Middle Rio Grande – San Acacia
Hydraulic Modeling Analysis
Comment Responses

Prepared for:
US Bureau of Reclamation
Albuquerque, New Mexico

Prepared by:
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#	Page	By	Comment / Response
1	various	Jaubuchon Dbaird	Editroial comments were made throughout the report. A majority of these comments were incorporated into the report.
			A majority of these comments were incorporated into the report.
2	1	Jaubuchon Dbaird	Not sure what the intent of this sentence is, begins "Interest is...". You may want to consider removing it entirely from the report. Drew made a text suggestion that has been accepted to clear up the intent of the sentence.
			The following text has been replaced ~~Interest is the evolution of the river is important to understand current and future trends.~~ Past and current trends are important to understand for better implementation of river management and maintenance practices.
3	1	JAubuchon	I noticed that the figure shown is the cover page of the RM 111 levee setback project. This reach has actually had two levee setback projects. One at RM 113/114 which is currently completed and one at RM 111 which is currently being constructed. It might be better to show a GIS map showing both of the setback areas. We could provide this as a pdf or another format if you would like.
			Maps provided by the USBR has been placed in Appendix A, which shows both levee setback projects.
6	4	Dbaird	It would be good to insert here a brief summary of the flood control acts of 1948 and 1950 which authorized Reclamation's activities.
			Text has been added to the report in reference to the Flood Control Act. The information was obtained from previous documents written by CSU.
7	4	Dbaird	Suggest adding a summary paragraph which summarizes anthropogenic effects upon the river…irrigation, water withdrawals, channelization, levee and drain construction and maintenance, upstream reservoirs etc. You have a copy of the River Maintenance Plan Part 1 which has nice information on the anthropogenic actions and effects.
			Additional text has been added regarding the anthropogenic effects. The information was obtained from previous documents written by CSU and the River Maintenace Plan.
8	5 to 6	JAubuchon	Corrections to GIS Exhibits
			Figure 2.1 to 2.3 have been corrected.
9	10	Dbaird	There should be some brief rational for why these four subreaches were selected. You can provide references to later sections in the report if needed.
			Text was not added to the report to explain the subreach delineation because the reach were divided by Reclamation, in the previous San Acacia Reach Report from 2003. The report written by Reclamation has been referenced as USBR 2003.
10	10	Dbaird	I added this statement because there are other data recorded earlier which I think are in a water supply paper which you don't have the time to look up. Thus the words USGS website were added
			We accept the change.
11	13	Dbaird	Figure 2.7 should come before Table 2.4.
			The location of the Figure has been changed to come before the Table.

#	Page	By	Comment / Response
12	16	Jaubuchon Dbaird	If you are using the GIS channel planforms Reclamation provided then these were derived from the aerial photography. If this is true then the observations are based on just aerial photography since the GIS channel planforms are just a derivative of the aerial photography. The sentence makes it seem like there are two independent data sources from which data is derived and this is likely not the case.
			Text has been added to clarify the confusion and state that there was only one data source.
13	16	Jaubuchon Dbaird	Not sure if inappropriate would be a better word choice than inapplicable. Drew suggest text…Instead of "deemed inapplicable" the following was used "were determined to not apply to this reach"
			Text change suggested by Drew has been implemented.
15	19	Dbaird	Replace Figure 3.2 with one which is more legible.
			The Figure has been replaced, but the quality was only slightly improved. This is due to the nature of the original file.
16	21	Dbaird	Replace Figure 3.4 with one which is more legible.
			The Figure has been replaced, but the quality was only slightly improved. This is due to the nature of the original file.
17	22 - 23	Dbaird	Figure 3.6 - Did the river change plan form during this period of time? In other words did it change from braided at 5,000 cfs, to straight single thread at 5,000. If so, the a title “Historical Planform” is ok and this change in planform should be described in the text. If you have evaluated that the planform did not change then the title should be “Historical Plan view”.
			Text has been moved so that it is clear why Figure 3.6 is labels as "Historical Planform". The delineation is of the planforms, which are based on the planview of the areial photographs.
