



Lahontan Regional Water Quality Control Board

April 29, 2013

California Tahoe Conservancy
Attn: Scott Carroll
1061 Third Street
South Lake Tahoe, CA 96150

COMMENTS ON THE SCH# 2007032099 DRAFT ENVIRONMENTAL IMPACT REPORT/ ENVIRONMENTAL IMPACT STATEMENT FOR THE UPPER TRUCKEE RIVER AND MARSH RESTORATION PROJECT, EL DORADO COUNTY

Thank you for the opportunity to provide comments on the Draft Environmental Impact Report/Environmental Impact Statement (Draft EIR/EIS) for the Upper Truckee River and Marsh Restoration Project (Project) adjacent to Lake Tahoe. Water Board staff in the Water Board Regulatory Compliance Division are augmenting comments of the Planning and Restoration Division with the following comments:

I. Regulatory requirements

a. Basin Plan Prohibition Exemptions

The Final EIR/EIS should describe how the specific exemption criteria are satisfied for each project element. We here clarify that Water Board exemptions to the narrative water quality objective for turbidity are not available for recreation-access elements (e.g., bridge at mouth of the Upper Truckee River). The Final EIR/EIS should also fully delineate all wetlands, SEZs, and any non-SEZ 100-year floodplain areas to aid in use of the document to grant exemptions to applicable prohibitions.

AO5-1

b. Avoid, Minimize, and Mitigate Impacts

The Stream Environment Zone (SEZ) impacts and impacts to all wetlands within those SEZs must be minimized to the extent feasible given the restoration and other goals. The Project must avoid and minimize impacts to the wetlands, 100-year floodplain and SEZ, including from haul routes. Heavy equipment should not be used or transported in any wetlands, including montane meadows, willow scrub wet meadow, or open waters, unless there is no reasonable alternative (e.g., pursuant to Clean Water Act section 404(b)(1) requirements for least-damaging alternatives).

AO5-2

PETER C. PUMPHREY, CHAIR | PATY Z. KOUYOUNDJIAN, EXECUTIVE OFFICER

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c. Monitoring Plan

Monitoring will be necessary under Water Board permits. California Rapid Assessment Method (CRAM) and stream invertebrate bioassessment should be two of the monitoring methods considered for the project. Pre- and post-project wetland delineations should also be incorporated into the proposed monitoring plans. A draft mitigation monitoring plan should be included for in the Final EIR/EIS, together with cost estimates for long-term monitoring that are absent in the Appendix E.

AO5-3

II. General Comments

As noted in comment I.a., above, exceptions to turbidity objectives are not allowed for recreation projects. A detailed assessment of why the impacts at the river mouth are needed, and how they meet prohibition exception criteria (including recreation alternatives), should be included in the Final EIR/EIS.

AO5-4

The relative benefits and impacts between alternatives should be analyzed in the Final EIR/EIS. As described in the Draft EIR/EIS Alternative 3 has the minimum number of grade control structures, and relies on natural geomorphic processes. This alternative also tends to avoid or minimize many of the potential impacts due to construction associated with Alternatives 1,2, and 4. In this less highly-engineered approach (Alternative 3), it would be helpful to compare sediment delivery estimates with those derived from the more extensive constructed riparian-system modifications of the other alternatives, both during and following construction.

AO5-5

III. Comments on Individual Alternatives

a. Alternative 1 – Bridge at Upper Truckee River Mouth

The Draft EIR/EIS does not adequately analyze the necessity of a bridge for public recreation at this location, and feasible alternatives that would reduce SEZ and wetland encroachments.

AO5-6

b. Alternative 3

i. Wetlands surrounding TKPOA Corporation Yard in Study Area:

Impacts to the western-most wetlands from reduced regular inundation (by relocating low-flow channel to the east) were not analyzed. Hydrologic modeling should be provided at various flow scenarios to analyze the effects and impacts to the wetlands and meadows in the western-most area surrounding the TKPOA Corporation Yard.

AO5-7

ii. Haul Routes:

Haul route placement, particularly in the marsh interior and in the lower Trout Creek area, was not adequately analyzed. The location of the haul routes must avoid and minimize impacts to wetlands and SEZ to the maximum extent practicable.

