Great Basin Water Co.
2018 Integrated Resource Plan
Volume II: Pahrump Division

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Great Basin Water Co.™

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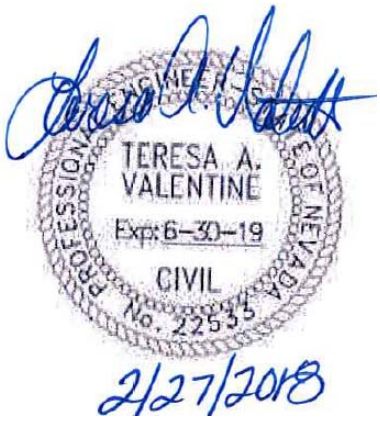

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LIST OF ABBREVIATIONS

2014 IRP	The Utilities, Inc. of Central Nevada 2014 Integrated Resource Plan
ADD	Average Day Demand
ADMM	Average Day Maximum Month
AF	Acre Feet
AFA	Acre Feet Annually
AFUDC	Allowance for Funds Used During Construction
AMR	Automatic Meter Reading
APWA	American Public Works Association
AWWA	American Water Works Association
AZ / NV	Arizona / Nevada Business Unit
bgl	Below Ground Level
amsl	above mean sea level
Basin 162	Hydrographic Basin 162
BOCC	Board of County Commissioners (Nye County)
CCA	Corrections Corporation of America (now known as CoreCivic)
CIP	Capital Improvement Projects
CM	Calvada Meadows
CN	Calvada North
CNUC	Central Nevada Utilities Company
Commission	Public Utilities Commission of Nevada
CPCN	Certificate of Pubic Convenience and Necessity
CV	Calvada Valley
CVE	Country View Estates
Dui	Desert Utilities, Inc.
DWR	Nevada Division of Water Resources
EPA	United States Environmental Protection Agency
ET	Evapotranspiration
FMEA	Failure Mode Effects Analysis
fps	Feet per Second
ft	Feet
GBWC	Great Basin Water Co.
GBWC-PD	Great Basin Water Co. Pahrump Division
gpd	Gallons per day
gpdpc	Gallons per day per customer
gpm	Gallons per Minute
GIS	Geographical Information Systems
GWMP	Basin 162 Groundwater Management Plan (not adopted)
GWMPAC	Groundwater Management Plan Advisory Committee
HGL	Hydraulic Grade Line
HOA	Home Owners' Association

LIST OF ABBREVIATIONS – cont.

Hp	Horse Power
I/I	Infiltration/Inflow
IRP	Integrated Resource Plan
ITB	Intent to Bid
kW	Kilowatt
lf	Linear Feet
LOS	Level of Service
LVVVWD	Las Vegas Valley Water District
ml	Milliliter
MCL	Maximum Contaminant Level
MDD	Maximum Day Demand
MF	Mountain Falls
MF WWTP	Mountain Falls Wastewater Treatment Plant
MG	Million Gallons
MGA	Million Gallons Annually
MGD	Million Gallons per Day
mg/l	Milligrams per Liter
MHz	Megahertz
MPN	Most Probable Number
msl	Mean Sea Level
MVE	Mountain View Estates
NAC	Nevada Administrative Code
NCWD	Nye County Water District
NDEP	Nevada Division of Environmental Protection
NRW	Non-Revenue Water
O&M	Operation and Maintenance
Pahrump Basin	Hydrographic Basin 162
PD	Great Basin Water Co Pahrump Division
PEC	Preferred Equities Corporation
PF	Peaking Factor
Plant	Wastewater Treatment Plant
PHD	Peak Hour Demand
PHFU	Plant Held for Future Use
ppm	Parts per Million
ppb	Parts per Billion
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
psig	Pounds per Square Inch Gauge
PUCI	Pahrump Utilities Company, Inc.
PUCN	Public Utilities Commission of Nevada
PVC	Poly Vinyl Chloride

LIST OF ABBREVIATIONS – cont.

PWRR	Present Worth Revenue Requirement
RPN	Risk Priority Number
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SIR	System Improvement Rate
SMMR	Spring Mountain Motorsports Ranch
SRF	Single Family Residence
SNWA	Southern Nevada Water Authority
TDH	Total Dynamic Head
UFW	Unaccounted-for-Water
µg/L	Micrograms per Liter
UI	Utilities, Inc.
UICN	Utilities, Inc. of Central Nevada
USEPA	United States Environmental Protection Agency
Valentine	Valentine Environmental Engineers, LLC.
VFD	Variable Frequency Drive
WCP	Water Conservation Plan
WSC	Water Service Corporation
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

The Great Basin Water Co. Pahrump Division ("GBWC-PD") water and wastewater assets were acquired in 2002 from the Central Nevada Utilities Company. GBWC is regulated by the Public Utilities Commission of Nevada ("PUCN"), Nevada Division of Environmental Protection ("NDEP"), Nevada Division of Water Resources ("DWR"), and other federal, state, and local government entities.

The GBWC-PD service area covers approximately 43 square miles in the Pahrump Valley generally along the Highway 160 corridor. The service area is comprised of five individual water systems and three wastewater collection systems, with the stand-alone newly annexed (but, not yet, dedicated) Spring Mountain Motorsports Ranch ("SMMR") water system and wastewater system in construction. The individual water and sewer systems are: (1) Calvada Valley water and sewer system; (2) Country View Estates/Calvada North water and sewer system; (3) Calvada Meadows water system; (4) Mountain View Estates water system; (5) Mountain Falls water and sewer system; and (6) Spring Mountain Motorsports Ranch water and sewer system.

The overall objective of this resource plan is to provide guidance to GBWC-PD as to how to provide adequate water and sanitary service to their customers in the service area over the next 20 years. This includes determining current system deficiencies and recommended improvements projecting growth over the next 20 years and determining the facilities needed to provide adequate service for the growth. A detailed Action Plan is provided identifying needed and recommended improvements over the next three years and the timing of those improvements. Additional sections address water conservation and reclamation as means to limit water demand and protect the water environment, and a plan for funding of the needed improvements and the financial impacts on the customers.

The existing water systems were evaluated for supply, storage, and distribution systems. The systems were analyzed for current operations and existing deficiencies. Following this was an analysis based on the 20 year growth projection. There are some areas with pressure concerns and some areas with marginal fire flows based on the analyses performed in this report. Infrastructure improvements to the piping systems are identified to improve the effectiveness of the existing system.

The three wastewater systems were evaluated for treatment capacity, treatment efficiency, collection system capabilities, and reclaimed water usage. There is sufficient capacity in all of the wastewater systems to meet current and future needs based on the 20 year growth projection. Treatment efficiency needs to be improved at Plant 3 and will improve the overall operations of the facility.

The Plant 3 and Mountain Falls facilities produce reclaimed water that gets used by local golf courses and a park. It is also proposed in this filing that reclaim water from Plant 3 be used at a local school complex for irrigation. This is a resource that needs to be maximized to protect and preserve the potable groundwater supply as much as possible.

