
**TRUCKEE RIVER MANAGEMENT PROJECT, NEVADA
GENERAL REEVALUATION REPORT PHASE
F-3 MILESTONE CLOSEOUT CONFERENCE
DOCUMENTATION**

DRAFT

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TABLE OF CONTENTS

| | | |
|------|---|----|
| 1.0 | PURPOSE OF THIS SUPPLEMENT | 1 |
| 2.0 | STUDY AREA | 1 |
| 3.0 | AUTHORITY | 1 |
| 4.0 | COMMUNITY COALITION PROCESS | 2 |
| 5.0 | PLANNING OBJECTIVES..... | 2 |
| 5.1 | Flood Damage Reduction | 3 |
| 5.2 | Ecosystem Restoration..... | 3 |
| 5.3 | Recreation | 3 |
| 6.0 | FLOOD DAMAGE REDUCTION UPDATE..... | 3 |
| 6.1 | Revised Hydrologic and Hydraulic Analysis..... | 3 |
| 6.2 | Flood Problems..... | 4 |
| 6.3 | Expected Annual Damages (EAD) at Without-Project Condition | 5 |
| 6.4 | Development of Preliminary Flood Damage for Downtown Reno, and Sparks and Truckee Meadows Area | 6 |
| 7.0 | ECOSYSTEM RESTORATION AS A PROJECT PURPOSE | 10 |
| 7.1 | Significance of Ecosystem Resources | 10 |
| 7.2 | Restoration Projects Currently Under Study..... | 11 |
| 8.0 | PROBLEMS IDENTIFIED WITHIN THE TRUCKEE RIVER ECOSYSTEM..... | 12 |
| 9.0 | ECOSYSTEM RESTORATION OPPORTUNITIES | 15 |
| 10.0 | ECOSYSTEM RESTORATION MEASURES UNDER CONSIDERATION | 16 |
| 10.1 | Passive Restoration of Riparian Habitat | 16 |
| 10.2 | Active Restoration of Riparian Habitat..... | 17 |
| 11.0 | PLAN FORMULATION AND ANALYSIS..... | 17 |
| 11.1 | Process | 17 |
| 11.2 | Preliminary Ecosystem Restoration Alternatives | 18 |
| 12.0 | DEVELOPMENT OF THE COMBINED PLAN | 19 |
| 13.0 | SPONSOR SUPPORT | 20 |
| 14.0 | FINDINGS..... | 20 |

15.0 CONCLUSIONS.....21

TABLE

1. Expected Annual Damages (EAD) at Without-Project Conditions.....6

PLATES

1. General Map – Truckee River Basin1
2. Study Area – Booth St. to Hwy 395 – Reno Reach2
3. Study Area – U.S. Hwy 395 to Vista – Truckee Meadows Reach3
4. Study Area – Vista to Pyramid Lake – Downstream Truckee River Reaches.....4
5. 100 & 500 Year Floodplains – Reno & Truckee Meadows Reaches5
6. Economics Damage Area Boundaries – Truckee Meadows Reach.....6

APPENDIXES

- Appendix A – Hydrology Analysis
- Appendix B – Hydraulic Analysis
- Appendix C – Economic Analysis for Without-Project Condition

1.0 PURPOSE OF THIS SUPPLEMENT

The purpose of this supplement is to address comments relating to the original F-3 Document previously presented in 1999. This supplement reevaluates the hydrology and hydraulic existing conditions, adds economic damages along the Truckee River, and proposes the addition of ecosystem restoration to the purpose of the authorized project. Currently, the three authorized project purposes are flood damage reduction, recreation, and fish and wildlife enhancement. Since the 1999 F-3 Conference, the Corps prepared an information paper in April 2000, a draft feasibility report in May 2000, and an In Progress Review Report in November 2000. Furthermore, a local community coalition has been formed, and they have developed a flood damage reduction alternative that calls for recreation and ecosystem restoration features.

2.0 STUDY AREA

The study area includes the Truckee River in Washoe County, Nevada, at and below Reno, Sparks, and the Truckee Meadows, extending east into Storey County and onto the Pyramid Lake Paiute Tribal lands to the river's terminus at Pyramid Lake (see Plate 1). Because of the vast expanse of land area and extensive length of river miles, the study area was divided into three reaches. The downtown Reno reach extends from Booth Street in Reno's central business district downstream to Highway 395 (see Plate 2). The Truckee Meadows reach encompasses an area along the Truckee River from Highway 395 on the west to Vista and the Virginia and Pah Rah Mountain Ranges on the east, south along Steamboat Creek to Huffaker Hills, and includes Sparks to the north (see Plate 3). The downstream Truckee River reach extends from Vista downstream to the river's terminus at Pyramid Lake (see Plate 4).

3.0 AUTHORITY

The initial Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada, investigation was authorized under a resolution adopted February 7, 1964, by the Senate Committee on Public Works. The resolution directed an investigation of water resource problems in the Truckee Meadows, Reno-Sparks Metropolitan area, and a project authorization under the Flood Control Act of 1954, which authorized interim channel improvement on the Truckee River and tributaries, California and Nevada, for flood control.

The Truckee Meadows Investigation resulted in a project authorized under the Water Resources Development Act (WRDA) of 1988, which reads:

“The project for flood control, Truckee Meadows, Nevada: Report of the Chief of Engineers, dated July 25, 1986, at a total cost of \$78,400,000, with an estimated first Federal cost of \$39,200,000 and an estimated first non-Federal cost of \$39,200,000; except that the Secretary is authorized to carry out fish and wildlife enhancement as a purpose of such project, including fish and wildlife enhancement measures described in the District Engineer's Report, dated July 1985, at an additional total cost of \$4,140,000.”

In addition, authority for this investigation comes from the Conference Report (House Resolution 1905) to the Energy and Water Development Appropriations Act of 1996, which directed the Secretary of the Army to initiate a general reevaluation report (GRR) for the Truckee Meadows Flood Control Project. The present name of the project has been changed to the Truckee River Management Project in lieu of the Truckee Meadows Flood Control Project.

4.0 COMMUNITY COALITION PROCESS

A community-based planning process was initiated by the project sponsors in direct response to the high level of expressed interest in public involvement in finding the most acceptable solution to the regional flooding problem. The Truckee Meadows Community Coalition was formed in 2000, and the local sponsors agreed to work with the Coalition in developing a preliminary alternative that would have broad community support and be included in the Corps/sponsors feasibility study's planning process. A facilitated community-based planning process began, and a diverse array of community members representing environmental, business, and neighborhood groups spend many hours establishing their goals and design objectives.

The Coalition pursued a preliminary alternative that would provide a 100-year level of protection while minimizing or eliminating floodwalls in existing residential neighborhoods, and providing as much open floodplain area adjacent to the river for floodplain management, ecosystem restoration, and parkway purposes. Some of the Coalition members have devoted their time to the Working Group and Hydrologic and Hydraulic (H&H) Modeling Group in developing the Coalition preliminary alternative. The Truckee River hydrology was reevaluated and received concurrence from the H&H Modeling Group as well as the Corps. Because the new HEC-RAS version 3.0 models were being used for hydraulic analysis, it was possible to size and analyze the performance of flood management measures at very specific locations within the floodplain. In March 2002, the Community Coalition provided their alternative for the Corps to consider in their feasibility study. The alternative provided flood protection in downtown Reno with the use of landmark bridges described in Section 6.0, flood protection combined with ecosystem restoration in the meadows, and increased flows downstream to support ecosystem restoration.

5.0 PLANNING OBJECTIVES

The following planning objectives were established and are used in the formulation of combined flood damage reduction, ecosystem restoration, and recreation alternatives to address identified problems and opportunities within the study area.

5.1 Flood Damage Reduction

- Reduce flood damages in the Reno-Sparks metropolitan area from overbank flows of the Truckee River and its tributaries to the fullest extent consistent with Federal participation and community financial capabilities.

- Reduce the potential for loss of life from flooding in the study area.
- The non-Federal sponsors' objective (as a minimum) is to remove the Reno/Sparks metropolitan area from the National Flood Insurance Program base floodplain by reducing the flood risk to no greater than 1 in 100 chance of flooding in any given year.

5.2 Ecosystem Restoration

- Increase riparian habitat along the Truckee River from Reno to Pyramid Lake.
- Restore hydrogeomorphic structure and functions of the Truckee River from Reno to Pyramid Lake.
- Increase wetland habitat within the historic floodplain of the Truckee River from Reno to Pyramid Lake.
 - Reduce nonnative invasive plant species along the Truckee River from Reno to Pyramid Lake.
 - Restore instream aquatic habitat in the Truckee River from Reno to Pyramid Lake.

5.3 Recreation

- Increase recreational opportunities along Truckee River from Reno to Vista.

6.0 FLOOD DAMAGE REDUCTION UPDATE

In February 1985, the Corps completed the Truckee Meadows (Reno-Sparks Metropolitan Area) Nevada Feasibility Report and Environmental Impact Statement with an estimated discharge for a 1 in 100 year event at Reno of 18,500 cubic feet per second (cfs). This flow has been used by the Federal Emergency Management Agency to identify areas subject to flooding for flood insurance purposes. However, incorporating hydrologic data since the mid-1980's has resulted in higher estimated peak flows and the need to update local and regional hydrologic conditions and to perform hydraulic analysis.

