Jun 26th, 1:30 PM - 1:50 PM

Concurrent Sessions D: Glendale Water Supply Improvements Project: Truckee River Full Channel Width Fish Passage Water Diversion Project - Glendale Water Supply Improvement Project: Design Case Study

Michael Wilkin
Stantec

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Glendale Water Supply Improvement Project

Truckee Meadows Water Authority
Reno, Nevada

ENR’s Southwest Region
Best Civil Works/Infrastructure Project for 2011
Project Requirement

- Flips tubers and novices
- Fun for kayakers
Glendale Water Supply Improvement Design Goals

- Provide a reliable water supply to the Glendale Potable Water Treatment Plant
- 100 percent capture of released storage water for TMWA customers in drought years
- Harmonious with the Truckee River Flood Management Project
- Supported by the community
- Full river width roughened channel with integrated fish passage, safe recreation passage, and low flow channel
Historical Flow in the Truckee River

Truckee River, USGS Gage #10348000, Mean Flow (cfs)

- Historical Avg Flow
- 1994 Avg Flow
Design Process

- Initial Study
- Preliminary Design
- Project Introduction to Regulators
  - ACOE
  - State Lands
  - USFWS
  - NDEP
  - Flood Committee
  - NDOW
- Public Outreach Process
- Physical Modeling
- Final Design
- Construction
Initial 5.7% Slope Weir Design
Public Involvement Process

Public Meetings

1

2

3

Monthly Working Group Meetings
Topics Studied By Working Group

- Slope and cost analysis

- Fish passage
  - Fish species of interest
  - Weir slope and velocities
  - Channel configuration

- Boat passage
  - Low flow passage for all experience levels
Weir Face Slope Analysis

- Slopes analyzed
  
  5.7 %  4%
  3%     2%

- Slope determined:
  - Cost
  - Upstream Fish Passage
  - Boat Passage
Cost vs. Slope Analysis

Estimated Cost vs. Slope

- $14
- $13
- $12
- $11
- $10
- $9
- $8
- $7
- $6
- $5
- $4
- $3
- $2
- $1
- $0

Percent Slope

- 5.7
- 4
- 3
- 2

Estimated Construction Costs

- 175 Ft Diversion Length
- 250 Ft Diversion Length
- 500 Ft Diversion Length

Estimated Contingency Dollars
Fish Passage Goals

- Seasonal Fish Passage of all species and ages
  - Slope and velocities
  - Mimic natural channel
  - Juvenile fish screen and bypass
Predicted Diversion Fish Passage Velocities for Lahontan Cutthroat Trout

Typical Spring Flow
1500 CFS

High Spring Flow
3000 CFS

LEGEND

<table>
<thead>
<tr>
<th>Velocities</th>
<th>Fish Eye</th>
<th>Percent Slope of Diversion Weir</th>
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<tbody>
<tr>
<td>Average</td>
<td>5.7%</td>
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</tr>
<tr>
<td>Sustained Swimming Speeds</td>
<td>4.0%</td>
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<tr>
<td>Darting Speeds</td>
<td>3.0%</td>
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Predicted Diversion Fish Passage Velocities for Adult Cui Ui Fish

** Typical Spring Flow 1500 CFS **

- CUI UI DARTING SPEEDS
- CUI UI SUSTAINED SWIMMING SPEEDS

** High Spring Flow 3000 CFS **

- CUI UI DARTING SPEEDS
- CUI UI SUSTAINED SWIMMING SPEEDS

** Legend **

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© Peter Rissler
Predicted Diversion Fish Passage Velocities for Mountain Sucker, Lahontan Tui Chub

TYPICAL SUMMER FLOW
400 CFS

VELOCITIES, FT/S

PERCENT SLOPE

LEGEND

VELOCITIES

AVERAGE FISH EYE

PERCENT SLOPE OF DIVERSION WEIR

- 5.7%
- 4.0%
- 3.0%
- 2.0%

Tahoe Sucker
Predicted Diversion Fish Passage Velocities for Adult Mountain Whitefish
Fish Passage Design Elements

- Roughened 4% channel
  - Fish passage for all species and ages
- Fish screens
- Juvenile bypass return
Boater Passage and Safety

- Minimum of 6 inches water depth during low flow conditions
- Boulder spacing in thalweg > 15 feet
- Safe hydraulic jumps
Design to be Avoided; A-Jumps

- Flips tubers and novices
- Fun for kayakers
Preferred Design

Little tendency to keep swimmers
Fun and safe for kayakers
Boat Passage Design Elements

- Removes previous safety hazard and recreation impediment
- Provides passage of boaters and inner tubers of all ages and experience levels based upon water flow rates and sound judgment by the user
- Complements recreational efforts of the community
1:20 Scale Physical Model Built to Test Design Performance

- Preliminary Testing
- Initial Design Testing
- Design Development and Refinement
- Performance Testing
Physical Model – Study Objectives

- Assess the performance of the fish and boat passage
- Assess the performance of the intake
- Assess the performance of the sediment sluicing facilities and debris passage capabilities of the facility
- Check regional flood project compatibility
- Refine the design to improve performance
Physical Model – Description

❖ 1:20 scale mobile-bed model

❖ Full river width (up to El. 4442 ft), extending 600 ft upstream and 600 ft downstream of the weir

❖ Simulate discharges up to the 100-year discharge (20,700 cfs)
Physical Model – Design Development

Summer Flow
250 cfs

Normal Spring Flow
1500 cfs
Physical Model – Design Development

High Spring Flow
3,000 cfs

5-Year Flood
6,000 cfs
Physical Model – Design Development

Regulatory Flow
14,500 cfs

100-Year Flood
20,730 cfs
Model Verified Fish and Boat Passage Opportunities

- River = 1,500 CFS
- Intake = 60 CFS

- <5 ft/s
- >5 to 8 ft/s
- >8 ft/s
Improvements from the Physical Model

- Improved fish guidance in intake channel
- Optimized intake hydraulics
- Optimized diversion face hydraulics
- Improved chute and pool locations
- Optimized bank restoration elevations
Final 4% Slope Weir Design
Final 4% Slope Design
Final 4% Thalweg Design
Final 4% Chute & Pool Design

4% SLOPE PLAN & PROFILE

SCALE: N.T.S.

A

D1
Critical Intake Components

- Trash Racks
- Fish Screens – Tuning Baffles
- Brush Cleaner
- Tuning Baffles
July 29, 2011
Project Summary

- The Constructed Project
- Low profile, grouted rock weir
- 4 % roughened channel
- Provides fish passage for all species
- Provides for sediment transport
- Provides safe boat passage
- Captures 100 percent of POSW during extreme drought conditions
Questions?