Current Service Issues

In October 2016, GBWC-PD and Valentine Environmental Engineers ("Valentine") created a current "Level of Service" ("LOS") assessment. The section listed GBWC-PD's level of service elements with regard to Regulatory and Contractual Deficiencies, Quality Standards, Reliability, Customer Service, and Wastewater Standards, including:

- Decreasing loss from leakage (non-revenue water) below 10%.
- Fire flows: inadequacies in the far ends of the water system and minor issues in water system.
- Lack of potable water storage in some areas.
- Redundancy improvement in some service areas (particularly Calvada Meadows and Mountain View Estates) within GBWC-PD.

Asset Registry Condition Assessment and Asset Management Analysis

GBWC-PD has an asset registry that contains the major assets in GBWC-PD's water and wastewater utility. This asset registry includes a condition assessment of the assets to ensure future fundamental replacement/rehabilitation schedule could be generated to deal with the assets once they exhaust their remaining useful life. For this Integrated Resource Plan ("IRP"), an updated asset registry was utilized to look at the current age and remaining useful life of water and wastewater infrastructure.

An Asset Management workshop for the GBWC-PD staff was also conducted in December 2016 to assess specific major assets and subsystems of the water system for vulnerabilities. The assessment did not include collection system piping, water system piping, or an assessment of pressure zones. The goal was to identify vulnerabilities based on the age and useful life of each asset, so that corrective actions and better monitoring protocols could be implemented to reduce the potential of asset and subsystem failures.

Asset Management is a continuous process which evolves over time.

Existing Conditions

The latest existing conditions of water supply, water distribution, wastewater collection and wastewater treatment infrastructure were documented. Description of the existing conditions were based on pertinent information for this infrastructure, gathered from available information (such as reports) as well as site visits that were performed.

Current and Projected Requirements

Growth Projection

The "Nevada County Population Projections 2017 to 2036" report prepared by the State Demographer's Office dated October 1, 2017, was used to develop the future population in the service area. The report estimates the Nye County 2016 population (with additional factors) at

45,737 people. Nye County also tracks the population and the Pahrump population through the planning department and posts the documents on their website. In the 2015 third quarter report (which is the most recent report posted to the website), Nye County lists their County 2015 population as 47,319 people and the Pahrump population as 39,312. This is a difference of 3.4% from the State Demographer. The projections are presented in Table E-1.

Table E-1. Population Projections

Year	Nye County Population Projections[1]	Pahrump Population Projections[2]
2012	44,292	38,153
2013	44,749	38,543
2014	45,456	38,793
2015	46,050	39,312
2016	45,737	39,219
2017	46,059	39,496
2018	46,337	39,734
2023	46,837	40,163
2028	46,896	40,213
2033	46,670	40,020
2038	46,773	40,108

Water System Forecasting

Historical water connections were tabulated and compared to historical population data to determine a reasonable assumption of growth forecasting regarding the future water connections to the GBWC-PD system. The forecasted water connections are based on a direct correlation of the projected growth rate at the historical proportional relationship between the number of connections and the overall population. This projection is summarized in Table E-2.

Table E-2. Water Connection Projections

Year	Pahrump Pop.[1]	New Res. Service Conn.[3]	Res. Service Conn.[4]	Res. Users[5]	GBWC-PD % of Pahrump Pop.[6]	Comm. Conn.[7]	Total GBWC-PD Conn.[8]
2014	38,793		5,351	12,682	33	330	5,681
2015	39,312	45	5,396	12,789	33	320	5,716
2016	39,219	208	5,604	13,281	34	332	5,936
2017	39,496	39	5,643	13,375	34	334	5,978
2018	39,734	34	5,678	13,456	34	336	6,014
2023	40,163	4	5,739	13,601	34	340	6,079
2028	40,213	-2	5,746	13,618	34	340	6,086
2033	40,020	-3	5,718	13,552	34	339	6,057
2038	40,108	6	5,731	13,582	34	340	6,070

Water Supply

There is currently enough water supply through the existing wells to meet current and forecasted future supply needs in each service except for Mountain Falls service area. Table E-3 shows the total well capacity with all wells in service for each service area.

Table E-3. Water Demand Forecasting

Year	Calvada Valley MDD (gpm)	Calvada North/Country View Estates MDD (gpm)	Calvada Meadows MDD (gpm)	Mountain View Estates MDD (gpm)	Mountain Falls MDD (gpm)
2018	2,019	143	5.6	2.48	1,932
2038	2,593	389	7.94	3.98	4,016
Adjusted Well Capacity (if more than one well) (gpm)	3,604	440	250	50	1,250
Difference (gpm) Between Capacity and 2038 MDD	1,011	51	242.1	46.02	-2,766

Many of the wells in the GBWC-PD service areas are over 40 years old. Since the existing condition of several wells is not known, GBWC-PD should consider a well rehabilitation and assessment program which evaluates the integrity of each well through camera inspection and provides a road map for well cleaning and/or replacement.

Water Storage

Water storage was evaluated on the basis of operational needs, emergency needs, and fire flow storage needs. Water storage is regulated by NAC 445A.6674, 445A.66745, 445A.6675, 445A.6755, and 445A.66755.

For the purposes of the GBWC-PD 2018 IRP, Valentine has included operating storage of MDD for one day, fire flow storage (depending on the service area highest requirement), and emergency reserves of ADD in it system-wide storage assessment. The storage capacity in the five service areas were analyzed separately based on the approximate number of connections in each service area. Table E-4 shows the storage requirements and available storage for each service area.

The Calvada Meadows and Mountain View Estates systems are too small to adhere to these requirements. It is recommended that the Mountain View Estates system be interconnected to the Calvada Valley system to provide more reliable flows and emergency supplies.

Table E-4. Required and Available Storage

Year	Calvada Valley (MG)	Calvada North/Country View Estates (MG)	Calvada Meadows (MG)	Mountain View Estates (MG)	Mountain Falls (MG)
2018	4.88	0.57	N/A	N/A	4.14
2038	6.19	1.13	N/A	N/A	8.33
Available Storage with Alternative Pumping Capacity	6.73	1.48	N/A	N/A	6.2 (assuming functional backup generators in 2038)
Meets NAC for Storage?	Yes	Yes	No	No	No

Transmission and Distribution Systems

The water distribution system was analyzed by hydraulically modeling the Calvada Valley water system with 2018 demands and future 2038 demands. The hydraulic model was analyzed on an existing demand basis for average daily demand ("ADD"), maximum daily demand ("MDD"), peak hour demand ("PHD"), and fire flow conditions. The pipeline network was evaluated based on flow velocities and head losses as they related to pressures throughout the distribution system. Where deficiencies were noted, the additional modeling was performed with potential changes to the system to determine the most technically feasible and cost effective solution(s). The hydraulic model was compared to design criteria outlined in NAC 445A.6672.

