Washoe County Community Services Department

Cold Springs Wastewater System Facility Plan

June 2017

Prepared by:

FARR WEST ENGINEERING

ch2m

PROFESSIONAL ENGINEER-STATE OF NEVADA
LUCAS R. TIPTON
Exp. 6/30/18
CIVIL
No. 21375
6/12/17

PROFESSIONAL ENGINEER-STATE OF NEVADA
PAUL M. STEELE
CIVIL
Exp: 6/30/18
No. 23752
6/26/17

TABLE OF CONTENTS

COLD SPRINGS WASTEWATER SYSTEM FACILITY PLAN

EXECUTIVE SUMMARY

Tables – Executive Summary

Figures – Executive Summary

TM NO. 1 HISTORICAL, CURRENT, AND FUTURE WATER DEMANDS

Tables – TM No. 1

Figures – TM No. 1

TM No. 2 Infrastructure Condition Assessment

Tables – TM No. 2

Appendices – TM No. 2

TM No. 3 Hydraulic Model Devlopment and Collection System Capacity Assessment

Tables – TM No. 3

Figures – TM No. 3

Appendices – TM No. 3

TM No. 4 Treatment Plant Capacity Analysis and Operational Assessment

Tables – TM No. 4

Figures – TM No. 4

Appendices – TM No. 4

TM No. 5 Treatment Plant Expansion Alternatives

Tables – TM No. 5

Figures – TM No. 5

Appendices – TM No. 5

TM No. 6 Effluent Disposal Alternatives

Tables – TM No. 6

Figures – TM No. 6

EXECUTIVE SUMMARY

WASHOE COUNTY COMMUNITY SERVICES DEPARTMENT

COLD SPRINGS WASTEWATER SYSTEM FACILITY PLAN

Prepared For: Alan Jones, P.E., Senior Licensed Engineer

Prepared By: Lucas Tipton, P.E.
Paul Steele, P.E.

Reviewed By: Brent Farr, P.E.

Date: April 7, 2017

Subject: **Executive Summary**

The Washoe County Community Services Department (County) operates and maintains the wastewater collection system (collection system) and the water reclamation facility in Cold Springs, Nevada. The County currently provides sewer collection and treatment services for 2,090 connections representing a population of approximately 4,527 persons. On behalf of the County, Farr West Engineering (Farr West) and Ch2M have prepared this update to the previous Cold Springs Wastewater Facility Plan (Kennedy/Jenks, 2002). This Wastewater System Facility Plan (Facility Plan) provides the County with a condition and capacity assessment of existing facilities; an updated development schedule; facility capacity assessments at four future planning points (2021, 2026, 2036 and 2050); and a Capital Improvement Program (CIP) for infrastructure improvements needed over the next ten years. This Facility Plan is comprised of six Technical Memorandums (TM) and the ten-year CIP as presented in this executive summary.

TM 1 – COLD SPRINGS POPULATION AND SEWER FLOWS

With significant development anticipated over the next 30 years, this TM provides annual growth projections and future sewer flow estimates for capital planning purposes. This TM found that the collection system will expand to approximately 3 times its current size by 2026 with average flows increasing by approximately 5 times over this same period.

The recommended planning approach used in this facility plan update was a hybrid of the Truckee Meadows Regional Planning Agency's (TMRPA) housing study and the development plans of local developers. The recommended approach utilized annual growth rates between 1 and 12 percent over the next 30 years providing a reasonable development schedule which limits the County's vulnerability to constructing excessive idle capacity in response to development plans. Table ES-1 provides a summary of the projected growth at each planning period along with the average daily and peak hourly flows using a wastewater generation rate of 270 gpd/ERU and a peaking factor of 2.0.

