

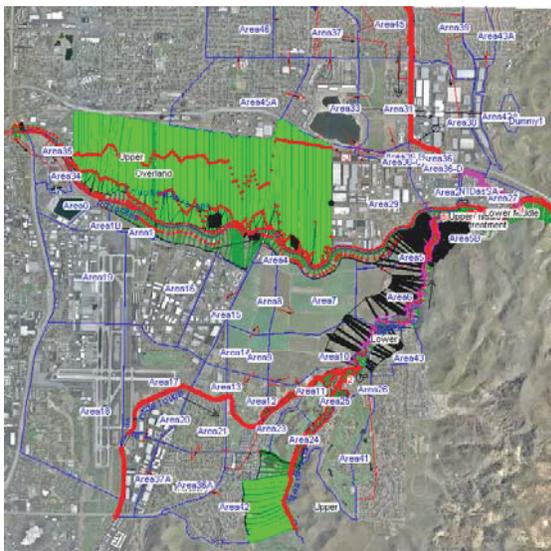


**US Army Corps
of Engineers**
Sacramento District

Truckee Meadows Flood Control Project Reno, Nevada

Attachment B - Hydraulic Design

July 22, 2013



- 5.34. SouthEast Connector.** It should be noted that the potential impact of the SouthEast Connector (SEC) highway, which would be located along the Steamboat Creek corridor, has not been incorporated into the detailed modeling or results discussed hitherto. However, given that one segment of the SEC project is currently under construction, a qualitative hydraulic assessment was performed to determine if cumulative impacts could occur due to the SEC when combined with the Recommended Plan. Additionally, an economic sensitivity analysis was performed to assess potential impacts of a fully-constructed SEC on the economic viability of the Recommended Plan.
- 5.34.1.** As illustrated in the Figure 22, the SEC is a 6-lane roadway connecting the intersection of Greg Street and Sparks Boulevard (City of Sparks) with the intersection of South Meadows and Veteran’s Parkways located south of the Huffaker Narrows. The proposed roadway will be about 5-1/2 miles in total length. The entire project should be completed approximately in April 2016.
- 5.34.2.** The SEC will be constructed in two phases. Phase I extends between the intersection of Sparks Boulevard and Greg Street going south over the Truckee River, over Clean Water Way (without connector), and will terminate about 200 feet south of Clean Water Way. Phase I is currently under construction.
- 5.34.3.** Phase II will extend between the southern limit of Phase I and run southward over the existing Yori Drain (bridge), an at-grade intersection with Pembroke Drive, over Boynton Slough (bridge), over a drainage channel in the golf course (bridge), and an at-grade intersection with Mira Loma Drive. The SEC will continue to run southward through the Huffaker Narrows and connect with Meadows Parkway on the southern end. Portions of the existing Steamboat Creek channel upstream of Mira Loma Drive may be impacted and/or relocated due to the SEC alignment.
- 5.34.4.** The roadway (Phase I and II) will be designed to allow for at least one travel lane in each direction to remain above the pool elevation corresponding to the 0.85% (1/117) ACE event. In addition, the design was required to not impact the water surface in the Truckee Meadows. There are several culverts included under/through the SEC to ensure equalization of water surface elevations on both sides of the SEC. Furthermore, the design includes volume mitigation “borrow” holes/pits to ensure that the volume-stage relationship of the Truckee Meadows is not impacted by construction of the SEC. A no-rise certificate was issued for Phase I of the SEC project by the City of Sparks.
- 5.34.5.** For both Phases, the without-project HEC-RAS model developed by WEST Consultants was used as the initial base model which focused on the 0.85% ACE event. Given the ill-defined situation wherein it is not clear which flood damage reduction (FDR) project will be constructed, the consulting firms have proceeded by simply comparing the with-SEC condition to the without-SEC condition. There is no FDR component to either of these conditions. To date, no modeling has been

performed to determine the cumulative impacts of the SEC in combination with the Corps' Recommended Plan (or in combination with a local interest plan).

5.34.6. As discussed above, it has been demonstrated that just the Phase I portion of the SEC project does not induce an increase in the water surface elevation for the 0.85% ACE event throughout the Truckee Meadows. This conclusion appears reasonable given that although most of the Phase I segment (i.e., with a total length of about 4400 feet) is to be constructed above grade, there is a wide opening under the proposed Truckee River bridge (i.e., the bridge spans about 1400 feet) and there is another opening over Clean Water Way. Additionally, there are two sets of equalization culverts located through the earthen road embankment which are designed to equalize the water surface elevation between the eastern and western sides of the roadway. There are two volumetric mitigation basins which provide volume to offset the volume of the roadway's earthen embankments. Furthermore, this segment is located in the deepest part of the Truckee Meadows floodplain where flood flows emanating from the Truckee River, Steamboat Creek, and Boynton Slough are fully comingled and the water surface elevations should approximate the elevations in the Truckee River, especially under the proposed are equal on either side of the SEC alignment. Nonetheless, it is unknown if there would be a cumulative impact on the water surface elevations if the Phase I portion was combined with the Corps TSP project.