Only a handful of 8-inch distribution pipes were observed to exceed the maximum head loss requirement (10 feet/1000 feet). Generally, most nodes in the system demonstrated that the system was able to meet fire flow at those nodes. The distribution piping meets the criteria for velocity, with velocities less than 8 feet per second observed.

Further calibration of the WaterCAD model should be conducted to validate the results of the model described above.

In addition, there are many dead ends within the Calvada Valley water distribution system. Per NAC 445A.6712, the water system should be designed to the extent possible to eliminate dead ends and form a grid system or system of arterial loops. Looping will help to minimize dead ends,

provide fire protection to areas that do not have adequate fire protection and provide more redundancy in the system in the event of main breaks.

At this time, the Calvada Valley water system is the only water system that has been hydraulically modelled. A comprehensive hydraulic model of all service areas in GBWC-PD should be considered in order to model future changes to the water distribution system and ensure NAC compliance in all GBWC-PD service areas.

Wastewater Connection Forecasting

The historical wastewater connections were tabulated and compared to the historical population data to determine a reasonable assumption of growth forecasting regarding the future wastewater connections to the GBWC-PD system. The forecasted wastewater connections are based on a direct correlation of the projected growth rate at the historical proportional relationship between the number of connections and the overall population. This projection is also correlated to the water connection forecasts to ensure that the projections do not contradict each other in any sense. This projection is summarized in Table E-5.

Table E-5. Projected Wastewater Connections

Year[(1)]	Plant 3 - Calvada Valley	Plant F - Calvada North	Plant MF - Mountain Falls	Total
2014	2,981	157	866	4,004
2015	2,964	156	943	4,063
2016	3,018	159	1,076	4,253
2017	3,094	163	994	4,252
2018	3,113	164	1,000	4,277
2023	3,147	166	1,011	4,324
2028	3,151	166	1,012	4,329
2033	3,135	165	1,007	4,308
2038	3,143	166	1,010	4,318

There are no capacity related improvements necessary in the three wastewater facilities currently in operation in GBWC-PD. However, there are improvements that should be made to increase the efficiency of the treatment facilities. Plant 3 operates well but has little operational flexibility in an event causing less than optimal processing conditions or a surge caused by a rain event. Increasing the emergency storage capacity onsite will provide more flexibility to the system and improve overall operations. Table E-6 shows the projected demands and how they relate to the facility capacity for each system. The demands were projected based on historical data per connection. The facilities are currently operating at less than 85% capacity, so it is not surprising that with the low projected growth rate there will be plenty of additional capacity at the end of the 20-year projection in 2038.

Table E-6. Projected Wastewater Flows

Year	Calvada Valley Projected Plant 3 WWTP ADMM (MGD)	Calvada North Projected Plant F WWTP ADMM (MGD)	Mountain Falls Projected Mountain Falls WWTP ADMM (MGD)
2014	0.607	0.023	0.089
2015	0.656	0.028	0.063
2016	0.653	0.024	0.078
2017	0.662	0.026	0.080
2018	0.666	0.026	0.080
2023	0.673	0.026	0.081
2028	0.674	0.026	0.081
2033	0.670	0.026	0.081
2038	0.672	0.026	0.081

Reclaimed Water Systems

Plant F does not produce reclaimed water; all of its effluent is disposed of through on-site spray irrigation. Plant 3 disposes of its reclaimed water to a holding pond Discovery Park. The reclaimed water is pumped from the receiving pond to spray irrigation at Discovery Park and, also, to another receiving pond at the Lakeview Golf Course approximately a mile away. Mountain Falls disposes of its reclaimed water to the Mountain Falls Golf Course.

Emergency Response Plan

The Emergency Response Plan is discussed in more detail in Volume I of this filing and is provided as an appendix (Appendix J).

Water Conservation Plan

The Water Conservation Plan is discussed in more detail in Volume I of this filing and is provided as an appendix (Appendix K).

Funding Plan

GBWC-PD's 2018 Integrated Resource Plan has a number of preferred and needed projects that will cost a total of $15.6 million over the action plan three year period of 2019-2021 and with all action plan and preferred plan projects totaling approximately $21 million. The funding plan is discussed in more detail in Volume I of this IRP filing, as well as Appendices L, L1 and L2. The project list in Section 10.1 *et seq.* will be funded through traditional funding sources using Great Basin Water Co. debt and equity investment

SECTION 1.0: INTRODUCTION

1.1 Report Organization

Executive Summary — The Executive Summary provides an overview of the study and the recommended capital improvement plan.

Section 1.0 — Introduction. This section provides background information on the Great Basin Water Co. – Pahrump Division ("GBWC-PD"), a description of Hydrographic Basin 162, and a discussion of the objectives of the Integrated Resource Plan ("IRP").

Section 2.0 — Existing Conditions. This section presents a complete description of the five existing service areas (and newly annexed, but not yet dedicated service area – Spring Mountain Motorsports Ranch), existing facilities, condition of the major assets and remaining useful life, and their operation and control.

Section 3.0 — Historical Data and Forecasting. This section presents an evaluation of the historical population and connections to the existing system. This data is used and presented as a basis for the population and demand forecasting for the utility.

Section 4.0 — Water Supply and Wastewater Treatment Plants. This section presents the analysis of the existing water and wastewater systems with regards to how it will be impacted by the demand forecasting presented in Section 3.0.

Section 5.0 — Emergency Response Plan. This section provides a reference to the GBWC-PD emergency response plan discussed in Volume I.

Section 6.0 — Water Conservation Plans. This section provides a reference to GBWC's water conservation plan discussed in Volume I.

Section 7.0 — Preferred Plan. This is a 20-year projected evaluation which includes a preferred plan for the necessary improvements over the 20-year planning period. This preferred plan is a planning level guideline based on current demands, growth projections, and remaining useful life of major assets.

Section 8.0 — Action Plan. This section is a summary subset of the Preferred Plan detailing the improvements which are recommended for implementation in the 3 years following approval of the 2018 IRP.

Section 9.0 — Funding Plan. This section details the financing impacts and strategies for meeting the needs addressed in the Action Plan.

Section 10.0 — System Improvement Rate Request. This section outlines the information required by NAC 704.6339 to support a request to designate water and sewer projects in the Action Plan as eligible for a System Improvement Rate.

Technical Appendix — This section is part of the comprehensive technical appendix that will support all of the specific resource plan volumes which will contain the complete details of the methodologies used in developing the resource plan along with all of the basic data used in the study.

1.2 Background

1.2.1 Pahrump Division Overview

The Great Basin Water Co.- Pahrump Division ("GBWC-PD") service area covers approximately 43 square miles in the Pahrump Valley generally along the Highway 160 corridor as shown in Figure 1.01. The service area is currently comprised of five separate water systems and three wastewater collection systems. The water systems include: Calvada Valley, Calvada North/Country View Estates, Calvada Meadows, Mountain View Estates, and Mountain Falls. The wastewater systems include: Plant 3 in the Calvada Valley area, Plant F in the Calvada North area and Plant MF located in Mountain Falls in the south. The Spring Mountain Motorsports Ranch ("SMRR") stand-alone water system and wastewater systems are newly annexed (but not yet, dedicated) and construction of both systems is expected to be completed in 2018.

