

December 2, 2015

## **Proposal for the Location, Number and Type of Steelhead Passage Features to Be Incorporated Into The San Francisquito Creek Flood Protection, Ecosystem Restoration, and Recreation Project, SF Bay – Highway 101.**

**Summary: To provide additional support for adult steelhead passage, the SFCJPA proposes to add six features (five constructed rock and rootwad structures, and one placed rock spur (partial weir) between stations 2897 and 4607 as indicated on the attached map and explained below.**

On November 23, 2015 NMFS provided to the SFCJPA a summary of its analysis of hydraulic modeling performed for the project, which included a list of suggested project features to be incorporated into the project design to remedy steelhead passage concerns at specific flow and tidal conditions, and within specific segments of the Project reach.

The summary concluded with a brief discussion of the types of features that could be incorporated into the project design to improve steelhead passage:

*“Design elements that can provide a velocity refuge include boulders, rootwads, constructed log jams, live vegetation, pools, channel widenings, alcoves, and partial baffles or weirs. Selection of appropriate design element type(s) should be based upon trying to find an analog for native historic velocity refuges that also provide the maximum habitat benefit. This should be balanced against cost, materials available, minimizing disturbance during construction, longevity, maintenance needs, and aesthetic qualities.”*

These recommendations were based on the Hydraulic Design method for analyzing steelhead passage, which was originally developed for application in culverts or other hard-bottomed or confined structures, but is the most appropriate method in NMFS’ opinion for assessing steelhead passage in the project reach. The SFCJPA believes that some of the design elements suggested would be more appropriate than others for the open channel dimensions proposed by the project, and in consideration of the project’s location within an area that experiences daily tidal action. Below is a brief summary of the appropriateness, relative impacts to other resources, and likely success of each suggested feature type.

1. **Boulders – Appropriate for Project Reach.** At the April 24, 2015 meeting between the SFCJPA, NMFS and other agencies, NMFS suggested that strategically placed 5-foot diameter boulders would provide adequate hydraulic breaks for steelhead passage.
2. **Rootwads and Constructed Log Jams – Appropriate for Project Reach.** These structure types would provide the desired hydraulic break function, and have the additional benefit of providing cover to resting steelhead. These types of structures require a larger construction effort, and would cause greater temporary and permanent disruption to marsh habitat than boulders.
3. **Live Vegetation – Appropriate for Project Reach, with limitations.** The Project proposes to fully vegetate the low, mid and high marsh areas of the project reach that will be disrupted, which will provide some fish passage benefits. Areas that will not be disrupted by construction are currently fully vegetated. Species of plants not currently present, or those proposed for areas where the project will disrupt existing vegetation, would not likely be consistent with the historical ecology of the area and would not likely have favorable establishment success. Based

on these limitations, the SFCJPA does not recommend live vegetation in addition to what is proposed by the Project.

4. **Channel Widenings – Not Appropriate for Project Reach.** The location and alignments of the proposed levees have been carefully selected to optimize hydraulic performance and sediment transport across the project reach, both for flood protection and to reduce potential impacts to marsh species in the Faber Tract. Changing the proposed channel dimensions would compromise flood protection and our commitment to USFWS to not adversely affect protected species in the Faber Tract marsh.
5. **Pools and Alcoves – Not Appropriate for Project Reach.** Because the project reach experiences daily tidal action, and because of the dimensions of the existing channel and the channel proposed by the Project, these types of features are not expected to persist due to the daily deposition and scour of Bay muds caused by rising and falling tides. In other words, the Bay would likely erase these features in a relatively short time period. The SFCJPA does not recommend these features for steelhead passage.
6. **Partial Weirs – Appropriate for Project Reach, with limitations.** In some locations a J-Weir or similar structure may serve the same function as a placed boulder or constructed log jam, and may be more appropriate based on the other project features in the immediate vicinity.
7. **Baffles or Partial Baffles – Not Appropriate for Project Reach.** Because the project reach is exposed to daily tidal action, relatively low velocities, and high fluvial sediment yield from the San Francisquito Creek watershed, baffles or partial baffles would require constant maintenance and sediment removal to maintain proper function. The SFCJPA does not recommend this feature type for Steelhead passage.
8. **ADDITIONAL FEATURE TYPE: Constructed Rock and Rootwad Structures.** This feature type was not listed in the November 23 NMFS summary. It is a constructed feature including wood logs with and without rootwads and large rocks for anchoring. The rootwad structure would be partially buried to provide for a stable structure with exposed rootwads that provide more complex cover variability and velocity refuge. SFCJPA believes this type of structure may provide the greatest benefit in some project segments.

Table 3 within the November 23 NMFS summary provided the stations or segments in which velocities under certain conditions are near or exceed the maximum allowable velocity over an established minimum length of stream. The table below is an updated version of Table 3, with minimum length and average velocities values adjusted to account for interpolated velocity at a point half way between the bounding cross sections for each location or reach. Values shown in parenthesis are from the original Table 3 and considered superceded.