18	23	Dbaird	Just a comment to check to make sure this statement is included in the width section
			The statement about the width of subreach 3 is not correct. It has been modified to explain the true condition.

#	Page	By	Comment / Response
20	25	Jaubuchon Dbaird	Just a question to consider - by calculating a valley length over a short stretch, such as a subreach, would this measurement be representative of the true valley length. The valley length should be measured as the centerline between lateral constraints such as levee's or geologic formations. This description sounds like you followed the channel thalweg to measure the valley slope. ?? is that what was intended. See Jonathan's comments for the Galesteo report.
			By placing smaller reaches and subreaches within the Middle Rio Grande we are providing a relative sinuosity of the river within the San Acacia reach. This is not a sinuosity of the overall river. It shows that even though the channel was straightened due to channelization it has a tendency to slightly meander within the river extents (i.e. valley) The valley where the Escondida Reach is located is relatively straight. The channel was measured along the thalweg, the valley was measured based on lateral constraints.
22	25	Dbaird	How does this data compare with statements in the planform section about some areas of local meandering?
			The following text has been added: From aerial photographs subreach 3 suggested a tendency towards a meandering planform; however, the sinuosity analysis does not show a meandering planform. This is because it looked at the overall channel and not a the few locations where river has a tendency to meander.
24	26	Dbaird	I suggest deleting this sentences associated with Elephant Butte and the LFCC. This is because there is a lot more to water delivery aspects of the LFCC than a low Elephant Butte reservoir.
			We accept the changes.
26	27	Dbaird	There are sizeable changes in bed elevation over this period of time. It appears that this statement oversimplifies some significant changes. Putting a graph of reach length weighted energy grade line slopes through time would be useful and would support conclusions. The data from the Hydraulic calculations section would be appropriate to use. You could reference the appropriate section for a discussion of how the data was developed.
			Though it would be useful to provided a weighted energy grade line information, that data set is different from the SO line data set. However, the authors have opted to add two additional graphs to clarify and remove the over simplification that was previously used to explain the phenomenon.
27	27	Dbaird	How can the slope remain in equilibrium with the width changes? See my above comment on this same paragraph. Somewhere…perhaps near the end of the report it would be useful to discuss how slope, width, sediment load, and discharge all relate and their interdependence.
			The concept of dynamic equilibrium was used to suggest that the river is changing from aggradation to degradation and so on. This line has been remove to reduce confusion.
28	28	JAubuchon	See attached Excel spreadsheet. For four plotted cross sections we did not experience this same elevation mismatch. The 2005 survey would have been done in the NAVD 88 datum, earlier cross sections, especially prior to 2000 will need to be adjusted as they are in the NGVD 29 datum
			That is why the discrepency was noticed in the San Acacia Report. There seems to be a 2.4 foot datum shift. The data has been corrected.

#	Page	By	Comment / Response
29	28	JAubuchon	Was this change done comparing the original aggradation-degradation data or the agg-deg data from Reclamation HEC-RAS models? The HEC-RAS models were typically adjusted by the TSC in Denver by modifying the in stream channel portion (lowering the bed elevation iteratively) to minimize the error difference between the observed wetted width from the aerial photography and the HEC-RAS model results for wetted width. If they are from the model then these would be fair representations of the mean bed elevations. If from the original agg-deg data the data would just show the water surface elevation at the time of the aerial flight and I think that may bias the results considerably.
			The mean bed elevation is based on the modified Agg/Deg.
30	29	Dbaird	Is this total a distance weighted average?
			The average is not based on a weighted average but a straight average. This was used because there was very little difference in reach lengths from cross section to cross section.
31	29	Dbaird	San Acacia Diversion Dam is about 5-6 feet high. It is unlikely that it reduced downstream sediment supply except during the period right after it was constructed in the 1930's. However, there is generally more sediment diverted per unit water than is in the river. This would be a better explanation along with the overall reduction in sediment from the Rio Puerco and the Main stem due to upstream reservoir construction.
			A USGS article about the reduced sediment supply from the Rio Puerco was used and provides an explanation of the degradation.
32	29	Dbaird	San Acacia diversion dam also controls the river grade.