The GBWC-PD water system is comprised of two (2) booster pump stations, five (5) storage tanks and a total of twelve (12) groundwater wells located in hydrographic Basin 162 that provide potable drinking water to their service territories. Six (6) of these wells are currently beyond their useful life (over 40 years old). In addition, one (1) booster pump station, two (2) storage tanks and two (2) groundwater wells are currently under construction in the newly annexed (but not yet, dedicated) GBWC-PD SMMR stand-alone system.

The primary use is residential although there are several large water users on the system. A total of approximately 5,936 metered water connections are currently installed along with 4,253 sewer connections as of December 2016.

Within or adjacent to the GBWC-PD service territory, there are over 11,000 domestic wells. There are approximately 300 wells within and adjacent to the GBWC-PD service territory which currently serves 500 connections. Of the 800 potential water users in the scenario, 35% are already served by domestic wells. This is also the case for GBWC-PD's other systems within their territory. GBWC-PD's system is currently not capable of serving many future customers without extension of their system and the installation of backbone infrastructure.

The purpose of this IRP is to balance the needs of the system, environment, and customers over the next 20 years. The Action Plan is a 3-year plan. The purpose of the Action Plan is to identify current major assets that have exceeded their useful life expectancy and identify needs in the system in order to develop a plan for the next three years balancing the objectives of minimizing cost, mitigating risk, and maximizing service reliability. The planning horizon for the IRP is 20 years, from 2018 to 2038, pursuant to NAC 704.923(2). Historical production data presented in this IRP covers the 10-year period preceding 2018 pursuant to NAC 704.923(1).

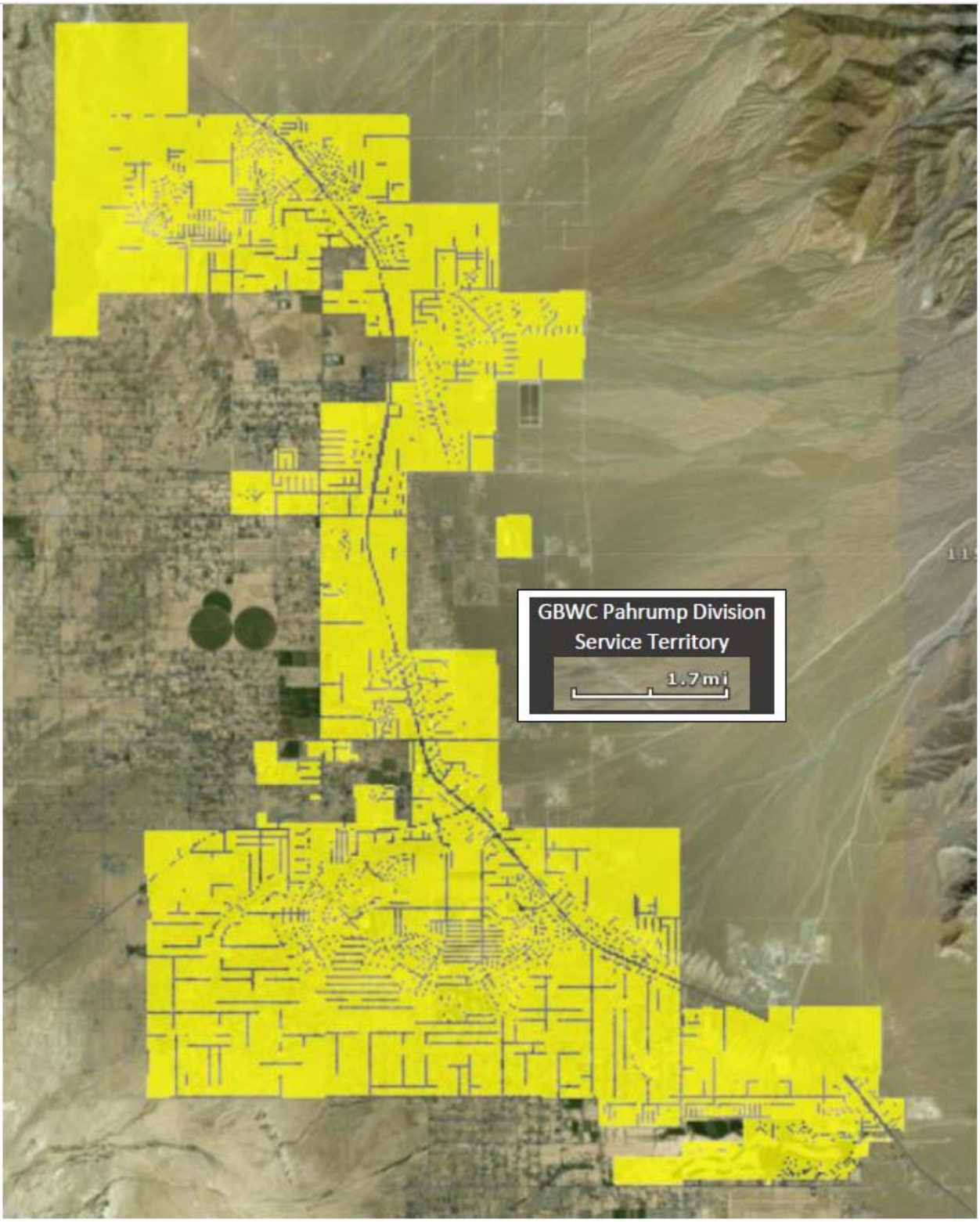

Figure 1.01: Overview of the Existing Water Systems

1.2.2 Basin 162 (Pahrump Valley) Overview

Hydrographic Basin 162, known as the Pahrump Basin ("Basin 162" or the "Pahrump Basin") is the groundwater source for all GBWC-PD's supply wells and for the entire Pahrump Valley.

According to the Groundwater Management Plan ("GWMP"), Stage One, as prepared by the Nye County Water District ("NCWD") Staff and Groundwater Management Plan Advisory Committee ("GWMPAC") members, "Basin 162 is one of the most over-appropriated basins in Nevada and has the highest density of domestic wells of any basin in the State." *See* the GWMP in Appendix B, on page 4. The perennial yield of Basin 162 has been set by the State Engineer's Office at 20,000 Acre-Feet-Annual ("AFA"). There are 60,416[1] permitted water rights in the basin. There are over 11,000 domestic wells with another 8,500 lots designated for domestic wells. The State Engineer's Office estimates 0.5 AFA per domestic well. Note that domestic wells are statutorily allowed to use up to 2 AFA, although no water rights are associated with a domestic well.

