

# **SLEEPY HOLLOW STEELHEAD REARING FACILITY**

## **River Intake Structure Solutions**

Operational objectives of the intake screen include:

1. Water supply during low summer flows, as low as 2 cfs in Carmel River
2. Sweeping velocity past screen to move material cleaned off screen downstream
3. Minimize the amount of fine sediment passing through screen and settling in the supply pipeline
4. Minimize sand and sediment accumulation around screen
5. Minimize rock and log damage to screen
6. Operational and maintenance access to screen

Construction issues related to intake screen installation include:

1. Minimize changes to the existing channel bottom and bank topography
2. Minimize the amount of in-channel excavation
3. Minimize the in-channel work period
4. Minimize the amount of bank shaping/contour revisions upstream and downstream of intake location

### General hydraulic and sediment transport considerations to all three designs

General sediment transport will not be significantly difference between the designs. Local scour and sedimentation can most likely be mitigated. Similarly, river hydraulics (flooding) are expected to be similar for each design.

It is anticipated that log transport would primarily be a concern at very high flows, when much of the infrastructure is submerged and not subject to damage from floating debris. During a flow higher than the 100-yr event the water-surface would be over 15 feet above the cone screen.

Our bedload mitigation is for the smaller size fractions. Scour calculations for the final design will give an indication of what large rock may be moving through the system and could damage the screen. A balance of preventative measure and risk is being considered with the vane design.

### **Option 1 – Cast in place concrete Slab with 8’ tall vertical back wall and 45 degree wing walls**

#### Hydraulic and Sediment Transport Review

Pros - This seems like it is the best design to make sure the infrastructure will persist for a long time. The slab and wall provide solid anchor points and will facilitate periodic maintenance. Keyed in properly they are likely the best bet against catastrophic failure. It could be designed to have a smaller plan view footprint.

Cons – The vertical and wing walls will need to be designed by a structural/geotechnical engineer to assure it can resist the pressure from the bank backfill. The slab will probably need footings to prevent failure if supporting ground is undermined.

#### Operation and Constructability Review

Pros:

- Achieves Operational Objectives 1, 2, 3 and 6
- Addresses Construction Issues 1, 2 and 4

Cons:

- Sand and sediment may accumulate downstream of supply pipeline
- Screen is exposed to rock and log damage
- Supply line under screen is exposed to rock and log damage
- Screen, pipeline and slab located in a depression in the channel bottom that may initiate deposition of sand and sediment around screen
- If slab and walls cast in place, in-channel construction period could exceed 20 days
- Bank shaping/riprap against angled wing walls will require extra time to complete correctly

#### **Option 2 – Precast concrete slab with precast 3.2' tall vertical back wall**

#### Hydraulic and Sediment Transport Review

Pros – Protecting the underside of the screen and pipe from bedload is advantageous. Provide a similar level of ruggedness as Option 1.

Cons – Similar issues as Option 1. Geotechnical and slab protection issues are still the same. Concrete box versus vertical wall would be reviewed for cost effectiveness.

#### Operation and Constructability Review

Pros:

- Achieves Operational Objectives 1, 2, 3, 4, and 6
- Addresses Construction Issues 1, 2, 3, and 4

Cons:

- Screen is exposed to rock and log damage

### **Option 3 – Precast concrete slab with rip rap bank above slab**

#### Hydraulic and Sediment Transport Review

Pros – Maintaining the natural shape of the bank will limit the amount of induced scour

Cons – Riprap is designed to be flexible and is expected to shift over time, while still providing scour/erosion protection. Shifting of rock over time may interfere or damage the infrastructure. If the desire is for a more natural looking final appearance, it may be difficult to recruit vegetation growth while still being able to maintain the system.

#### Operation and Constructability Review

Pros:

- Achieves Operational Objectives 1, 2, 3, and 4
- Addresses Construction Issues 1, 2, 3, and 4

Cons:

- Screen is exposed to rock and log damage
- Screen is also exposed to bank riprap rolling down slope onto screen
- Access to screen is restricted as service truck may not be able to get close enough to top edge of bank to use hoist needed to lift and service screen