6.1 Revised Hydrologic and Hydraulic Analyses

Hydrologic Analysis. Project sponsors from Washoe County, City of Reno, and City of Sparks had concerns about the hydrologic analysis in the initial phases of the feasibility study. Their main concerns were focused on observed peak flows, hydrologic models, and methods to the analysis. These issues were analyzed and addressed in recent work by the study team. The recent flood of 1997 provided highly useful data on the characteristics of a major flooding event within the Truckee River floodplain. The 1997 peak flows at the Reno and Vista gages were revised to 23,000 cfs and 21,400 cfs, respectively, and were used in the calibration of a new

hydraulic model (HEC-RAS) to match observed high water marks. The study team adopted these new peak flow values. After adopting the new peak flow and volume for the 1997 event that was determined in the calibration of the HEC-RAS model, a reanalysis of the design hydrology was needed. Due to backwater effects on rating curve accuracy and malfunctioning equipment at the gages, there was some controversy over the true peak flow at Reno and Vista. A reanalysis of the flow-frequency at the Vista gage involved new methodologies not used in the 1999 F3 Report. As a result, the existing conditions hydrology at Vista has been modified. The results showed that the existing conditions hydrology for the downtown Reno reach remained unaltered; however, the existing conditions hydrology for the Truckee Meadows area was revised. The updated hydrologic data and analysis have been reviewed through the Independent Technical Review process and have been found acceptable for a feasibility-level analysis of flood damage reduction alternatives (see Appendix A).

Hydraulic Analysis. Project sponsors from Washoe County, City of Reno, and City of Sparks also had concerns about the hydraulic analysis in the initial phases of the feasibility study. The sponsors questioned the development of the existing conditions hydrology, as well as the accuracy of the FLO-2D program, which was used in the hydraulic analysis. In response to the sponsors' concerns, new hydraulic modeling was completed using an unsteady-flow HEC-RAS model. The physical features of the Truckee River that dictate flow breakout and floodplain depths can be depicted more accurately with an unsteady-flow model. An unsteady-flow model can also evaluate the complex river-floodplain interactions that are critical in the evaluation of project alternatives. The downstream limit of the updated HEC-RAS modeling is currently Wadsworth, which is farther downstream than the authorized project limit of Vista. The HEC-RAS evaluation of the project alternatives shows peak flow increases downstream of Vista. Future HEC-RAS modeling will extend all the way to Marble Bluff Dam, near Pyramid Lake, to evaluate restoration features that mitigate project-induced peak flow increases (see Appendix B). Existing conditions floodplains have been delineated using the HEC-RAS model, with an extensive amount of data input to precisely represent the physical characteristics of the basin (see Plate 5).

6.2 Flood Problems. The downtown section of Reno is partially in a steeply banked reach of the river. The reach through downtown Reno, also recognized as the central business district, consists of dense urban development with residential, commercial, and public uses, including casinos and hotels. The floodplain will experience a sheetflow of water back into the river from basically two areas where water overflows the banks. During times of high flow, structures within the first several blocks of the river tend to become inundated up to 6 feet or so when the river flows through this part of the city. The downstream section of the area of interest begins just east of Highway 395. The river emerges from the more channelized upstream reach onto a broad plain historically known as the Truckee Meadows. It is this area that receives the greatest inundation of floodflows. Flooding in this area is characterized as volume generated, with ponding due to hydraulic backwater effects backing up Steamboat Creek at its confluence with the Truckee River. This area has several distinct land uses. Included in this reach is the Reno/Tahoe International Airport to the south. Flooding around the airport consisted of sheetflow up to McCarran Boulevard. Also included in this area is the Truckee Meadows and the city of Spark's industrial area. Because of the hydrologic disconnect between the downtown

Reno reach and the Truckee Meadows reach, the plan formulation for flood damage reduction alternatives was done separately in these two reaches.

The Truckee Meadows area is subject to severe flooding from the Truckee River and its primary tributary, Steamboat Creek. The storm events that have produced historically significant flooding in the Truckee Meadows typically occur between November and February, and consist of warm winter precipitation events on snow and rapid snowmelt runoff. These events are usually regional storms of long duration that produce flooding on several adjoining watersheds.

The drainage area of the Truckee River is about 1,500 square miles at Vista. This area is characterized by highly urbanized expanses of floodplain land containing portions of the two incorporated cities of Reno and Sparks. Commonly known as the Truckee Meadows, this area has a long history of flooding from the Truckee River. Five significant floods were recorded within the floodplain in the 19th century, and at least nine floods were recorded in the 20th century. Floods in the magnitude of 20,000 cfs, close to the 1997 event, were recorded in 1950, 1955, and 1963. The most recent flood events occurred in February 1986 and January 1997. The estimated peak flows of the 1986 and 1997 floods are 14,400 and 23,000 cfs, and the estimated return periods are 50 and 120 years, respectively. The 1997 event is the event of record for the Truckee River, a flood that caused over \$500 million in flood-related damages in the Truckee Meadows. Much of these damages occurred in the industrial areas of the cities of Sparks and Reno and at the Reno-Tahoe International Airport.

The existing channel capacity in downtown Reno is 14,000 cfs and decreases to 6,000 to 8,000 cfs farther downstream in the Truckee Meadows reach. When the channel capacity is exceeded, flow overtops the channel banks that are flanked by discontinuous levees. One of the major causes of flood inundation is the limited conveyance capacity of the Truckee River near Vista, where the river enters a narrow canyon on its way to its terminus in Pyramid Lake. That constriction of the river as it enters the canyon and its relatively mild slope causes a significant backwater effect during major flows, resulting in overbank flooding upstream on the Truckee River and its three tributaries, Steamboat Creek, Boynton Slough, and the North Truckee Drain. The flow in the overbanks remains separated from the main channel until it is forced back into the channel near the lower end of the Truckee Meadows near Vista. Flow in the right (south) overbank co-mingles with the flow from Boynton Slough and Steamboat Creek, and flow in the left (north) overbank co-mingles with the flow from the North Truckee Drain before reentering the Truckee River. Roads, buildings, and the airport runways and taxiways obstruct the overbank areas. Overbank flooding occurs in the Truckee Meadows about every 10 to 15 years and results in a wide expansive floodplain with considerable overbank storage. Flood depths in the Truckee Meadows range from 1 to 6 feet during a major flooding event.

6.3 Expected Annual Damages (EAD) at Without-Project Conditions. Two distinct areas were evaluated in the economic analysis: (1) Downtown to Vista and (2) Vista to Pyramid Lake. The first area was evaluated quantitatively and was divided into sub-areas (A,B,C,D,F, & G). There are approximately 14,000 structures in the 500-year flood plain worth approximately \$3.0 billion (structure value only). The Washoe County figure was compiled from assessor's data. It reflects a "depreciated" value and is more conservative than the "depreciated replacement" value required by Corps guidelines. There is additional discussion regarding this issue in the

economics appendix, and work is now proceeding to determine what future adjustments may be required. Table 1 is a summary of the calculated damages for the downtown Reno and Truckee Meadows areas by sub-area. The delineated boundaries of each sub-area are described in Table 1 and are shown on Plate 6. More detailed information about the sub-areas is presented in Appendix C. The second area (Vista to Pyramid Lake) was evaluated qualitatively for now until additional information becomes available. This is an area where induced damages may occur when the alternatives are considered in more detail. Additional discussion about this area is presented in Appendix C.

Table 1. Expected Annual Damages (EAD) at Without-Project Conditions

| Reach | Location | Total Damages |
|--|--|----------------------|
| A | Downtown (west of U.S. Hwy 395, north of U.S. Hwy 80, and west of Pyramid Dr.) | \$ 2,175,000 |
| Total Damages Downtown Reno | | \$ 2,175,000 |
| B | North Meadows (north of Truckee River, south of U.S. Hwy 80, east of U.S. Hwy 395, and west of McCarran Blvd.) | \$ 3,780,000 |
| C | South Meadows (south of Truckee River, Airport, east of U.S. Hwy 395, and west of McCarran Blvd.) | \$1,970,000 |
| D | North Truckee Drain (north of U.S. Hwy 80 above Vista and east of Pyramid Dr.) | \$ 3,350,000 |
| F | East Meadows (east of McCarran Blvd., south of U.S. Hwy 80, west of Steamboat Slough, and north of Pembroke Drive) | \$18,825,000 |
| G | Upper Steamboat Creek and Boynton Slough (south of Pembroke Dr. and west of Steamboat Slough) | \$ 1,950,000 |
| Total Damages below Downtown Reno (Truckee Meadows) | | \$32,050,000 |

6.4 Development of Preliminary Flood Damage Alternatives for Downtown Reno, and Sparks and Truckee Meadows Area.

The following discussion is a summary of the plan formulation completed for the original F3 document as well as the addition of the alternatives considered through the community coalition process. This range of preliminary alternatives for flood damage reduction was formulated by combining measures retained during the screening process. These preliminary alternatives were formulated to meet only flood damage reduction objectives.

Downtown Reno Area. In June 2002 a report entitled “Flood Damage Reduction Alternatives Report Addressing Downtown Reno Bridges,” was developed for the Corps. This report presented the first five preliminary alternatives listed below. This information was intended to support future plan formulation; particularly addressing options for flood damage reduction that takes into account bridges constructed prior to 1940 in downtown Reno. This report was not intended to fulfill the requirements of the National Environmental Policy Act or any other laws.

Preliminary Alternative 1 – Rehabilitation Alternative. This alternative would increase flood protection in the downtown Reno reach of the Truckee River by incorporating the following measures:

- Bridge rehabilitation
- Floodwalls
- Channelization
- Flood proofing

This alternative would rehabilitate the Sierra, Lake, and Virginia Street Bridges and extend their lifespan by about 25 years. Downtown Reno Alternative 1 is presently estimated to cost \$23.8 million.

Preliminary Alternative 2 – New Span Alternative. This alternative would increase flood protection in the downtown Reno reach of the Truckee River by incorporating the following measures:

- Bridge rehabilitation
- Widening
- Plazas
- New span at Virginia Street
- Culvert around Lake Street Bridge
- Minispans at Sierra and Center Street
- Floodwalls
- Containment at First Street
- Channelization
- Flood proofing

This alternative would provide the best hydraulic results possible without replacing the pre-1940 bridges. Downtown Reno Alternative 2 is presently estimated to cost \$27.3 million.