AO5-8

iii. Trout Creek Bank Stabilization and Grade Control Features - Design

On the lower reaches of Trout Creek (near RS 92+00 and RS 66+00 to 95+00) the specific types of materials that will be used are not disclosed and should be. Hardening of banks and grade controls with rock as cited on p. 2-32 is inappropriate in this system where sand and gravel dominates substrate. Access must be addressed for this area in the Final EIR/EIS and must comply with Basin Plan prohibitions and exemption criteria to minimize encroachments. Also, the need for bank protection and grade control in the lower sections of Trout Creek is not sufficiently supported. The Final EIR/EIS should provide results of modeling under various flows to support the need for extensive bank protection in the lower Trout Creek.

AO5-9

Thank you for the opportunity to provide comments on this Project. If you have any questions regarding this letter please contact me at (530) 542-5430.



Alan Miller, P.E.,
Chief, North Basin Regulatory Unit

AEM/adwT: UTR Marsh CEQA comments NBR
File under: new pending Upper Truckee River Marsh Restoration, El Dorado Co.

AO5-1

The commenter suggests describing how specific exemption criteria are satisfied for each project element and states that the exemptions to the narrative water quality objective for turbidity are not available for recreation-access elements.

The Lahontan Regional Water Quality Control Board (Lahontan RWQCB or Water Board) may grant exemptions to water quality prohibitions for restoration projects that are “intended to reduce or mitigate existing sources of soil erosion, water pollution, or impairment of beneficial uses” (Lahontan RWQCB 1995:5.2-1), provided that the project meets six criteria. Exemptions may be granted for certain types of projects in the Stream Environment Zone (SEZ). The circumstances applicable to this project are included in Table 4-2. Exemptions also may be granted for certain types of projects in the 100-year floodplain that meet certain criteria. The types of projects applicable and criteria are provided in Table 4-2. As discussed in Section 1.4.2, “Project Objectives,” of this Final EIR/EIS/EIS, two of the primary objectives of the project are to improve water quality through the enhancement of natural physical and biological processes and to design the wetland/urban interface to help provide habitat value and water quality benefits.

The Preferred Alternative includes moderate recreation infrastructure on the west side of the Marsh, similar to existing conditions, and no new infrastructure on the Marsh’s east side. Specifically, it includes a partial reroute of the existing public-access trail to Cove East Beach along the restored wetlands, lagoon, and dunes; one new viewpoint and one new observation area; one fishing platform; and development of an interpretive program and installation of additional signage, all on the west side of the Marsh. Recreation design features would focus recreation activities in certain areas, consistent with the purpose of land acquisitions by the State. As discussed in Section 3.9, “Geomorphology and Water Quality,” of the 2013 Draft EIR/EIS/EIS, construction of recreation features could have the potential to increase transport of sediment and other pollutants to surface water bodies during construction, and increased hard surfaces could increase or concentrate runoff. The Conservancy would implement Environmental Commitments 5 and 6 to address short-term water quality impacts. In addition, the final project design would include permanent stormwater detention features or infiltration systems for runoff from any hard surfaces (Environmental Commitment 11, “Incorporate Effective Permanent Stormwater Best Management Practices”). Therefore, it is expected that with implementation of the construction BMPs and the Conservancy’s commitments, exceedance of the water quality standard for turbidity established in the *Water Quality Control Plan for the Lahontan Region* (Basin Plan) is unlikely to result from the recreation features included in the Preferred Alternative.

The restoration elements of the Preferred Alternative, however, may not meet the discharge prohibitions during certain construction activities (i.e., activating the new channel), for which the Conservancy would request an exemption. These prohibitions include discharges that do not meet water quality objectives, specifically the turbidity standard, and development within the 100-year floodplain and SEZ. Nearly all of the study area is in the existing 100-year floodplain, except the uplands adjacent to the Highland Woods subdivision, between Cove East Beach and the Sailing Lagoon, and along the margins of the Tahoe Keys Marina (Exhibit 3.8-14 as shown in Chapter 5, “Revisions to the Draft EIR/EIS/EIS”). Construction activities for the restoration elements along the Upper Truckee River, Trout Creek, Tahoe Keys Marina, and near the shoreline of Lake Tahoe pose short-term risks to water quality, including increased turbidity and accidental releases of hazardous materials or other pollutants. Stream segments with streambank work (locations with biotechnical treatments, revegetation, the pilot channel, and some backfilled channel sections)

could be vulnerable to erosion if an unusually high river flow were to occur in the few first years after construction, and may result in a short-term exceedance of the turbidity standard.