Table ES-1 – Future Growth and Sewer Flow Estimates

Year	System Size (ERU)	Average Flow (MGD)	Peak Hour Flow (MGD)
2016	2,120	0.354	0.779
2021	3,421	0.705	1.482
2026	6,029	1.409	2.890
2036	11,359	2.848	5.768
2050	19,119	4.944	9.959

TM 2 – INFRASTRUCTURE CONDITION ASSESSMENT

This TM is an assessment of the condition of the existing infrastructure at the Cold Springs Water Reclamation Facility (CSWRF) and the two major lift stations in the Cold Springs basin, the Woodland Village lift station and the Diamond Peak lift station. The condition assessments of the facilities are based on observations from a team of four CH2M engineers comprised of mechanical, structural, electrical, and wastewater process disciplines during a site visit.

The TM concluded with the Table ES-2 list of recommendations to repair or replace items at CSWRF that were either non-functioning, in need of repair, or otherwise beyond the expected useful life of the equipment. In addition, a list of all the major equipment at CSWRF and the two lift stations was provided along with the anticipated remaining useful life for the installed equipment at each of the three sites.

Table ES-2 – Summary of Recommendations

Recommendation Number	Description
1	Remediation of influent pump station wet well
2	Test and verify performance of pumps and motors for the influent pumps.
3	Repaint grit chamber gearbox
4	Replace headworks thermal insulation
5	Replace grit classifier
6	Repair or replace influent sampler
7	Repair flow meter vault pipe flanges and repaint
8	Replace missing tines at oxidation ditch Brush Rotor ME-300
9	Repaint air piping near the digester blowers
10	Replace the original pump in the effluent pump station

Recommendation Number	Description
11	Review dewatering polymer and centrifuge operating parameters to achieve a drier cake.
12	Recalibrate or replace the flow meter to the centrifuge
13	Replace the polymer pump
14	Install new curtains or baffles to reduce sludge splatter in the disposal room
15	Replace the sodium hypochlorite tank
16	Replace corroded chemical electrical conduit
17	Replace the peristaltic chemical metering pumps
18	Replace the standby generator
19	Accurately document the size, number, and routing of major electrical distribution conductors
20	Complete Arc Flash Studies and apply appropriate warning labels to equipment
21	Recommend replacement of the standby engine generator once maintenance becomes impractical
22	Backflow preventer code update
23	Investigate cause of frequent water line leaks in paved area near the influent pump station.
24	Access provisions into the Woodland Village Lift Station dry well and meter vault should be modified to comply with IBC and OSHA standards.
25	Correct source of errors in the Woodland Village Lift Station flow meter
26	Complete Arc Flash labeling at Diamond Peak
27	Complete Arc Flash labeling @ Woodland Village
28	Repair metal manhole wall at corroded locations. Connect cathodic protection system.
29	Install guardrail around the Equalization Basins to meet IBC minimum height requirement.
30	Replace pumps and motors at the Diamond Peak Lift Station

TM 3 – HYDRAULIC MODEL DEVELOPMENT AND COLLECTION SYSTEM CAPACITY ASSESSMENT

The purpose of this TM was to assess excess capacity in the Cold Springs sewer collection system in 2016, 2021, 2026, 2036 and 2050. All capacity estimates were translated into values of equivalent residential units (ERUs) so that capacity triggers can be monitored as development actually unfolds in Cold Springs. The Cold Springs sewer collection system is comprised of two lift stations, one pump station, 11,506 linear feet (lf) of PVC force main pipe, 489 manholes and approximately 113,000 lf of PVC sewer interceptor pipes 8-inches in diameter or greater. The existing collection system was found to have adequate conveyance capacity through the 2026 planning period. Figure ES-1 provides a color-coded map of the remaining capacity in the system in the existing condition.

In 2036, there are two areas in the System which exceed the pipe surcharge capacity criteria and the existing Influent pump station is no longer capable of conveying peak hourly flows. Three improvement projects are recommended as shown in Table ES-3.

Table ES-3 – 2036 Collection System Improvement Projects

Name	Details
Glen Lakes Ct. Interceptor Replacement	Replace and regrade 1,650 lf of existing 8-inch pipe with 10-inch interceptor and 6 manholes.
Briar Dr. Interceptor Replacement	Replace 1,500 lf of 12 and 15-inch interceptor with 18-inch pipe and 9 manholes.
Influent Pump Station	Replace existing 800 gpm pump and 2,300 gallon wet well with a 2,700 gpm duplex pump station with a 6,600 gallon wet well.

