

Appendix J

Responses to MRGCD Comments

October 18, 2002

Craig Roepke, Acting Director **VIA EMAIL** croepke@ose.state.nm.us
New Mexico Interstate Stream Commission
P.O. Box 25102
Santa Fe, NM 87504-5102

Re: Comments of the Middle Rio Grande Conservancy District on the report of Colorado State U./SSPA regarding the MRGCD

Dear Mr. Roepke:

Thank you for the opportunity to provide comments on the March 1, 2002 report by Dr. Ramchand Oad and SSPA of their study of the Middle Rio Grande Conservancy District (MRGCD) irrigation system.

The MRGCD understands that Dr. Oad is now preparing a proposal, for funding by the BOR, to implement some of the recommendations of this study. The MRGCD looks forward to working with Dr. Oad on that project.

This report is an academic analysis of the MRGCD irrigation system, with special emphasis on the measurement program. Several of the underlying assumptions, and the conclusions drawn from them, are inaccurate and reflect an unfortunate bias. The MRGCD would like the opportunity to address these problems with the authors and ISC staff at a later date.

Please contact me at your convenience to follow up on these matters.

Sincerely,

(original signed)

Subhas Shah
Chief Engineer and CEO

**GENERAL COMMENTS
OF THE
MIDDLE RIO GRANDE CONSERVANCY DISTRICT**

ISC/SSPA Responses to Comments are Inserted in Italics

Creation of an Irrigation Advisory Service (IAS) is a good idea. However, the MRGCD is not prepared to host the IAS. Rather, this kind of service should be provided by agencies such as NRCS, the agricultural extension service, possibly the Farm and Livestock Bureau, or others.

It is not clear to us why the MRGCD believes this should be solely a Federal responsibility. Although it is true that agencies such as the NRCS do provide services like those described for an IAS, shouldn't the MRGCD, as a taxpayer-funded organization, bear significant responsibility for encouraging efficient water use by farmers within the district?

The report points out that ditchriders commonly make intuitive decisions, and they do not meter individual farm turnouts or keep exact records of delivery. They do need technical training, and cross-training, and could benefit from coordination meetings as the report mentions.

ISC and MRGCD are in agreement on this point; ISC is interested in working with MRGCD in implementing this training.

The report strongly supports the value of rotational water delivery, such as the MRGCD has had in place during the 2001 and 2002 irrigation seasons. However, it is important to understand that giving less water to farmers will not solve any problems. Water rotation merely provides efficient delivery of the amount of water required to grow healthy crops.

This report does not advocate giving less water to farmers – it advocates rotation as a mechanism for improving efficient delivery such that the appropriate amount of water is delivered to a farmer at the appropriate time(s). Such efficient delivery is the responsibility of the MRGCD.

It is obvious that there is not enough water for everyone during drought. To survive during drought, farmers should be encouraged to choose appropriate new irrigation techniques such as “supplemental irrigation”, sprinkler irrigation, drip irrigation, etc. However, it must be pointed out that, for the farmers of the middle Rio Grande valley, there are significant economic barriers that currently prevent the widespread application of new irrigation technology.

We agree with this point – new irrigation technologies could improve on-farm efficiencies within the district, but are cost prohibitive in much of the district.

General comments about Sections 4 and 6: Much time is spent here taking a stab at crop consumptive use and developing a “water budget” for MRGCD. These are both very important and necessary steps towards understanding MRGCD in particular, and the water supply of the entire region in general. However I was disappointed in this portion of the report. A lot of time and energy was spent analyzing incomplete, or known inaccurate data. This study breaks no new ground here, and is at best a rehash of several previous works done by various public and private

entities. Assumptions and estimations are an unavoidable fact of life trying to analyze water in the MRGCD and one should not be criticized for using such in the absence of solid data, however this report makes the mistake of overanalyzing limited data. Sort of like looking at clouds, scrunching up your eyes, and convincing yourself you are seeing dragons.

Although the data are lacking in several key areas for a water-budget analysis, the process of creating a template and performing provisional analyses is useful for highlighting data gaps, and the areas where additional data would provide the most benefit for district operations. Furthermore, the provisional analysis illustrates, at a general level, division characteristics and differences. The fact that the data are not fully available or satisfactory to support a definitive water accounting analysis is an indication of the need for improvement in water quantification and management within the district.

Estimates of crop use, efficiencies, and a stab at an estimated water budget are all appropriate here, as is the definition of various terms for evaluating efficiency. But I would also like to see something more. The MRGCD is not typical of many irrigation districts, where a lot of the terms used were derived from. Those terms are perhaps meaningful in the areas where they originated, where water is removed from a watershed, transported some distance, and applied at a geographic location where it would not have been without the hand of man. In such a case, the cost of moving the water to where it is used must be balanced against the value of the water use. However, irrigated agriculture in the MRGCD occurs only in the historic floodplain of the Rio Grande. There is no removal of water from the river system, and any unused water from the irrigation system is logically returned to or otherwise available to the river system.

The terms used by the State of New Mexico to define water rights and water management are relevant to the MRGCD, since they define the legal framework within which the district operates. However, we also recognize that water used by the district remains within the floodplain, and much of it is returned to the river downstream, as is true in most traditional irrigation systems in arid lands.

The Elephant Butte Irrigation District (EBID) operates a similar system to that of the MRGCD and also does not remove water from the floodplain. A comparison of diversions for the two districts is worthwhile in this context, as is described in a memorandum by Spronk Water Engineers, Inc to the New Mexico State Engineer (Appendix A of the report). That comparison indicates the EBID has achieved significantly greater efficiency than the MRGCD, and we expect that the MRGCD can increase efficiency significantly.

It is my belief, and I would like to see it discussed here, that the River and the irrigation system are inextricably linked. We have narrowed and confined the river from its historic floodplain, but we spread water out across the historic floodplain through our canals and our farmer's fields. The river serves as an integral part of our conveyance system. One might say today that it should not be that way, but when the conservancy came into being 70 years ago it made good sense. I introduced SSPA to the term Net water Use during my conversations with them, and in some of my water budget calculations I shared with them. I think the term is very appropriate and necessary to understanding what is really happening water-wise in the Middle Rio Grande valley. Net water use takes into account the nearly constant exchange of water into and out of the river and our canals and I think it is the most realistic approach to describing water

use for this report. It is certainly a much more realistic approach than looking at “Total Diversion” as has been done by many previous reports.

“Total Diversion” has long been touted as MRGCD water use. Unfortunately this report does little to dispel this unfortunate and inaccurate practice. It is apparent to me that parties from all sides of the current water controversy seize on this number, and use it to further whatever their particular point of view happens to be. The typical use is that if “Total Diversion” is nearly 500,000AF (as this report states) and Crop use is somewhere around 150,000 AF, then there is 350,000 AF of free water to be had here in the Middle Valley. Absolutely untrue, but a logical conclusion based on the numbers and the way they are presented in this report. I do not know the correct way to present this, and I don’t necessarily think that the traditional way of reporting irrigation numbers should be removed from the report. But I would like to see alternate ways of looking at those numbers, and a discussion of how the MRGCD differs from many other irrigation districts. This could be the most significant feature of this report, and the one thing that could distinguish it from yet another rehash of old and generally bad data.