A05-2 The commenter requests that wetlands, SEZ, and other 100-year floodplain boundaries be indicated to assist in determining the suitability of Water Board exemptions. The commenter describes permitting requirements and restrictions required to avoid, minimize, and mitigate impacts on SEZs, wetlands, and the 100-year floodplain.

To assist the commenter with preliminary considerations regarding eventual permit requirements for the Preferred Alternative, the locations of the Federal Emergency Management Agency 100-year floodplain, TRPA SEZs, and potential jurisdictional wetlands are overlain on the conceptual drawings of the Preferred Alternative in Exhibit 4-1 of this Final EIR/EIS/EIS. Additionally, final design development would be completed in close coordination with the Lahontan RWQCB to integrate options or adjustments that reduce impacts and/or meet exemption criteria.

A05-3 The commenter suggests that California Rapid Assessment Monitoring and bioassessment monitoring be considered for the project and recommends that pre- and post-project wetland delineations be included in monitoring plans. The commenter requests that a draft mitigation monitoring plan be included in the Final EIR/EIS/EIS.

As described in Section 2.3, “Monitoring,” of this Final EIR/EIS/EIS, a monitoring framework has been developed for this and other restoration projects in the Upper Truckee River, which includes project specific monitoring. Baseline and post-construction monitoring would include qualitative and quantitative surveys of numerous geomorphic, biological, and vegetation variables, as outlined in Section 2.3.

See response to Comment A04-3 for information on the wetland delineation.

A05-4 The commenter requests additional justification for impacts at the river mouth for recreational features, in light of the Water Board’s prohibition exemption criteria.

As discussed above in response to Comment A01-1, the Preferred Alternative does not include impacts at the river mouth because recreation elements that could cause substantial impacts (construction-related or long-term) near the mouth have not been included. The Conservancy anticipates that it would request exemptions to the turbidity objectives related to the project’s restoration design elements, not the recreation elements.

A05-5 The commenter requests that the relative benefits and impacts of alternatives be analyzed; notes that Alternative 3 relies on natural processes and has fewer engineered structures; and recommends that sediment delivery be compared.

The Conservancy conducted a two-step process for recommending alternative components to be brought forward into the Preferred Alternative in this Final EIR/EIS/EIS, based on three criteria: Benefits; Responsiveness to Public Comments; and Overall Feasibility. (See additional description of this process in Chapter 2 of this Final EIR/EIS/EIS.) The relative benefits, including natural geomorphic processes, and the relative impacts, including sediment delivery, were considered in selecting Alternative 3 as the basis for the restoration element of the Preferred Alternative.

**Table 4-2
Summary of the Ability of the Preferred Alternative to Meet Lahontan Regional Water Quality Control Board Exemption Criteria**