In 2050, or the buildout condition, the conveyance capacity of the Influent pump station will again require improvement and additional segments of pipe will require upsizing as well. Because these collection system improvement projects are projected to be needed far in the future, it is not recommended for the County to include these projects in their current capital improvement program (CIP). Because these future assessments were made according to the development schedule presented in TM 1, it is important that the actual sequencing of new homes and businesses in and around Cold Springs be referenced against the remaining capacity of system assets presented in this TM. It is recommended that the County reference this report with all community development applications as they come in.

P:\Client Projects\Washoe County 086\0961 Cold Springs Wastewater Facility Plan\5.0 Design\5.13 GIS\Map\Figure_ES_1.mxd, Editor: michael, Printed: 4/21/2017

TM 4 – TREATMENT PLANT CAPACITY ANALYSIS AND OPERATIONAL ASSESSMENT

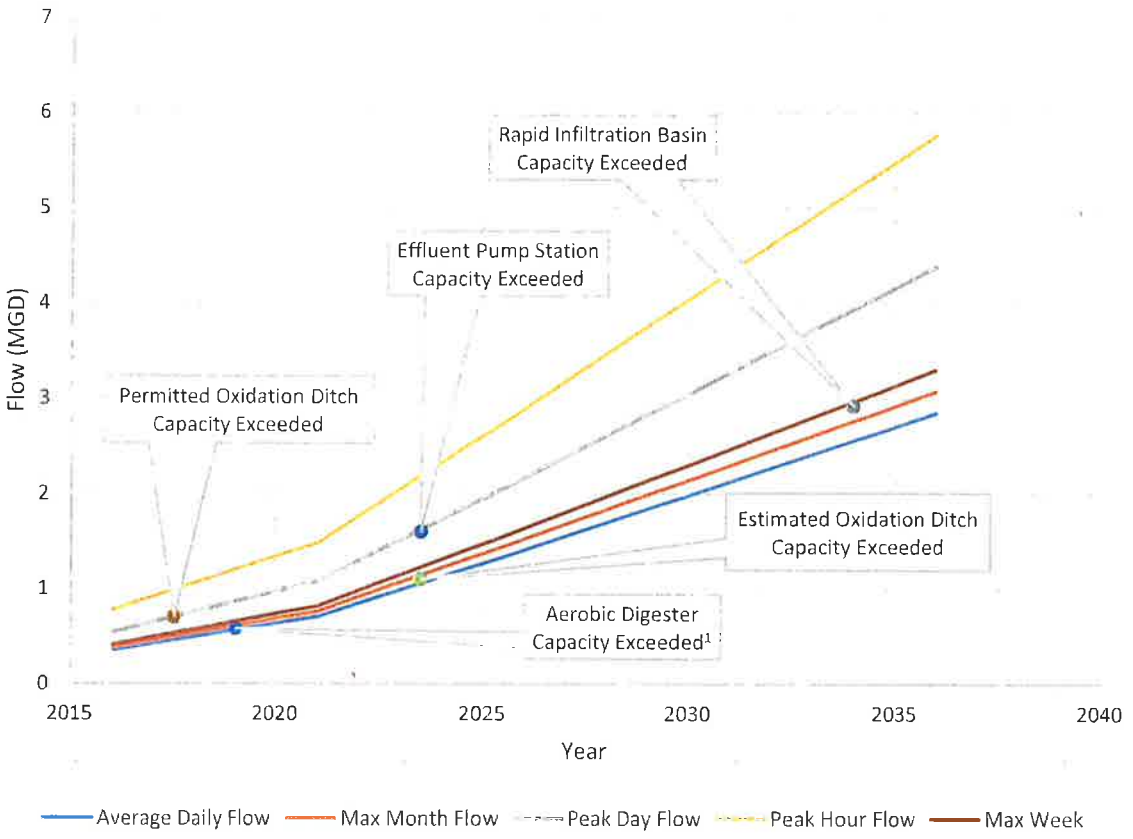
The primary objectives of this TM were to determine the capacity of CSWRF to convey, treat and dispose of wastewater generated in the Cold Springs Basin, and to evaluate the current operational practices of the facility to determine if there are any opportunities to reduce chemical or energy use or improve the treatment performance of the facility.