Preliminary Alternative 3 – Matching Bridges Alternative. This alternative would increase flood protection in the downtown Reno reach of the Truckee River by incorporating the following measures.

- Bridge replacement (Center Street design)
- Floodwalls
- Channelization
- Flood proofing

This alternative would increase channel conveyance through the downtown reach principally by replacing the existing bridges at Sierra, Virginia, and Lake Streets with new bridges whose design and architecture would be similar to that of the Center Street Bridge. The Center Street Bridge was built in 1996, is capable of passing the design flow of 20,700 cfs, and blends architecturally with the U.S. Post Office and nearby floodwall railings on the river side of the building. Use of a design similar to the Center Street Bridge would provide a consistent and

coherent architectural theme. Downtown Reno Alternative 3 is presently estimated to cost \$28.2 million.

Preliminary Alternative 4 - Landmark Bridges Alternative. This alternative would increase flood protection in the downtown Reno reach of the Truckee River by incorporating the following measures:

- Bridge replacement (clear span design)
- Floodwalls
- Channelization
- Flood proofing

This alternative is identical to the Matching Bridges Alternative except that a bridge without any supporting structures located in the river (a clear span) would be constructed instead of a Center Street type bridge. Downtown Reno Alternative 4 is presently estimated to cost \$32.2 million.

Preliminary Alternative 5 - Widening Alternative. This alternative would increase flood protection in the downtown Reno reach of the Truckee River by incorporating the following measures:

- Widening
- Culvert around Lake Street Bridge
- Mini span at Center Street
- Bridge replacement (Center Street design)
- Floodwalls
- Channelization
- Flood proofing

This alternative would create additional flow capacity by widening the river channel and by replacing the pre-1940 bridges with Center Street Bridge configurations. Downtown Reno Alternative 5 is presently estimated to cost \$38.6 million.

Preliminary Alternative 6 – Preservation Alternative. Rehabilitation of the Virginia Street Bridge had been a mitigation requirement for the removal and replacement of the Center Street Bridge because both had historic significance; Virginia Street Bridge has National Register status. Unfortunately, the Virginia Street Bridge and Sierra and Lake Street Bridges constrict floodflows that must be conveyed through downtown Reno during a 100-year or greater event. Every flood management measure conceivable at that time was considered to move flows around these existing structures without flooding the adjacent downtown area. Increased floodwall heights were necessary in the alternatives that include bridge preservation at existing elevations. A report entitled “Historic Architectural Engineering Analysis for the Preservation of the Virginia Street Bridge Reno, Nevada” dated July 8, 2003, developed by Ferrari Shields & Associates (Structural and Civil Engineers Consulting Firm) for the U.S. Army Corps of Engineers, Sacramento District, will be further evaluated during the planning process. The

recommendations outlined in this report by Ferrari Shields will be further evaluated and possibly incorporated into future design alternatives.

Sparks and Truckee Meadows Area. In September 2002 a report entitled “Reno/Sparks, Nevada Flood Damage Reduction Alternatives Design Paper, Truckee Meadows Flood Damage Reduction and Ecosystem Project” was developed for the Corps. This report presented the three preliminary alternatives listed below. This information was intended to support future plan formulation for this area.

Preliminary Alternative 1 – Levees and Floodwalls with 2,800-cfs Additional Downstream Flows. This alternative accomplishes flood damage reduction in the Truckee Meadows area by primarily containing and channeling the flows within a constructed system of levees and floodwalls. Because this alternative does not include detention basins or channel benching, it has the highest design water-surface elevations relative to other alternatives. The containment method in this alternative increases the downstream flows by about 2,800 cfs in comparison to existing conditions. The effect of the additional flow is being determined. Mitigation of hydraulic effects may be required, in which case a mitigation plan will be developed. Truckee Meadows Alternative 1 is presently estimated to cost \$231.3 million.

Preliminary Alternative 2 – Levees, Floodwalls, and Detention Basins with No Increase in Downstream Flows. This alternative accomplishes flood damage reduction in the Truckee Meadows area by capturing peak flows in off-line detention basins, and by containing flows with levees and floodwalls as water is moved through the system. Detention basins would be located on existing open land areas within the boundaries of Huffacker Hills, University of Nevada Reno-Nevada Agricultural Experiment Station, and Mustang Ranch. Through the use of these peak flow detention facilities, Alternative 2 does not increase flows downstream any farther than Mustang Ranch, the location of the last detention basin in the series. Therefore, this alternative does not induce flooding in the lower reach (Vista to Pyramid Lake), and there is no need for hydraulic mitigation. Truckee Meadows Alternative 2 is presently estimated to cost \$304.9 million.

Preliminary Alternative 3 – Channel Benching Alternative – Community Coalition Alternative Plan. This alternative accomplishes flood damage reduction in the Truckee Meadows area by enlarging the flow area of the existing channel and by capturing peak flows in detention facilities. Detention basins would be located at Huffacker Hills and Mustang Ranch. The use of setback levees would maximize the conservation of available open space within the urban area to reconnect the river with its floodplain. These setback levees combined with channel benching would provide additional channel conveyance as the primary purpose and area available for the reestablishment of a riparian corridor and adjacent recreational parkway. With the use of setback levees and channel benching, this alternative has the lowest water-surface elevations in most areas of the Truckee Meadows relative to the other alternatives. However, this alternative increases flows downstream by 2,400 cfs. The effect of this increased flow is being determined by this study. Mitigation of hydraulic effects would be required. Truckee Meadows Alternative 3 is presently estimated to cost \$270.8 million.

7.0 ECOSYSTEM RESTORATION AS A PROJECT PURPOSE

Since the August 1999 F3 Conference, the local sponsors (Washoe County and the cities of Reno and Sparks) through a community-based planning process have embraced the relationship between flood damage reduction and improving the river's physical and biological stability through ecosystem restoration.

At the request of the sponsors, the scope of the study has been expanded to include formulation and analysis of ecosystem restoration measures and alternatives designed to restore riparian and wetland habitat within the historic floodplains of the Truckee River that extend from the Highway 395 crossing of the Truckee River, Nevada, downstream to the river's terminus at Pyramid Lake. The Federal interest in ecosystem restoration of the lower reach of the Truckee River was first established in the Lower Truckee River, Nevada, Reconnaissance Report completed by the Corps in July 1995.

Existing aquatic and terrestrial habitat degradation coupled with the frequent flooding in the incorporated urbanized areas of the cities of Reno and Sparks in Washoe County, Nevada, warrant the addition of ecosystem restoration as a project purpose to solve both the ecosystem and flooding problems.

This supplemental report is intended to describe the significance of the ecosystem resources, discuss restoration problems and opportunities, recommend corrective actions, and provide justification for the inclusion of ecosystem restoration as a purpose in the Truckee Meadows project.

The addition of ecosystem restoration will also improve the riverine environment for federally listed fish and wildlife species. It is anticipated that fish and wildlife species, which are the subject of the authorizing language, will benefit from ecosystem restoration actions.

7.1 Significance of Ecosystem Resources

Truckee River. The Truckee River headwaters are in California's high Sierra Nevada Range surrounding Lake Tahoe; the river flows from Lake Tahoe, California, downstream to Pyramid Lake, Nevada. While the greater portion of the Truckee River Basin's surface area and the majority of its demands for water resources lie within the State of Nevada, most of the precipitation and virtually all of the basin's water storage lie within the State of California. Water is Nevada's most precious natural resource because of its scarcity throughout this predominantly arid desert environment.

The Truckee River is a significant water resource at local, state, and regional levels as one of the few waterways that is relied on as a major source of municipal, industrial, and agricultural water supply. The river is also a fundamental component of fish and wildlife habitat and serves as a major outdoor recreational resource area. Additionally, streamflow reaching terminal and intermediate basins have historically replenished lakes, oxbows, and wetlands that support a diverse array of both flora and fauna. Although degraded due to extensive development within the watershed, the Truckee River still supports riparian, wetland, and fisheries habitat of statewide value and significance.

Pyramid Lake. Located on the Pyramid Lake Paiute Tribal (PLPT) lands at the terminus of the Truckee River, Pyramid Lake is about 50 miles northeast of the cities of Reno and Sparks. The lake is one of the largest remnants of the ancient Lake Lahontan and is fed by Lake Tahoe via the Truckee River. Pyramid Lake is home to such species as Lahontan cutthroat trout (LCT), cui-ui, Tui-chub, Tahoe suckers, and Sacramento perch. Because of its importance to the survival of several of these fish species, several fish hatcheries have been established on the banks of the river to help encourage their reproductive success and continued survival. Cui-ui (*Chasmistes cujus*) is a large plankton-feeding fish that only occurs in Pyramid Lake, Nevada. The cui-ui was listed as an endangered species in 1967 based on a declining population and absence of reproduction. The LCT is also a listed species and was delisted to threatened status in 1975.

Pyramid Lake is a significant natural resource in the arid Nevada landscape. Fish, wildlife, and riparian vegetation are sustained by its 300-foot-deep waters and by the fresh water flowing in from Truckee River. The lake is a resting place for a variety of migratory birds. Anaho Island, a National Wildlife Refuge, is the breeding ground for the largest colony of American white pelicans. Anaho Island is also home to a variety of other shorebirds. The tufa formations found at this lake are some of the lake's most distinctive natural features. These formations are calcium carbonate deposits formed by precipitation over hot springs. They include the Pyramid (which gives the lake its name) and the Needles Rocks.