Potential Prohibition Exemption	Preferred Alternative
Waste Discharge	
Will eliminate, reduce, or mitigating sources of soil erosion, water pollution, and/or impairment of beneficial uses or water.	The proposed project is necessary for environmental protection because it is designed to, in part, reduce streambank and streambed erosion and enhance sediment retention in the floodplain, thereby reducing sediment from discharging directly into Lake Tahoe. The Preferred Alternative includes engineered restoration elements that would restore the river channel and its connection to the broader floodplain and distributary channels in the central portion of the study area.
There is no feasible alternative to the project that would comply with the provisions in the Basin Plan.	All the alternatives considered, including the No-Action/No-Project Alternative and those considered but not evaluated, have the potential to exceed Basin Plan water quality standards for turbidity during construction of the restoration elements and immediately after construction until vegetation growth increases. All alternatives considered would have reduced sediment inputs into Lake Tahoe compared to the No-Action/No-Project Alternative. The Preferred Alternative is expected to provide approximately the same level of streambank protection as other action alternatives, while providing the greatest floodplain area and connectivity for potential sediment and adsorbed particulate storage.
Land disturbance will be limited to the absolute minimum necessary to correct or mitigate existing sources of soil erosion, water pollution, and/or impairment of beneficial uses.	Extensive analyses and recent modeling (2D modeling included in the Final EIS/EIS/EIS) have been conducted to identify the most problematic sediment source areas, and to optimize location and extent of treatment actions versus passive measures to address these issues as well as meet the other project objectives.
All applicable BMPs and mitigation measures have been incorporated into the project to minimize soil erosion, surface runoff, and other potential adverse impacts to the environment.	Numerous avoidance, minimization, and mitigation measures have been incorporated into the Preferred Alternative that would reduce the potential for violations to the discharge prohibitions to the extent feasible. BMPs would be employed in the study area at all times and throughout construction. The Conservancy would make a number of commitments that would minimize risks to water quality, including Environmental Commitments 5, 6, and 11. In addition, Mitigation Measure 3.9-2 requires implementation of an adaptive management plan that commits to actions that would prevent short-term water quality problems from becoming chronic, long-term water quality issues. Exact erosion control measures (i.e., BMPs) and their performance standards have not yet been specified. However, general BMPs would include the use of construction fencing, silt fences, straw bales, temporary settling basins, vegetation protection, hydroseeding, and straw mulch to assure protection of water quality. To the extent feasible, these water quality protection measures would be designed to be redundant so that if one means of protection were to fail, a backup would be in place.
Project complies with all applicable laws, regulations, plans, and policies.	Environmental Commitment 6 would ensure that the Conservancy would obtain and comply with all applicable federal, State, regional, and local permits.
Additional exception criteria apply to restoration projects proposed in the Lake Tahoe Basin. To the extent that they are more stringent, the Lake Tahoe Basin criteria supersede the regionwide criteria.	
New Development and Disturbance in the SEZ¹	
For erosion control projects, habitat restoration projects, wetland rehabilitation projects, SEZ restoration projects, and similar projects:	
Criteria (all must be met)	
The project, program, or facility is necessary for environmental protection.	Two of the primary objectives of the project are to improve water quality through the enhancement of natural physical and biological processes and to design the wetland/urban interface to help provide habitat value and water quality benefits. Restoration of channel and floodplain connectivity and function within this reach of the Upper Truckee River, and reconnection of the river lagoon system, are critical elements to protect and improve the water quality discharged to Lake Tahoe from its largest tributary basin.
There is no reasonable alternative, including relocation, which avoids or reduces the extent of encroachment in the Stream Environment Zone.	By its nature, the project must work within the channel and 100-year floodplain to rehabilitate areas that have been directly modified and compensate to restore more natural conditions and processes. Environmental Commitment 5 includes measures to limit construction activities in sensitive areas. Specifically, the measure specifies that soil and other loose material should be stored at least 100 feet from the active channel; that overwinter storage of construction materials within this area should be limited; and that staging and haul routes should be designated in existing developed or disturbed areas where feasible, or where not feasible, in the least sensitive natural areas feasible. In addition, construction area boundaries would be flagged.
Impacts are fully mitigated.	Numerous avoidance, minimization, and mitigation measures have been incorporated into the proposed Preferred Alternative that would reduce the potential for violations to the discharge prohibitions to the extent feasible. BMPs would be employed in the study area at all times and throughout construction. The Conservancy is committed to a number of commitments for minimizing risks to water quality, including Environmental Commitments 5, 6, and 11. In addition, Mitigation Measure 3.9-2 requires implementation of an adaptive management plan that commits to actions that would prevent short-term project-related water quality problems from becoming chronic, long-term water quality issues. Exact erosion control measures (i.e., BMPs) and their performance standards have not yet been specified. However, general BMPs would include the use of construction fencing, silt fences, straw bales, temporary settling basins, vegetation protection, hydroseeding, and straw mulch to assure protection of water quality. To the extent feasible, these water quality protection measures would be designed to be redundant so that if one means of protection were to fail, a backup would be in place.
Discharge in the 100-Year Floodplain in Cases Where Also Not a SEZ¹	
For erosion control projects, habitat restoration projects, SEZ restoration projects, and similar projects, provided that the project is necessary for environmental protection and there is no reasonable alternative which avoids or reduces the extent of encroachment in the floodplain.	The engineered restoration elements in the Preferred Alternative, including the channel construction, streambank and streambed stabilization treatments, and lowering of the terrace surfaces, are designed specifically to address the degraded floodplain and SEZ conditions to improve water quality over the long term and to improve conditions compared to the existing conditions. Nearly all of the study area is in the 100-year floodplain, except the uplands adjacent to the Highland Woods subdivision between Cove East Beach and the Sailing Lagoon, and along the margins of the Tahoe Keys Marina (Exhibit 3.8-14 as shown in Chapter 5, "Revisions to the Draft EIR/EIS/EIS"). The Upper Truckee River and Trout Creek channels, adjacent areas, and the shared floodplain in the central meadow are the designated floodway. Therefore, the project would require work within the 100-year floodplain and SEZ.