Nowhere does this report indicate that “Total Diversions” are equivalent to MRGCD water use, and (as further described below) we have added language throughout the report to emphasize the distinction between water use and Total Diversion. The quantification of total diversions is meaningful. It indicates the total quantity of water removed from the Rio Grande for district purposes (conveyance or irrigation). Whether or not this water is used for irrigation, and whether or not it is returned to the river further downstream, it is all water that is not flowing within the Rio Grande for the given reach of river but is instead being used within the district.

We have considered the concept of “Net Water Use” in evaluating the District water budget, but have not used it because of the unquantified influence of river seepage, ungaged arroyo inflow, and changes in groundwater storage that become lumped in this calculation. A division-by-division analysis of the “Net Water Use” illustrates the problems with this quantification, in that some divisions will evidence negative “net water use”, inconsistent with the physical use of diverted water in the division.

SPECIFIC COMMENTS OF THE MIDDLE RIO GRANDE CONSERVANCY DISTRICT

MRGCD: The following comments are arranged according to the structure of the draft report. Under each section heading, narrative comments are followed by specific suggestions for changes in the text of the report. ~~Struckthrough~~ text is suggested to be deleted, underlined text is suggested to be added.

Section 2.0. Background

Sec 2.2, 3rd paragraph:

So-called “Borrow/payback scheme” is not an arrangement between COA and MRGCD. Rather it is an action taken by BOR primarily to provide recreational flows on Rio Chama. MRGCD

and COA do not have an agreement in place, but do cooperate with BOR's request as much as is practical. Also, MRGCD has authorized storage of 2000 AF at Abiquiu, for SJC water, in addition to EL Vado storage.

4th paragraph:

As SSPA and others have been informed, "Crop production and water utilization data" reports quoted are known to be inaccurate. Spot checking of 2000/2001 ditch rider logs has indicated significant underreporting of irrigated acreage in many service areas. An internal analysis by MRGCD of 2000 Ikonos imagery supports the figure of 73,000 acres of irrigated land in MRGCD.

The text of the report has been modified to reflect these comments.

Page 4, 4th paragraph:

"The US Bureau of Reclamation (USBR) rehabilitated part of El Vado Dam, and rehabilitated irrigation and drainage works with MRGCD funds, and performed river channel maintenance."

Federal funds were used for this work, with a repayment schedule established.

Page 5, 1st paragraph:

"Extensive rehabilitation work was performed on canals, laterals, drains, and acequias by the USBR between 1953 and 1961 and MRGCD took over O&M in 1975."

The text of the report has been modified to reflect this comment.

Page 5, 4th paragraph:

"This reservoir was constructed by the MRGCD in 1935 with a total storage capacity of 198,110 acre-feet, since reduced by sedimentation to approximately 180,000 acre-feet."

"The MRGCD does not have a reservoir or storage capacity other than that provided by the El Vado Reservoir."

The MRGCD has 2,000 AF of SJC storage space available in Abiquiu. The text of the report has been modified.

Page 6, 2nd paragraph:

"It is currently operated by the USBR under an agreement with the MRGCD."

The text of the report has been modified to reflect this comment.

Page 7, change the end to read:

"Cochiti Reservoir was authorized primarily for flood control purposes and is not available to the District for water storage or re-regulation of El-Vado releases or flood flows."

The text of the report has been modified to reflect this comment.

Section 3.0 Physical Aspects of the Water Supply

Sec 3.1, 1st paragraph:

It is worth noting that original diversion structure at Cochiti was replaced by USACE with existing massive dam and reservoir.

This is noted in Section 2.1.

Also interesting that original MRGCD structure was a broad crested weir, specifically designed to measure all water entering the Middle Rio Grande Valley!

Yes, this is interesting.

Also, note that MRGCD diversions from LFCC are made only when water arriving at San Acacia is insufficient to supply entire division. Diversion from LFCC is most likely less than volume returned to LFCC. Particularly at Brown Arroyo, LFCC return and diversion acts as a bypass canal, to get larger volume of water around the Brown arroyo siphon.

4th paragraph:

Many Community ditches are the descendants of historic acequias, 200-400 years old, and not generally the “result of subdivided farmland”. State law defines a community ditch as simply “one from which two people irrigate”.

The text of the report has been modified to reflect this comment.

Sec 3.2.2, 1st paragraph:

Initial expansion of MRGCD gauging program in 1997 was done in cooperation with BOR, and federal funding. Program evolved after first year into state sponsored program. Please give credit where due!

The text of the report has been modified to reflect this comment.

Also, current completion schedule is for diversions and returns in 3 lower divisions to be completed around end of 2002. Work in Cochiti division will not begin until at least 2003.

The text of the report has been modified to reflect this comment.

3rd paragraph:

At this time, not planning to install gage in Barr-Chical, prefer not using Barr-Chical at all.

The text of the report has been modified to reflect this comment.

5th paragraph:

Lower San Juan Riverside Drain gage probably does represent return flow to river! Though about 2 miles above outfall, probably not much happens between gage and outfall. When Bernardo siphon is built, gage will logically be moved to siphon/siphon wasteway.

It has been noted in this paragraph that the Lower San Juan Riverside Drain is a significant contributor of return flow to the Rio Grande. Also, your recommendation for a new gage location if a siphon is built has been noted, although we do not believe that a final decision has yet been made on whether that siphon will be constructed.

Sec 3.2.3 5th paragraph:

Cochiti Division Gages: Regarding “gauging needs in this division are not yet satisfied”. Yes, we know!!!

The text in this paragraph has been modified to read: “Design and implementation of monitoring in this division should be pursued, and the MRGCD has plans to begin this work in 2003 or 2004.”

Belen division gages: Regarding “preventive measures”: Already being done!

The text of this paragraph has been modified to read: “Complete (already underway) implementation of preventative measures to protect solar panels and transmitters from vandalism.”

Socorro Division Gages: Regarding Rio Grande and LFCC gages. Good idea, but not for MRGCD to do!

You are correct; it is not the MRGCD’s role to monitor the river or the Low Flow Conveyance Channel. To clarify this point, the text of this paragraph has been modified to read: “It is noted that the installation and monitoring of gages on the Rio Grande and LFCC at the North Boundary of the Bosque del Apache (by the USGS or the State of New Mexico, for example) would be of great benefit to the MRGCD, since it would allow a complete accounting of surface water in the Rio Grande Valley as it leaves the MRGCD system.”