			This has been stated.
35	33	JAubuchon	I would suggest giving a drop/year rather than actual figures unless you include the time span for the observed drop
			The time period and the overall drop were used instead of the actual elevation values.
36	34	JAubuchon	at 5000 cfs?
			The word bankfull flow of 5000 cfs is added to the text for clarification.
37	34	JAubuchon	Suggest rounding off numbers to same significant figures as other tables
			Significant figures have been corrected on all tables.
39	35	JAubuchon	Value is missing
			The tables have been fixed so that no values are missing.
41	34-35	Dbaird	In subreach 3 and 4 the channel area, wetted perimeter, all go up and velocity goes down. Potential causes should be described in this section or in the results summary section. One concept is that there has been deposition in reach 4 after 1992. This deposition could have caused these changes.
			Based on the data for all 4 subreach the channel area and wetted perimeter decrease and the depth increases. Since the width decreases the velocity increases to pass the same amount of flow through the channel. Explanations will be provided in the conclusion to explain the changes.
44	39-40	Dbaird	Replace Figures 4.1 and 4.2 with a better copy.
			The figure has been update
45	40	Dbaird	How is the main flow area defined. Is based on width or discharge .
			The largest portion of the main flow was evaluated based on cross sectional area (i.e. a combination of both discharge and width)

#	Page	By	Comment / Response
47	41	JAubuchon	It seems an assumption is being made that the bedform spatially dominating the channel is the one being compared against the equations. In many cases the Rio Grande in regions where it is a sand bed region there are 1-2 channels that seem to carry the bulk of the flow. These regions are separated by inundated bars that also contain flow, but a much less proportion of the flow. Spatially these shallower areas may dominate the cross section, but if you are using the discharge from the gage stations the bedform in the portion of the channel containing the bulk of the flow may be more applicable . Also as I think you mentioned later on - observations can be subjective and more than one observer may have a biasing effect on the consistency of the field observations.
			The dominant bedform was selected from the actual field notes as the bedform that covered the largest portion of the main flow area in a cross-section. As you mentioned the results are subjective and thus more data is needed for better prediction.
48	41	Dbaird	Cross Sections in HEC-RAS can be divided up into sections of equal conveyance (I believe) then the depth, shear stress, and other parameters could be determined separately for each subsection of the total cross section where a particular bed form is found. This would likely make the results more comparable to the phase diagrams for ripples, dunes, antidunes, etc. This would address Jonathan's comment.
			At the time of the analysis this was considered and used for determination of hydraulic parameters. Based on the available data additional data would be needed to make this a more reliable study.
49	42	JAubuchon	Suggest adding an introductory sentence stating figure 4.4 is looking at cross sections where dunes were observed
			An introductory sentence has been added.
50	42	Dbaird	This result is actually pretty good 75% fitting the phase diagrams. See my comment above which should improve the % which fits a given phase.
			See comment from page 40.
51	43	JAubuchon	Suggest adding an introductory sentence stating figure 4.5 is looking at cross sections where anti dunes or plane bed formations were observed
			An introductory sentence has been added.
52	43	Dbaird	This result is actually pretty good 75% fitting the phase diagrams. See my comment above which should improve the % which fits a given phase.
			See my previous comments for dunes and ripples
53	44	Dbaird	This conclusion would change with the additional analysis.
			The conclusion was not varied since HEC-RAS local parameters were used.
54	46	Dbaird	Any way to improve the quality of Figures 5.1 and 5.2?
			These figures were obtained directly from the journals. The only way to improve the quality is to recreate the file.
55	49	Dbaird	I suggest clarifying whether these values are the average of the peak mean daily discharge or the average of the instantaneous peak flow. How did you determine the average 5 year peak for the data sets for which there is less than 5 years between them? I suggest that you describe how you obtained these values and why you chose the 5 year peak discharge instead of the 2 year.
			An empirical width relationship was developed for the San Acacia reach based on active channel widths determined from GIS channel planforms and peak flows for the 5 years prior to the survey date (Knighton 1998). Knighton (1998) suggests that it is the high magnitude, low frequency floods that may control the channel form in arid-zone rivers where the flow regime is very variable. For the hydraulic geometry equations, the peak discharge from the 5 years prior to the survey was used.