CSWRF has sufficient capacity in each unit process to meet both the present flows and the current permitted flows. However, the growth projections developed in TM #1 show that the flow to the plant is anticipated to grow rapidly. Accordingly, most of the major unit processes at the plant will be undersized by 2023. See Table ES-4 and Figure ES-2.

Table ES-4 – Unit Process Capacity Analysis Figure for Critical Processes

Unit Process	Current Capacity	Estimated Year Capacity Exceeded
Headworks	2.5 MGD peak instantaneous flow	Concurrent with any lift station addition
Oxidation Ditch (Permitted Capacity)	0.7 MGD peak day flow	2017
Oxidation Ditch (Estimated Capacity)	1.1 MGD maximum month flow	2023
Aerobic Digester	0.58 MGD maximum month flow	2019[1]
Effluent Pump Station	1.6 MGD peak day flow	2023
Rapid Infiltration Basins	2.93 MGD maximum week flow	2034

Notes: 1. Revising the current 60-day SRT design criteria will lengthen the time period before the aerobic digester capacity is exceeded.



Notes: 1. Revising the current 60-day SRT design criteria will lengthen the time period before the aerobic digester capacity is exceeded.

Figure ES-2 – Unit Process Capacity Analysis Figure for Critical Processes

TM 5 – TREATMENT PLANT EXPANSION ALTERNATIVES

The primary objectives of this TM were to determine water quality objectives for CSWRF through the end of the planning period and determine cost effective and beneficial expansion alternatives for CSWRF to maintain permit compliance as the influent flows and loads to CSWRF increase as described in TMs 1 and 4 of this Facility Plan.

Water quality goals for the expansion of the facility were defined as treating the 2036 planning period flows to the existing permit limits as well as a total nitrogen effluent of 5-7 mg/l and an effluent ammonia concentration below 2 mg/l. Solids treatment shall achieve 270 degree-days of sludge stabilization in the aerobic digester, and shall be acceptable for landfill disposal. Reuse treatment shall be to Nevada Class A standards designed for filtration and UV disinfection assuming an approximately 1 MGD seasonal reuse sidestream to a future development.

The expansion of CSWRF has been divided into six separate expansion projects. Individual projects have been developed to expand the headworks, secondary treatment, tertiary treatment for the reuse sidestream, digestion and thickening, dewatering and loadout, and emergency generator and plant water system. Three alternatives were developed for the secondary treatment expansion

project that were compared on the basis of life-cycle cost and non-monetary factors. Each of the expansion projects has been designed to the capacity listed in Table ES-5.

Table ES-5 – CSWRF Design Criteria by Expansion Project

Expansion Project	Design Influent Flow (MGD)	Flow Type
Headworks	10	2036 Peak Pumped Flow
Secondary Treatment	3.08	2036 Max Month Flow
Reuse	1	Estimated Demand
Digestion and Thickening	3.08	2036 Max Month Flow
Dewatering and Loadout	3.08	2036 Max Month Flow
Emergency Generator and Plant Water System	N/A	Estimated Demand

The life cycle costs and non-cost evaluation scores for the secondary treatment system are summarized in Table ES-6 to determine the option with the lowest life cycle cost per rating point of non-cost benefit.

Table ES-6 – Secondary Treatment Lifecycle Cost and Non-Cost Rating

Option	Life Cycle Cost (NPV)	Non-Cost Rating
Option 1 - Four Oxidation Ditches	$29,000,000	3.81
Option 2 - A2O Process	$23,400,000	3.24
Option 3 - 5 Stage Bardenpho	$25,400,000	3.95

Option 3, 5 Stage Bardenpho, was the recommended option as it is the most stable process, provides the greatest ability to meet permit limits over a wide range of influent flows and loads, has the highest non-cost score, and is the second lowest life cycle and capital cost option.

