



Park City Municipal Corporation's Mining-Influenced Water Program

During the mining period in Park City's history, drainage tunnels were constructed at the lower elevations of the mine works to keep water within the mountain from interfering with the mining operations. Over the course of Park City's history, these waters have been used for various purposes such as drinking water, irrigation, and snowmaking. The water, which exits existing mine tunnel entrances (portals), contains trace metals from the natural soils and mining operations which are toxic to aquatic life, even at low concentrations. This water is referred to as Mining-Influenced-Water (M-I-W).

The M-I-W Program

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program to provide for the

treatment of the mining-

influenced-water from the

Judge and Spiro Tunnels. The

currently within budget and

behind the original schedule.

Completion is scheduled for

just a projected 30 days

Park City is currently

undertaking a \$135M

nine year "Project" continues today and is

May 2023.

As part of the EPA's Clean Water Act, it established that cleanup of mining-influencedwaters is a significant environmental benefit. Consequently, in 2015 The Utah Division of Water Quality and Park City entered into a Stipulated Compliance Order (SCO) which contained major milestones for treatment compliance and requirements on pollutant loadings related to the discharges from the Judge and Spiro mine tunnels.

In response to the SCO, in 2015 the Park City Water Department initiated the Mining-Influenced Water (M-I-W) Program. The M-I-W Program – with the new 3Kings Water Treatment Plant (3KWTP) being the heart of the program – has faced a myriad of challenges. The following describes the overall project, key elements, some of the challenges experienced, and the 3KWTP Team's approach and solutions.

M-I-W PROGRAM GOALS:

The goals established by Park City are straightforward:

- Provide quality, safe, and reliable drinking water meeting the long-term needs of the City
- Meet the SCO requirements, schedule, and deadlines
- Integrate City Council's Critical Priorities specifically Net Zero Energy policy ٠
- Develop a welcomed community asset be a good neighbor •

M-I-W PROGRAM TIMELINE:

2013	Judge Tunnel water removed as a drinking water source due to elevated antimony levels
2015	SCO Executed
2015 - 2018	Desktop, bench-scale, year-long pilot-scale, and siting studies conducted
2018 - 2019	3KWTP design phase
2018	Spiro Tunnel stability study conducted
2018 - 2020	Displaced Facilities design and construction
2017 - 2021	Water Conveyance Improvements design and construction
2019 - 2023	3KWTP construction, start-up and commissioning
Jan. 1, 2024	SCO Compliance Deadline

CHALLENGE 1 – FUNDING:

Though financial modeling, the City determined the best approach for project funding was an immediate series of substantial increases to existing water rates resulting in only annual cost-of-living rate increases going forward. Relying on Park City's excellent bond rating and the favorable bonding climate, revenue bonds have been issued for the entire M-I-W Program.

CHALLENGE 2 – MASTER PLANNING AND WATER SUPPLY DURING CONSTRUCTION:

A program of this magnitude and complexity requires a concerted planning effort. Some fundamental beginning points were:

- treatment of Judge, Spiro, and Thiriot in the most cost-effective way
- Searching for the nation's top experts on MIW to help with the solution
- Fostering community and political trust and support
- upgrades to the existing QJWTP, and connections to neighboring water systems for emergency supply.

CHALLENGE 3 – 3KWTP DEVELOPMENT:

The 3KWTP will be the location for Water Department administration staff, treatment personnel, and treatment process equipment. The facility consists of 8 buildings totaling 60,000 square feet, is located in the middle of town in a sensitive residential and recreational area in Park City, and is sandwiched between Hole No. 11 and Hole No. 12 of the existing mature Park City Municipal Golf Course. The 3KWTP design and construction approach includes:

3KWTP Innovative Treatment Process Design:

- Meets Drinking Water Quality regulations for use in the City's • water system
- Meets Clean Water Act for treated water discharge to McLeod Creek
- Capable of treating 5,000 gpm (7.2 mgd) of Judge Tunnel, Spiro Tunnel, and Thiriot Spring source waters •

Mining-Influenced Water Treatment Schematic



- Zero-liquid discharge of treatment process water
- Virtual Reality modeling of facility design to assist during design reviews and construction
- Digital Twin computer modeling of the treatment process to reduce start-up time and assist in operator training