7.2 Restoration Projects Currently Under Study

Lower McCarran Ranch. In June 2002, the Nature Conservancy (TNC) of Nevada published a Preliminary Restoration Plan for the McCarran Ranch Reach of the Truckee River, prepared by Otis Bay Riverine Consultants. The study leading up to publication of this plan was funded by the Cities of Reno and Sparks, Nevada Division of Environmental Protection, and the U.S. Fish and Wildlife Service (USFWS). This preliminary restoration plan consists of the first phase of developing a comprehensive habitat restoration project for the 5-mile reach of the middle Truckee River commonly known as the McCarran Ranch property. TNC has acquired the McCarran Ranch property in 2003 and has developed a preliminary restoration plan to restore habitats for a diverse array of native species. The plan includes re-constructing the river channel to elevate the existing incised riverbed and to reestablish the meandering pattern of the channel. The plan also includes an eradication program to eliminate nonnative invasive plant species and revegetation specifications. This restoration plan combined with other measures and alternatives is currently under study as a Corps Section 1135 Continuing Authorities Program project.

Lockwood. Washoe County, one of the project sponsors, recently acquired the Lockwood property on the downstream Truckee River floodplain for permanent open space and potential ecosystem restoration purposes. The County hired Otis Bay Riverine Consultants to prepare a Phase I conceptual level restoration and improvement alternatives study. This property is located about 2.5 miles downstream of Vista, extends 4,000 feet along the channel within Washoe County, and has a history of flooding and flood-related damage. The County purchased the property and removed all but one of the homes (one home is still in private ownership) to prevent future flood-related problems. The report entitled "Truckee River – Lockwood

Conceptual Restoration Project,” prepared by Otis Bay Riverine Consultants (January 2001), states that it is the County’s intent to either use the Lockwood property as land area where required mitigation could be implemented for adverse effects on water quality caused from operation of the Truckee River Municipal Wastewater Treatment Plant, or where increased flood storage or ecosystem restoration could occur as a part of this project. Washoe County has informed the Corps that it is not pursuing this project at this time.

Steamboat Creek. In October 2001, the Corps completed a Section 206 Preliminary Restoration Plan for Steamboat Creek. The proposed project consists of excavation of a new channel through the alfalfa fields to the west of the current creek location, with an objective of creating a restored stream channel length from 1.1 miles to 2.2 miles upstream from the confluence with the Truckee River. The conceptual design for the new channel is a single threaded, low-gradient meandering channel. Placement of grade control structures and planting of appropriate native obligate wetland species in the channel and on floodplains are also features of this restoration plan. Analysis that is more recent has determined that this project should proceed under the Corps 1135 Continuing Authorities Program in the planning process. Ecosystem restoration measures and alternatives have been formulated, and the Corps’ Project Delivery Team is nearing completion of a preliminary design.

8.0 PROBLEMS IDENTIFIED WITHIN THE TRUCKEE RIVER ECOSYSTEM

PROBLEM: A decrease in fisheries and associated aquatic habitat in the Truckee River.

Truckee River water allocations for various uses are complex and are the result of a long history of Federal and interstate decrees, lawsuits, and laws. There are a total of 19 diversions from the Truckee River between the California-Nevada border and Pyramid Lake; 11 of the diversions are downstream of Vista. The Truckee River is the principle source of water for irrigation, municipal, industrial, and domestic uses in the cities of Reno and Sparks, and in the neighboring rural communities of Washoe and Storey Counties. The most significant water development project to affect the Truckee River resulted from the Reclamation Act of 1902 that authorized the Newlands Project and construction of Derby Dam, a transbasin diversion for agricultural development in the Fernley and Fallon areas.

This development has changed the hydrology of the Truckee River downstream of Vista to a highly variable regime of minimal low flows and periodic high floodflows when upstream storage is exceeded.

The diversion of over half of the annual flow of the Truckee River since 1905 is the major contributing cause of the lowering of the water-surface elevation of Pyramid Lake. Pyramid Lake inflows have been significantly reduced during the last century as a result of these transbasin diversions that caused the level of Pyramid Lake to drop about 80 feet between 1905 and 1967. Lake level fluctuations at the exposed delta at the river mouth have historically created channel instability and aquatic habitat degradation, including the blockage of endangered fish passage at the river’s delta/lake interface to spawning grounds upstream.

While the lack of water available for ecosystem resources is recognized as a problem, there is no opportunity to address this problem in this study.

PROBLEM: Invasive nonnative plant species have caused the quantity and quality of related riparian and floodplain habitats to diminish.

Disturbed land areas that have a lack of vegetative cover allow for the introduction and dispersal of nonnative plant species. Whitetop presents the greatest nonnative plant problem in the project area. Tamarisk and Russian olive are other problem invasive plant species. All of these invasive plant species have very low wildlife habitat value.

Whitetop, a nonnative invasive plant species, is abundant in the upper reaches of the Truckee River below Vista. This plant species is most commonly associated with agricultural fields, river scoured areas, and other disturbed areas all characteristic of the Truckee River within the study area.

Tamarisk is another well-documented invasive plant species in the West and is found in the lower portion of the project area. The occurrence of this nonnative invasive plant is especially prevalent along the Truckee River between Wadsworth and Pyramid Lake. Tamarisk is a phreatophyte in that it evapotranspires tremendous amounts of water into the atmosphere. The large amount of water consumed by tamarisk reduces the amount of water available for wildlife and for native riparian and wetland plant communities. Tamarisk tends to form dense, monotypic stands, outcompeting native vegetation. It is also far less preferred as wildlife habitat than the native riparian vegetation that it invades and eventually replaces.

PROBLEM: The quality and quantity of riparian and related floodplain habitats have diminished.

The Truckee River was an integral part of a healthy riparian forest dominated by a cottonwood forest, willows, and alders. Historical accounts supported by geomorphic and photographic evidence indicate that the river channel was once well connected to its floodplain, its banks abundant with willow growth supporting a continuous, multi-canopied riparian forest.

In 1954, the Corps was authorized to construct the Truckee River and Tributaries Project to protect the cities of Reno and Sparks from frequent flooding by straightening, widening, and deepening large expanses and reaches of the river channel from Lake Tahoe to Pyramid Lake. This project caused excessive erosion and entrenchment of the river channel because of the altered hydrologic and geomorphologic conditions. This combined with other urban and agricultural encroachments into the floodplain caused substantial destruction and fragmentation of the riparian forest.

PROBLEM: The Truckee River is no longer a stable river system.

River damming, diminished flows, riparian forest destruction, and channel alterations all have contributed to channel instability throughout the study area. The banks in some areas have been stabilized with rock to protect the land from erosion. The Truckee River suffers in some reaches from considerable erosion that undercuts streamside habitat and results in barren stream banks with no habitat value.

Work done for the Corps 1980 Hydrology Report documented that historic peak flows attenuated as they moved downstream. However, under regulated conditions, flows actually get larger as they move downstream. This hydrological occurrence can be related to the channelization work done in the lower river by the Corps in the 1960's. This work likely induced geomorphic instability in the river.

Between Vista and Wadsworth, significant quantities of sediment have historically been delivered to the river by tributary alluvial fans. Due to the construction of Truckee Canal and Interstate 80 through the canyon, sediment delivery to this reach of the river has been significantly reduced. This lack of balance in the erosion/deposition characteristics normally seen in a healthy river system prevents the Truckee River from recovering on its own.

The channel in some locations has become incised, stranding cottonwood riparian forests on terraces. Cottonwoods that depend on a wet substrate for seed germination and development are now isolated from all but the more extreme floodflows. Eventually these isolated forests will die without regenerating new growth.

PROBLEM: The aquatic ecosystem is degraded due to poor water quality and high water temperatures.

The Truckee River suffers from persistent water quality problems. Flows entering the study area have a high nutrient content largely from treated sewage effluent, agricultural runoff, and urban stormwater runoff. High nutrient levels accelerate algae growth and other indicators of water pollution including physical and biological changes such as elevated aquatic temperatures and total dissolved solids, lowered dissolved oxygen levels, and modified existing biota towards pollution-tolerant species. Tertiary treated sewage enters the Truckee River from many treatment facilities throughout the system.

High instream temperatures are another significant water quality problem. Many factors influence instream temperature within the downstream reach of the Truckee River: loss of overstory shading through direct and indirect removal of riparian vegetation; lower than normal water flow levels due to diversions; naturally occurring thermal springs (upstream on Steamboat Creek); natural and human-induced surface runoff including agricultural flows; and decomposition of organic materials. High water temperatures result in less than optimum habitat conditions for cold water fish species including the cui-ui and the LCT, and allow for the introduction of warm water species (native and nonnative) in their place.

The water quality of the Truckee River affects Pyramid Lake; water quality within Pyramid Lake has been degrading along with that of the river. Poor water quality has led to large blue-green algae "blooms" within Pyramid Lake that then further decrease water quality for the species present.

PROBLEM: Under the current water allocation system, there is a lack of water for ecosystem restoration under the without-project condition.

Future conditions of the ecosystem on the Truckee River will be heavily influenced by the availability of water for instream uses under any new water allocation arrangements. The latest effort to resolve long-standing disputes over water use and water rights on the Truckee River has been the enactment of congressional legislation known as Public Law 101-618 or the Truckee-Carson-Pyramid Lake Water Rights Settlement Act of 1990 (Public Law 101-618). For the act to be effective, an operating agreement, known as the Truckee River Operating Agreement (TROA), must be negotiated. TROA will implement provisions of the act, including interstate allocations between California and Nevada; greater flexibility in the operation of Truckee River Reservoir for efficient water use; changes to the exercise of water rights that will benefit listed species; and storage of water in Federal reservoirs for the cities of Reno and Sparks during drought. However, before TROA can be signed and implemented, it must be evaluated under state and Federal environmental laws, approved by the courts, and promulgated as a Federal regulation. Until then, flows in the river continue to fall under the Orr Ditch Decree of 1944. Accordingly, estimates of future water allocations are based on adhering to operation of the system under the current operational criteria.