CSRWF upgrades are broken down into six recommended projects, described in Table ES-7. The costs and timetable for these individual projects are summarized in the capital improvement program.

Table ES-7 – Summary of Expansion Projects

Unit Process	Description
Headworks	Two inclined fine screens, bypass channel with a manual bar screen, two screenings washer/compactors, mechanically induced grit vortex, grit washer/dewatering
Secondary Treatment	5-stage Bardenpho, blower building, 2 secondary clarifiers, RAS/WAS pumps station
Reuse	Continuously backwashed upflow sand filter, in-vessel UV disinfection
Digestion and Thickening	Design criteria revision, rotary drum thickener in existing dewatering building
Dewatering and Loadout	Centrifuge, dewatering and loadout facility
Emergency Generator and Plant Water System	New 750 kW emergency generator and new vertical turbine plant water pump station

TM 6 – EFFLUENT DISPOSAL ALTERNATIVES

As the Cold Springs area grows in the future, increased potable water use will result in larger volumes of treated effluent generated from CSWRF which could be put to use in a variety of ways. An important consideration will be the County's ability to dispose of treated effluent as system size increases. It was found that the existing CSWRF rapid infiltration basins (RIBs) contain adequate effluent disposal capacity to meet the demands of the system for the next twenty years, or until 2036. On the high side, up to 3,191 acre-feet of treated effluent could be available for reuse purposes in twenty years.

CAPITAL IMPROVEMENT PROGRAM

This section provides a planning assessment of capital improvements required at CSWRF and in the collection system for the planning period of 20 years, or the year 2036. Additionally, a 10-year program is presented with estimated impacts to user rates and connection fees. All costs shown are in 2016 dollars unless otherwise noted.

Per TMs 3 and 5, there are a total of nine improvement projects needed to increase the capacity of the collection system and CSWRF to convey and treat the increased sewer flows anticipated by 2036. Combined, these projects are estimated to cost $42.5 million dollars as presented in Table ES-8.

Table ES-8 – Cold Springs Infrastructure Needs Summary

Year	Description	Cost
2017	Headworks [10 MGD] – Screening + Grit Removal	$4.1M
2023	Secondary Treatment [3.08 MGD] – 5-stage Bardenpho, blowers, clarifiers, RAS/WAS pump station	$21.6M
2023	Emergency Generator and Plant Water System	$2.3M
2026	Solids Handling [3.08 MGD] – Centrifuge, new dewatering, and loadout facility	$5.8M
2036	Category "A" Reuse Treatment [1.0 MGD] – Upflow sand filter w/ UV disinfection	$4.6M
2036	Digestion and Thickening [3.08 MGD] – Digester Blowers and Diffusers	$1.7M
2036	Glen Lakes Ct. Interceptor Replacement [0.9 MGD] – 1,650 lf of 10-inch interceptor w/ 6 manholes	$0.6M
2036	Briar Dr. Interceptor Replacement [3.3 MGD] – 1,500 lf of 18-inch interceptor w/ 9 manholes	$0.8M
2036	Influent Pump Station [1.0 MGD] – 2,700 gpm Duplex Pump Station w/ 6,600 gallon wet well	$1.0M

By the year 2026, four improvement projects totaling approximately $34 million dollars will be needed to improve the CSWRF facility. Table ES-9 provides an additional breakdown of the capacity replaced and the capacity added for each improvement. Costs associated with added capacity should be covered by connection fee revenues while the costs of replacement capacity should be covered by user fee revenues.

