City of Ouray

Water Measurement Plan

Prepared for:
City of Ouray

Wright Water Engineers, Inc.

July 2016

051-036.110

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1.0 INTRODUCTION

Wright Water Engineers, Inc. (WWE) in collaboration with the City of Ouray (City) has prepared this Water Measurement Plan (Plan) as a means to inventory existing measurement capabilities, and to prioritize desired improvements for measuring and accounting for the City's water use. The Colorado Water Conservation Board (CWCB) provided financial and technical support for this Plan.

This Plan is intended to be implemented in phases, as funding allows, and to be continually updated as improvements are made and as the City's water measuring needs evolve. The Plan aims to provide a foundation for implementing subsequent water conservation measures, support the City's water rights, help meet legal obligations for maintaining measurements, and improve water system efficiency. Table 1 outlines the City's water structures along with measurement needs. Figures 1 shows the structure locations within the City limits, and Figure 2 shows the structure locations within the greater Ouray County region.

1.1 Phase I Implementation

The Phase I implementation of the Plan focuses partly on Supervisory Control and Data Acquisition (SCADA) improvements to enable the City to create a baseline of water supply and usage data (see Table 1).

Items completed in Phase I include: measurement with SCADA capabilities for the Hot Springs Pool (Pool) outflow to the river, installation of a water meter for the Panoramic Heights and Whispering Pines subdivisions, data logger upgrades for the Wastewater Treatment Plant (WWTP) influent and effluent and installation of pressure transducers, flow/water quality measurement equipment for the OX2 geothermal well, and a data logger on Red Mountain Ditch (see yellow highlighted items on Table 1). As of June 2016, the last remaining measurement device was installed, which was the Red Mountain Ditch data logger.

1.2 Phase II Implementation

Measurement upgrades proposed for Phase II implementation are highlighted in blue on the Measurement Plan (see Table 1). The proposed Phase II upgrades include: flow and water quality measurement equipment for the Box Canyon Line at Manganese Spring and at the Pool, flow measurement device for municipal water delivered to the Pool, a flow meter for the Mineral Farms subdivision, a flow meter for the distribution system at 3rd Street Bridge and a flow measurement device for the Wehawken Spring collection box. Phase II items are slated for funding and installation.

1.3 Proposed Future Phase Implementation

A list of low priority improvements have been identified by the City and are outlined in Table 1 as un-highlighted rows. These items are on the City's foresight and a phase has yet to be determined. The items listed are OX6 automation of water quality measurements of the well, water quality measurement of pumped hot springs water at the Pool, water quality measurement devices at the three Pool sections, water quality measurements at the fish pond, a monitoring program of all of the City's hot springs, water quality metering of Wiesbaden Hot Springs, remote automation of meters at pressure reducing valves on the water distribution system, and measure devices at the Wehawken and Oak Creek decreed point of diversion.

2.0 CONCLUSION AND SUMMARY

WWE has collaborated with the City to inventory the existing water structures. Each structure was tabulated with the current measurement capabilities and measurement needs. New measurement devices or upgrades were assigned to each structure and prioritized by the City based on need. As of June 2016, all of the high priority items or Phase 1 items have been completed. As funding becomes available, the medium priority items or Phase 2 items will be installed. The low priority items have yet to be assigned an installation or upgrade timeline. It is recommended that this plan be updated as milestone measurement needs are met.