Table 1.01: Basin 162 Over-allocation[2]

Pahrump Hydrographic Basin	
Existing Permitted Rights	60,416 AFA
Existing and Future Domestic Wells	9,750 AFA
Potential Groundwater Withdrawal	70,166 AFA
Perennial Yield	20,000 AFA
Over Appropriation	**50,166 AFA**[3]

On a positive note, currently the total pumping in the Basin 162 is approximately 15,000 AFA, which is a new sixty-year low. Perhaps the best summary of the history and issues facing those who receive their water supply from the Pahrump Basin was presented to the Legislative Commission's Subcommittee to Study Water by Rick Felling, Deputy Administrator of DWR, on July 11, 2016. *See* Appendix B.

The State Engineer is pro-interconnecting the utilities in Basin 162. This is a challenge with not only three water companies spread out by miles, but even within the three utilities, there are nine sub-water systems. However, all the utilities and the State Engineer's Office agree that additional means to serve future customers through a utility service is an overall benefit to Basin 162.

1.3 Objectives

The overall objective of this IRP is to provide guidance to GBWC-PD as to how to provide adequate water and sanitary sewer service to their customers in the GBWC-PD service area over the next 20 years. This includes identifying any current system deficiencies and needed improvements, projecting growth over the next 20 years, identifying innovative tools and systems for improving operation and maintenance efficiencies, and determining the facilities needed to provide adequate

[1] Division of Water Resources ("DWR") website June, 2016.
[2] GWMP, p. 8. Appendix B.
[3] To understand the magnitude of the potential shortage, this is 44,785,377 gallons per day ("gpd").

service for growth. An asset management framework has been integrated into the IRP to identify and determine when existing critical assets will need to be replaced or rehabilitated in the future. GBWC-PD provides a detailed Action Plan herein, identifying the needed and recommended improvements over the next three (3) years, and the timing of those improvements. Additional sections address water conservation as a means to limit water demand and protect the groundwater resource, and a funding plan for each of the proposed improvements and estimating the financial impacts on the customers. GBWC-PD's goal is to balance the objectives of minimizing cost, mitigating risk, and maximizing service reliability.

1.3.1 Current Level of Service

In October 2016, GBWC-PD and Valentine Environmental Engineers ("Valentine") created a current "Level of Service" ("LOS") assessment. The section listed GBWC-PD's level of service elements with regard to Regulatory and Contractual Deficiencies, Quality Standards, Reliability, Customer Service, and Wastewater Standards, including:

- Regulatory/Contractual
  -NDEP Tier 1 and Tier 2 water treatment and quality parameters
  -NSF 61 compliance for lead
  -NAC standards of service (general compliance, leakage, line pressure, fire flow, storage, fire hydrants testing, backup power, redundancy, dead ends)
  -Consumer Bill of Rights
  -NDEP Backflow Prevention Program
  -NDEP FOG Requirement
  -NDWR water withdrawal limit
  -Emergency response
  -PUCN and NDWR water conservation requirements
  -Maintain O&M manuals on file
  -Mountain Falls Water Supply Contractual requirements
- Water Quality Standards
- Potable Water Reliability (including outages and monthly reading of meters)
- Customer Service (flexible billing options and access to customer service)
- Wastewater Standards (effluent quality, wastewater collection system and treatment reliability) and Reclaimed Water Agreements
- Other (submitting IRP documents, site security, worker health and safety, maintaining acceptable architecture, odor and noise levels, etc.)

The LOS sections have helped GBWC-PD identify areas where improvement will help to strengthen services and relations with their customers. Some of the areas for improvement include:

- Decreasing real and apparent water loss (non-revenue water) below 10%.
- Fire flows: inadequacies in the far ends of the water system and issues in water system.
- Lack of potable water storage in some areas.
- Redundancy improvement in some service areas (particularly Calvada Meadows and Mountain View Estates) within GBWC-PD.

1.3.2 Asset Registry Condition Assessment

GBWC-PD has an asset registry that contains the major assets in GBWC-PD's water and wastewater utility. This asset registry included a condition assessment of the assets to ensure future fundamental replacement/rehabilitation schedule could be generated to deal with the assets once they exhaust their remaining useful life. Appendix A contains the asset registry and condition assessment with time tables and estimated costs for replacement/rehabilitation for non-linear assets. The assets which have estimates for remaining useful life are based on "nominal" design lives of specific assets. The nominal design life of an asset is a rough guideline that has the capability of either out-living or prematurely failing, which is dependent on design attributes and degree of operation and maintenance of an asset. The asset registry is considered a living document which will be updated on an as-needed basis to ensure sufficient monitoring of the assets are being conducted regularly. The asset registry only contains the major fixed assets.

1.3.3 Asset Management Analysis

In December 2016, David Kitching of Corix and Stephani Jackson of Water Service Corporation conducted an Asset Management workshop for the GBWC-PD staff to assess specific major assets and subsystems of the water system for vulnerabilities. The agenda of the workshop consisted of the following:

- Asset Management Refresher
- Asset Registry Analysis
- Review of Condition and Consequence of Failure Assessment Guidelines
- Level of Service Analysis
- Review of 5-Year Capital Plan
- System Summary
- Conclusions and Next Steps

The assets and subsystems assessed included water supply, storage, and booster pumping systems as well as wastewater collection system lift stations and WWTP equipment. The assessment did not include collection system piping, water system piping, or an assessment of pressure zones. The goal was to identify vulnerabilities based on the age and useful life of each asset, so that corrective actions and better monitoring protocols could be implemented to reduce the potential of asset and subsystem failures. The workshop was not meant to be exhaustive but rather to identify the highest-priority potential failures. Appendix C, GBWC-PD Asset Management Workshop Evaluation, contains a presentation created that displays the results of the evaluation of major assets. Failure Mode and Effects Analysis ("FMEA") was also briefly discussed. Asset Management is a continuous process which evolves over time.

SECTION 2.0: EXISTING CONDITIONS

2.1 Pahrump Division

2.1.1 Location

The GBWC-PD service area is located approximately 60 miles west of Las Vegas, Nevada, along U.S. Route 160. Specifically, the GBWC-PD service area is located in Township 19, 20, and 21 South, Ranges 53 and 54 East in the Pahrump Valley within Nye County, Nevada. The most recent service territory maps for each water and wastewater system can be found in Appendix D.

2.1.2 Service Territory

In late 1970, Preferred Equities Corporation ("PEC") began recording subdivision plats throughout the Pahrump Valley. The lots created through the subdivision plats recorded by PEC principally and can be largely classified into three categories of water and sewer service. The first of the categories included lots which were to have central water and sewer service. Second designation included lots which were to have central water service, but an individual septic disposal system. Third designation included lots which were to have a domestic well and individual septic disposal system. From 1970 to 1997, PEC platted in excess of 28,000 residential units which were approved for service by central water system and about 16,400 lots were to be served by a central water and sewer system. Almost another 8,000 lots were to be served by a central water system.

In order to provide central water and sewer services, PEC established and owned Central Nevada Utilities Company ("CNUC"). However, PEC did not install all the infrastructure necessary to provide central water and sewer service. Instead, the majority of the expansion of the central infrastructure occurred on a piecemeal basis as individual lots were developed. As a result, today there is only infrastructure to serve about 6,400 of the original 28,000 lots.