Reservoir storage requirements and instream flow requirements are not assumed to change under the future without-project conditions to the benefit of the in-stream ecosystem. Current negotiations are addressing the need for additional water, but many complex issues and conflicting values among the participants result in uncertainty associated with predicting the future without-project conditions. River system operations are not assumed to change significantly since conflicting environmental, social, and economic factors will continue to make storage and instream flow changes to the system increasingly more difficult with time. Additionally, specific projects of the LCT and Cui-ui Recovery Plans designed specifically to benefit these two Federally listed fish species are assumed to continue to be implemented in the future under the without-project condition. However, because of the scarcity of water in Nevada and the institutional pressures created by that scarcity, it is appropriate to assume that no specific increases in flow for recovery are implemented in the future without Federal action.

9.0 ECOSYSTEM RESTORATION OPPORTUNITIES

In July 1995, the Corps completed the Lower Truckee River, Nevada, Reconnaissance Report, which included findings indicating that it is in the Federal interest to resolve the ecological and fluvial geomorphologic problems identified within the study area. The study identified problems of ecosystem degradation caused by urban and rural development activities and associated water resource demands that have intrinsically altered the aquatic and terrestrial habitats that once flourished throughout the river corridor. The following opportunities

associated with the downstream reach of the Truckee River ecosystem have been identified for inclusion in this study in an effort to move from a reconnaissance level to a feasibility level of detail.

OPPORTUNITY: Decrease or eradicate nonnative species along the Truckee River.

Vegetation along the river has been heavily degraded by infestation of nonnative invasive plant species, reducing the value and quality of habitat available for wildlife. The opportunity exists to reduce the nonnative invasive plant populations and to revegetate with native plant species throughout the areas identified for restoration.

OPPORTUNITY: Reestablish riparian and related floodplain habitats along the Truckee River.

High water temperatures associated with low-flow conditions during high temperature times of the year and loss of streamside vegetation are identifiable ecosystem problems that provide the opportunity for restoration. There is opportunity for reestablishment of the riparian corridor on the river's banks, a restoration action that would provide shaded riverine aquatic habitat that lowers instream temperatures and provides improved habitat for fisheries and other aquatic invertebrates. Terrestrial species will also benefit from the creation of shaded riverine aquatic habitat. Additional opportunities exist to reconnect historic oxbows with the floodplain to create floodplain wetland complexes.

OPPORTUNITY: Provide a more natural stream geomorphology to the Truckee River.

There has been channel modification including deepening and straightening that has led to channel instability and associated habitat degradation. The opportunity exists to restore natural stream channel stability by reconstructing the channel to mimic historic conditions, which would allow the stream to laterally migrate but maintain its channel capacity, thus eliminating the existing condition of degradation and aggradation that is prevalent throughout this incised stream channel.

OPPORTUNITY – Restore wetlands within the historic floodplain of the Truckee River.

Historic oxbows and restored floodplains along the Truckee River provide an excellent opportunity to restore important wetland habitats. Both fish and amphibians would benefit from these habitats that have diminished significantly over time from land use changes, gradation of the floodplain for agriculture and reduction in flows in the Truckee River. The result of these changes has been down cutting of the channel and a decline in the groundwater table, which has rendered the loss of wetland in the floodplain to be permanent without restoration efforts.

10.0 ECOSYSTEM RESTORATION MEASURES UNDER CONSIDERATION

These measures were formulated to achieve the ecosystem restoration objectives in the study area. They may also contribute to the flood damage reduction objectives. Where possible, the measure may remove the cause of environmental degradation and improve the ecosystem by eliminating the stressors that are affecting the environment. The ecosystem restoration measures considered are discussed below.

10.1 Passive Restoration of Riparian Habitat

Passive restoration is a technique whereby the restoration is left to natural recruitment of native vegetation (without outside intervention). This measure depends on other measures such as construction of point bars or other instream features to facilitate the natural processes of erosion and deposition within the channel.

10.2 Active Restoration of Riparian Habitat. Once an appropriate substrate is created, native riparian vegetation would be planted in quantities that would produce a self-sustaining riparian forest of similar habitat value as the riparian habitat that was lost or degraded by past land use practices.

Excavate New Channel Meanders. Stream restoration would seek to reestablish the natural dynamic equilibrium of the river channel by reconstructing the channel into a meandering stream that generally follows the historic course of the channel.

Create New Channel Bed and Terraces/Benches. This measure would include placement of new bed materials, gravels cobbles, and boulders to armor the new channel bed. Instream features such as diagonal bars or point bars would also be placed. New benches would be constructed within the floodplain adjacent to the channel. These benches would provide additional opportunity for either passive or active restoration of revegetation.

Excavate New Floodplain Ground Contours. This measure would provide the opportunity for floodplain wetlands to be created. This measure would also allow the reconstructed river channel to access its floodplain. A diverse topographic profile facilitates the restoration of diverse habitats within the floodplain.

Restore Floodplain Wetland Habitat. When the river is reconnected with its historic floodplain, the reestablishment of wetland habitat in abandoned oxbows and other low-lying areas would be recontoured for appropriate hydrologic conditions; soil would be amended, if necessary, to provided the appropriate hydric soil conditions; and the area would be revegetated with obligate wetland plant species to recreate the habitat values and function. These measures would also include raising gravel bars to raise the channel bed to reconnect the river to its floodplain.

Remove Nonnative Invasive Plant Species. An effective weed and nonnative invasive plant eradication plan would be implemented that would remove problematic plant species in the area and allow for the successful reestablishment of native wetland and riparian plant communities within the areas targeted for restoration.

Restore Pool and Riffle Complex within River. This measure would include the placement of processed rock material within the riverbed to create a series of alternative pool and riffle complexes at various locations. The rock specifications would mimic the particle size distribution expected in a naturally functioning Truckee River.

11.0 PLAN FORMULATION PROCESS AND ANALYSIS

11.1 Process

Plan formulation of the project alternatives is being performed consistent with EC 1105-2-404 for multi-purpose projects, as well as Planning Guidance ER 1105-2-100 and Planning Principles and Guidelines (P&G). Alternatives will be formulated to produce both NED and NER benefits. As part of the formulation for a multipurpose project, a primary purpose must be identified, and a plan that optimizes benefits for that purpose must be identified. Based on the preliminary results of the analyses, the primary project purpose for the Truckee Meadows Management Plan is flood damage reduction. An optimized NED plan will be identified during the study. Ecosystem restoration measures were formulated to address other problems and opportunities, as well as those identified for flood damage reduction.

Ecosystem restoration measures were considered for the portion of the Truckee River from downtown Reno to Pyramid Lake. No ecosystem restoration opportunities exist for the downtown Reno reach, and the area has been dropped from further consideration. The Truckee Meadows reach had substantial opportunities for restoration and was retained for further study. The reach from Vista to Pyramid Lake was also assessed for restoration and flood attenuation potential. The river was subdivided into 26 segments based on their geomorphic characteristics for the purpose of evaluating their potential for restoration. These segments were assessed and scored based on their potential for flood attenuation, riverine restoration, and floodplain reconnection. The 12 river segments with the highest ranking scores were retained for further analysis.

The following river segments were retained for further analysis: (7) Upper Lockwood, (9) Mustang Ranch, (10) Upper McCarren Ranch, (12) Granite Pit, (13) Tracy Power Plant, (14) 102 Ranch, (15) Eagle Picture, (17) Ferretto Ranch, (18) Railroad Cut, (19) I-80 Rest Stop, (20) Above I-80 Bridge, and (21)Wadsworth.

11.2 Preliminary Ecosystem Restoration Alternatives

Ecosystem restoration measures were developed for specific reaches of the Truckee River to address specific objectives. These measures were then combined using cost effectiveness and incremental cost analysis into high, medium, and low intensity preliminary alternatives. As part of this evaluation process, some reaches may drop out as not cost effective or not effective. The following are general descriptions of each preliminary ecosystem restoration alternative.

High Intensity Restoration Alternative. This alternative consists of extensive restoration and revegetation efforts from Truckee Meadows to Wadsworth. Benches would be

constructed to replace streambeds along approximately 10,000 linear feet of river in the Truckee Meadows reach. These benches would be revegetated with native vegetation. Restoration of the stream channel consists of increased channel length with numerous additional meanders. The channel sinuosity would be raised to the upper reaches of the natural range. The channel bed would be constructed at a higher elevation than the existing entrenched channel. Alternating point bars would be constructed to create a pool-riffle sequence within the channel. Revegetation efforts would primarily consist of creating new or enhancing existing riparian habitat. Other habitats to be restored include seasonally flooded scrub/shrub habitat, emergent wetland vegetation, wet meadow habitat, and sagebrush shrublands.

Medium Intensity Restoration Alternative. This alternative consists of moderate restoration and revegetation efforts from Truckee Meadows to Wadsworth. Channel restoration would be intended to restore the channel pattern and sinuosity, but to use the existing channel as much as possible. Sinuosity of the channel would be at the low end of the natural range. Channel bed features such as point bars, lateral bars, and diagonal bars would be constructed in the existing channel where possible. Revegetation efforts would primarily consist of creating new or restoring existing riparian habitat. Other habitats restored would include seasonally flooded scrub/shrub habitat, emergent wetland vegetation, wet meadow habitat, and sagebrush shrublands.

Low Intensity Restoration Alternative. A minimum of channel restoration and revegetation is considered under the low intensity restoration alternative along the river between the Meadows and Wadsworth. The alternative is designed to allow the natural fluvial processes to naturally restore aquatic and riparian habitat types. Riprap removal and bank sloping would be the primary restoration techniques. Neither channel bed raising nor in-channel bed features are included in this alternative. Revegetation efforts would consist primarily of riparian habitat. Other habitats created would include seasonally flooded scrub/shrub habitat, emergent wetland vegetation, wet meadow habitat, and sagebrush shrublands.

12.0 DEVELOPMENT OF THE COMBINED PLAN

Since the primary purpose for the Truckee River Management Project has been identified as flood damage reduction, the National Economic Development plan or NED plan must be identified. The NED plan is the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment.

