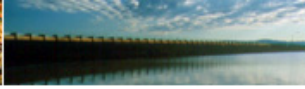


Glendale Water Supply Improvement Project



# **GLENDALE WATER SUPPLY IMPROVEMENT PROJECT**

*Consensus Paper by Project Working Group*

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## **Introduction**

In August, 2004, the Truckee Meadows Water Authority (TMWA) formed a “Working Group” to obtain public input on reconstruction of the diversion facility for the Glendale Water Treatment Plant (“Glendale Facility”). The Working Group consisted of representatives of various agencies and groups with an interest in Truckee River health and management. It met every month for seven months to devise design criteria for the proposed Glendale Facility. This consensus paper is a product of those meetings and represents, to the fullest extent possible, the collective opinion of the Working Group regarding design features that are worthy of proceeding to the physical modeling stage.

## **Glendale Water Supply Improvement Project Goals**

TMWA is the largest water supplier in the Truckee Meadows. It serves over 80,000 residential and commercial customers using water from the Truckee River and groundwater sources. In non-drought years, TMWA’s diversion share represents only 7 % of the water diverted from the Truckee River. In drought years, TMWA’s share increases to about 17% of the total water diverted. TMWA is also able to store water in upstream reservoirs that can be drawn upon in drought years.

The federal Safe Drinking Water Act sets water quality standards that TMWA must meet. Surface water treatment is performed at TMWA’s Chalk Bluff Plant in northwest Reno, and the Glendale Plant in Sparks.

The existing diversion that funnels water into the Glendale Plant is essentially a pile of rock and rubble that backs up the water just upstream of the plant. This structure creates many difficulties:

- In normal years, the diversion cannot supply enough water to the plant to allow it to operate at full capacity.
- In drought years, the diversion cannot capture all of the community’s water that has been released from upstream storage reservoirs.
- After several drought years, TMWA must go into the river with heavy equipment to try to “plug the leaks” in the diversion so it can capture all of the water it has released for customers.
- TMWA also needs to put heavy equipment into the river after every major flooding event to repair the diversion.
- The diversion does not provide fish passage.
- The diversion was not designed to provide passage for boaters.

TMWA’s goals with regard to the Glendale Project are straightforward. It seeks to (1) revamp the diversion works to ensure a more reliable water supply to the Glendale Plant;

(2) receive public input into evaluation criteria and the concepts for the proposed diversion facility and (3) complete the project by the end of 2008.

### **Project Criteria**

The following project criteria for the new diversion were selected by TMWA and the Working Group:

- Reliable water supply for the Glendale Water Treatment Plant
- Full capacity treatment in normal flow years
- 100 % capture of stored water that is released for TMWA customers in drought years
- Cost-effective
- Technically feasible
- Sensitive to the Truckee River Flood Management Project
- Environmentally-sensitive
- Supported by the community

In developing possible conceptual approaches for the proposed Glendale Facility, the Working Group took into account a number of important issues. These included:

- Maintaining a reliable water supply to the Glendale Plant and the community over a broad range of river flow conditions.
- Improving the fishery of the Truckee River, including threatened and endangered species migration capability, and increases to population connectivity for other known indigenous fish species within the Glendale reach of the river.
- Improving the diversion in a manner that works with the flood control efforts being actively pursued by the Army Corps of Engineers (ACE) and local community groups.
- Improving the riparian habitat in the vicinity of the Glendale Diversion
- Constructing a facility that allows for safe boat passage and bolsters the community's goal of improving recreational opportunities along the Truckee River corridor.
- Constructing a facility that is efficient in water use and economical to build.
- Aesthetic considerations.

This paper is divided into the following sections: (1) A brief review of the process pursued by TMWA and the Working Group with a description of the design that will

proceed to the physical modeling stage, (2) A description of the existing structure and its deficiencies, (3) A review of historical activities that have affected (both negatively and positively) the Truckee River to provide a historical context against which the proposed Glendale Project can be measured, and (4) References to the activities of the Working Group and technical memos produced by team members.