Where PEC did install water system infrastructure, much of it was undersized. In some cases, two-inch main would be installed for thousands of feet to serve one home. If other homes were built along the route of the two-inch main, they were allowed to connect to the undersized main. These practices resulted in water systems with numerous undersized and dead end mains which create challenges for GBWC-PD to meet pressure and fire flow requirements for current system users.

GBWC-PD currently covers approximately 43 square miles and consists of five individual water systems and three wastewater systems (See Appendix D), with the stand-alone newly annexed (but, not yet, dedicated) SMMR water system and wastewater system in construction. The individual water and sewer systems are: (1) Calvada Valley water and sewer system; (2) Country View Estates/Calvada North water and sewer system; (3) Calvada Meadows water system; (4) Mountain View Estates water system; (5) Mountain Falls water and sewer system; and (6) Spring Mountain Motorsports Ranch (SMMR) water and sewer system.

GBWC-PD is one of three utility companies providing water and sewer service in the Pahrump Valley. GBWC-PD serves the southern, central, and northern areas of Pahrump. Desert Utilities, Inc. serves approximately 3.5 square miles in north Pahrump. Pahrump Utility Company, Inc. serves approximately 1.0 square mile in south Pahrump. Desert Utilities Inc.'s and Pahrump Utility Company's service areas are located adjacent to GBWC-PD's service area (*See* Appendix D). GBWC-PD's service area constitutes about 90 percent of the total area served by the three utility companies in the Pahrump Valley. Currently, water and sewer service in the Pahrump Valley is provided by the three utility companies and numerous private wells and septic systems.

For the 2018 IRP, it has been assumed that there are 5,936 connections throughout the existing five GBWC-PD service areas consisting primarily of residential (single family and multi-residential) clients, with a number of commercial clients and small number of public authority and connections used for irrigation. Growth is expected to continue in the existing service territory.

The legal description of the water service territory is contained in GBWC-PD's Tariffs Rule No. 17 which is maintained on file in the office of the PUCN and at GBWC offices in Reno and Pahrump, as well as the GBWC website at www.GreatBasinWaterCo.com.

2.1.3 Maps

The location and general map showing the GBWC-PD service territory is shown in Figure 1.01. For more maps showing specific service areas and locations of major assets in each water and wastewater system, please refer to Appendix D.

2.1.4 Geography and Climate

The Pahrump Valley has elevations ranging from approximately 3,000 feet above mean sea level ("msl") dropping to under 2,600 feet msl.

Summer in Nye County is hot and dry with highs in the low 100's and lows in the low 60's. Winter temperatures range from highs in the upper 50's and lows in upper 20's. Precipitation is low, averaging approximately 5 inches per year with the wettest months occurring in the winter.

Table 2.01: Pahrump, Nevada Average Monthly Weather Data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max. Temp. (^{0}F)	57.4	62.5	68.0	75.5	85.2	95.2	101.6	99.8	92.6	81.5	67.3	57.8	78.7
Min. Temp. (^{0}F)	27	32.1	36.9	43.2	52.2	60.0	67.3	65.7	56.8	44.8	33.8	26.6	45.5
Total Precip. (in.)	0.65	0.82	0.53	0.31	0.20	0.09	0.33	0.32	0.33	0.24	0.36	0.54	4.71
Total Snowfall (in.)	0.2	0.1	0.1	0	0	0	0	0	0	0	0	0.2	0.6

Station: Pahrump, Nevada (265890)
Period of Record: 3/10/1914 to 6/10/2016
Source: Western Regional Climate Center

2.1.5 Land Use

Land use within the service territory is primarily residential with some light commercial and public facilities. Commercial facilities include mostly small commercial stores and restaurants with a few large retail stores and casinos.

Spring Mountain Motorsports Ranch ("SMMR") is under development with a service area composed of residential, over 20 acres of commercial development including planned 1,250-seat movie theater, 97-room hotel, restaurants, retail shops, race track facilities, and an RV park.

2.1.6 Population

The 2010 census shows a population of 36,411 people living in the Town of Pahrump. The 2015 3rd quarter report shows a population of 39,312 people living in the Town of Pahrump. The 2016-2036 State Demographer population projections report estimates the Nye County population to be 46,677 in 2036. The State Demographer projections estimate a 0.1% average annual increase in County population from 2016 through 2036. Based on the average historical proportion of Pahrump population to the Nye County population, the Pahrump population in 2036 is estimated to be 40,026.

GBWC-PD serves approximately 34% of the Town of Pahrump. The household per capita for the area is estimated at 2.37 persons per household (Source: 2007-2011 US Census Quick facts for Pahrump).

2.1.7 Water Supply and Quality

The water supply for GBWC-PD is groundwater from two irrigation wells (Wells 10 and 21) plus twelve potable wells. Seven wells, of which two are for irrigation, in the Calvada Valley system, three wells in the Country View Estates/Calvada North system, one well in Calvada Meadows, one well in Mountain View Estates, and two wells in the Mountain Falls system.

Over the 20-year analysis period there is estimated to be approximately 0.10% growth annually. Based on the existing water supply well capacities, there are no anticipated water supply problems in the planning period. However, GBWC-PD's wells provide supply from Basin 162. As previously addressed, Basin 162 is over-appropriated. Nye County has a groundwater level monitoring program in which GBWC-PD participates. GBWC should consider an expansion of groundwater level monitoring in support of this program.

Water quality data from the 2013, 2014, 2015, and 2016 Consumer Confidence Reports for GBWC-PD specific water systems are provided in Tables 2.02 through 2.06. The reports illustrate that no regulated contaminates exceed MCLs in any of the service areas. At this time, there is no reason to assume that water quality degradation will occur during the planning period. However, groundwater quality must be protected and GBWC-PD takes these precautions as well as proposing additional water quality protection measures in this filing.

A summary of the December 2015 water quality laboratory report data provided for the drilled well (Well 1) in Spring Mountain Motorsports Ranch, which is not yet in service is provided in Table 2.07. Only one well has been drilled and tested at this time, though another well (Well 2) will be constructed. The SMMR stand-alone system has been annexed, but is not yet dedicated to GBWC-PD.