Stations with higher than or near max. allowable velocities	Minimum length (ft) exceeding threshold velocity	Average Velocity (fps)	Max.allowable length (per Table 1) (ft).	Number of velocity refuges needed (Max. allowable length /Length)
5807 to 5604	299 (203)	2.1 (2.2)	300	1
5203	150 (One station)	2.1 (2.16)	300	1
4607 to 2897	1855 (1710)	2.3 (2.5)	300	6
1801	200 (One station)	2.4 (2.8)	300	Needs closer look
1401	200 (One station)	2.8 (3.3)	300 (200)	Needs closer look
1000 to 200	800	3.3 (3.5)	200	4

In order to balance NMFS’s desire to provide variability in project feature type due to the different benefits likely to be provided and consideration of feasibility and likely impact to other resources, the SFCJPA proposes to include the following design features at the locations or within the station ranges suggested as follows:

1. **Station 5807 to 5604** – Threshold velocity over the maximum allowable length is not exceeded in this segment. Under the flow and tide conditions needed to produce velocities that approach maximum allowable velocities, all of the flow is contained within the low flow channel. In order to provide velocity refuge under these conditions, the structure would have to be placed within the low flow channel, which in this segment would not otherwise be disturbed by the project. It is not advisable to disturb creek bed and surrounding habitats if a velocity break is not needed for fish passage.  
**Proposed Feature: None**
2. **Station 5203** – Threshold velocity over the maximum allowable length is not exceeded in this segment. Under the flow and tide conditions needed to produce velocities that approach maximum allowable velocities, all of the flow is contained within the low flow channel. In order to provide velocity refuge under these conditions, the structure would have to be placed within the low flow channel, which in this segment would not otherwise be disturbed by the project. It is not advisable to disturb creek bed and surrounding habitats if a velocity break is not needed for fish passage.  
**Proposed Features: None**

- 3. Station 4607 to 2897** – This segment of the project reach extends from a distance approximately 1300 feet upstream of Friendship Island to a point immediately downstream of Friendship Island. As Steelhead move upstream, the first area of unfavorable velocity is just downstream of Friendship Island. As suggested by NMFS on April 24 and during subsequent discussions, extending the rock slope protection material to provide a hydraulic tail out at the downstream end of the Island, angling towards and into the low flow channel, would provide the greatest fish refugia of the feature types that could be installed in this location.

Five additional features would be needed upstream from the Friendship Bridge at approximately 300 foot intervals to provide steelhead refugia within the maximum allowable length between each feature for this segment. To provide complex cover variability and velocity refuge, we suggest constructed rock and rootwad structures. These structures would be installed along the outboard bank of the low flow channel, with the above-grade portion of each structure extending 5 to 7 feet into the low flow channel, and the below grade portion of the structure buried vertically up to 5 feet below the low flow channel and extending horizontally beneath the marshplain bench up to 20 feet. These structures will be scaled to allow detection by fish and provide adequate velocity shadow.

**Proposed Features: Five constructed rock and rootwad structures, One placed rock spur (partial weir) at downstream end of Friendship Island**

- 4. Station 1801 and Station 1401** –The channel in this segment is in an area that will not be disturbed by other project elements, and contains critical habitat for Salt Marsh Harvest Mouse and Ridgeway’s Rail that would not otherwise be impacted. The project cannot restore this area to historic conditions; however, the project will not alter the low flow channel or worsen velocity conditions for migrating steelhead in this segment. Installation of rock or wood in this area would be extremely difficult with respect to mobilizing heavy equipment and the anchoring of hydraulic structures in the mud flat environment. For these reasons, it is not advisable to install features that would benefit steelhead only occasionally and for very short time durations. Returning tides would provide more favorable steelhead passage conditions one or two hours following Mean Lower Low Water (MLLW), providing opportunity for steelhead migration without negative impacts to other species.

**Proposed Features: None**

- 5. Station 1000 to 200** –This segment extends from just upstream of the creek mouth to 1000 feet upstream, along the levee that separates the Creek from Outer Faber Tract marsh. The Project proposes to degrade this levee to marshplain elevation, however, because the water surface elevation in this segment under the flow and tidal conditions needed to produce non-favorable velocities is so low, water would be fully contained in the low flow channel and not inundating the newly exposed marsh to the north. As such, degrading the existing levee will not change velocities under the flow and tide conditions of concern. The channel in this segment is in an area that will not be disturbed by other Project elements, and contains critical habitat for Salt Marsh Harvest Mouse and Ridgeway’s Rail that would not otherwise be impacted. The project cannot restore this area to historic conditions; however, the project will not alter the low flow channel or worsen velocity conditions for migrating steelhead in this segment. Installation of

rock or wood in this area would be extremely difficult with respect to mobilizing heavy equipment and the anchoring of hydraulic structures in the mud flat environment. For these reasons, it is not advisable to install features that would benefit steelhead only occasionally and for very short time durations. Returning tides would provide more favorable steelhead passage conditions one or two hours following MLLW, providing opportunity for steelhead migration without negative impacts to other species.

**Proposed Features: None**