56	49	Dbaird	Table 5.2. Width is not an input parameter for any of the equilibrium state predictors. These values are included in figure 5.5.
			The widths shown in Table 5.2 are width inputs for Figure 5.3. It is used to develop a regressions equation that compares flow rate to width. The widths in the other figures are calculated based on equilibrium equations.
57	49	Dbaird	Figure 3.13 does not necessarily show that the channel is continuing to narrow. It shows that the width has recently increased and then decreased to about the late 90's value. I think that these predictions showing lower width than the latest could suggest that the channel may narrow at least when compared to the rivers used in the development of these 3 methods.

#	Page	By	Comment / Response
			Based on the this analysis the measure widths are still slightly larger than the predicted widths; however the channel is still narrowing suggesting that the equilibrium has not been achieved and that the channel may still narrow.
58	49	Jaubuchon Dbaird	Why? Blench method over predicts.
			Because it is based on flume data
62	52	JAubuchon	Not sure if this should read "coefficients may be..." or "coefficients are..."
			This has been changed to read the coefficients are a function of…
63	57	JAubuchon	Please clarify as this was confusing. The regressions are smoother than what to the existing data?
			Overall, both regressions seem to match well, thus produceing a smoother regression to the measured data and show a reasonable trend.
64	57	JAubuchon	Why? Is it because it is close to the measured GIS widths or is it because W2020 and We are almost the same?
			This is because the equilibrium and 2020 widths are almost the same.
65	58	JAubuchon	spell out BORAMEP here and not in the paragraph below
			This has been corrected.
69	59	Dbaird	The wash load should be subtracted from the BORAMEP calculations. The other 5 methods calculate total bed material load and do not calculate (use depth integrated samples) to estimate wash load, but BORAMEP does.
			This has been corrected. The bed material load is compared to the methods. The MPM cannot be compared.
70	59	Dbaird	Move Table 5.9 after Figure 5.9
			This has been moved.
71	59	Dbaird	It is not clear how the regression was estimated. There was a regression curve at the San Acacia Gage using BORAMEP. Were BORAMEP calc's done in each subreach? I don't think there is the data available to accomplish this task. Please describe how the regression equation was developed.
			This is explained in greater detail in the methods section. Here is more information: A combination of suspended sediment samples from the San Acacia gage and bed material samples from the range lines were used as inputs into BORAMEP to determine the total sediment load at each location, since suspended sediment measurements were only measured at the San Acacia gage. Than the calculated total sediment load at each gage was plotted against the water discharge. A power regression is fitted to the data set and the total sediment load is determined at a discharge of 5,000 cfs.
72	59	JAubuchon	Various Editorial Comments
			Changes were made
73	60	Dbaird	How was this done? Was there an actual stream gaging measurement together with bed material sample size and a depth integrated sediment sample for each of these data points in earch reach?
			This is explained in pervious comment.
74	61	JAubuchon	Are all these equations equally applicable to the Rio Grande on this reach? If they are not than averaging should not be expected to get closer to any "real" slope any more than the individual slope results.
			They were not necessarily created for the Rio Grande that is why multiple equations were used. The averaging was intended to show a general magnitude not to suggest that it would get closer to the actual slope. The average has been removed.
76	61	Dbaird	Table 5.11 - Average of all the methods? Clarify please. Standard Deviation would also be useful
			The average is not a useful indicator. It has been removed. The results have also be compared to the bed material load not the total load.

#	Page	By	Comment / Response
77	61	Dbaird	Put in a table which shows the computed average, and the measured slope and the % change needed.
			This has been added as Table 5.12
78	61	Dbaird	There are some significant questions about this analysis which should be addressed prior to developing conclusions.
			Changes have been made
80	62	Dbaird	It would be a good idea to show a table supporting this statement.
			A reference to the tables have been added.
82	63	Dbaird	What other methods? Show table of data supporting this statement.