**Table 4-2
Summary of the Ability of the Preferred Alternative to Meet Lahontan Regional Water Quality Control Board Exemption Criteria**

Potential Prohibition Exemption	Preferred Alternative
Projects solely intended to reduce or mitigate existing sources or erosion or water pollution or to restore the functional value to previously disturbed floodplain areas.	The engineering restoration elements in the Preferred Alternative, including the channel construction, streambank stabilization treatments, and lowering of the channel, are designed specifically to address the degraded floodplain and SEZ conditions in the study area to improve water quality over the long term and to improve conditions compared to the existing conditions, and therefore require work within the 100-year floodplain and SEZ.
Projects necessary for public recreation.	The Preferred Alternative includes elements that would provide recreation benefits, with minimal adverse impacts, compared to existing conditions.
Projects that would provide outdoor public recreation within portions of the 100-year floodplain that have been substantially altered by grading and/or filling activities which occurred prior to June 26, 1975.	The Preferred Alternative would enhance the recreational experience and opportunities focused on the lower west side and Cove East portions of the site, which were degraded by fill and grading actions before June 26, 1975.
Criteria (all must be met)	
Project is included in one of the categories above.	Yes.
No reasonable alternative to locating the project or portions of the project within the 100-year floodplain.	The goal of the project is to restore the channel and 100-year floodplain to a more natural condition and by its nature must occur within the 100-year floodplain.
No reasonable alternative to locating the project or portions of the project within the 100-year floodplain.	
The project, by its nature, must be located within the 100-year floodplain.	
Project incorporates measures which will ensure that any erosion or surface runoff problems caused by the project are mitigated to levels of insignificance.	Numerous avoidance, minimization, and mitigation measures have been incorporated into the proposed Preferred Alternative that would reduce the potential for violations to the discharge prohibitions to the extent feasible. BMPs would be employed in the study area at all times and throughout construction. The Conservancy is committed to a number of commitments for minimizing risks to water quality, including Environmental Commitments 5, 6, and 11. In addition, Mitigation Measure 3.9-2 requires implementation of an adaptive management plan that commits to actions that would prevent short-term project-related water quality problems from becoming chronic, long-term water quality issues. Exact erosion control measures (i.e., BMPs) and their performance standards have not yet been specified. However, general BMPs would include the use of construction fencing, silt fences, straw bales, temporary settling basins, vegetation protection, hydroseeding, and straw mulch to assure protection of water quality. To the extent feasible, these water quality protection measures would be designed to be redundant so that if one means of protection were to fail, a backup would be in place.
The project will not, individually or cumulatively with other projects, directly or indirectly, degrade water quality or impair beneficial uses of water.	Two of the primary objectives of the project are to improve water quality through the enhancement of natural physical and biological processes and to design the wetland/urban interface to help provide habitat value and water quality benefits. The project would improve water quality and beneficial uses of waters associated with other projects.
The project will not reduce the flood flow attenuation capacity, the surface flow treatment capacity, or the ground water flow treatment capacity from existing conditions. This shall be ensured by restoration of previously disturbed areas within the 100-year floodplain within the project site, or by enlargement of the floodplain within or as close as practical to the project site. The restored, new or enlarged floodplains shall be of sufficient area, volume, and wetland value to more than offset the flood flow attenuation capacity, surface flow treatment capacity, and ground water flow treatment capacity lost by construction of the project.	The proposed Preferred Alternative would increase the area of the marsh that would be inundated during small (2-year) and moderate (5- and 10-year) flow events, increasing the potential for sediment and adsorbed particulate retention and long-term storage within the floodplain. However, it would not reduce the conveyance capacity for large (25-year) or major (100-year) floods. See Section 3.1.1, "Flooding and Flood Hazards," in Chapter 3, "Master Responses," of this Final EIR/EIS/EIS.
<p>Notes: 2D = two-dimensional; Basin Plan = <i>Water Quality Control Plan for the Lahontan Region</i>; BMP = best management practice; Conservancy = California Tahoe Conservancy; Final EIR/EIS/EIS = Final environmental impact report/environmental impact statement/environmental impact statement; SEZ = Stream Environment Zone ¹ Applicable to this project. Source: Data compiled by Cardno in 2015</p>	