Table 2.02: Calvada Valley Water Quality Data (2016) Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No Detected Microbiological Contaminants Were Found in 2016 Calendar Year					
Inorganic Contaminants					
Aluminum	N	2016	Ppm	0.2	ND-0.015
Arsenic	N	2016	Ppb	10	ND-2
Barium	N	2013	Ppm	2	0.054
Chromium	N	2011	Ppb	100	1
Fluoride	N	2016	Ppm	4	0.13
Nickel	N	2013	Ppm	0.1	0.003
Nitrate	N	2016	Ppm	10	0.33-0.82
Disinfection By-Products					
Chlorine	N	2016	Ppm	4	0.4-1.2
Lead and Copper					
Copper, Free	N	2016	Ppm	1.3 AL*	0.006-0.268
Lead	N	2016	Ppb	15 AL*	ND-3
Radionuclides					
Combined Radium (-226 & -228)	N	2008	pCi/L	5	ND-1.45
Uranium	N	2014	Ppb	30	2
Gross Alpha, Incl. Radon & U	N	2008	pCi/L	15	0.57-3.52
Gross Beta Particle Activity	N	2008	pCi/L	50	0.6-1.85
Radium 226	N	2008	pCi/L	5	0.08-0.50
Secondary Contaminants					
Sodium	N	2016	Ppm	200	1.70-3.50

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

Table 2.03: Calvada North/Country View Estates Water Quality Data (2016) Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No Detected Microbiological Contaminants Were Found in 2016 Calendar Year					
Inorganic Contaminants					
Aluminum	N	2016	Ppm	0.2	0.002-0.003
Arsenic	N	2016	Ppb	10	1-4
Barium	N	2014	Ppm	2	0.11-0.16
Chromium	N	2014	Ppb	100	2
Fluoride	N	2014	Ppm	4	ND-0.13
Nickel	N	2014	Ppm	0.1	0.002
Nitrate	N	2016	Ppm	10	0.73-1.79
Selenium	N	2014	Ppb	50	6
Disinfection By-Products					
TTHM	N	2016	Ppb	80	7.35
Chlorine	N	2016	Ppm	4.0	0.4-1.0
Lead and Copper					
Copper, Free	N	2010	Ppm	1.3 AL*	0.016-0.21
Lead	N	2010	Ppb	15 AL*	ND-6
Radionuclides					
Uranium	N	2015	Ppb	30	2
Gross Alpha, Incl. Radon & U	N	2015	pCi/L	15	0.906-2.46
Gross Beta Particle Activity	N	2015	pCi/L	50	1.12-1.70
Radium 226	N	2015	pCi/L	5	0.555-0.927
Radium 228	N	2015	pCi/L	5	0.0389-0.320
Secondary Contaminants					
Sodium	N	2016	Ppm	200	6.5-7

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

Table 2.04: Calvada Meadows Water Quality Data (2016) Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No Detected Microbiological Contaminants Were Found in 2016 Calendar Year					
Inorganic Contaminants					
Aluminum	N	2016	Ppm	0.2	0.011-0.031
Arsenic	N	2015	Ppb	10	1
Barium	N	2015	Ppm	2	0.13
Chromium	N	2015	Ppb	100	4
Fluoride	N	2015	Ppm	4	0.10
Nickel	N	2015	Ppm	0.1	0.003
Nitrate	N	2016	Ppm	10	0.50
Selenium	N	2014	Ppb	50	6
Disinfection By-Products					
Chlorine	N	2014	Ppm	4.0	0.3-0.6
Lead and Copper					
Copper, Free	N	2016	Ppm	1.3 AL*	0.018-0.036
Lead	N	2016	Ppb	15 AL*	ND-6
Radionuclides					
Combined Radium (-226 & -228)	N	2009	pCi/L	5	0.265-1.29
Uranium	N	2015	Ppb	30	1
Gross Alpha, Incl. Radon & U	N	2009	pCi/L	15	0.317-1.89
Gross Beta Particle Activity	N	2009	pCi/L	50	0.256-2.31
Secondary Contaminants					
Chlorine	N	2016	Ppm	4	0.3-0.9
Iron	N	2016	Ppm	0.6	0.02-0.03
Magnesium	N	2015	Ppm	150	37
pH	N	2015	pH	8.5	8.17
Sodium	N	2016	Ppm	200	4
Sulfate	N	2015	Ppm	500	14
TDS	N	2015	Ppm	1000	230

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

Table 2.05: Mountain View Estates Water Quality Data (2016) Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No Detected Microbiological Contaminants Were Found in 2016 Calendar Year					
Inorganic Contaminants					
Arsenic	N	2016	Ppb	10	2
Barium	N	2010	Ppm	2	0.057
Chromium	N	2010	Ppb	100	2
Fluoride	N	2015	Ppm	4	0.30
Nickel	N	2012	Ppm	0.1	0.002
Nitrate	N	2016	Ppm	10	0.62
Disinfection By-Products					
TTHM	N	2016	Ppb	80	2.23
Chlorine	N	2016	Ppm	4.0	0.4-1.1
Lead and Copper					
Copper, Free	N	2010	Ppm	1.3 AL*	0.007-0.045
Lead	N	2010	Ppb	15 AL*	1-3
Radionuclides					
Uranium	N	2016	Ppb	30	3
Gross Alpha, Incl. Radon & U	N	2016	pCi/L	15	2.44-6.68
Radium 226	N	2016	pCi/L	5	0.150-0.361
Radium 228	N	2016	pCi/L	5	0.0251-0.279
Secondary Contaminants					
Chlorine	N	2016	Ppm	4	0.3-0.9
Sodium	N	2015	Ppm	200	16

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

Table 2.06: Mountain Falls Water Quality Data (2016) Consumer Confidence Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range	
Microbiological						
No Detected Microbiological Contaminants Were Found in 2016 Calendar Year						
Inorganic Contaminants						
Barium	N	2011	ppm	2	0.055-0.059	
Chromium	N	2011	ppb	100	2	
Fluoride	N	2015	ppm	4	0.10	
Nickel	N	2014	ppm	0.1	0.002	
Nitrate	N	2016	ppm	10	0.23-0.27	
Disinfection By-Products						
Chlorine	N	2016	ppm	4.0	0.5-1.9	
Lead and Copper						
Copper, Free	N	2016	ppm	1.3 AL*	0.007-0.120	
Lead	N	2016	ppb	15 AL*	1-4	
Radionuclides						
Combined Radium (-226 & -228)	N	2008	pCi/L	5	0.47-1.116	
Uranium	N	2014	ppb	30	2	
Gross Alpha, Incl. Radon & U	N	2008	pCi/L	15	0.41-2.47	
Gross Beta Particle Activity	N	2008	pCi/L	50	0.25-1.61	
Secondary Contaminants						
Chlorine	N	2016	ppm	4	0.5-1.9	
Sodium	N	2016	ppm	200	1.9-2.70	

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

Table 2.07: Spring Mountain Motorsports Ranch Well 1 Water Quality Data (2015) Laboratory Report

