

## Summary Description of Existing Infrastructure

The three culverts included in this proposal are road stream crossings. The three culverts spread creek flow across the entire width of the channel, creating shallow depths at low flows and high velocities at high flows. The first location is a culvert located just downstream of Highway 84 where Fox Hollow Road crosses Bear Creek in the city of Woodside. The site is owned by the City of Woodside. The second location is a double box culvert road crossing upstream of Alpine Road on Los Trancos Creek. The third location is on Los Trancos Creek where an emergency fire access road branches off of Los Trancos Road. Both of these sites are owned by the City of Portola Valley and are located between Jasper Ridge Preserve and the Stanford University Campus.

The Fox Hollow Bridge over Bear Creek requires a 2.3-foot jump from a pool that is 2.9 feet deep, which makes passage difficult in low flows. The biggest challenge, however, is for the fish to negotiate the twin box culverts that are each 10 feet wide and 30 feet long. The first and second Los Trancos Creek paired concrete box culverts require storm flows for passage.

Below we include specific descriptions of each barrier.

### Los Trancos Creek at Los Trancos Road

#### Existing Conditions

The existing Los Trancos road stream crossing at Los Trancos Creek consists of a double bay concrete box culvert. Each bay is 8-feet by 6-feet (width by height), with an overall length of 78 feet and a constant bottom slope of 1.8 percent. The outlet is perched 1.1 feet above the downstream tailwater control, with outlet drops between 0.5 and 1.0 feet at fish migration flows. Preliminary evaluation of the culvert hydraulics, stream morphology, and fish passage conditions identified three areas of concern:

1. The stream crossing fails to accommodate the 100-year peak flow, as recommended by NOAA Fisheries and CDFW. The resulting overbank flows may impact adjacent properties.
2. At fish migration flows a combination of insufficient water depths, excessive velocities, and a slightly perched outlet hinders passage for both juvenile and adult salmonids.
3. A distinctive knick point, indicative of head cutting and channel incision, was identified approximately 80 feet downstream of the culvert. If the knick point continues moving upstream, the culvert outlet will become perched as much as 3 feet.

## **Los Trancos Creek at Fire Access Road**

### Existing Conditions

A short fire access road that connects Los Trancos Road and Valley Oak Road crosses Los Trancos Creek upstream of the Los Trancos Road crossing. It consists of a double bay concrete box culvert. Each bay is 10 feet by 8 feet (width by height), with an overall length of 34 feet and a constant bottom slope of 1.7 percent. Because the culvert is wider than the channel, bedload is deposited throughout the right bay which is on the inside depositional portion of the natural channel. The outlet is perched 0.8 feet above the downstream tailwater control.

Preliminary evaluation of the culvert hydraulics, stream morphology, and fish passage conditions identified insufficient water depth for fish migration as the primary area of concern. Additional issues needing to be addressed at the site are the small drop at the outlet and excessive velocities for juvenile salmonids.

## **Bear Gulch Creek at Fox Hollow Road**

### Existing Conditions

The Fox Hollow Road crossing at Bear Gulch Creek consists of a double bay concrete box culvert. Each bay is 10 feet by 10 feet (width by height), with an overall length of 31 feet and a constant bottom slope of 1.0 percent. The outlet is perched 2.5 feet above the downstream tailwater control.

Preliminary evaluation of the culvert hydraulics, stream morphology, and fish passage conditions identified the outlet drop as creating a relatively severe barrier to migrating adult steelhead. Additionally, the culvert fails to provide sufficient water depths for fish to swim through at all migration flows.