Red River Floodway Expansion Project
Notice of Alteration
Response to Questions

Question

1. Table 2 shows a substantial reduction in shear stress between the 2004 and 2006 projects for the CEMR and PTH 44 bridges despite the fact that the now to be unmodified bridges provide a channel constriction. How does this arise?

Response

The values for the shear stresses at the CEMR and PTH 44 bridges shown in Table 2 for the 2006 project are in error. The values should be 26.0 N/m^2 at the CEMR – Pine Falls bridge and 28.0 N/m^2 at the PTH 44 bridge. An updated table is attached. Based on the results of the updated table, the overall conclusion remains the same as that presented in the report. That is, the shear stresses at these bridges are below the shear limit for vegetated till soil, therefore no additional erosion protection on the channel upstream or downstream of the bridges would be required.

Question

2. There is no discussion about the integrity of the St. Mary's Road and PTH 44 bridges during operation when the superstructures are below the channel water level. During design conditions, the St. Mary's Road bridge is completely submerged. Is there a possibility that the decks could be dislodged under any flow conditions, leading to a reduction in channel capacity?

Response

The bridge girders at PTH 44 would be partially submerged and the bridge deck at St. Mary's Road Bridge would be submerged at the peak of the design flood (1-in-700 year event), if the bridges were not modified as had been originally considered in the Floodway Expansion Plan.

The impeding effect of the bridge girders (assuming they stay in place under these conditions) has been recognized in the hydraulic design of the modified channel. However, it is possible that the girders may be displaced from their seats on the piers /abutments, and/or the piers could be overturned due to the lateral load placed on them. If the pier/girder/deck system were to fall into the channel and lie flat on the channel bed, the additional hydraulic effect over what has been adopted for design would be insignificant. This is believed to be the most likely scenario.

If, on the other hand, the bridge deck and piers were to fall in such a way as to block a significant portion of the channel cross section, then there could be a

backwater effect created. This would require, for example, the deck to stand on its side with the width of the deck projecting upwards into the flow, or to fall in a skewed manner into the flow with one end possibly still attached to one pier. Such extreme possibilities could theoretically reduce the channel discharge capacity. However, the creation of a blockage would impose a significant hydraulic thrust on the deck and it is highly unlikely that it could remain in an upright position.

In the extreme case, only 5 per cent or approximately 115 m3/s (4,060 cfs) of the flow passes the St. Mary's Bridge location. It is unlikely that this flow would be totally blocked by the bridge debris. Even if the St. Mary's Road Bridge were to block say 50% of the channel as an extreme example, the gaps provide more than 5 times more flow area per cfs than was available in the passage of the peak of the 1997 flood. It is highly unlikely that the bridge could cause a significant increase in the water level above the design level for the 1-in-700 year event.

In an extreme case at PTH 44, it has been assumed that the bridge "debris" could somehow cause a rise in water level of 1 m above the profile with no failure of the bridge. This extreme case would cause a reduction of the peak capacity of the expanded Floodway by about 1.0 per cent or approximately 40 m^3/s (1400 cfs) if the bridge debris were to withstand the forces exerted on it, without being pushed by the flow into a less upright position.

It would also be consideration at the time if the deck of one or both bridges should be removed. This consideration will be included in the Emergency Preparedness Plan.