Discharge Measurements for Rating curves: Disagree with comments regarding 5%/25 measurement rule. USGS standards are great, but developed generally for rivers. With a few exceptions, MRGCD Canals generally provide a more controlled environment, with sections that are straight and unobstructed. Very few of our metering sections are earthen now, and the concrete lined sections do not change shape, and are kept clear of debris. There is typically very little change in velocity/depth across the sections, except as the edges are neared. We have a much easier and simpler measurement job to do than the USGS!

I would argue that in such sections, better measurements could be made by concentrating more sections near the edges, and having fewer in the center where velocity and depth are higher but the rate of change is much lower. This is directly contrary to USGS procedure, which calls for more measurements in the higher depth/velocity water, while virtually ignoring the edges. Again, USGS procedure is ideally suited to large rivers, but not so practical for small canals. Many MRGCD measuring sections which are falling below the 5%/25 section rule are in smooth

straight channels less than 20 feet in width. This still gives a velocity/depth measurement every foot, and in some cases every 6 inches.

These comments are valid. It is appropriate for the MRGCD's hydrologist to use his judgment in determining the most accurate method for measuring discharge at a given location. The text has been modified to reflect this.

Frequency of gage height measurements: Impractical to use two separate schedules for telemetry system. At present, inclined to continue with 30 minute data.

OK, this is simply a recommendation. If it becomes more practical to implement at a later time, then it might be appropriate to do so. The text of the report has been modified to say that the MRGCD might consider implementing this change, if it is practical.

Data transmission, On-site records: Already working on a redundancy feature for data transmission. Not too interested in data –logging on site, at least outside the redundancy feature. Currently losing far less data due to occasional missed transmissions than used to be the case with on-site data logging. Virtually all loss of data happens when stations are vandalized or otherwise destroyed, which negates the value of on-site logging!

A note has been added to the data transmission paragraph, saying "The MRGCD has indicated that it is presently working on adding this redundancy feature to data transmission." Based on your comment, the recommendation for on-site records has been deleted from the report.

Rating curves: Recommendation already being done!

A note has been added to the data transmission paragraph, saying "The MRGCD has indicated that this recommendation is currently being implemented."

Vandalism: Already have taken many steps to prevent vandalism of power supplies. Pointing out locations of gauging stations may not be good idea. Many valley residents resent the implications of metering, and might like to know locations of gages for the express purpose of destroying them! Recharging and switching batteries is not practical as transmitting data is relatively power intensive.

Your perception of the resentment of many valley residents to gaging is valid. However, gaging is actually a benefit to irrigators in the valley and to the MRGCD. It would seem that the MRGCD would benefit from – and may even bear some responsibility for - educating the community about the benefits to irrigators of gaging, since it allows the district to more effectively manage its available supply to maintain a fair distribution of water among its constituents.

Since the farmers of the district have had essentially a full supply of water for over twenty years, they have become accustomed to seeing the ditches full and taking water as they wish. However, if the Rio Grande Compact Article VII prohibition stays in affect for several years, as is likely, the district's supply will be significantly constrained, especially during the later part of the

irrigation season and those customs will not be achievable. Under such a situation, the need for reliable gaging will increase in order to ensure and defend that each farmer is getting his/her fair share of the available supply.

This paragraph has been modified to reflect your comments and the statements made above.

Training: Recommendation already done. MRGCD personnel have already attended both USGS and BOR training courses and will continue to do so in the future.

A note has been added to the data transmission paragraph, saying “The MRGCD has indicated that this recommendation is currently being implemented.”

Data handling and processing: May be worth looking into recommendation, but not enthusiastic about it. MRGCD purchased a “water data collection computer package” in 1997. Cost a lot, and did not work worth a damn! We started using EXCEL spreadsheets because they worked a lot better than the so-called “water data collection” software.

The text of this paragraph has not been modified – since its tone is already soft (“...could benefit...”). However, we recognize that the MRGCD has put a lot of thought and effort into its data handling, and may be using the most appropriate software for this work at this time.

Staff Load: Already doing. Measurements and data collection in Belen are largely being handled by Belen division personnel this year. New gages in Socorro division will be maintained by Socorro personnel.

A note has been added to the data transmission paragraph, saying “The MRGCD has indicated that this recommendation is currently being implemented. Staff in the Belen Division have assumed responsibility for operation and maintenance of the gages in that division, and the Socorro Division will soon assume responsibility for the gages in that division (many of which are recently installed).”

Sec 3.3.1

You found info about the origin of the “water distribution reports” about which I was unaware. But, nothing unexpected. I would like to see it very forcefully pointed out that these documents are nothing more than estimates, assumptions, and guesses. Perhaps they were meaningful at the time the procedure was developed, perhaps not, but in any case they are meaningless in today’s situation.

The report text clearly states which of these parameters are estimates, and describes the estimation procedures to the extent they have been documented.

Sec 3.3.2.2, 2nd paragraph:

Although the flow in the Unit 7 drain may not have comprised such a large portion of the water arriving at San acacia, it should be clear now that Belen return flows still account for virtually all water supplied to the Socorro division, whether through Unit 7, LSJDR, SABDR, SFRDR, or other returns!

Yes, it is clear that Belen return flows account for a significant portion of the water supplied to the Socorro Division – whether those flows are run down the river, or they are routed into the Unit 7 drain. This, in itself, could be an indication of over-diversion at Isleta – i.e., diversion of significantly more water than is needed within the Belen Division. However, it is also clear that significant passive diversion occurs from the river to the riverside drains in the Belen division such that a portion of the water in the Unit 7 drain is actually water from the river and not water diverted at Isleta. In addition, during certain times of year tributary inflow (from the Rio Puerco, Rio Salado, and even Abo Arroyo) can and does serve to meet the Socorro division demand. The text has expanded relative to this comment.

3rd paragraph:

Barr-Chical cannot flow backward, though water often backs up into it from Isleta dam and become stagnant. Canal was not dredged, but gates were opened and area at intake pipes was cleaned of debris, causing increase in flow.

Thank you for the clarification. We have adjusted the text to reflect this information.

Sec. 3.3.3, 1st paragraph:

None of this PC stuff! For 70 years they have been “dams”. The word “dam” is even cast into the concrete at each structure!

Cochiti Dam is a Dam (with a reservoir), and the Angostura, Isleta, and San Acacia Dams are diversion wiers. We only used these terms because they describe the structures. The sentence has been changed to read “...at Cochiti Dam, Angostura Dam (diversion wier), Isleta Dam (diversion wier), and San Acacia dam (diversion wier).

Page 1:

“The Cochiti Division obtains water from canals with headings at the Cochiti Dam.” ~~Cochiti Dam is owned by the U.S. Army Corps of Engineers, and was constructed primarily for flood and sediment control (replacing the MRGCD diversion structure)~~

“The Albuquerque Division diverts water from the Angostura Diversion structure at Algodones.”

“The Belen Division diverts water from the Isleta Diversion structure at Isleta.”