5.34.7. Phase II of the SEC project is currently undergoing final hydraulic analysis and tweaking of the final design to ensure a no increase in water surface elevation condition. A review of the Phase II 50% Design Submittal plans indicates the following:

- 5.34.7.1. Most of the roadway will be located on top of an earthen embankment which is required to ensure that at least two lanes will be above the 0.85% ACE water surface elevation. This requires that the Mira Loma and Pembroke Drive intersections will be elevated compared to their current configuration.
- 5.34.7.2. A series of approximately five bridges are included which allow the SEC to cross the various watercourses in the Truckee Meadows.
- 5.34.7.3. Approximately six sets of equalization culverts are included through the roadway embankment.
- 5.34.7.4. A number of additional structures are included which will act as equalization culverts during a flood event (e.g., a golf cart underpass through the embankment, etc.)
- 5.34.7.5. Several large areas graded to provide volumetric mitigation to offset the volume of the roadway embankment are also included. These volumetric mitigation basins were not identified or completely illustrated on the plans that were provided.

5.34.8. Hydraulic modeling for either Phase I or Phase II was not available for this review and documentation of the hydraulic modeling for Phase II was also not available for this review.

5.34.9. Cumulative Impact Assessment. Given the alignment of the SEC (Phases I and II), it is obvious that the earthen embankment will act as a levee or a dam which will interrupt movement of overbank floodwaters in the Truckee Meadows from moving eastward to drain through Steamboat Creek to the Truckee River. As discussed above, there are a number of design features passing through the embankment to minimize the damming effect.

5.34.10. Hydraulic modeling performed to date for the SEC did not include any impacts from the Corps' Recommended Plan. This situation is of concern since the Recommended Plan will displace large volumes of flood waters from the Sparks commercial area and from the Reno airport area into the Truckee Meadows ponding area. As discussed above, the Recommended Plan results in increases in flood depths in the Truckee Meadows ponding area for the 1% ACE event and an increase in flow going downstream past Vista.

5.34.11. Given that the hydraulic modeling corresponding to the 50% submittal of the SEC Phase II segment is just mitigating the SEC project by itself, it is very likely that the two projects (i.e., the Corps' Recommended Plan and the SEC – Phases I and II) will have a noticeable cumulative impact on flood depths (or stages) in the Truckee Meadows for either the 1 or 2% ACE events. This conclusion is qualitative in nature (i.e., not based on analytical or modeling analysis) and is based on engineering judgment taking into consideration the hydraulic modeling results for the Phase II segment, the familiarity with the Truckee Meadows HEC-RAS model, and the impact of transference of large volumes of flood waters from the Sparks commercial and Reno airport areas to the Meadows' ponding area. A quantitative determination of the cumulative impact will require hydraulic modeling.

5.34.12. Floodplain for Economic Sensitivity Analysis. To facilitate the assessment of risks to the project, an economic sensitivity analysis was performed to assess potential impacts of a fully-constructed SEC on the economic viability of the Recommended Plan. Refer to the section 5.8.5 of the GRR for a discussion of the results of the sensitivity assessment.

5.34.13. In order to provide sufficient data for the economic sensitivity analysis, a qualitative estimate of the increase in stage for the 1% ACE floodplain was developed which assumed a maximum increase in stage of 12 inches due to the SEC. Specifically, as illustrated in Figure 23, the with-project stages were increased by 0, 3, 6, 9, or 12 inches for the HEC-RAS storage areas located in the Truckee Meadows ponding area. In general, the 12 inch increases were located immediately adjacent to the west side of the SEC embankment and lesser depths were used to simulate the tapering of the backwater effect towards the west. The new 1% ACE

depths, corresponding to the with-SEC and with-Recommended Plan features condition, were computed as the difference between the assumed water surface and the ground elevation. The stages at all other locations throughout the HEC-RAS model were assumed to be unchanged from the without-SEC condition.

- 5.34.14.** As discussed above, quantitative cumulative impacts of the SEC will require hydraulic modeling. At the time of this writing, the PDT proposes that hydraulic modeling will occur shortly to validate the assumed impacts and the results will be incorporated into the study documentation.
- 5.34.15.** Impacts to uncertainty values were not considered in the design of the top of levee/floodwall since the bulk of the uncertainties in the SEC impacts are located in the Truckee Meadows ponding area, away from the proposed lines of protection. Again, hydraulic modeling of the SEC will be required to quantify and validate the preceding assumptions.
- 5.35. With-Project Rating Data.** **Table 16** lists the rating data developed for the with-project condition for the index points located on the Truckee River in the Truckee Meadows reach. **Table 17** lists the rating data for the index points located along the North Truckee Drain, **Table 18** lists the rating data for the index point located along Boynton Slough, and **Table 19** lists the rating data for the index points located along Steamboat Creek. These values were used in the economic analysis of the Truckee Meadows reach which constitute economic damage area numbers 3 through 15.
- 5.36. Interior Drainage.** As illustrated in **Figure 3**, the Recommended Plan includes levees and floodwalls along the line of protection. In addition, the plan raises water surface elevations between Highway 395 and Greg Street (see **Figure 10**). Given the ability of the proposed levees and floodwalls to block interior sheet flow from entering the river channel, it can be concluded that the Recommended Plan has the potential to impact the interior drainage of the Truckee Meadows area. Two potential areas where the project may impact the interior drainage have been identified and are shown in **Figure 3**: 1) the north (left) overbank of the Truckee River just upstream of McCarran Boulevard, and 2) the west (right) overbank of the Truckee River just upstream of Glendale Avenue.
- 5.36.1.** In general, the study approach developed for the interior drainage analysis of the Truckee Meadows area consists of the following steps:
- 5.36.1.1. Develop without-project mainstem floodplains for the areas of interest (i.e., already have these as discussed in paragraph 5.14);
 - 5.36.1.2. Develop interior drainage floodplains for the without-project condition;