### **Working Group Process**

The process undertaken by TMWA staff to obtain public input on the proposed Glendale Facility started with an initial meeting for the general public in August 2004 to present the goals of the project and to solicit membership into the Working Group. Thereafter, ongoing Working Group sessions were held approximately once every three weeks to address one or two issues of concern. Subsequent public meetings were held to inform the general public of the project status and to obtain feedback.

TMWA hired a Project Design Team headed by ECO:LOGIC Engineering and consisting of environmental, fisheries, and hydraulic sub-consultants. A facilitator was also hired to keep the process on track and to ensure that all issues and concerns were being properly and thoroughly addressed. The Project Team made technical presentations, provided technical memos, and responded to inquiries and comments from Working Group participants. The following topics were analyzed:

- **Location:** Selection and review of site alternatives, including construction at the existing location and other locations 700, 1400 and 2100 feet upstream. Analysis of the issues and concerns raised by consolidation of diversion structures was also presented.
- **Construction Methods:** Analysis of construction methods that could be used for the project, including structural and foundation requirements, staging options and construction timelines. General construction methods for various project approaches were presented.
- **Flood Control/Sediment Transport:** Flood flow analysis of each alternative using HEC-RAS was performed, taking into account present flood control planning efforts by the Community Flood Coalition and the Army Corps of Engineers (ACE). This analysis also included a study of sediment transport for each designated alternative.
- **Fish Passage:** A detailed review of Truckee River fisheries and methods to ensure fish passage and to prevent fish entrainment, including screens, weir design, swimming speeds, and off-channel passage alternatives. All known indigenous species of fish were evaluated at all ages. Discussions and analysis covered the passage of designated threatened and endangered species (Cui-ui and Lahontan Cutthroat Trout) as well as passage of known species, all ages in most years.

- **Boat Passage:** Analysis of various methods which would allow for safe boat passage across the facility under various flow regimes taking into account various experience levels in most flow conditions. Velocities and safety factors for boaters (spacing of boulders, hydraulic conditions) were considered.
- **Environmental Issues:** Environmental evaluation for each of the project alternatives was discussed. Mitigation measures, with an emphasis on restoration of natural riparian habitat and elimination of bank erosion, were discussed.

### **Working Group Considerations**

After evaluating and discussing the various issues, concerns, and potential alternatives, the Working Group members developed a list of considerations that they wanted to see incorporated into the project design. These ideas generally represent refinements to the joint goals established by TMWA and the Working Group early in the process. The Working Group members understand that the project's primary goal of providing a reliable water supply must be met. TMWA has agreed to include as many of these considerations as possible into the project as it proceeds to the physical modeling stage and is further refined.

### **Working Group Considerations**

- Use a 4 % slope at the existing location
- Mimic the natural channel by using a “roughened channel” design with interstitial spacing; interstitial spaces are critical for fish passage biological and hydraulic connectivity.
- Minimize the amount of exposed concrete in the structure.
- Include a low flow channel to provide best opportunities for fish and boat passage in low flow years.
- Keep the structure in the main channel; analysis shows that creation of a bypass channel for fish passage in high flow years is not effective.
- Evaluate upstream and downstream passage for know species, all ages of fish in most years.
- Work within the range of flows to be expected on the Truckee River; review at the exceedence curves.
- Evaluate sediment transport; design for minimal maintenance requirements.
- Work with the Truckee River Flood Management Project.

## **Project Alternatives Evaluation**

A project alternatives evaluation was performed in conjunction with the Working Group to analyze potential weir locations and their associated impacts on performance and the environment.

In addition to the recommended project fully described the next section, five other project alternatives to construction of a new weir in the existing location were evaluated as part of the Working Group process.