“The Socorro Division diverts water from the San Acacia Diversion structure at San Acacia and from the LFCC.”

The text on page one has been modified to reflect this, based on this comment and similar comments from another reviewer.

Page 1, 2nd paragraph:

These inter-divisional flows are conveyed through ~~riverside~~ drains and are eventually diverted into the ~~main~~ canal for re-use in the District. The following drains supply the Albuquerque, Belen, and Socorro Divisions, respectively: Algodones Riverside Drain, Barr Chical, Isleta Drain, and Unit #7 Drain.

The text has been modified to reflect this comment.

Page 2, 2nd paragraph:

Several other water users rely on MRGCD diversion and conveyance facilities, including the La Joya Acequia Association, the New Mexico Department of Game and Fish refuges: Bernardo Wildlife Area, Casa Colorado, La Joya Wetland Game Refuge, US FWS Sevilleta National Wildlife Refuge (Sevilleta), and the Bosque del Apache National Wildlife Refuge (BdA).

The text has been modified to reflect this comment.

Page 2, 4th paragraph:

Each irrigator in the MRGCD may own at least one a turnout and share with neighbors and may have more if the size or configuration of the irrigation parcel warrants it.

(see below)

Page 2, at the last paragraph, insert:

“Each irrigator in the MRGCD owns at least one turnout, or shares one turnout, and may have. . . . warrants it.”

The text has been modified to reflect these two comments, as follows:

“Each irrigator in the MRGCD either owns one or (if the size or configuration of the irrigated parcel warrants it) more turnout(s), or shares a turnout with one or more neighboring properties. “

Page 4, 2nd paragraph, insert after “Ditchriders . . . turnouts.” the following:

“But water is provided based on an estimated time schedule.”

The meaning of your comment is unclear. We have added the following text to the end of that sentence: “(although they do estimate water delivery based on time required for irrigation).” Hopefully, that was the intent of the comment.

Page 4, 2nd paragraph:

“However, during years that the MRGCD experiences water shortages, water saving measures such as farm-delivery rotation ~~may be~~ are practiced.”

This change has been made in the text.

Page 4, 3rd paragraph, insert:

“The MRGCD also conducts other activities necessary to ensure adequate water operations, including maintenance of the conveyance and drainage system (excluding private community ditches).”

This change has been made in the text.

Page 4, 3rd paragraph, replace:

“Irrigation seasons includes ~~weed~~ vegetation control. . . . and emergency repairs.”

This change has been made in the text.

Page 4, 3rd paragraph, insert:

“These problems vary,storms or flooding, vandalism.”

Page 6, 2nd paragraph:

“MRGCD staff has determined that some of these differences are attributable to inaccuracies in ditchrider reports and ditchrider-identified lands due to the presence of several community ditches.”

This change has been made in the text.

Page 7, 1st paragraph:

“While some ditchriders service as many as 300 irrigators who water mostly residential lawns, gardens, and pastures in ~~the bosque of~~ Albuquerque, other ditchriders serve comparatively fewer irrigators who irrigate thousands of acres of alfalfa and pasture in Socorro and Valencia counties.”

This text now reads “...in the valley in Albuquerque”.

Page 8, 2nd paragraph:

“Beginning in 1997, the MRGCD, in cooperation with the BOR, ISC and the OSE, ~~has~~ embarked on an expanded monitoring program with the goal of measuring additional diversion points within the irrigation system and measuring all outfalls and drain return flows.”

Based on a previous comment, this sentence now reads:

“Beginning in 1997, the MRGCD embarked on an expanded monitoring program with the goal of measuring additional diversion points within the irrigation system and measuring all outfalls and drain return flows. This program was initiated in cooperation with the USBR, using Federal funding, and was continued in cooperation with the ISC and the OSE using State of New Mexico funding.”

Page 14, section 3.2.3., replace:

“Vandalismin ~~the Belen Division~~ the District.”

This section has been modified based on a previous comment. The first sentence now reads:

“Vandalism continues to be a major problem, particularly in the Belen Division.”

Section 4.0 Physical Aspects of Water Demand

Page 4, end of the 2nd paragraph, insert at the end of 4.1.1:

” New methods of crop census reports may not comply with BOR requirements.”

The suggested addition has been made to the text.

Section 5.0 Description of Water Delivery Operations

Page 4, insert at the end of section 5.2.2.,

“Recentrecord keeping.” “The ditchrider contract requires better bookkeeping.”

The following sentence has been added to the end of section 5.2.2: “The MRGCD has informed us that its contract with its ditchriders requires better bookkeeping.”

Page 5, at the end of section 5.2.3, there are 4 procedures, to which we suggest adding 3 others:

- (1) Irrigation event scheduling
- (2) Pre-season irrigation scheduling
- (3) Free-flow irrigator scheduling
- (4) Complete absence of scheduling
- (5) Rotation
- (6) Scheduling
- (7) Drought Management

We are not sure what you mean by procedure 6 – Scheduling, since the first 3 of the original procedures are all forms of scheduling. Also “rotation” (or a rotational water delivery pattern) is a management form that requires use of the first listed procedure, Irrigation Event Scheduling”. Drought Management also is not a water-scheduling procedure, but a plan that might require a change in drought management procedure. Therefore, we have added the following sentence to the paragraph after the above list:

“They may also change the water-scheduling procedure in their area during drought, as a drought management procedure.”

Page 7, section 5.2.3.4.:

“The Pueblo lands ~~can~~ are essentially take-taking as much water as they desire at any time. However, a large portion of the water taken by Pueblo lands returns back to the river or into the system though the drainage system.”

These changes have been made in the text.

Page 10, at the end of the first paragraph of section 5.2.3., insert:

“Although the MRGCD may divert a large amount of water from the river, the unused portion is ~~continuously~~ returned back to the river, and diverted for down stream use. (Section 3.3.1-3.3.2.)”

The sentence now reads: “Although the MRGCD may divert a large amount of water from the river, the unused portion is returned to the river, and much of it is re-diverted downstream (Section 3.3.1-3.3.2).”

Page 12, at the end of the last paragraph of the section 5.4.1., insert:

“For example,through “wasteways” which ~~are spillways returning water to the river~~ return water to drains and divert the water for use downstream.”

This sentence now reads: “For example, in situations where supply may be greater than demand, a ditchrider may attempt to match supply and demand by releasing supply through “wasteways” that return water to drains, and then diverting that water from the drains for use downstream.”

Section 6.0 Water Accounting and Efficiency Analysis

Note: The organization of Section 6 of the draft report has been modified. In the final report, all details of the analysis are presented in Appendix I. A general summary of the analysis and findings are provided in Section 6. As a result, the referenced section numbers below may not necessarily correspond with those of the final report.

Sec. 6.4.3 top of page, next to last paragraph

Water probably goes as mostly for shallow aquifer recharge, shallow aquifer obviously rises shortly after beginning of irrigation season, as reflected in drain flows.