Table 1
Water Measurement Plan
City of Ouray

	Structure	Measurement Need	Current Measurement Ability	Proposed New or Upgraded Equipment for Measurement	Phase	Priority
Hot Springs	**OX2 (geothermal well)**	Water Level (depth), Flow and pumped Volume, temperature, conductivity, pH	Twice per week recording by staff of flow, water level, temperature, conductivity, and pH (see Wiesbaden Agreement). Measurements are automated and in SCADA system	Flow meter and water quality monitoring equipment	**2**	Completed
	OX6 (geothermal well)	Well head pressure, flow and pumped volume if used in the future, Temperature, Conductivity, pH	Twice per week measurements taken by staff of wellhead pressure, water level, temperature, conductivity, and pH (see Wiesbaden Agreement)	Automation of water quality measurements	**TBD**	Low
	Box Canyon Line near Pool	Natural Flow available to pool Temperature, Conductivity, pH, alkalinity, calcium hardness	Measured by observation once per month for flow, temperature, conductivity and pH note existing weir is not good location for installing automated measuring devices	Flow meter and water quality monitoring equipment (TBD per further analysis)	**2**	Medium
	Box Canyon Line near Source and Manganese Spring	Natural Flow available to pool Temperature, Conductivity, pH	Measured by observation once per month for flow, temperature, conductivity and pH note existing weir is not good location for installing automated measuring devices	Potential measurement at Manganese Spring input to pipeline to be evaluated after survey and metering near pool completed; Potential flume at source of Box Canyon Line to be evaluated after survey and metering near pool completed; automation of water quality measurements to be evaluated	**2**	Medium
	Pool Pumped Volume of Hot Water Supply	Flow, temperature, pH, residual Chlorine	gpm - instantaneous read-out from in-line meter; temperature, pH, residual Chlorine measured by staff three times per day	Primary water quality measurement devices. Determine if existing meter can be connected to SCADA	**TBD**	Low
	Water Quality in 3 pool sections	Temperature, pH, residual Chlorine	Temperature, pH, residual Chlorine measured by staff three times per day	Primary water quality measurement devices	**TBD**	Low
	Pool use from City Water Supply	Flow into pool from hydrant	Can observe hydrant use instantaneously on SCADA	Totalizing flow meter to be connected to hydrant when filling the pool.	**2**	Low
	Fish Pond	Flow, temperature, conductivity, pH	Once per month, field measurements taken by staff of flow, temperature, conductivity, and pH	Automation of water quality measurements	**TBD**	Low
	Radium Ditch and Pipeline No. 222 (Pool Outflow to River)	Flow into river from pool outfall and excess flows from Box Canyon Line and OX2	Add flow transmitter to pool effluent location and connect to SCADA system Future work may include feasibility of installing water quality measurement device and logger	Work completed in Phase I implementation	**1**	Completed
	City Hot Springs Monitoring Program: Fish Pond, 8 Minion Springs, OX wells in Box Canyon	Flow, temperature, conductivity, pH	Once per month, field measurements taken by staff of flow, temperature, conductivity, and pH	Primary flow or water quality measurement devices	**TBD**	Low
	Wiesbaden Monitoring Locations: (Wiesbaden outfall (radium wastewater pipeline), Wiesbaden Hillside (Fellin), Wiesbaden Rear Cave, Wiesbaden Reservoir Spring, OX2, OX6	Flow, temperature, conductivity, pH	Field measurements taken by staff of flow, temperature, conductivity, and pH. Wiesbaden outfall, caves, and reservoir monitored weekly, Fellin Spring monitored every two weeks, OX2 and OX6 twice per week	Water quality metering at some or all locations to be evaluated; Chart recorder at Wiesbaden outfall; to assist in compliance with Wiesbaden Settlement Agreement	**TBD**	Low

COLOR CODING LEGEND	
Phase 1	COMPLETED WORK IN PHASE I IMPLEMENTATION
Phase 2	PROPOSED FOR PHASE II IMPLEMENTATION
TBD	PROPOSED FOR FUTURE PHASE IMPLEMENTATION

Note: * TBD = To be determined

Table 1
Water Measurement Plan
City of Ouray

	Structure	Measurement Need	Current Measurement Ability	Proposed New or Upgraded Equipment for Measurement	Phase	Priority
Water Distribution and Treatment System	**Storage Tank Influent from Source**	Flow Water Quality (grab samples sent to lab)	FIT-100 Meter on inflow line Turbidity meter on inflow line Chlorine measured when leaving the tank - automatically adjust based on outflows (every other month raw water quality sample (per Reg 85) for nutrients- send to Grand Junction Labs)	Done by Others	**1**	Completed
	Storage Tank overflow back to stream	Flow	Metered - shows real time data but not totalized data	Done by Others	**1**	Completed
	Storage Tank Effluent into Water Distribution System	Flow	FIT-101 Meter	Done by Others	**1**	Completed
	Flow into Microhydro/Ice Park Line	Flow	FIT-102 Meter	Done by Others	**1**	Completed
	Storage Tank Heights	Water levels in tanks	Metered Measures instantaneous height in tanks	Done by Others	**1**	Completed
	Bachelor Switch (i.e. Panoramic Heights and Whispering Pines subdivisions)	Flow	Meter on line	Work completed in Phase I implementation	**1**	Completed
	Mineral Farms Subdivision	Flow	Subdivision has meter on its pumps, no records kept by the City	Meter on line		Medium
	WWTP Influent	Flow Water Quality (grab samples sent to lab)	Upgrades to data logger to be compatible with SCADA and connection to SCADA via telemetry	Work completed in Phase I implementation	**1**	Completed
	WWTP Effluent	Flow Water Quality (grab samples sent to lab)	Upgrades to data logger to be compatible with SCADA and connection to SCADA via telemetry	Work completed in Phase I implementation	**1**	Completed
	Meters at PRVs in Water Distribution System	Flow Automation so can adjust pressure in different zones from SCADA controls and remotely	None	Meter at PRVs - remote automation	**TBD**	Low
	Distribution System at Junction between East and West Side (at 3rd Street Bridge)	Flow	None	Meter on line	**TBD**	Medium
Decreed Water Supply Sources	**Red Mountain Ditch**	Flow in the Ditch as measured at the watershed divide Bypassed Flow remaining in Red Mountain Creek	2-ft Parshall Flume Concrete weir at headgate (improvements may be needed to calibrate for bypass flows)	Digital data logger (TruBlue Pressure Transducer in existing stilling well) to keep continuous records of RMD Diversions. Digital data logger and rate the diversion dam so that bypassed flows can be measured and data recorder.	**1**	Completed
	Wehawken Spring Collection Box	Total flow into pipeline and bypassed to stream (raw reports)	None	Primary measuring device and data logger for water going into transmission pipeline and for water bypassed to creek (method TBD)	**2**	Medium
	Wehawken Creek	Measure flows at decreed point of diversion	None	Method to be determined	**TBD**	Low
	Oak Creek	Measure flows at decreed point of diversion	None	Method to be determined	**TBD**	Low