Table ES-9 – 10-Yr Capital Improvement Program

Year	Improvement	Cost Estimate	User Fee		Connection Fee	
2017	Headworks	$ 4,100,000	25%	$ 1,025,000	75%	$ 3,075,000
2023	Secondary Treatment	$ 21,600,000	0%	$ 0	100%	$ 21,600,000
2023	Generator + Water System	$ 2,300,000	50%	$ 1,150,000	50%	$ 1,150,000
2026	Solids Handling	$ 5,800,000	0%	$ 0	100%	$ 5,800,000
	Totals	$ 33,800,000		$ 2,175,000		$ 30,475,000

User Fees

The headworks improvement project is needed in 2017 and will replace an existing capacity of 2.5 MGD at an approximate cost of $1.03M. The impact to user rates is dependent on the funding source the County selects for this improvement (i.e. cash vs. financed). If the County utilizes cash reserves for this project and the system size grows to 11,359 ERUs by 2036 as projected by TM 1, the County can expect to receive a full return on the $1.03M investment by 2036 after increasing user rates by approximately $0.64 per month. If no growth occurs, the County would need user rates to increase by $2.01 per month to generate $1.03M in additional revenues by 2036. If the County chooses to finance the project with a 20-year loan at 3 percent interest, the monthly impacts to user rates become $1.16 with the expected growth and $3.64 with zero growth over the next 20 years.

The emergency generator and plant water system improvement project is needed by 2023 at a total cost of $2.3M. Since this project does not have a specific capacity associated with it and will equally benefit the existing facility as well as the future CSWRF expansion, the cost of construction should be covered equally by user fees and connection fees. With $1.2M in 2016 costs attributable to user fees, the 2023 future value of these costs will be approximately $1.4M. The rate impacts presented below will use the same methodology as the headworks improvement project. Using cash, the impacts to user fees starting in 2017 will be $0.88 with growth and $2.78 without growth. If the project is financed, it is recommended that the County increase user rates by $1.30 per month assuming system growth or $4.08 if zero growth occurs by 2036.

In conclusion, the impact to user fees should range between $1.52 and $7.72 per user per month depending on the funding source used for project costs and on how the system grows over the next 20 years.

Connection Fees

The impact of approximately $31M in capital improvements to future connection fees is between $4,535 and $6,096 per ERU. In general, these values are found by dividing the future cost of construction for each improvement project by the number of future connections which will benefit from or will cause these improvements to occur. More specifically, these estimates account for inflation, the future value of money, and the costs associated with financing projects at a rate of 3 percent over a 20-year term.

For example, the Secondary Treatment improvement project is needed in the year 2023 at a cost of $26.6M. This cost estimate assumes a 3 percent growth in construction industry costs due to inflation from 2016 until 2023 (see Table ES-9 for 2016 cost estimate). The project will add treatment capacity up to 3 MGD or until the year 2036. If the capacity of the existing Secondary Treatment system is exceeded in 2023 (4,291 ERUs) and the improvement project adds sufficient capacity until 2036; then the cost of this improvement should be covered by the 7,086 ERUs which require this additional treatment capacity. If the County uses cash reserves to construct this improvement, the cost per connection is simply $26.6M divided by 7,086 ERUs or $3,758.53 per ERU. If the County wishes to fund the project with a 20-year loan at 3 percent interest, the annual debt service becomes $1.8M for a true project cost of $35.7M. This is equivalent to a cost of $5,052.64 per ERU.

Table ES-10 – Connection Fee Impacts

Year Needed	Improvement	Connection Fee Cost (year of construction dollars)	Capacity Added (ERUs)	Funded by Cash Cost ($/ERU)	Funded by Loan Cost ($/ERU)
2017	Headworks	$ 3,075,000	16,999	$ 186.32	$ 250.47
2023	Secondary Treatment	$ 26,565,275	7,068	$ 3,758.53	$ 5,052.64
2023	Generator + Water System	$ 1,414,355	14,828	$ 95.38	$ 128.23
2026	Solids Handling	$ 7,794,715	5,330	$ 1,462.42	$ 1,965.96
	Total =	**$ 38,849,345**		**$ 5,502.65**	**$ 7,397.30**

Table ES-10 provides an accounting of connection fee impacts for each improvement project at the expected year of construction. This analysis only presents the costs associated with system facility upgrades for Cold Springs only and does not consider the cost of existing capacity or capital improvement costs for other County owned systems. Farr West recommends that the County pursue a more thorough analysis of user and connection fees prior to making any modifications to the current fee schedule.