1. Use of the existing location for an infiltration gallery
2. Use of the existing location with a 2 % side channel for fish passage
3. Locating the weir structure 500 feet upstream with a 2 % slope
4. Locating the weir structure 700 feet upstream
5. Locating the weir structure 2100 feet upstream

The primary elements evaluated for each alternative were:

- Location
- Diversion Slope
- Water Delivery Method
- Point of Diversion
- Environmental Effects
- Flood hydraulics

Each of the five alternatives was evaluated against the primary criteria listed in the Project Criteria section of this document, as well as the evaluation items listed here.

### *Infiltration Gallery*

Use of an infiltration gallery placed in a gravel bed in the river was investigated for possible efficiency, and to determine if it would be feasible to remove the weir structure requirement completely. There were several negatives outcomes associated with this concept, with the primary one being inefficient capture of low river flows. TMWA could not be guaranteed capture of released drought storage water without some method of diverting the water into the plant. Use of an infiltration gallery would result in the loss of “drought reserve water” to the community.

In addition, this stretch of river near the Glendale Plant tends to be sediment depositional during low flow years, with intermittent scouring during high flow periods. An infiltration gallery would require excessive maintenance and constant use of equipment in the river to ensure adequate water diversions to the plant. These two factors removed the infiltration gallery from further consideration by the Working Group.

*Use of Existing Location with a Two Percent Side Channel for Fish Passage*

This analysis centered on the feasibility of constructing a 2 % side channel for fish passage around a 6-10 % grade weir in the existing location. Difficulties with fish attraction to the side channel entrance, entrance location constraints due to the proximity of the Glendale Bridge overpass, and the preference of the USFWS, NDOW, and the Working Group members to maintain “in-the-river” flow, excluded this option from further consideration.

*New Weir Five Hundred Feet Upstream of Existing Location*

This location was analyzed as part of the overall slope analysis, as the 500 foot upstream location equates to a 2 % slope from the existing location. Moving the weir 500 feet upstream had negative environmental consequences associated with it. By moving the structure upstream, the backwater pool created by the existing weir was dewatered by 300 feet, without a corresponding increase in the length of backwater pool created by new weir in the same location. Correspondingly, on the downstream face of the new weir, the existing riverbanks would become perched above the river level. Overall, 300-500 feet of the current pool and shade structure in the river created by the existing diversion would be reduced with this option. This condition was not acceptable to the Nevada Division of Wildlife (NDOW) representative at the Working Group meetings. Creating a 2 % slope for 500 feet would require 500 feet of rock fill to be placed in the river, potentially impacting the flood profile which the project is trying to reduce. All of these issues led to a non-recommendation of this option by the Working Group.

*Locating the New Weir Seven Hundred Feet Upstream*

Locating the new weir structure 700 feet upstream of the existing weir developed as an option due to preliminary analysis indicating benefits for flood height reductions. Upon closer examination however, the supposed flood benefit resulted from a required reduction in riverbed elevation by means of excavation of bed material for almost the entire 700 feet. Also, the slope of the weir needed to be accounted for by in-fill of some of the bed, thus removing the preliminary flood benefit.

This location raises water quality issues as well. Three major storm drains discharge to the river here, and there is not adequate mixing time before this storm water is drawn into the plant intake for treatment. Therefore, the plant could be dealing with more concentrated pollutants than they do now. In addition to these issues, the existing pool in the river would be gone and the riverbanks would be perched above the new bottom elevation. There would be substantial habitat disruption on the left bank during construction of the intake and pipeline, and the pipeline would logically have to go through the City of Sparks Fisherman’s Park, requiring renovation of the park. Overall, this alternative would be costly in terms of environmental impacts to the river riparian habitat, and would carry an excessive cost for the TMWA ratepayer with very little or no benefit in return.

*Locating the Weir 2100 Feet Upstream With Pump Station*

Analysis of this location was driven by the exploration of possible ways to reduce the flood profile of a weir in the current location. This site was chosen for analysis because it was upstream of the three storm drains previously mentioned as discharging above the 700 foot location. Also, Highway 395 and Kietzke Lane bridges cross the river in this proximity, and the 2100-foot location is upstream of the piers and bridge abutments for those structures.