The topic you reference relates to estimation of tailwater in the provisional accounting analysis. This discussion is now located in Appendix I. An element has been added to the accounting analysis to represent use of water in building soil moisture in the early part of the irrigation season. With this adjustment, we no longer show elevated amounts of tailwater in the early spring. This is also consistent with your remark.

Sec. 6.4.3 last paragraph:

What is this? Very confusing? Unclear to me, so presumably will also be unclear to most others!

This text described results of the sensitivity analyses, as also tabulated on Table 6.4 of the draft report. This discussion has been modified and is now provided in Appendix I.

Sec. 6.4.3 Entire section

Again, need more explanation. Particularly, low “efficiency” of Cochiti division needs further explanation. What is rationale for changing CIR?

The explanation has been revised and is in Appendix I. Regarding alternate model runs with several values for CIR, these are provided to illustrate the sensitivity of the calculated efficiency to the assumption regarding CIR. Similar sensitivity analyses can be conducted with any parameter for which uncertainty exists, or to explore the range of impacts of various assumptions. These sensitivity runs illustrate that regardless of the assumed CIR, general conclusions regarding the relative efficiency of various divisions are maintained.

Section 6.1, insert after “Quantification of interceptedsystem returns(....)” “Field conditions, soil types, and the availability of sufficient head to reach lands.”

These factors are identified in the following paragraph.

Section 6.3, change as follows:

“Acreage distribution factors are defined using land use classifications from the NM Resource GIS Program (NMRGIS), including Indian lands defined by the ~~BLM~~, BIA cropped areas within the MRGCD’s divisions and fallow lands.”

Source was BLM.

Section 6.4., insert another subheading as follows:

“Open Water/Riparian ET(WRET):”

Bosque Consumption: How much water is being used.

“Average Canal and Riparian Zone Width (CV):”

Section 6.4.2., change to read:

“Albuquerque Division-~~none~~ Algodones RSD.”

The Algodones RSD is not included here because it is gaged; this list only referenced the ungaged flows affecting the calculation of the division supply.

Section 7.0. Evaluation of Operations and Infrastructure

Sec. 7.1.1 3rd paragraph, last sentence.

Very interesting way to put it! But implies that in the absence of scarcity, use is necessarily inefficient, which is not true for majority of irrigators!

No, it just says that the appearance of water scarcity encourages efficient water use, which it does. In the absence of scarcity, there is less efficiency – this is really true for any resource. I think we all agree that over-watering is damaging to crops, and therefore that most farmers don’t purposely over-water. However, if water is cheap and appears to be abundant, they are not as likely to spend money or energy on structures or operational approaches that save water.

Sec. 7.1.1 6th paragraph, 2nd sentence.

A key point expressed here. Suggest reason for problem with pueblo rotation be stated here, and the domino effect it has on rotation for others.

Good suggestion. There is now a paragraph in this section that reads as follows:

“Some ditchriders believe rotation could not be implemented for canals servicing both Pueblo and non-Pueblo irrigators because delivery practices cannot be enforced within Pueblo lands. This is likely true in many ditchrider areas in the Cochiti and Belen divisions. The independent control over irrigation scheduling and water use that the Pueblos maintain adds a significant operational complexity to the MRGCD system. It also limits the flexibility of the MRGCD to implement operational improvements, since the Pueblos are embedded within the system, not separate from it, and therefore the limits of the MRGCD’s operational flexibility within the Pueblos have a ripple effect through much of the system.”

Sec. 7.1.2

Agree with premise, clarify “site-specific concerns” to be inability to schedule pueblo rotation. This summers experience has dramatically made that point.

Text has been added to address your comment. This section now reads: “It is recognized that site-specific concerns throughout the MRGCD, particularly difficulty in scheduling or inability to schedule rotational water delivery within the Pueblos, may influence the feasibility of implementing rotation through the entirety of the District.

Sec. 7.2.1 1st paragraph:

Disconnection between service charge and water delivery is not necessarily cause of presumed inefficiency. Important to consider unique history of water use and ownership in New Mexico, and NM water law determines cost of water. MRGCD charges only to deliver water, not for the water, as is the case in most other irrigation districts in the country. Also, Incentive for efficient use is and should be a good crop! Using price of water to encourage efficient use is a common but fundamentally flawed concept!

As previously noted, we agree that over-watering produces bad crops, and that this in itself is an incentive to not over-water. However, not over-watering is not the only aspect of efficient on-farm water use. Incentives for efficient water use are also incentives to make improvements on a farm, such as laser leveling and lining of ditches, and for implementing new technologies, which can pay for themselves, for example, through savings in water costs. This is not a fundamentally flawed concept, it is basic economics.

It is true that the MRGCD is different in structure from some other irrigation districts, but not all. However (and we would appreciate clarification on this), it seems from the records that there are irrigators within the MRGCD that irrigate based on the MRGCD’s permit water, rather than through their own water right. If this is true, then the MRGCD does provide water, rather than just deliver it.

Sec. 7.3:

Excellent recommendation, already beginning to take place with development of ET Toolbox. Should be expanded, and MRGCD should be an integral part. But county extension, USDA, NRCS and others should have equal or greater roles. Also already starting plan to incorporate irrigation advisories into local newspapers.

We are glad to hear that the MRGCD will play an integral part in working toward this goal. In response to your comment, the following has been added to Section 7.3:

“Presently, some of the functions of an IAS are served by the NRCS. The NRCS has cost sharing programs to support on-farm efficiency improvements, and has supported laser leveling of fields and lining of on-farm canals throughout the district (especially, in recent years, in the Socorro Division). The MRGCD Engineering Department refers irrigators to the NRCS for this kind of service.”

Sec. 7.4.4 2nd paragraph:

Interesting comments, perhaps expand upon ways MRGCD can encourage urban irrigation, particularly where farmland is being subdivided. Worth pointing out here that Urbanization of a given parcel (40 acres for example) does not necessarily reduce water consumption on that parcel, and may very well increase it. That 40 acres can be carved up into 40 plots, which are then often landscaped with high water use vegetation, and fed either from individual wells, a community well, or municipal treated water. The end result is higher consumption than when land was agricultural.

This point would be better made in the introductory section to urbanization, Section 7.4. The following text has been added to the end of that section: “ The net effect of this is likely an increase in water consumption, since small urban plots are generally planted with high water-use vegetation, and generally have associated domestic water use (from a municipal supply or private well) in addition to irrigation.”

Sec 7.5.1 2nd paragraph:

This is a complicated issue, and I do not agree with the comment about it not being a primary function of an irrigation system to supply groundwater recharge. It is the function of an irrigation system to deliver water to points where it is beneficial. Since the MRGCD system, and the river are inextricably linked. No water is moved outside the Rio Grande floodplain. Since urbanization/drainage/flood control have forever altered the wetted areas of the valley, the MRGCD system is the only device capable of sustaining aquifer recharge at anything even close to historic conditions, thus it has become a de-facto function of the irrigation system.