			Seems repetative from what is show in Table 5.5, 5.7 and 5.8. A reference has been added
83	64	Dbaird	Mention here the increase in width in subreaches 3 and 4 since the mid 1990's and then decreasing again poit 2002.
			Subreaches 1 and 4 decrease in both channel width from 1962 until 1999, then increase from 1999 to 2005, while subreaches 2 and 3 decrease from 1962 to 1999, than increase from 1999 to 2002 and deceases again from 2002 to 2005. This is potentially occurring because the river is still trying to balance the amount of flow transported with the amount of available sediment.
84	64	Dbaird	It would be a good idea to report your own observations about the channel classification…similar to USBR 2003? are fine.
			The results of the channel classification methods indicated that the channel was primarily straight and or braided channel. A comparison between the USBR study and this study is provided in Table 3.2. The comparison shows that there is some variability between the two studies.
85	64	Dbaird	There is data going to 2002 please clarify.
			Baird provided data on mass curves until 2005. This was also used to aggument the findings in the Escondida reach report.
86	64	JAubuchon	Not sure about this. The San Acacia Diversion Dam was constructed in 1934. The LFCC was first built in the late 1950's and then rehabilitated in the late 1980's.
			Your comments are true. I have modified the text to explain the vertical degredation better.
88	65	JAubuchon	The tables show the magnitudes of change? This is what it appears to be but it is unclear.
			This is true. We have added text to clarify.
90	65	Dbaird	How don't they agree?
			One analysis suggest aggradation while the other shows deggradation.
91	66	JAubuchon	Is this a reference to Cochiti dam as the San Acacia Diversion Dam was much earlier (1934)?
			This is associated with closure of Chochiti Dam not San Acacia Dam.
92	67	JAubuchon	See previous notes on when San Acacia Diversion Dam was built
			The comments is associated with consturction and operation. I am aware that San Acacia diversion dam was built in the 1934 and rehabilitated in 1957. It also provides water to the Soccoro Main Canal.
94	69	JAubuchon	should this be increase?
			The text has been changed from decrease to increase. Thanks
96	69	Dbaird	I suggest another set of results based upon 1962 to 2002. This may be a better indicator since this is a longer period of time over which to estimate changes. It is not likely that a new dynamic equilibrium is reached within 10 years. The large change in sediment was after 1972. Prior to 1972 the changes were most likely channelization. Also, annual peaks at the San Acacia gage should be shown and used in this comparison.
			A 1962 to 2002 comparison has been provided. Annual peaks are shown in section 2.
			Q does not change by reach unless you are estimating channel seepage losses. Q bankfull may change by subreach, but Q input does not except for tributary inflow which is relatively small, and infrequent. Q channel forming…depending upon your specific definition should not change by reach. Sediment is supplied at the upstream of the reach and can change to downstream subreaches by either aggradation or degradation. Are you comparing theroretical transport capacity by reach for this analysis? Transport capacity may change by reach.

#	Page	By	Comment / Response
97	69	Dbaird	*Both the San Acacia (SA) and San Marcial (SM) gauges have similar flow trends. Both curves show breaks around 1979 and 2000. In about 1979, the discharge increased from approximately 600 cfs to over 2000 cfs. A similar increase in discharge was observed in the San Felipe, Cochiti, and Rio Puerco reaches (Bauer 2000, Novak 2006, Vensel et al. 2005). However, the increase in discharge was not as great as in the Escondida reach. At the break around the year 2000, the gauge at San Acacia decreased from 2900 cfs to 1000 cfs, and the gauge at San Marcial decreased from 2200 cfs to 750 cfs. Refer to the Escondida Reach Report. In addition, there is less flow reaching San Marcial.*
98	69	Dbaird	I suggest another set of results based upon 1962 to 2002. This may be a better indicator since this is a longer period of time over which to estimate changes. It is not likely that a new dynamic equilibrium is reached within 10 years. The large change in sediment was after 1972. Prior to 1972 the changes were most likely channelization. Also, annual peaks at the San Acacia gage should be shown and used in this comparison.