Several issues stand out when discussing this location for use as a diversion site for the Glendale Treatment Plant. First, it is no longer in proximity to the plant, and there are several physical barriers between the diversion site and plant intake. If the diversion intake were maintained on the same side as the treatment plant, the left bank, there is minimal probability that the diverted water could be delivered to the plant without use of a pump station. Construction of a pump station would be expensive on several fronts. The dollar cost to the ratepayer for the pump station and pipeline would be several million dollars, and even careful construction techniques would cause an extensive amount of riparian habitat destruction.

Removal of the existing rock/rubble weir, and construction of a new weir in this location would change the river hydraulics for this reach of the river. There would be head-cutting of the river bottom caused by removal of the existing weir, which would continue upstream until stabilization was achieved. The mobilized material would be deposited downstream, potentially choking spawning areas, and continuing to exacerbate the sand bar depositional situation in East Sparks. In the Glendale area, the head-cutting would lower the river bed, leaving perched riverbanks in its wake.

There is a bend in the river below the 2100-foot location, and this area would require armoring if the diversion was upstream. Velocities on the downstream side of the weir would be higher than those experienced in the area now, especially in flood or high river stage situations, and bank stabilization methods would have to be employed to avoid bank failure in the region. All of these issues contributed to rejection of this alternative by the Working Group.

**Recommended Project**

After careful analysis, discussion and deliberation, the Working Group agreed with the design team's recommendation that the following design proceed to the physical modeling stage. The design elements outlined below, to the extent possible, balance the economic, environmental and recreational needs of the competing demands on the river while adhering to criteria outlined by TMWA at the outset of the public process. Elements of the recommended project include the following:

- **Weir Structure:** Construction of a low-head concrete weir with a roughened channel surface, both downstream and upstream. Hydraulic analysis indicates

that the weir will have little or no effect on flood flows in the area and, in fact, will slightly reduce the local flood profile when compared to the existing structure. The height of the weir will be set as low as hydraulically possible and will allow operation of the Glendale Treatment Plant under various flow regimes in the river. Under normal flow conditions the weir will be submerged. The proposed weir structure complements the ACE's flood plans for the Truckee River.

- **Location:** Construction of low-head weir on the river at approximately the same location as the existing structure. The existing location minimizes environmental impacts during construction and keeps water in the river as long as possible prior to its diversion into the Glendale Plant.
- **Grade, Fish and Boat Passage:** Incorporation of a roughened channel on the downstream side of the weir set at a 4% grade on the downstream face. The roughened channel concept with this grade mimics a natural stream, provides opportunities for passage of all fish species– both adult and juvenile- and will allow for boat/kayak passage at certain rates of flow.

**Fish Protection:** Incorporation of self-cleaning fish screens, either off-channel or on-channel, which prevent fish entrainment in the treatment plant works. Further work by the project team has resulted in the selection of on-channel fish screens, most likely of the high profile, wedge wire style. The screens would be designed utilizing current NOAA/NMFS criteria with respect to approach and sweeping velocities.

### **Existing Glendale Plant and Diversion Facility**

The Glendale Water Treatment Plant was originally placed into service in 1975. Through the years, the plant has been upgraded to improve capability and capacity. Substantial improvements were completed in the mid-1990's, including the addition of a flocculation/sedimentation process and improvements to the filtration system.

Diversions into the plant are presently made from a rudimentary rock and concrete structure in the river. This structure essentially was an expansion of an old ditch diversion. The existing diversion structure does not provide the flow necessary to operate the plant to its fully-rated capacity. Also, by nature of its construction and configuration, the diversion structure leaks, precluding full capture of municipal water that is released from TMWA's upstream reservoirs for customers during dry years. This condition becomes quite serious during lengthy droughts when the only water in the river may be the community's drought water rights and reserves. During such periods, TMWA's operating personnel have had to pump the river and seal the existing rock/concrete structure with plastic sheeting and sand bags, requiring the undesirable use of heavy equipment in the river channel. Even with these measures, the existing diversion still loses water that could otherwise be used for municipal water supply purposes if a more reliable diversion were in operation.

