duration of the critical period being about 25 years. Under the Proposed Hydrologic Determination, the overall computed shortage is less than 6 percent over the worst 25-year period of reservoir storage draw down, and much less than 6 percent over other longer periods. The computation of shortages in each instance assumed an annual delivery of 8.25 maf to the Lower Basin in accordance with the Long-Range Operating Criteria.

5. Would it be reasonable for us to expect New Mexico to identify a method by which its water rights in New Mexico would be administered in the event of a shortage? Plainly, no matter how dry it gets, once the Navajo-Gallup Project is in place, its diversions are unlikely to be curtailed. Thus, isn't it reasonable for us to ask New Mexico which water right would be curtailed in the event of a basin call?

The Settlement Agreement provides for the Navajo Nation's rights pursuant to the proposed Settlement Contract for its Navajo-Gallup Water Supply Project uses in New Mexico to be fulfilled or serviced by the Secretary under New Mexico State Engineer permits with a priority date of June 17, 1955, for water originating in the drainage of the San Juan River above Navajo Dam and a priority date of December 16, 1968, for inflow to the San Juan River arising below Navajo Dam (see Appendix 1, Partial Final Decree, subparagraphs 3(b), 5(a) and (b); Appendix 3, Settlement Act, section 403). This is consistent with New Mexico state law and the requirements to share shortages in the Navajo Reservoir supply among contractors pursuant to subsection 11(a) of the Act of June 13, 1962, that authorized the Navajo Indian Irrigation Project and the San Juan-Chama Project.



Should shortages in the Navajo Reservoir supply occur, either due to physical shortages in supply or due to implementation of use curtailments pursuant to Article IV of the Upper Colorado River Basin Compact, such that contract uses, including Navajo-Gallup Project deliveries, are curtailed, the Navajo Nation in accordance with state law could transfer portions of its Navajo Indian Irrigation Project water allocation or other irrigation rights to supply Navajo-Gallup Project uses. The Settlement Agreement also provides at subparagraph 9.3.1: "The Navajo Nation and the United States agree that the State of New Mexico may administer in priority water rights in the San Juan River Basin in New Mexico, including rights of the Navajo Nation, as may be necessary for New Mexico to comply with its obligations under interstate compacts and other applicable law."<sup>1</sup>

6. I'm concerned about the theory upon which water use on the ephemeral tributaries is (or is not) to be included in Upper Basin consumptive use. My concern is predicated from two sources. First, the Compact allocates use, and does not distinguish ephemeral tributary use. Second, Colorado tried this approach in our recent *Kansas v. Colorado* case and lost.

Under New Mexico's Proposed Hydrologic Determination, water use on the ephemeral tributaries within the San Juan River drainage is to be included in determining Upper Basin consumptive use, but only to the extent that such use affects the flow of the San Juan River. Article III(d) of the Colorado River Compact requires that the Upper Basin not deplete the flow at Lee Ferry below 75 maf in any period of ten consecutive years. Thus, the depletion in the Upper Basin must be measured at the point of delivery (that is, Lee Ferry). Second, Article III(a) of the Upper Colorado River Basin Compact apportions the flow available to the Upper Basin at Lee Ferry, and Article VI of this compact provides for the use of the inflow-outflow method to account historic consumptive uses in the Upper Basin. The inflow-outflow method would account for the net of all impacts of man's activities on stream flow, including salvage of river channel losses, by measuring the net effect of depletions at the downstream point (that is, the delivery point at Lee Ferry). The Upper Colorado River Commission by unanimous consent may adopt a method other than the inflow-outflow method, but has not done so.<sup>2</sup> Third, the yield studies of the 1988 Hydrologic Determination and the current hydrologic determination update determine the yield available for development in the Upper Basin as measured at Lee Ferry.

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<sup>1</sup> In lieu of priority administration, water users in the San Juan River Basin in New Mexico may agree to alternate methods of water administration to share the water supply available to them in a given year, including available storage in Navajo Reservoir. Such water administration agreements were developed and implemented in each of the years 2003-2005.

