FMM Feasibility VE Study - Comments

Proposal	Civil	PM	Structures	Geotech	H&H	Environmental
#1						
Realign ND diversion East of the Sheyenne River & protect Harwood, ND with ring levees.	The ND alignment is a locally preferred alignment and therefore they chose the locations to be taken out of the flood plain to include Harwood. By placing a ring levee around Harwood it would defeated the local sponsors goal of eliminating the small town from becoming isolated each flood season. In addition, the Federal Government would not be able to play a role in a ring levee proposal for the town of Harwood because the Benefit to Cost ratio is not above 1.0 and therefore the local sponsors would have to come up with other means on their own to accomplish this proposal in full.					
#2						
Realign MN diversion by shortening channel & re-orienting outlet works.	This proposal is to realign and shorten the MN diversion by shifting the alignment to the West of Kragness. The alignment is to include the town of Kragness to eliminate their flooding from the Buffalo River which is to the East of the town. If the channel were aligned to exclude the town of Kragness it would also make the city of Moorhead feel as though they are being squeezed for future development which was not acceptable for their city's acceptance of the MN diversion alternative.				Figures 2 & 3 regarding the outlet design and location of the MN alignment were agreed and completed during phase 3 of the feasibility study.	
#3						
Begin ND diversion channel further North.	Again, the ND alignment is a locally preferred alignment and therefore they chose the general location for the inlet. Their reasoning for the location of the inlet being further South than the MN alignment was to accommodate the city of Fargo's current future plans of development and to protect the city from the Wild Rice River flooding to the South.	To eliminate and relocate the 10 houses of Horace will not be acceptable to the Locally Preferred Plan sponsors.			With the new location proposed of the inlet structure it is very probable that a control structure of some sort will need to be placed at the intercept of the Wild Rice River and the Red River of the North due to the amount of water build up that will occur. This is a similar concept to the extension channel on the MN alignment that was needed for conveyance, no structure at the proposed ND inlet on the Wild Rice will potentially disrupt the design of the channel.	
#4						
Redesign Wild Rice Diversion for MN alignments.	Agreed…This is a possibility to consider during plans and specifications if the MN alignment is chosen.					
#5						
Replace bridged crossings with at grade crossings.			The level of design that has been done is only feasibility level and for the purpose of feasibility the cost needs to be as close as possible to construction cost and therefore actual bridges were only considered at this stage. This is an option to look into during plans and specifications as each crossing will need to be considered individually. The major issue with this idea is the impedance it will cause with the low flow channel. The purpose of the low flow channel was to continually pass enough flow through the channel so that it did not change the environmental habitat that will be meandering through for example the northern end of the ND alignment. This idea will require the concurrence of the natural resource agencies, the safety council for the required work to patrol the roads during every rain storm as well as the hydraulics department to ensure the overall channel purpose will not be affected. This is a possibility for cost savings and will be considered during plans and specifications.			

#6						
Realign North end of ND diversion/outlet further South.	As the ND alignment is a locally preferred alignment the inlet and outlet locations were generally chosen by the local sponsors. During plans and specifications the exact locations will be further surveyed and analyzed for project acceptance and local sponsor acceptance.					
#7						
Construct U-Channel through areas of multiple bridges.				This is a possible betterment that could be considered during plans and specifications, but additional geotech modeling would be required because of the poor stability with the interaction of the Brenna and Argusville interface around 30-35 feet below ground surface.		
#8						
Redesign intercept inlet works.			Concepts #4 & #6 should be farther examined during the plans and specifications stage of the project.	After completeing phase 3 design of the channel two significant changes have been made. The channel was having stability issues with the depth of the channel on the ND alignment and the MN alignment was having uplift issues with the Buffalo aquifer. To eliminate these issues both alignment designs now include a minimum of a 50 foot bench to increase the neutral block on global stability analysis. The second alteration to the design was side slopes being maintained at a 7:1. Drawing #2 of the proposal shows the invert 72" pipe being raised, this would cause too much errosion for stability purposes of the channel. Drawing #3 reverts to a side slope of 3:1, this is also not possible with the requirements of stability factors of safety.		
#9						
Raise in city protection to 100 year level		Due to the phase 3 hydrology of the synthetic events and calibration with the 2009 flood event it has been found that the cities of Fargo and Moorhead now have never faced a 100 year event. The cities goal of passing a 100 year event with a stage no greater than 30.0 feet at the Fargo gage and a 500 year event with a stage no greater than 36.0 feet at the Fargo gage is now no longer feasible with the 25K cfs plan. It has been determined that the National Economic Development plan through further analysis is the MN 40K plan. The cities have come to agreement that the ND 35K cfs plan provides enough protection and is what they can afford, therefore the ND 35K plan is now compared with what is known as the Federally Comparable Plan, FCP, the MN 35K plan. The FCP is the plan that provides equal benefits to the Locally Preferred Plan. In conclusion, it is no longer possible due to the development in the hydrology and hydraulics for the cities to raise their in town level of protection to the 100 year, without sacrificing a dramatically large levee footprint along the Red River of the North.				
#10						
Railroad yard relocation.	Due to the constraints of the Buffalo Aquifer it is as impossible to construct the diversion channel East of BNSF's rail yard as it is for them to shift or expand their rail yard any farther East. This was learned in a conference with BNSF where they explained to the FMM PDT that their last refueling station lies just East of their rail yard and they had looked into expanding East, but were not able to because of the Buffalo Aquifer proximity the rail yard.		The other part of this proposal involved constructing the diversion channel through the rail yard. After the conference with BNSF they explained that this was not an acceptable design option for them due to safety and operation. The safety factor included for them how dangerous it is to have a car derail over the diversion channel in the yard, where they would have to drag it off the bridged rail yard. The operation for the rail yard required that they not be interrupted with this construction and if they are to make use of their existing rail yard while under construction they expressed the need for an ulternate functioning location because they would not be able to shut down the main line or any switching on bridges even if they were temporary.			