Additionally, since the existing diversion consists of loose rock and concrete, the structure has had to be rebuilt on numerous occasions following floods, again requiring the operation of heavy equipment in the river. Lastly, but certainly as important, the existing diversion acts as an impediment to fish and boat passage.

### **History of Human Activities on the Truckee River System**

Once a wild and untamed river, the Truckee River and its tributaries has become a highly regulated and appropriated river system. It is also one of the most litigated river systems in the United States. Early diversions and regulation of the river system were largely due to the discovery of silver in the Comstock and construction of the transcontinental railroad.

In 1859 silver was discovered in the Virginia City area. The “silver rush” that ensued created a great demand for lumber and water. Saw mills powered by river flows were constructed along the river. Those mills dumped sawdust and other waste products were allowed to freely discharge into the river.

Diversions and regulation of the Truckee River system accelerated rapidly in the late 1800’s and into the 1900’s. Many irrigation/ municipal supply ditches were constructed in the Truckee Meadows, and a number of hydroelectric diversions were rapidly constructed on the river between Reno and the California/Nevada State line.

Perhaps the most significant diversion impact on the Truckee River system was the Newlands Project, which allowed for a large inter-basin transfer of water from the Truckee River system into the Carson River system. The Newlands Project provided for the construction of Derby Dam, the Truckee Canal and the Lahontan Dam and Reservoir on the Carson River, thereby facilitating the agricultural development of the Fallon area. The Derby Dam diversion is located approximately 15 miles downstream of the Glendale Facility. The barrier to fish passage created by Derby Dam would later be somewhat mitigated by a fishway designed for travel by the Pyramid Lake Cui-ui.

### **Evolution of Restoration Efforts on the Truckee River and its Tributaries**

Attitudes have changed over the years and today the Truckee River is valued not only as a municipal, industrial, and agricultural water supply but also as an environmental and recreational resource that deserves and demands protection. Many Working Group members are active participants working to protect the health of the Truckee River either through governmental agencies or private and philanthropic organizations concerned with the environmental and aquatic health of the Truckee River.

Along with slowly-changing perceptions and attitudes towards the river, perhaps the most important positive water quality event for the Truckee River was the enactment of the Clean Water Act of 1972 (CWA). The CWA established nationwide effluent standards, a nationwide discharge permit program with effluent guidelines, and a stated goal of reducing microbiological and nutrient-based pollutants to the nation's rivers and streams. Due largely to the CWA and its amendments, major improvements have been made to the Truckee Meadows Wastewater Reclamation Facility, which have greatly reduced the microbiological, suspended solids and nutrient loading to the river. In addition, the wastewater plant must abide by discharge permit parameters enforced by the Nevada Department of Environmental Protection.

More recently there has been momentum to restore the natural fisheries and aquatic environment of the river as much as possible taking into account its highly regulated nature and the many barriers to fish and boat passage. The 1990 signing of PL 101-618 into law (the Truckee-Carson-Pyramid Settlement Act) seeks to provide a balanced approach to the operation of the Truckee River, its tributaries, dams and reservoirs. It was landmark legislation which called for negotiation, consensus building and appreciation for the multi-use nature of the Truckee River. The agreement which was negotiated as the result of this legislation is known as the Truckee River Operating Agreement (TROA), which is proceeding through the CEQA process in California and the NEPA environmental process at the federal level.

Recent construction projects have taken a more proactive approach to the Truckee River ecosystem. Examples of projects that have been recently completed, or are in the midst of being completed, include the following.