The impact of irrigation practices on aquifer recharge has not been evaluated as part of this project and is beyond the scope of work for this study. This study evaluates the efficiency of irrigation practices for the purpose of delivering necessary water to irrigated lands.

Sec 7.5.4 end of first paragraph:

Absolutely do not agree with this recommendation. Wooden stoplog check structures are overflow devices, thus somewhat self-regulating. No less secure than steel screw type check structures. In fact, many more problems are caused by individuals cutting locks off the steel screw type check structures than with the old board type. Old fashioned board structures give a bit of charm and historic feel to MRGCD, also encourage cooperation/communication between irrigators, more of the ‘acequia culture’ that many feel should not be lost from MRGCD.

We have removed our recommendations for removal of the wooden stop-log checks and turnouts. Section 7.5.4 has been replaced with the following.

7.5.4 Control of Irrigation

The MRGCD should give serious consideration to methods of controlling the timing of water use. Efficiency in an irrigation system is decreased when ditchriders do not have rigid control over water use. If the MRGCD does not have the ability to control the irrigation times of its irrigators, it cannot effectively implement rotational water delivery (or any other form of scheduled water delivery).

The MRGCD will need to develop methods to gain this control – probably through education, as well as structural improvements. Steel screw-type check structures and turnouts can be locked, but problems are caused to this system when these locks are cut. Also, the MRGCD feels that these structures give them less flexibility, due to their underflow design. Wooden check structures, which are still common in the district, have an overflow design, which, the district says, makes them somewhat self-regulating. However, to operate the wooden check structures, boards are placed in the check to raise the level of water in the canal; and they are removed at the irrigator’s own wooden stop-log turnouts, so water will flow onto his field. This is typically done by the irrigator himself, and therefore the MRGCD doesn’t have control over when and for how long this is done. The MRGCD will need to determine the most appropriate combination of check structure and turnout design and education to gain effective control over irrigation within its system.

End of Section 7.1, add:

“Water demands and deliveries are based on head availability to effectively irrigate lands. Return flows are available for diversion downstream. The system is designed to operate with return flows, which keeps the river wet and helps wildlife survive.”

This discussion is not appropriate in this section or in this report; report deals with irrigation, not benefits to wildlife. No changes were made.

Section 7.1.1, insert after “To better understand....evaluated.”

“Rotation delivery allows lag or delayed irrigation which may or may not produce healthy crops.”

This point is made in Section 7.1.1, where we have the following text: “If a strict rotation schedule were implemented in the MRGCD, and particularly if the rotation system is not well designed, many users may not receive water at the time they deem most optimal, and this may have a detrimental affect on their crops.”

Section 7.1.1, insert:

“..provided except on pueblo lands.”

It is not clear where you are suggesting this language be inserted. No change has been made.

Section 7.3., insert at the end:

“Irrigators are placed in contact with the NRCS through the Engineering Department. Laser leveling has increased throughout the District.”

As we said in response to a similar, previous comment, we have added the following to the end of Section 7.3: “Presently, some of the functions of an IAS are served by the NRCS. The NRCS has cost sharing programs to support on-farm efficiency improvements, and has supported laser leveling of fields and lining of on-farm canals throughout the district (especially, in recent years, in the Socorro Division). The MRGCD Engineering Department refers irrigators to the NRCS for this kind of service.”

Section 7.5.1., insert after “An increaseefficiency.”:

“Piping is not always a feasible solution due to the shallow gradient, high head losses and heavy maintenance cost.”

The text in Section 7.5.1 has been modified to say: “Where feasible and appropriate (for example, where gradients are sufficient and sediment loads and flow variations are favorable, and where there are high losses from earthen canals) conveyance of water through pipes or lined canals, as opposed to earthen canals, can increase water savings and decrease maintenance requirements.”

Section 7.5.4, insert at the end:

“Wooden check structures provide better control of water diversions than do steel screw gates.”

Section 7.5.4 has been replaced. Please see response to the previous comment on this section for the revised text.

Section 8.0 Feasibility and Implementation

Sec. 8.1:

Agree that water delivery via rotation should be the norm in MRGCD. Historically it has been this way. Charging for water on volumetric basis probably not legal under current law/ water rights.

On the legality of charging for water on a volumetric basis – this is a complicated issue, and is not explored in detail in this report, since the report deemed that it is not feasible or practical at this time. Other districts in New Mexico legally charge on a volumetric basis, and provide financial incentives if an irrigator meters his use and demonstrates it is below standard amounts. This program has definitely resulted in water savings. The text in this section has been modified to say: “Charging for water on a volumetric basis could also create this scarcity, but this approach is not deemed practical or feasible at this time. Also, its implementation may have some conflicts with current water-rights law (this would require further investigation).”

Sec. 8.1.5:

Implementation of rotation is problematic in Cochiti and Albuquerque divisions due to presence of pueblos. MRGCD cannot require rotation by pueblo water users. Perhaps BIA can? Non-rotational irrigation by Isleta pueblo also impacts Belen (and Socorro) division, but represents a smaller percentage of that divisions water use, so not as much impact.

We have discussed these concerns at several other locations in Section 8. This discussion is not appropriate in this section, which discusses infrastructure.

Sec 8.5 1st paragraph:

Recommend caution on canal lining. May be positive benefits, but potential negative impact on shallow aquifer is unknown.

Sec 8.5 last paragraph:

Once again, this recommendation is poor. Replacing wooden checks with steel screw checks is no benefit. Overflow type structure than becomes underflow type, increasing flooding risk. In any case, very easy to place a board in front of a steel screw type check, negating its value as a lockable device. At best, a waste of money.

As in Section 7, the recommendation to remove wooden check structures has been removed. The last paragraph in Section 8 has been replaced with the following: “The MRGCD should give serious consideration to methods of controlling the timing of water use. Efficiency in an irrigation system is decreased when ditchriders do not have rigid control over water use. If the MRGCD does not have the ability to control the irrigation times of its irrigators, it cannot effectively implement rotational water delivery (or any other form of scheduled water delivery). The MRGCD will need to develop methods to gain this control – probably through education, as well as structural improvements.”

Section 8.3., insert after “With few irrigation....effort.”:

“MRGCD is not an irrigation district. The functions of an IAS are being performed by agencies such as NRCS, county extension services, the farm bureau etc.”

Section 8.3., we suggest to replace the sentence ~~“An IAS provides the services and resources suggested above by managing demonstration plots for new technology and providing hands-on demonstrations, providing on-line and telephone services for weather forecasting and irrigation scheduling, distributing free educational literature, and providing extension agents for on-line consultations.”~~ with the following sentence:

“Services such as online or telephone weather forecasting, educational literature, and extension agents for on-farm consultations are not provided by MRGCD.”