<sup>2</sup> Agreement on the Proposed Hydrologic Determination, including the proposed methodology for determining irrigation consumptive uses and the consideration of impacts of ephemeral tributary uses and ground water uses on mainstream river flows, could provide a mechanism for the Upper Colorado River Commission to account consumptive uses in the Upper Basin.

Thus, depletions that are compared against the yield should reflect the depletions at Lee Ferry after salvage, not the depletions at the sites of use.

New Mexico at this time is not proposing to quantify or account salvage of river channel losses on the Upper Colorado, Green or San Juan rivers. New Mexico proposes only that the Upper Colorado River Commission agree in principle that small amounts of use of ephemeral tributary waters and ground waters in the San Juan River drainage be accounted just to the extent that they impact the flows of the San Juan River. Such accounting would be consistent with the allocations of water available for use by the Upper Division States made at Lee Ferry under the yield studies. New Mexico would include in its depletions schedule what it believes are reasonable estimates of the net impacts on San Juan River flows resulting from uses in ephemeral tributary drainages, but the Commission would not be agreeing to the specific quantification of these impacts at this time.<sup>3</sup>

New Mexico is not aware of how the situation in *Kansas v. Colorado* may parallel or be analogous to the situation in the Upper Colorado River Basin.

7. Finally, with respect only to an issue that Colorado cares about, we must have New Mexico's approval and support for the Long Hollow Reservoir Project. Whether that project alone is adequate in terms of the compromise that will be required to get our unqualified support for this project is uncertain, and we are soliciting reaction from the appropriate people in Colorado on this subject at this time.

The State of Colorado previously requested that New Mexico by February 1, 2006, provide to Colorado a written statement of support for the Long Hollow Reservoir project. Colorado indicated to me that it could support the Navajo-Gallup Water Supply Project after receipt of said written statement. In response to Colorado's request, I sent a letter to Hal Simpson, Colorado State Engineer, dated January 31, 2006, stating New Mexico's support for the Long Hollow Reservoir project (copy attached). As recently as March 23, 2006, Hal told me that the letter satisfies Colorado's request.

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<sup>3</sup> The Upper Colorado River Commission also is not agreeing to the specific quantities of anticipated future depletions for other uses in New Mexico that New Mexico has estimated and included in its depletions schedule.

*La Plata -1*



**STATE OF NEW MEXICO**  
**OFFICE OF THE STATE ENGINEER**

John R. D'Antonio, Jr., P.E.  
State Engineer

P.O. Box 25102  
Santa Fe, NM 87504  
(505) 827-6091

January 31, 2006

Mr. Hal D. Simpson  
Colorado State Engineer  
1313 Sherman Street, Room 818  
Denver, Colorado 80203

Subject: Proposed Long Hollow Reservoir and La Plata River Compact

Dear Hal,

Based on our telephone conversation on January 17, 2006, members of my staff attempted to contact the staff of the Environmental Protection Agency (EPA) in Denver and the Corps of Engineers (COE) in Durango regarding the La Plata Water Conservancy District (District) proposed Long Hollow Reservoir project to understand the misconception that New Mexico does not support the project. Although we have not received a response from these two federal agencies we want to adhere to your February 1<sup>st</sup> deadline regarding your inquiry.

We realize that administration of daily obligations on the La Plata, especially during times of drought is extremely difficult. As we have discussed in the past we do not want the historic operation of the La Plata by Colorado consisting of split flow operations to be the underlying assumption of how the La Plata River Compact (Compact) is being complied with. However, we hope that the construction of Long Hollow Reservoir and through an acceptable long-term operation plan Colorado will comply with its future Compact obligations.

New Mexico supports Colorado's right to develop its La Plata River system apportionment through the construction of the Long Hollow Reservoir and looks forward to your continued support regarding New Mexico's hydrologic determination as it relates to the Navajo Nation Water Right Settlement Agreement in the San Juan Basin.

Sincerely,

A handwritten signature in cursive script that reads "John R. D'Antonio, Jr.".

John R. D'Antonio, Jr., P.E.  
New Mexico State Engineer

cc Jim Dunlap  
Estevan Lopez