Spending hours of "whiteboarding/brainstorming" ideas to most efficiently solve all the related problems including

Evaluating site alternatives considering water source location, traffic impacts, construction disruption, etc. Determining how to maintain water supply to the community during construction of the 3KWTP and the temporary loss of 3 main water supply sources. Ultimately this required the construction of the Creekside WTP, expansion and



Treatment process relies on pH adjustments to optimize metals removal reflected in the M-I-W Treatment Schematic

3KWTP Special Siting and Building Design Considerations:

- The new 3KWTP site is 1.92 acres which required the relocation of existing City facilities (consisting of an arsenic removal water treatment plant, the City Water Distribution Division, Park City Golf and Parks Department) and the associated 50 full and part-time staff.
- Inclusion of 6,500 s.f. of Public Utilities Administration space •
- Neighborhood and golf course sensitive architectural design ٠
- Attention to building massing and surrounding viewpoints •
- Preservation of "signature" existing mature trees
- Use of golfing activity resistant building materials
- Use of a "Living Roof" (sedum) on three buildings
- Noise and Light Trespass attenuation
- Site and Cyber Security systems •

3KWTP Sustainable Design Elements:

- Net Zero Energy design of buildings and building systems projected to be 30% "net-positive"
- Energy-efficient treatment design and equipment selection •
- On-site power generation by micro-hydro and rooftop solar -• producing a maximum of 186 kW of electricity
- Energy-efficient and Dark Sky compliant lighting
- Water-to-Water HVAC system projected to reduce heating • and cooling energy use by 30% over conventional systems
- Natural gas fueled standby generator to reduce emissions •
- On-site chlorine generation to shrink building footprints for ٠ storage and reduce local traffic from supply deliveries
- Storm water BMP filtration/infiltration system •

3KWTP Construction Challenges:

- Selected an alternative construction contract delivery method Early Contractor Involvement (ECI) also referred to as Construction Manager/General Contractor (CM/GC) – based on an evaluation of project goals, identification of project needs, review of project risks, and an assessment of complexities, innovations, cost considerations, and the design schedule. A Guaranteed Maximum Price (GMP) for construction was established at the 90% design level.
- Through the CMGC, key treatment equipment suppliers were prequalified, equipment selected, and procured early saving design time and project costs.
- Temporarily converted one hole on the Park City Golf Course, from a par four to a par three, for construction staging -• reducing truck traffic on local streets by an estimated 40 to 60 trips per day.
- Construction personnel are shuttled to and from the site each day from a City parking lot at the edge of town addressing • on-site parking limitations and reducing local traffic.

CHALLENGE 4 - COVID-19 IMPACTS:

Impact of the COVID-19 pandemic have been felt from the outset of Project construction (early spring of 2020), threatening the well-being of workers, and construction engineering staff, as well as the project costs and schedule resulting from supply-chain challenges, resource limitations, travel restrictions, staffing confinements, and shipping/delivery delays. Mitigation measures taken include:

- On the site, the Team implemented COVID-19 safety protocols, eliminated close quartering, and restructured construction sequencing to promote a better separation between workers.
- To mitigate supply chain disruptions, material shortages, and delivery delays, in early 2019 the 3KWTP Team identified key materials and equipment that could be procured early. These items were purchased and warehoused locally. Added benefit is the mitigation of price escalations that have been seen as the pandemic continues.
- Implemented robust project management software to enable access to project documents by all parties even those • restricted to working remotely from home in various cities.

CHALLENGE 5 – 3KWTP AND OTHER M-I-W PROGRAM COMPONENTS:

Key components of the M-I-W Program include.