			Look at Makar 2010, suspended sediment mass curves show a in reduced sediment supply post Cochiti and not before 1972. So, it does not appear that USGS data supports this conclusion. How can there be an increase in discharge when there are only some small ephemeral tributatires between San Acacia Dam and Reach 4? It is not clear what data supports this statement.
			How can there be an increase in discharge when there are only some small ephemeral tributatires between San Acacia Dam and Reach 4? It is not clear what data supports this statement.
			These comments were connected so I have put them together. They are in reference to the Schumm model. Additional analysis has been done to compare 1962 to 2002. In addition, clarifications have been made to the text since it was unclear.
99	71	JAubuchon	See notes on when San Acacia Diversion Dam became operational
			It is a combination of the San Acacia Dam and the Cochiti Dam. More the operation of these facilities has a potential impact. This facitility provides flows to the Soccoro Canal.
100	71	Dbaird	I will send you the 1996 data and all suspended sediment data I have.
			Thanks. This information has been incorporated.
101	71	Dbaird	Again, I'm not sure where this comes from?
			The trigger looks at the pluses and minuses in Table 6.4. If one of them is different from the other responses that that is the trigger.
102	71	Dbaird	Figure 19 in Makar 2010 shows a change in water sediment relationship between 1962 and 1972. There was more sediment per unit water then from 1955 to 1966, and less than from 1975 to 2005. Figure 19 in Makar 2010 indicates that there is a reduction in suspended sediment per unit water, so this is accurate.
			The Schumm model is not the same as the data from the USGS. Text has been added and should support Makar 2010.
103	71	Dbaird	Again the changes from 1972 to 2002 would be good to group together since this is the period of change in the water and sediment relationship. Also, did you look at like how annual mean daily peak flow changed through this period of time. This could be done by preparing a mass diagram of maximum mean daily peaks vs years. A 10 year moving mean of the maximum mean daily peak flow would also be useful.
			A change from 1972 to 2002 has been added. Nothing new is necessarily observed. The mass diagrams were created in the Escondida Report. Since the reports were written at the same time and referenced the same gages this information was not copied to this report.
104	71	Dbaird	It would be a good idea to give a definition of dynamic equilibrium. Like the channel will tend towards balancing sediment supply with transport capacity but that channel position and local width/slope etc may change. Hydraulic geometry are reach average predictors.
			A stream classified as being in dynamic equilibrium does not have to be static. It will exhibit temporary morphological changes in response to the impacts of extreme events or even extended periods of low flow. It will take time (recovery time) for a moderate event to restore the stream; this is considered a river which is dynamically stable.
			What is the equilibrium width? We don't really know for this reach. I think you should state that a given reach appears to be tending towards this dynamic equilibrium width, and Blench results are much larger. The earlier text in this report should be edited to add this concept as well.

#	Page	By	Comment / Response
105	72	Dbaird	*The hydraulic geometry equation developed by Blench (1957) over predicted the equilibrium widths for all subreaches ranging is width from 1200 to 2400 feet. This occurred because the Blench data was based on flume results. Simons and Albertson (1963), Nouh (1988), and Julien-Waradalam (1995) all predicted similar equilibrium widths between 250 ft and 350 ft. The consistent prediction by these three methods indicates that they may be the most effective in predicting a dynamic equilibrium width condition for this reach, but the river is still changing.*
106	72	Dbaird	As included in previous comments it is unclear how subreach sediment concentrations were developed. Also, base upon previous comments is this a valid analysis?
			The incoming suspended sediment concentration is estimated from a combination of gage data and range line data for each subreach and the total reach, the equilibrium widths for the channel were all about 150 ft.
107	72	Dbaird	Restate measured slope here
			The slope has been restated.
108	72	Dbaird	State how compare with measurements and re-state measurements.
			The measurement has been restated and compared.
110	73	JAubuchon	include year
			The years of the study were added.
113	74	Dbaird	Give range similar to sinuosity
			The range of sinuosity have been provided.
114	74	Dbaird	Give measured slope changes…complete reach average would be great.
			The measured slope changes have been provided.
115	A-2	JAubuchon	This is an older map may want to update this
			New maps have been provided and included.