COLOR CODING LEGEND	
Phase 1	COMPLETED WORK IN PHASE I IMPLEMENTATION
Phase 2	PROPOSED FOR PHASE II IMPLEMENTATION
TBD	PROPOSED FOR FUTURE PHASE IMPLEMENTATION

Note: * TBD = To be determined

Legend

General Measurement Location Description

- Box Canyon Line at Pool
- Box Canyon Monitoring
- Fellin Spring
- Fish Pond
- Flow into Micro Hydro
- Hot Spring Pool System
- Manganese Mine Spring
- Minion Spring System
- OX Well
- Oak Creek
- Storage Tank Monitoring
- Wiesbaden System
- Water Valves and PRVs (per water system map)
- Biota Line
- Ice Park Line
- Ouray Water Distribution System
- Weehawken Pipeline

N
W E
S

1 inch = 400 Feet

0 400 Feet

ID	Structure Name
1	Box Canyon Line at Pool
2	Box Canyon Monitoring
3	Fellin Spring
4	Fish Pond
5	Manganese Mine Spring
6	Minion Spring No 1
7	Minion Spring No 2
8	Minion Spring No 3
9	Minion Spring No 4
10	Minion Spring No 5
11	Minion Spring No 6
12	Minion Spring No 7
13	Minion Spring No 8
14	Oak Creek
15	OX-1
16	OX-2
17	OX-4
18	OX-5
19	OX-6
20	Pool Outflow to River
21	Tank Monitoring
22	Water Quality in 3 Pool Sections
23	Wiesbaden Outfall
24	Wiesbaden Rear Cave (approximate)
25	Wiesbaden Reservoir (approximate)
26	Pool Pumped Volume of Hot Water Supply
27	Pool Use from City Water Supply
28	Storage Tank Influent from Source
29	Storage Tank Overflow back to Stream
30	Storage Tank Effluent into Water Distribution
31	Storage Tank Heights
32	Flow into Micro Hydro

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OURAY COUNTY, CO

WATER MEASUREMENT LOCATIONS - CITY VIEW

CITY OF OURAY

PROJECT NO. 051-036.110

FIGURE 1

Legend

Selected Measurement Locations

- OX-2
- OX-6
- Oak Creek
- WWTP effluent
- WWTP influent
- Wehawken Creek
- Wehawken Spring Collection Box
- Biota Line
- Ouray Water Distribution System
- Weehawken Pipeline
- Mineral Farms Subdivision
- Panoramic Heights Subdivision
- Whispering Pines Subdivision

N
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S
1 inch = 2,000 Feet

Panoramic Heights Subdivision
Whispering Pines Subdivision
WWTP effluent
WWTP influent
OX-6
OX-2
Oak Creek
Mineral Farms Subdivision
Wehawken Creek
Wehawken Spring Collection Box

Red Mountain Ditch Location Map

Ouray
Camp Bird
DEN
MOUNTAIN
158 ft
Red Mountain Ditch
1 inch = 4 miles

Document Path: P:\051-036\110 - Measurement Plan\Mapping\Figure 2 - Ouray Water Measurement-Zoom Out.mxd

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WATER MEASUREMENT LOCATIONS - OVERVIEW

CITY OF OURAY

PROJECT NO. 051-036.110

FIGURE 2

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