- 3Kings Water Treatment Plant (3KWTP): GMP Construction Cost: \$76M, Total Project Cost \$103M
- Spiro Mine Tunnel Rehabilitation Total Project Cost: \$4.6M Mine Tunnel operated and maintained by Park City
- Water Conveyance Improvements -

 - Replace Empire Water Tank Total Project Cost: \$1.65M
- Relocation of Existing Facilities and Staff Displaced by the 3KWTP Total Project Cost: \$7.82M
 - Golf Maintenance New Building
 - Replaced an existing facility, relocated to a new location on the Park City Golf Course
 - Parks Department Rehabilitated Building at Publics Works
 - Water Distribution Division New Storage Building and Office
- Golf Course Pond Outlet Controls and Dredging Improvements Project Cost: \$3.9M
 - snowmaking purposes.
- City Fiber Optic Communications System Upgrades Project Cost: \$0.5M
- and security system. • Ice Pigging of Existing Water Distribution Mains - Project Cost: \$0.6M
- in service reducing exposure risk to customers.

M-I-W PROGRAM TEAM:

To make it all happen requires a special and dedicated team. The following are key firms involved in its' development, design and construction.

- Zehren: Avon, CO Golf Maintenance Building and 3KWTP Architectural Services
- Water Quality and Treatment Solutions, Issam Najm: Los Angeles, CA Treatment Process Technical Advisor
- Bowen Collins & Associates: Salt Lake City, UT 3KWTP Support Infrastructure and Empire Tank Engineering and **Construction Engineering Services**
- Van Boerum Frank & Associates: Salt Lake City, UT Energy Modeling & Building Commissioning
- Construction Materials Technologies: Salt Lake City, UT Third Party Testing and Special Inspections
- Manager/General Contractor
- Harrison Western: Lakewood, CO Spiro Mine Tunnel Construction Manager/General Contractor
- Lithos Engineering: Fort Collins, CO Spiro Mine Tunnel Design Services
- Silver Spur Construction: Draper, UT Water Conveyance Pipelines
- Hidden Peak Electric: Salt Lake City, UT Fiber Optic Lines
- VanCon Construction: Springville, UT Replace Empire Tank



Micro-hydro Generation Unit

Design and CMGC construction contract delivery approach to stabilize the first 400 feet of the 13,000 feet of the Spiro

Judge Tunnel Pipeline and SR-224 Raw Water and Potable Water Supply Lines – Total Project Cost: \$13.75M,

4.1 miles of 12, 16 and 18-inch diameter HDPE potable and raw water pipe lines installed through town to convey water to storage tanks, the water distribution system, for raw water transfer purposes.

Repurposed a 1MG end-of-life steel water storage tank, that receives water from the Judge Tunnel prior to entering the Judge Tunnel Pipeline, and replaced it with a 0.2MG operations buried concrete raw water tank.

New 8,200 square feet facility for equipment storage and maintenance, and administration space Award: Utah Construction and Design, 2020 Most Outstanding Project Award, Municipal category

Provided 14,500 s.f. of repurposed and remodeled space within an existing bus barn at the Public Works Facility

Provided 3,600 square feet of remodeled operations office space within the existing Quinn's Junction Water Treatment Plant and a new 2,400 Square feet water distribution maintenance storage building

 Installed pond outlet controls and removed 15,000 cubic yards of legacy metals contaminated soils within Park City Golf Course ponds that receive 3KWTP treated water discharges and are used for golf course irrigation and

• Installed 3 miles of fiber optic conduit and cable throughout the City to support the 3KWTP SCADA communications

o Removes legacy metals from the interior pipe walls of water distribution mains in advance of placing the new 3KWTP

Jacobs: Salt Lake City, UT & Denver, CO – 3KWTP Engineering/Architectural and Construction Engineering Services

Alder Construction Company: Salt Lake City, UT – Golf Maintenance Building General Contractor and 3KWTP Construction



3Kings Water Treatment Plant





3KWTP North View - Rendering



3KINGS WATER TREATMENT PLANT PROJECT

View Point from Tour Location

3KWTP South View - Rendering



Spiro Tunnel Portal - Before



Spiro Tunnel - Before

SPIRO TUNNEL REHABILITATION PROJECT



New Spiro Tunnel Plaza

For more information please visit the City's M-I-W webpage at: https://www.parkcity.org/departments/publicutilities/engineering-construction-division/water-projects/3kingswater-treatment-plant Or contact Roger McClain, Public Utilities Engineering Manager Office 435.615.5329 Cell 435.640.7435





Spiro Tunnel During Rehab



Spiro Tunnel Stabilization