Upon identification of the NED plan, a series of combined plans would be formulated to take advantage of the synergies created by the plans that address both the primary problem and secondary problems. The array of ecosystem alternatives to be combined with the NED plan would come from those described above.

After these combined plans have been formulated, they will be evaluated using both cost-effectiveness and trade-off analysis. First, the combined plans would be screened to identify a set of cost-effective plans. Once this set is defined, a trade-off analysis would be performed. It has not been determined at this time which method of trade-off analysis would be the most appropriate for this project.

After the trade-off analysis is completed, the plans would be ranked. The highest ranking plan would be the Combined Plan. The Combined Plan would then be subjected to an analysis to determine if it is justified. The Combined Plan is justified if the benefits of each purpose included in the plan exceed the separable costs of the purpose plus the joint allocated costs. Should the highest ranking plan not be justified, the analysis would continue until the highest ranked justified plan is identified.

A final trade-off analysis, quantifying the benefits forgone, benefits gained, and the differences in total cost, would be performed and documented. Included in this analysis would be the benefit-to-cost ratio for the Combined Plan.

If the Combined Plan is not justified, then the NED or NER plan that is justified would be recommended.

Projects may deviate from the NED Plan and/or the NER Plan if requested by the non-Federal sponsor and approved by ASA(CW). In some instances, a non-Federal sponsor may not be able to afford or otherwise support the NED, NER, or Combined Plan. In other instances, a non-Federal sponsor may want to support a larger plan than the Combined Plan. Plans requested by the non-Federal sponsor that deviate from these plans will be identified as the Locally Preferred Plan (LPP). When the LPP is clearly of less scope and cost and meets the Administration's policies for high-priority outputs, an exception for deviation is usually granted by ASA(CW). If the sponsor prefers a plan more costly than the NED plan, the NER Plan, or the Combined Plan and the increased scope of the plan is not sufficient to warrant full Federal participation, ASA(CW) may grant an exception as long as the sponsor pays the difference in cost between those plans and the LPP. The LPP, in this case, must have outputs similar in-kind and equal to, or greater than, the outputs of the Federal plan. The LPP may also have other outputs. The incremental benefits and costs of the LPP, beyond the Federal plan, must be analyzed and documented in feasibility reports

13.0 SPONSOR SUPPORT

There are three non-Federal sponsors of the Truckee River Management Project, Washoe County and the Cities of Reno and Sparks, who have indicated support for ecosystem restoration to be added as a project purpose to the authorized project purposes of flood damage reduction, recreation, and fish and wildlife enhancement. The sponsors have actively worked with and continue to work with several environmental groups at the community level to further the interest in ecosystem restoration along the Truckee River corridor.

14.0 FINDINGS

- The existing without-project estimated annual flood damages are significant, totaling about \$31 million in economic reaches A, B, C, D, F, and G.

- The existing riverine ecosystem is extensively degraded. The historic diversion of over half of the annual flow of the Truckee River is the major cause of the lowering of the water-surface elevation of Pyramid Lake; lake level fluctuations at the exposed delta that created channel instability and aquatic habitat degradation, including the blockage of fish passage; and severance of the river from its historic floodplain. These altered hydrologic and geomorphologic conditions have led to destruction and fragmentation of the riparian forest and floodplain wetlands. Disturbed lands areas that lacked vegetative cover have allowed the introduction and dispersal of nonnative invasive plant species along the river corridor.
- Existing flooding is considered significant given the magnitude of the problem identified and the floodplains delineated on the cities of Reno and Sparks, Washoe and Storey Counties, and Pyramid Lake Paiute Tribal lands. One of the major causes of Truckee Meadows flood inundation is the limited conveyance capacity of the Truckee River near Vista where the river enters a very narrow canyon as it leaves the cities of Reno and Sparks. This constriction of the river causes a significant backwater effect during major flow events, resulting in overbank flooding upstream on the Truckee River and its three tributaries, Steamboat Creek, Boynton Slough, and the North Truckee Drain.
- A range of flood damage reduction solutions has been formulated to date. Additional formulation is necessary to further respond to our understanding of the flood problem. These alternatives have not been evaluated in terms of environmental effect or cost allocation between purposes, nor analyzed incrementally by reach.
- Further alternative formulation and evaluation are required to define the Federal interest. The focus of the next step in plan formulation will be to determine whether alternatives are economically justified, technically sound, and environmentally acceptable.
- The significance of the flooding and ecosystem problems indicates that there is potential Federal interest and further study is warranted.

15.0 CONCLUSIONS

There is a potential Federal interest in participating in both flood damage reduction and ecosystem restoration of the Truckee River. This interest was established in the comprehensive Reconnaissance Report of the Lower Truckee River, Nevada, in July 1995. There is also some available area in the urbanized Truckee Meadows reaches of the Truckee River that will be available for ecosystem restoration between setback levees and the river's edge. By combining ecosystem restoration with the flood damage reduction purpose of this project, a more sustainable project can be planned, designed, and constructed.

Furthermore, because of the large increase in peak flow that has been recently documented, expansion of the project area boundary from Vista downstream to Pyramid Lake is necessary due to the peak flow increases above existing conditions in this downstream area. This expansion of the study area also supports the justification for adding the ecosystem restoration of the downstream reach of the Truckee River as a purpose of this project to both alleviate flooding

and restore the riverine ecosystem. There is also potential Federal interest in participating in flood damage reduction as stated in the Hydraulic Analysis report for both Downtown Reno and the Truckee Meadows Areas, which have had five significant floods in the nineteenth century, and at least nine were recorded in the 20th century. The preliminary alternatives discussed in this report will be evaluated further in the next phase of the study.