As we said in our response to your up-front comment on this topic, it is not clear to us why the MRGCD believes IAS services should be solely a Federal responsibility. Although agencies such as the NRCS do provide services like those described for an IAS, the MRGCD also bears some responsibility for encouraging efficient water use by farmers within its jurisdiction.

Also, the sentence you are referring to describes the services performed by an IAS. It doesn't describe what is or is not done by the MRGCD presently. Therefore, your suggested change is not appropriate.

Section 8.4, add to the first and third recommendations as follows:

“1) Limit the number of turnouts in new subdivisions. The District has policies regarding turnouts and their installation. Sometimes politics plays an important part in the installation of turnouts not in accordance with MRGCD policies.”

“3) Require Water User Associations (WUA's) for new subdivisions in order to decrease MRGCD's maintenance and repair burden. The county and city zoning departments are responsible for subdivision approval and requiring necessary easements.”

The MRGCD does have the ability to impose rules on its users related to the structures and practices associated with its system and its services. We are sorry that the MRGCD has political

difficulties in the implementation of these policies, particularly on turnouts. However, this report presents technical recommendations, not political ones, and therefore we have not modified our text.

Section 8.4, insert after “Subdivisions requesting.....only. “It is very important to understand the topography of the land as well as the water surface elevation prior to installation of a turnout.””

This is true, and we have discussed this point elsewhere in this text. This point, however, is not relevant here, since this discussion recommends that the MRGCD discourage its users from installing new turnouts.

Section 8, page 10, insert after “Implementation.....Belen Division.”:

“The city of Albuquerque is already working on a project to use gray water or treated effluent for golf course and other turf irrigation.”

In this section, we are discussing the use of raw irrigation water in urban areas, not the use of gray water by the cities. This point is not relevant to this section.

Section 8 page 10 insert after “Also, the revenue generated.....existence.”:

“The use of gray water can provide revenues to appropriate government agencies.”

OK, but again, we are not discussing gray water in this section.

Section 8, page 11, add the general areas of concerns below”

- “Lining of canals and the use of pipe for water conveyance. It is important to know the gradient of the conveyance system to determine the feasibility of concrete lining or piping a conveyance channel.”
 - *This bullet now reads: “Lining of canals and the use of pipe for water conveyance, where feasible and beneficial”*

The text of the following paragraph has been modified to read: “However, in limited areas it may be beneficial to line or pipe sections of canal. Before implementation, comprehensive study is needed to identify areas where lining or piping might be beneficial, and where system gradients are sufficient to make concrete-lining of canals or piping feasible.”

- Canal crossings need improvements. The crossings may have to be replaced by a bridge or a box culvert in order to have effective flow conditions and reduced maintenance.

The text, following the bullet list, which discusses this issue, has been modified to read: “The MRGCD should enforce existing policy concerning canal crossings. In theory, policy changes need not be implemented, in practice it will be necessary to improve existing crossings (such as by replacing them with bridge or box culverts, which allow more effective flow) as well as better manage future policy regarding the approval of canal crossings.”

- Seasonal flooding of arroyos. Counties and local flood control authorities, not MRGCD, are responsible for the prevention of flooding from arroyos.”
- “Wooden check structures. There are a few wooden checks that exist in the MRGCD. These checks are not permanent and if needed will be replaced in the future by concrete structures.”

We have deleted our recommendation to remove wooden check structures, and instead noted that the MRGCD will need to find ways – through education and structural improvements – to improve its control over irrigation.

Section 9.0. Conclusions and Recommendations

Sec 9.1 4th bullet:

In total river returns, statement is made that very little Socorro division outflow returns to river. Major misrepresentation here! Must be made clear that Socorro Division returns are quite significant, est. 50,000 to 75,000 AF. This water is sent onto the Bosque Del Apache refuge, where some is used for irrigation, some is ponded for waterfowl, and presumably some passes through the BDA and eventually returns to river or EB reservoir. Socorro division outflow to BDA should be deducted from MRGCD use as if it returned directly to river, making Socorro division quite efficient.

It is correct that little Socorro Division outflow returns to the river. It is true that Socorro Division outflow becomes inflow to the Bosque del Apache, and this is stated in the text. Without exact measurement of this outflow, and use by BdA, it is difficult to represent this use accurately. We have incorporated the water use in the BdA, served by the Socorro Division outflow by adding an “equivalent acreage” of 4,000 to the acreage served by the Socorro Division supply. Though an approximation, this allows for a better assessment of efficiency in the Socorro Division.

Sec 9.1 5th bullet:

There is that “intercepted Cochiti dam seepage” number again. This water DOES NOT enter the canals and should not be added to MRGCD “diversions”. Also, the term “Net water use” is very appropriate and necessary to understanding what is really happening water-wise in the Middle Rio Grande valley. There are many limitations on the current data, and many current assumptions may prove incorrect with further study, but at present this is the most realistic approach to describing water use for this report. It is certainly a much more realistic approach than looking at “Total Diversion” as has been done by many previous reports. SSPA insistence on analyzing MRGCD with traditional irrigation terms such as “on-farm efficiency” and “off-farm efficiency” do little to further our understanding of the Rio Grande, and only serve to reinforce widely held and incorrect beliefs about agricultural water use. Those terms are perhaps meaningful in the areas where they originated, where water is removed from a watershed, transported some distance, and applied at a geographic location where it would not have been without the hand of man. However, irrigated agriculture in the MRGCD occurs only in the historic floodplain of the Rio Grande.

Cochiti dam seepage has been removed as we understand that it is not intercepted by canals, rather, by drains. Discussion on diversions v. water use has been addressed above. Text has been augmented to guard against misunderstanding.

Sec 9.1 recommendations:

Shallow groundwater monitoring, seepage losses, and river losses are recommended as MRGCD projects. These are more along the lines of scientific research. While MRGCD will and should be involved in these, its role should be as cooperator and sponsor, rather than principal investigator.

These studies are important to understanding how operations of the district can be optimized to deliver sufficient water to irrigators, particularly under conditions of water shortage. This list of recommendations is not just a list of proposed MRGCD projects. It is a list of suggestions for improvements to the system, and these suggestions could be implemented by the MRGCD, the State, or Federal agencies.

Sec 9.2 3rd bullet:

Strike the Cochiti dam seepage again!

See above comment.

Sec. 9.3 1st paragraph:

Barr-Chical canal flow is generally insignificant at 3 to 4 cfs. Normal operations should result in very little water flow in this facility. Only under the circumstances that occurred in 2001, and reported to SSPA on gage records did flows increase for a limited time. SSPA's conclusion that flows are "estimated to be significant" is baseless and incorrect.

The statement refers to the numbers provided by the MRGCD for the combination of the Barr Chical canal and the Isleta Drain. Text revised for clarification.

