

BUNKERVILLE DIVERSION RECONSTRUCTION BENEFITING LOCAL FARMS & WILDLIFE



“The reconstruction of the Bunkerville Irrigation Company’s (Bunkerville, Nevada) diversion structure serves multiple purposes in the local community. Supporting both local agriculture and endangered species, the structure provided important functions that over time had become more significant than the original intended service.” Mike Chandler, BC&A Project Manager

When the local irrigators in the Virgin Valley (Clark County, NV) teamed with the U.S. Army Corp of Engineers in 1957 to construct a structure to arrest long term erosion on the Virgin River they could not have foreseen the multiple functions the structure would come to serve over the next five decades. Originally erected as a grade control structure at the irrigation company’s diversion near Mesquite, Nevada, the structure was constructed using old steel railroad rails as soldier piles with wood and rock cribbing. The structure consisted of upstream and downstream piles offset twenty-four feet apart with a riprap apron between the two rows, with a total elevation difference of 8 feet. The two rows of sheet piles were bookended by two soil cement dikes which constricted the broad Virgin River channel to a width of just 330 feet. The primary purpose of the structure was to maintain water surface elevations sufficient to allow the diversion of river water into the BIC canal. Typically, 120-130 cfs of sediment laden water is diverted into the canal with several return channels acting as sediment sluiceways. The large diversions are necessary to flush the consistently heavy sediment load while providing 30 cfs to local agriculture.

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Concurrent with the irrigation challenges, on this same stretch of the Virgin River was the 1970 listing of the Woundfin Minnow as an endangered species. The subsequent listing of the Virgin River Chub in 1989 and the Southwest Willow Flycatcher in 1993, both as endangered, has increased the scrutiny on the natural habitat of these species within the river corridor. During this same period of time, increasing numbers of sports fisherman were flocking to Lake





Mead where a successful striped bass program was producing prolific numbers and sizes of bass, benefiting the local economy. The use of the red shiner as a bait fish for the bass resulted in the unintentional release of thousands of red shiner into Lake Mead and the lower Virgin River, the proliferation of which created pressure on local endangered species. The unlawful introduction of Blue Tilapia within the watershed has accelerated the increasing pressure on wildlife managers already stretched thin by limited resources. The pressure applied by these invasive species has prompted the construction of multiple fish barrier dams along the Virgin River. Although not initially intended as such, the Bunkerville Irrigation Diversion had become the last checkpoint against the upstream migration of the invasive species between Lake Mead and the Virgin River Gorge.

The structure had survived several natural disasters during the course of its 53 years of service. The Virgin River watershed is renowned for violent storms and significant floods. Flows that average 400 – 500 cfs throughout the year can quickly reach 10,000 – 20,000 cfs during summer monsoons and 30,000 – 40,000 cfs during the most intense winter storms. The structure was severely tested on January 1, 1989 when an estimated 61,000 cfs passed due to the failure of Quail Creek Dam in the upstream community of St. George, Utah. The diversion structure was damaged multiple times throughout its service life being repaired each time by the irrigators.

Four days of intense rain, combined with pre-existing high moisture content in the soils resulted in high runoff and a surge in Virgin River flows during the last days of December 2010. Accurate flow measurement in the river was not possible due to the damage sustained to the USGS gaging station. Flow estimates, however, indicated that flows approached or exceeded 31,000 cfs. Of more significance than the peak was the duration of the storms. Four days of pounding surge and scour undermined the existing structure and resulted in its collapse along two-thirds of its length. The damage left the irrigators without the ability to divert and invasive fish were left to migrate unfettered upstream.

In the weeks following the storms the Bunkerville Irrigation Company placed a system of berms diverting river water back into their headgate and forcing excess flows over the remaining portion of the structure. Simultaneously, the BIC began seeking out funding assistance to rebuild the structure. They found willing partners in the City of Mesquite and US Department of Agriculture’s Natural Resource Conservation Service (NRCS). An Emergency Watershed Protection (EWP) system grant was procured and Bowen Collins & Associates was retained to perform engineering design and construction support services.

Due to the volatility of the river, impacts to local floodways, and limited funding, the replacement structure was designed with a similar arrangement to the original structure. The new design consisted of a double row of pre-drilled concrete encased soldier piles with precast concrete lagging. Between the two rows of piles a significantly longer riprap apron was placed. The original apron, only 24 feet in width was replaced with a new apron, 64-feet in width.

Trade West Construction, Inc., the contractor awarded the installation of the new structure worked diligently installing the new piles, removing the pre-existing structure and installing the riprap apron while battling difficult drilling conditions, incessant groundwater, and occasional monsoon floods filling excavations and the work site with mud and debris.

One year after awarding the design contract the BIC in conjunction with their partners the City of Mesquite and USDA NRCS had installed a new diversion structure capable of performing the necessary grade control and fish barrier functions.

Special thanks to the many stakeholders and organizations involved including: Bunkerville Irrigation Company, City of Mesquite, Trade West Construction, USDA NRCS of Nevada, U.S. Bureau of Land Management, U.S. Army Corp of Engineers, U.S. Fish and Wildlife Service, Clark County Regional Flood Control, Nevada Department of Environmental Protection, Nevada Department of Wildlife, and the Southern Nevada Water Authority.

✓ AGENCY COORDINATION:

- US ARMY CORPS OF ENGINEERS
- US BUREAU OF LAND MANAGEMENT
- USDA NRCS
- NEVADA DEPARTMENT OF ENVIRONMENTAL PROTECTION
- NEVADA DEPARTMENT OF WILDLIFE
- SOUTHERN NEVADA WATER AUTHORITY
- CITY OF MESQUITE
- BUNKERVILLE IRRIGATION COMPANY
- CLARK COUNTY REGIONAL FLOOD CONTROL

🐟 ENDANGERED & INVASIVE SPECIES:

ENDANGERED

- WOUNDFIN MINNOW
- VIRGIN RIVER CHUB (ENDANGERED)
- SOUTHWEST WILLOW FLYCATCHER

INVASIVE

- RED SHINER
- BLUE TILAPIA



PRE CONSTRUCTION



DURING CONSTRUCTION



POST CONSTRUCTION

BC&A 2014 New Partners



Todd Olsen, PE

Todd has been with BC&A for 10 years. He graduated from Utah State University with a Bachelor of Science degree in Civil Engineering-Hydraulics and Water Resources.

At BC&A Todd's expertise lies in master planning, modeling, and design of water, storm drain, and wastewater facilities. He has managed the construction of multiple water, sewer, storm drain, flood control, and stream restoration projects. Todd recently moved to St. George, Utah to help manage projects and grow the southern Utah office.



Jon Oldham, PE

Jon has been with BC&A for 7 years. He graduated from Utah State University with a Bachelor of Science degree in Environmental Engineering, followed by a Master of Science Degree in Civil and Environmental Engineering.

Jon has over 13 years of experience on projects involving planning, design, construction, maintenance and repair of water, wastewater, roadway, communication and power utilities, and commercial/industrial buildings. Before coming to BC&A, Jon served active duty in the United States Air Force as project manager and project engineer for a wide variety of projects in California, Utah, and the United Arab Emirates.



Rodolfo Garcia

Rodolfo has been with BC&A for 13 years. He graduated from Michoacan University in Mexico with a Bachelor of Science degree in Civil Engineering.

He has over 24 years of experience in the design and detailing of civil, mechanical, and structural disciplines. Rodolfo manages the design and CAD department at BC&A. His team is fully trained in AutoCAD as well as Microstation and other advanced design applications.

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