Plate 1. General Map – Truckee River Basin

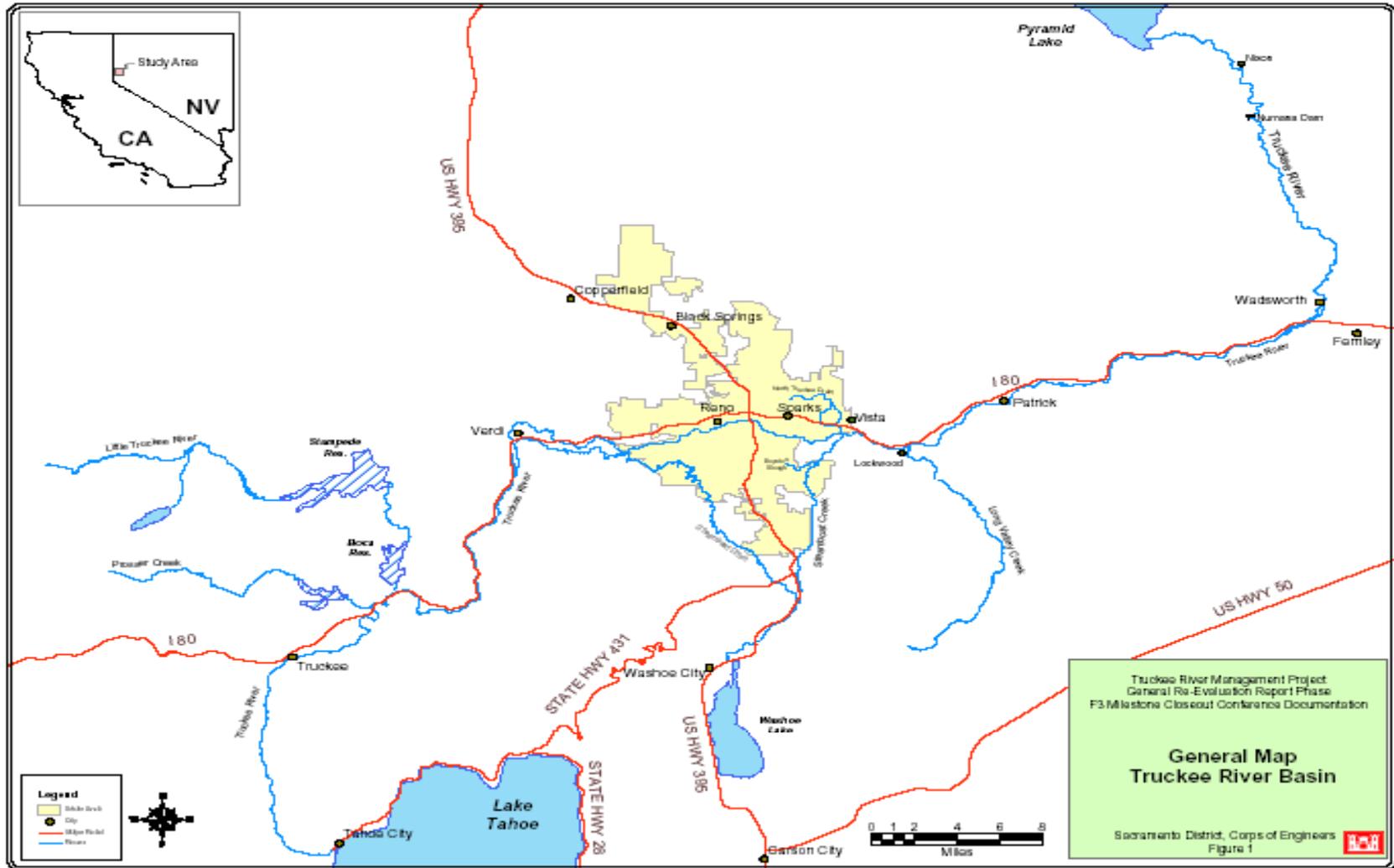


Plate 2. Study Area – Booth Street to U.S. Highway 395 – Reno Reach

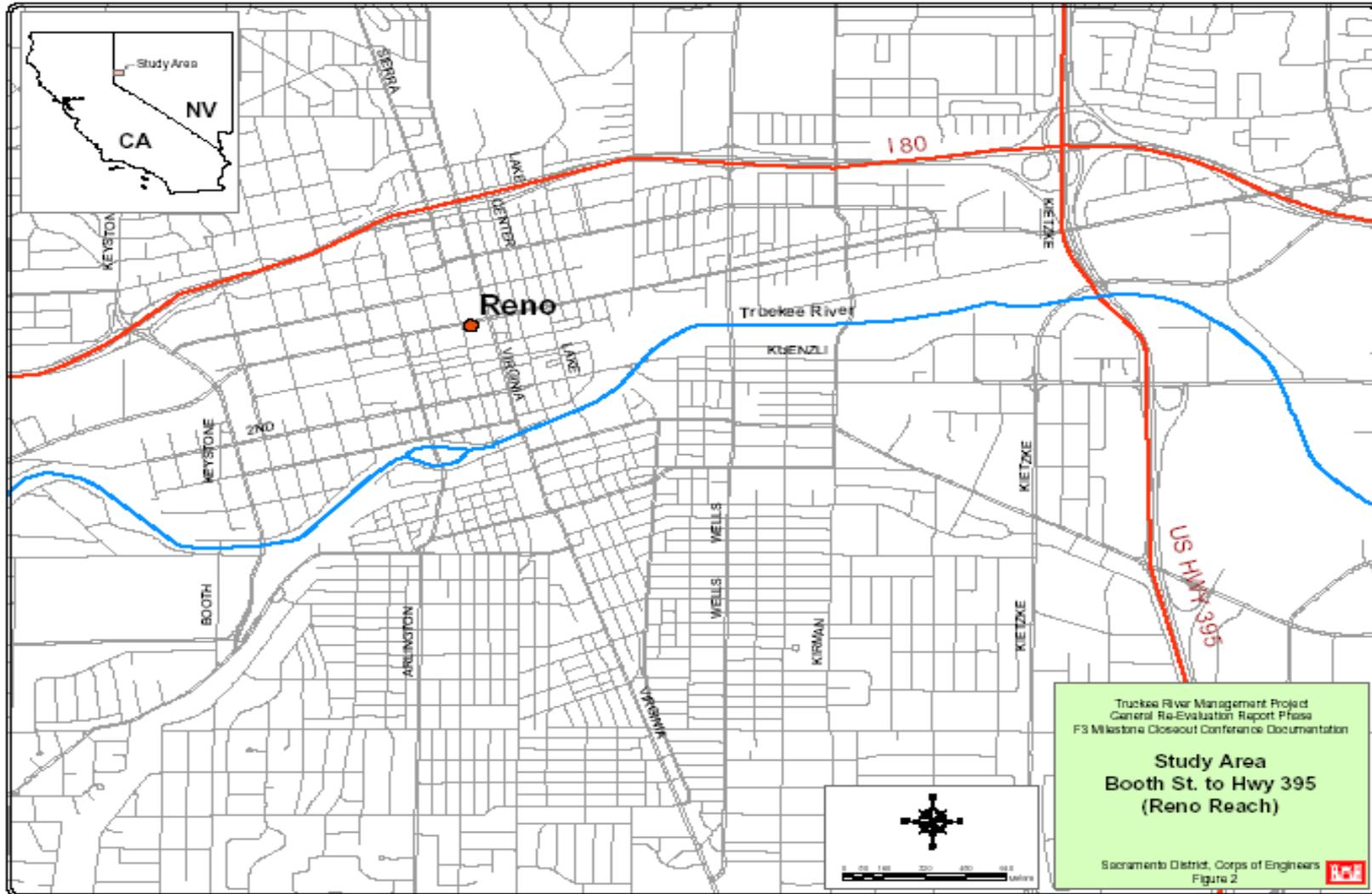


Plate 3. Study Area – U.S. Highway 395 to Vista – Truckee Meadows Reach

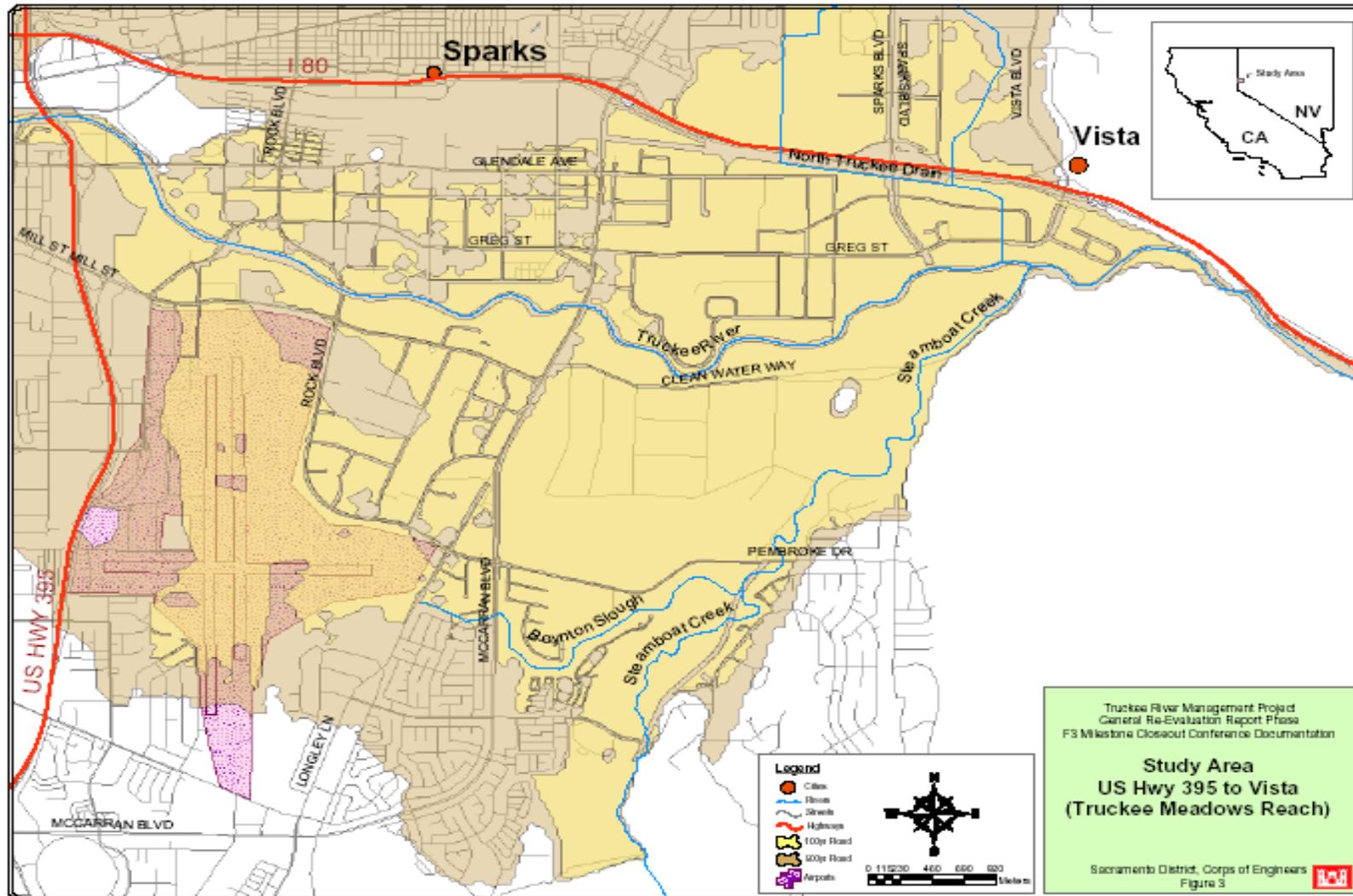


Plate 4. Study Area – Vista to Pyramid Lake – Downstream Truckee River Reach

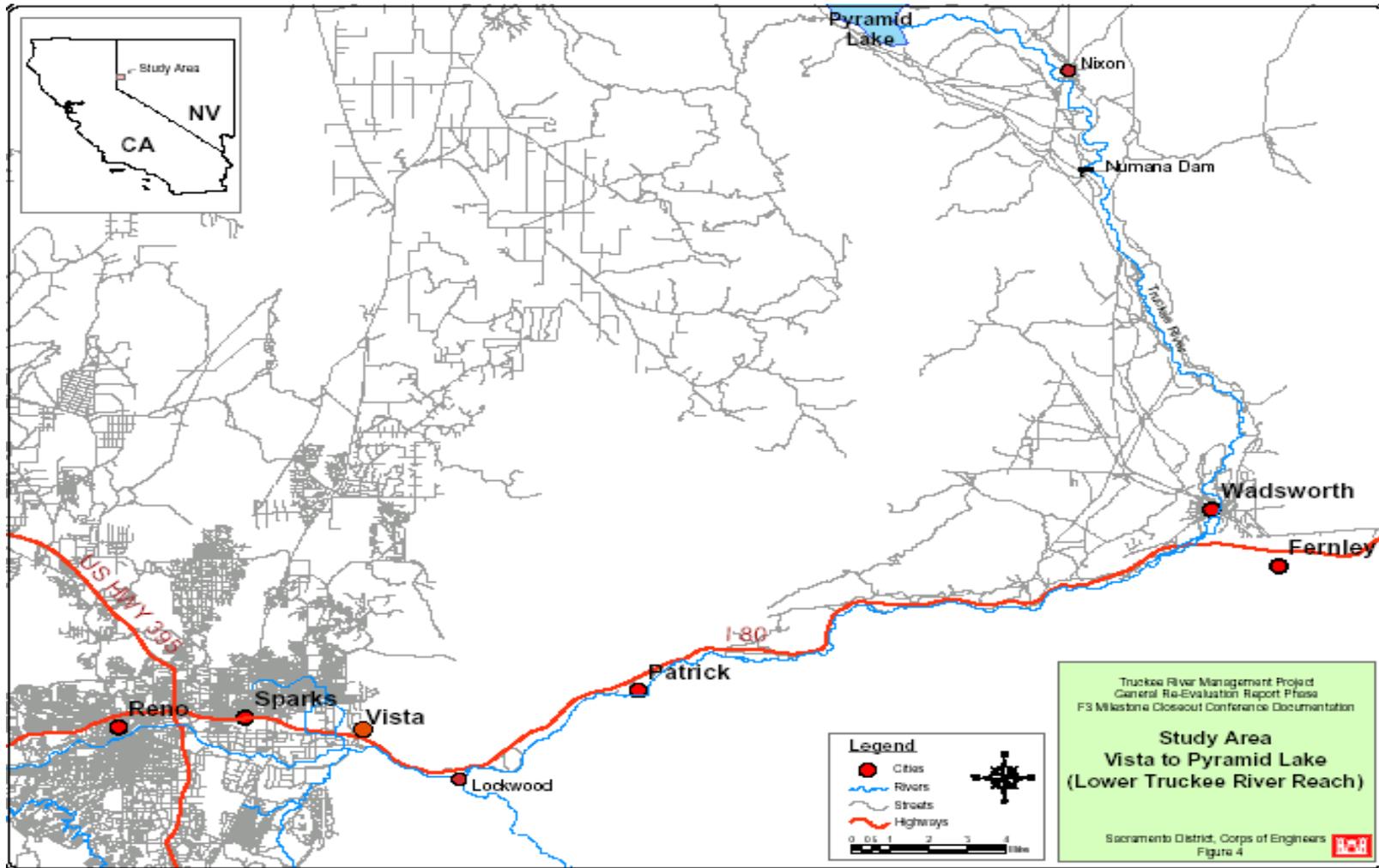