Sec 9.4 4th bullet:

Recommendation to construct new San Juan Drain gage at river is OK, but present location is good, and probably makes sense to postpone this project until if and when Bernardo siphon project begins

A note was added to this bullet indicating this. It now reads: "Construct a gage on the San Juan Riverside Drain at its return to the river (note: If a siphon is built at Bernardo, it would be more appropriate to wait and install the gage at the siphon)"

Sec 9.4 8th bullet:

What water logging conditions? Elaborate!

Sec 9.5 4th bullet:

Gages to monitor outflow to BDA already done!

This draft report was completed prior to that time. Acknowledged.

Sec 9.5 6th bullet:

Abandon Socorro ditch? Why? What is rationale for this?

Field observations suggest there are very few irrigators using this ditch, and most of them seem to have a potential alternate source of water. The recommendation is only to look into this. Certainly, more investigation is needed.

Sec 9.5 7th bullet:

Excellent idea!

Sec 9.5 paragraph after bullets:

On San Acacia Dam removal, incorrect about needs of Socorro division being met from Belen. While possible throughout much of the season, problems exist in early season and occasional other times. Flows in drains arriving at San Acacia do not increase to a point sufficient to supply the Socorro division until Belen division Irrigators have been operating for several weeks, causing increase in shallow aquifer under irrigated lands. Socorro division is south, and thus warmer, generally requiring irrigation water in the spring before irrigators in Belen area start. Also, ditch breaks and thunderstorms in Belen area can cause cessation of diversions at Isleta, causing insufficient water to operate Socorro Division without river diversion. Finally, San Acacia dam is contentious issue and subject to separate study. Vigorously supported by enviro activists for largely emotional and symbolic reasons. Bitterly opposed by Socorro irrigators for equally emotional and symbolic reasons. Probably best to delete it entirely from this report.

Agree this is controversial and technically complex. Text qualified accordingly.

Page 1, insert after “Despite these For 2001 season”:

“The following conclusions do not reflect reality, are based on assumptions that appear to be false, and therefore MRGCD does not agree with them.”

These conclusions are based on gaged data for the 2001 season, QA’d and provided by the MRGCD, in combination with reasonable assumptions for unmeasured system parameters. The quantitative evaluations can and should be revised annually, as new data become available.

Page 1, insert following “River Diversions” part. “The 2001....achievable.”:

“These diversions do not include downstream redirection of return flows.”

The term, “river diversions” means the sum of water physically diverted from the river at the four diversion points. The origin or prior use of the water diverted at these locations is not described. Text is revised to clarify.

Page 2, change at “District Net Water Use” subheading to read:

“With estimated237,000 acre feet.” ~~The net water use cannot be isolated from this lumped quantity until the Socorro Division outflow becomes gauged, and, therefore, is unknown at present.~~ The net water use can be estimated. “When theuse or efficiency.”

The net water use could be estimated if assumptions were made for quantities of arroyo inflow, changes in groundwater storage, river seepage to riverside drains and Socorro Division outflow. In the future, when data are available to quantify the net water use, it should approximate the division's consumptive use for irrigation and delivery. However, we do not see the value of this term in assessing operational efficiency at present.

Page 2, at "Ratio of Composite Division Supply to District Supply", change to read:
"The composite division, defined, is assumed to be approximately 660,000 acre feet per year."

This number is largely based on gaged flows provided by the MRGCD. No change has been made.

Page 2, at "Ratio of Composite Division Supply to District Supply", add following "On the other hand,losses.":

"This is a contradictory statement. Carrying water through the conveyance system is beneficial because carriage losses there are demonstrably less than those in the river."

As noted, a comparison to conveyance efficiency within the MRGCD system to conveyance efficiency in the Rio Grande is outside of the scope of this study and has not been evaluated. This statement only notes that over-diversion into the irrigation system could reduce water in the Rio Grande at adjacent reaches.

Page 3, change to read:

"Identify channel capacity.....and drains" with the below sentence. Return flow gages at certain outfalls may not be practical because they would have immeasurably low flows."

This bullet is referring to measurement of channel capacities, not gaging of flows. Channel capacity can still be determined in canals and drains that typically have very low flows.

Page 3, insert:

- "Quantify ~~river~~ conveyance losses in key.....District."

This bullet does refer to river seepage losses, not canal seepage losses. Quantification of canal seepage losses is listed in a previous bullet. However, in response to this comment, we have inserted the word "seepage" after "river", and hope that change clarifies our meaning.

On page 3, insert:

- "Develop linksriver, and vice versa."

We assumed that the links would address interactions in both directions, but have added language to clarify this.

On page 4, insert:

- "Creation of an Irrigation Advisory Service (IAS), with assistance from these agencies."

We have changed this to say: “Creation of an Irrigation Advisory Service (IAS), possibly with assistance from Federal agencies that currently provide IAS services.”

On page 4, Section 9.2. change to read:

“Interdivision outflow from this, through the ~~Angostura Drain~~. Algodones Drain.”

Corrected.

Page 4, Section 9.2., insert at the end of the “Characteristics of the Cochiti Division contributing to lower efficiencies include”:

- “Measurements are necessary to quantify the amount of diversions and return flows within Pueblo lands.”

The text after this bullet list has been modified to read: “Quantitative evaluation of conditions in this division is difficult due to the lack of data on key inflow and outflow parameters. These include drain and tailwater returns to the Rio Grande, and flows into and out of Pueblo Lands.”

Page 6, Section 9.2, insert:

“Evaluate lining of canals or piping of reaches of major canals where feasibleis a problem,”

Cannot identify sentence in question. But, in general, an evaluation should consider feasibility, this is understood.

Page 7, Section 9.2, insert after the “ Addressdeficiencies.”

- “Consider small farm economics and quality of life issues.”

Language has been added to address this comment.

Note: The following comments relate to Section 2, and are repeated from the comments on Section 2 earlier in this document.

[Section 2] Page 4, 4th paragraph:

“The US Bureau of Reclamation (USBR) rehabilitated part of El Vado Dam, and rehabilitated irrigation and drainage works with MRGCD funds, and performed river channel maintenance.”

Federal funds were used for this work, with a repayment schedule established. No change made.

[Section 2] Page 5, 1st paragraph:

“Extensive rehabilitation work was performed on canals, laterals, drains, and acequias by the USBR between 1953 and 1961 and MRGCD took over O&M in 1975.”

The text of the report has been modified to reflect this comment.

[Section 2] Page 5, 4th paragraph:

“This reservoir was constructed by the district in 1935 with a total storage capacity of 198,110 acre-feet, since reduced by sedimentation to approximately 180,000 acre-feet.”

The text of the report has been modified to reflect this comment.

[Section 2] Page 6, 2nd paragraph:

It is currently operated by the USBR under an agreement with the MRGCD.

The text of the report has been modified to reflect this comment.

[Section 2] Page 7, add to the end:

“Cochiti Reservoir was authorized primarily for flood control purposes and is not available to the District for water storage or re-regulation of El-Vado releases or flood flows.”

The text of the report has been modified to reflect this comment.