- A05-6 The commenter states that the Draft EIR/EIS/EIS does not adequately analyze the necessity of a bridge for public recreation in Alternative 1 and feasible alternatives that would reduce SEZ and wetland encroachment.
- Alternative 1, “Maximum Recreation,” included the proposed bridge for public recreation, while Alternatives 2–4 analyzed in the 2013 Draft EIR/EIS/EIS included recreation features with varied SEZ and wetlands footprints. The Preferred Alternative would limit encroachment on SEZ and wetlands because it does not include the bridge at the mouth or additional recreation infrastructure on the east side of the marsh. Recreation access on the west side of the marsh would be minimal and focus recreation in designated areas along trails on the upland edge. See additional information of the selection process in Chapter 2 of this Final EIR/EIS/EIS.
- A05-7 The commenter requests hydrologic modeling of potential effects of low-flow channel relocation on wetlands near the western edge of the study area near the Tahoe Keys Property Owners Association (TKPOA) Corporation Yard under Alternative 3.
- Wetlands near the western edge of the study area near the TKPOA Corporation Yard are isolated from regular surface water inundation via overbanking of the Upper Truckee River under existing conditions (because the river does not overtop its banks in this reach until flows exceed about the 5-year event). Existing wetlands in this vicinity likely receive their dominant hydrologic support from a combination of local surface runoff (and seasonal on-site snowpack melt) and groundwater support. Relocating the low-flow channel of the Upper Truckee River would not adversely modify the normal hydrologic support to these wetlands: the frequency of overbank flows reaching this area would not be decreased relative to existing conditions and groundwater support may be improved, because the partially backfilled channel would reduce groundwater losses to the existing incised streambed during low-flow periods.
- A05-8 The commenter requests additional consideration of haul route alignments relative to impacts on wetlands and SEZ under Alternative 3, in particular for the Trout Creek bed and bank protection features.
- The haul routes and staging areas for the Preferred Alternative, which incorporates restoration elements of Alternative 3, are shown in Exhibit 2-2, “Preferred Alternative—Storage/Staging and Access Plan,” of this Final EIR/EIS/EIS. As outlined in Environmental Commitment 5, the Conservancy is committed to designating staging areas and hauling areas to existing developed or disturbed areas, or where not feasible, in the least sensitive natural-habitat areas. Haul route alignments are determined based on consideration of potential impacts on sensitive resources, restricting the extent of internal access roads to the minimum likely required and fewest stream crossings. In response to comments on the 2013 Draft EIR/EIS/EIS, access points, storage/staging areas, and internal haul route options have been modified to specifically confirm that storage areas are not in wetlands and have limited physical flood hazards. (That is, these areas are outside the existing 100-year floodplain based on the updated, detailed two-dimensional [2D] hydraulic modeling discussed in Section 3.1.1, “Flooding and Flood Hazards,” in Chapter 3, “Master Responses,” of this Final EIR/EIS/EIS.) Additionally, some of the access points and possible routes along public roads were adjusted to respond to public comment about traffic and neighborhood concerns. (See Section 3.3.4, “Traffic, Access, and Staging,” in Chapter 3, “Master Responses,” of this Final EIR/EIS/EIS.) Therefore, the internal haul routes required adjustments to ensure that all potential work areas could be reached, including the lower Trout Creek stabilization locations. The storage, staging, and access locations for the Preferred Alternative as depicted in Exhibit 2-2 of this Final EIR/EIS/EIS represent the worst-case possibilities, because Final design adjustments and permitting could further modify them to avoid or minimize wetland or SEZ impacts.

A05-9

The commenter requests clarification about the types of potential bed and bank stabilization treatments for lower Trout Creek and requests additional modeling to support the protection locations and treatment types under Alternative 3.

The detailed topographic information used to build the 2D hydraulic model (bed and bank profiles) and 2D modeling results for the 10- and 100-year flood events (water depths and velocity vectors) provide information about the bed profile slopes (showing the existing bed knickpoints in this previously degraded channel) and water surface gradients under moderate to large flood events (showing worst-case stress). These data were used to create the worst-case envelope polygon for potential bank and bed treatments for lower Trout Creek in the project schematics (Appendix A). The exact mixture of bed and bank treatments required to prevent project-related destabilization of the Trout Creek channel will be determined during additional modeling and final design analyses to avoid over-design and to meet permit requirements for materials, and treatment measures. However, to provide better information about the likely types of bed and bank treatments, representative details for buried boulder grade controls and biotechnical bank stabilizations with plantings have been included in the Preferred Alternative's schematic plans (Appendix A).