Plate 5. 100 & 500 Year Floodplains – Reno & Truckee Meadows Reaches

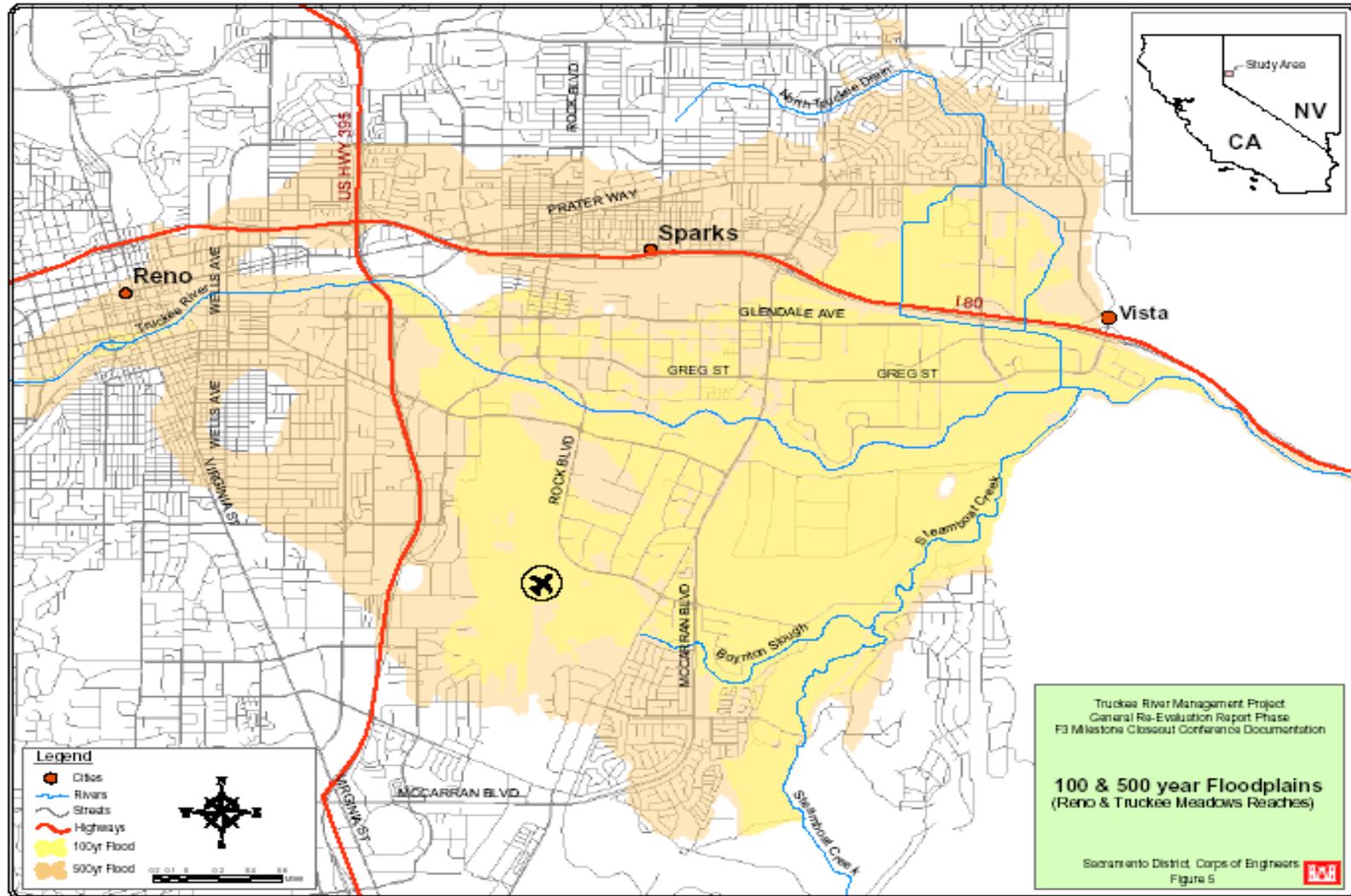


Plate 6. Economics Damage Area Boundaries – Truckee Meadows Reach

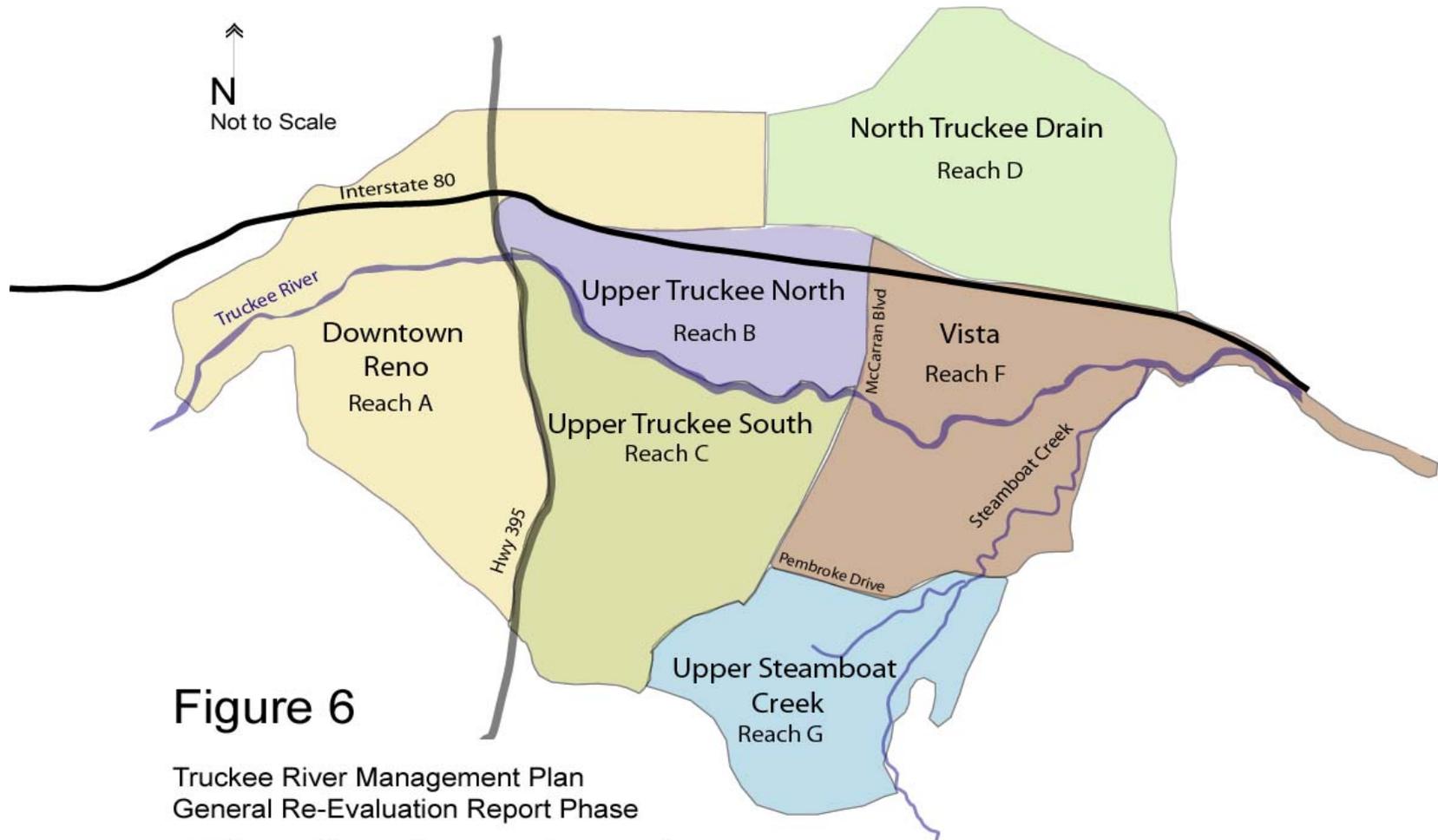


Figure 6

Truckee River Management Plan
General Re-Evaluation Report Phase
F3 Milestone Closeout Conference Documentation
U.S. Army Corps of Engineers, Sacramento District