- **Chalk Bluff Diversion Weir (1994):** Included fish ladders and fish screens which were state of the art at the time.
- **Derby Dam Fishway (date?):** A fishway was recently constructed by the Bureau of Reclamation to allow for the upstream migration and spawning of the Cui-ui and Lahontan Cutthroat Trout.
- **Restoration of Lower Reaches of the River:** Efforts are on-going to restore as much as possible the aquatic and riparian habitat in the lower reaches of the Truckee River. Work includes cottonwood restoration and the reestablishment of riffles and meanders on the river. This work will improve the health of the river and enhance water quality by further reducing nutrient loading.
- **Truckee River Whitewater Park at Wingfield in Downtown Reno:** A whitewater rafting park was recently constructed in downtown Reno at Wingfield Park for kayaking, rafting, tubing, and other recreational activities. To a certain extent, the park mimics natural pools and riffles in the river. It has become popular with locals and tourists alike and has provided a boost to the local economy. The City of Sparks is also planning a similar park downstream of the Glendale Diversion near Rock Park.

- **Proposed Reconstruction of the Farad Hydroelectric Diversion Weir:**  
Destroyed in 1997 by a significant flood, reconstruction of this facility is planned in the near future. The design incorporates a roughened channel concept for fish passage, fish screens, and provides for safe boat passage, all elements of the proposed Glendale project.

Construction of the Glendale Project, as recommended, incorporates well into recent restoration efforts along the Truckee River. The project will provide a reliable water supply for the residents of Reno, Sparks and Washoe County and in a manner that improves river health and recreational opportunities.

### **Sources of Working Group Activities and Technical Memoranda**

Technical memoranda which review and summarize hydraulic, fisheries and sediment transport analyses are included within Appendix A. The reader is encouraged to go to the Glendale Water Supply Improvement Project website ([www.glendalewatersupply.com](http://www.glendalewatersupply.com)) where summaries of working group and public meetings can be viewed and downloaded.

Working group and public meetings were held on the following dates:

- **Public Information meeting**, August 23, 2004: Project and process overview – participants invited to participate in the Working Group
- **Working Group meeting**, September 14, 2004: Process and schedule and topics for discussion, project overview and background information
- **Working Group meeting**, September 27, 2004: Flooding and localized impacts, location analysis, consolidation of diversions, sediment transport, TMWA river operations
- **Working Group meeting**, October 19, 2004: Fish passage and screening, boat passage
- **Working Group meeting**, November 9, 2004: Funding options, continuation of discussion of fish passage, velocity for fish passage,
- **Working Group meeting**, November 30, 2004: Construction methods, reconstruction and re-vegetation
- **Working Group meeting**, December 14, 2004: Cost and funding options
- **Working Group meeting**, January 25, 2005: Criteria for the alternatives selection matrix, review and discussion of aesthetics, flooding, fish passage and screening
- **Working Group meeting**, February 24, 2005: Prepare for Public Information meeting

- **Public Information meeting**, March 2, 2005: Project update and progress report
- **Working Group downstream tour**, May 24, 2005: See current downstream diversions and fish passage
- **Working Group meeting**, September 14, 2005: Prepare for Public Information meeting
- **Public Information meeting**, October 26, 2005: Project update and progress report
- **Working Group meeting**, December 14, 2005: Project Summary

### **Future Activities**

The Working Group is nearing completion of its review and input into the Glendale Water Supply Improvement Project. The Working Group will be proactively involved as the project progresses into physical modeling, early design development and permitting. Pending successful modeling and simulation efforts, it is expected that the project will be submitted for permitting with various jurisdictional agencies in the late fall/winter of 2005-06.

## **APPENDIX A**

Reference: [www.glendalewatersupply.com](http://www.glendalewatersupply.com)

1. Geomorphologic and Sedimentation Analysis: September, 2004, Northwest Hydraulic Consultants
2. Fisheries Engineering Technical Memo: October, 2004, Chinook Engineering
3. Hydraulic Design for Public Safety: September, 2004, Northwest Hydraulic Consultants

## **Working Group Participants\***

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**\*The working group process was a collaborative process and the statements and opinions in this paper may not totally reflect the views of all members.**