Parameter	Violation Y/N	Test Year	Units	MCL	Range
Microbiological					
No Detected Microbiological Contaminants Were Found in 2015 Calendar Year					
Inorganic Contaminants					
Asbestos	N	2015	MFL	7	<0.2
Arsenic	N	2015	Ppm	0.01	<0.001
Barium	N	2015	Ppm	2	0.054
Cadmium	N	2015	Ppb	5	<1
Chromium	N	2015	Ppb	100	5
Cyanide	N	2015	Ppm	0.2	<0.05
Fluoride	N	2015	Ppm	4	0.11
Lead	N	2015	Ppb	1	15
Mercury	N	2015	Ppb	1	2
Nickel	N	2015	Ppm	0.1	0.002
Nitrate	N	2015	Ppm	10	0.31
Nitrite	N	2015	Ppm	1	<0.10
Selenium	N	2015	Ppm	0.05	<0.025
Thallium	N	2015	Ppb	2	<1
Disinfection By-Products					
Chloride	N	2015	Ppm	4.0	2.32
Lead and Copper					
Copper, Free	N	2015	Ppm	1.3 AL*	ND
Lead	N	2015	Ppb	15 AL*	ND
Radionuclides					
Radium 226	N	2015	pCi/L	5	0.22
Radium 228	N	2015	pCi/L	5	0.59
Uranium	N	2015	Ppb	30	1
Gross Alpha, Incl. Radon & U	N	2015	pCi/L	15	2.5-3.6
Gross Beta Particle Activity	N	2015	pCi/L	50	0.68-1.43
Secondary Contaminants					
Aluminum	N	2015	Ppm	0.2	0.014
Iron	N	2015	Ppm	0.6	<0.01
Magnesium	N	2015	Ppm	150	15.7
pH	N	2015	pH	6.5-8.5	8
Sodium	N	2015	Ppm	200	2.10

AL = Active Level, ppb = parts per billion, ppm = parts per million, pCi/L = picocuries per liter, CU = Color Units.

2.2 Calvada Valley Water System

2.2.1 Distribution Piping (Pressure Zones)

The GBWC-PD Calvada Valley ("CV") water system consists of 2, 4, 6, 8, 10, 12, 14, 16, and 18-inch diameter piping. There is approximately 104 miles of piping within the service territory. Table 2.08 is a list of the pipe diameters and approximate total linear footage for each diameter of pipe within the service area, which is gathered from the hydraulic model.

Table 2.08: Calvada Valley Pipe Sizes and Lengths

Pipe Size (inches)	Pipe Length (feet)
2-inch	1,041
4-inch	11,022
6-inch	51,205
8-inch	271,323
10-inch	39,977
12-inch	103,390
14-inch	11,906
16-inch	43,364
18-inch	12,654
Total	545,882

2.2.1.1 Distribution Piping Existing Conditions Assessment

An asset management condition assessment matrix can be developed to further categorize the condition of the existing distribution piping through the newly implemented GIS. To develop the matrix, the distribution piping would be divided into segments and a numerical value would be assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand ("ADD"). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe.

Because GBWC-PD acquired the system in 2002, the year segments of piping were installed is not documented and is therefore not logged in GIS. Based on fire hydrant reports, approximate age of distribution piping in Calvada Valley can be determined. The fire hydrant reports suggest a range of 40 years with the initial piping constructed during the 1970's, where the earliest documented fire hydrant installation year is 1972. The fire hydrant installation years suggest that the majority of distribution piping was installed in the 1980's, 1990's and early 2000's. Most of the piping is PVC C900 or Ductile Iron. On average, there are approximately 5 main breaks and 33 service line breaks per year based on data from 2010 through November 2017. Plotting the approximate addresses of main breaks and service line breaks shows that these breaks are relatively scattered throughout the Calvada Valley system. Though the breaks are scattered, a cluster of breaks have occurred on the west side of Highway 160, particularly in the area near and along Mount Charleston Drive and the area near and along Comstock Circle.

At this time, GBWC-PD does not currently have breaks or installation years logged in the GIS database system for the water piping of linear assets, so a more in-depth condition assessment of the distribution system will need to be conducted in the future. The intent of the future condition assessment will be to conduct a more comprehensive assessment to help identify areas of piping which may need repairs and replacement.

2.2.1.2 Pressure Zone Existing Condition Assessment

The GBWC-PD Calvada Valley water system has two distinct pressure zones known as the Low Zone and the High Zone. There are two storage tanks in the Low Zone and one storage tank in the High Zone. The Low Zone is located on the west side of Highway 160. The High Zone is located on the east side of Highway 160. More description on the low zone and high zone system operation is provided in Section 2.2.6, System Operation and Control.

The Maximum Day Demand ("MDD") pressures in each pressure zone are located in Table 2.09. At the time the water system infrastructure was installed, installation of the infrastructure was in accordance with all state and local agencies approved design requirements and construction standards. Subsequently, as the GBWC-PD makes repairs or improvements, the newer infrastructure is designed and constructed to meet the most current approved design requirements and construction standards, in addition, Pressure Reducing Valves ("PRV's") have been added into the system to help regulate changes in pressure. However, based on the available modeling results, pressures in certain segments still exceed the maximum allowable delivery pressure of 100 pounds per square inch ("psi") per NAC 445A.6711(2).

Table 2.09: Calvada Valley Pressure Zones

Pressure Zone	Supply	Hydraulic Grade Lines	Hydraulic Model MDD Pressures (psi)
Low	Wells 1,2,9 and 11	2,780.80	55.3 to ~120 psi
High	Well 12 and Alfalfa Booster Pump Station	2,949.98	41.7 to ~127.4 psi

(1) psi = pounds per square inch.

2.2.1.3 Pressure Reducing Valve Existing Condition Assessment

There are seven PRVs in the GBWC-PD Calvada Valley water system. The PRV's typically prevent the lower elevations in the system from being over-pressurized and to sustain pressures in the higher elevations. The setting and location of the PRV's can be critical to the proper balancing of the system pressures. Table 2.10 lists the existing PRV's.

Table 2.10: Calvada Valley Pressure Reducing Valves

Zone	Location	Size (in)	Elevation (Feet)	Downstream Pressure Setting (psi)
High	Winery Road and Cortina Street	16	2,732	Full open
Low	Comstock Street and Red Butte Street	8	2,606.5	75
Low	Basin Ave at Cottage Grove Estates	12	2,605	90
Low	Calvada Blvd and Upland Ave	12	2,610	75
Low	Rodeo Ave and Mt Charleston Drive	8	2,622	75
Low	Jaybird Street and Pahrump Valley Blvd	8	2,624	75
Low	West Mesquite Avenue	6	2,618	60
High	Highway 160 and Crawford Way (Pahrump Nugget)	14	2,716	77
Low	Mesquite Booster Pump Station	12	2,672	75

Most of the PRV's were installed in 2006, with the exception of the Pahrump Nugget Casino PRV and Mesquite Booster Station PRV, both of which were installed in 2010. The 6-inch PRV on West Mesquite Avenue was installed in 2016. The fixed asset management registry, with the remaining useful life for the PRV's, is located in Appendix A. The PRV's are serviced annually.

2.2.2 Water Supply

All of the water that supplies the Calvada Valley system comes from 5 wells located in the Low Zone. The location of these wells are shown in the maps located in Appendix D. There is a total well capacity of 4,904 gpm. Wells 2 and 11 have backup generators in place. In the event of a power outage, Wells 2 and 11 can provide a pumping capacity of 2,350 gpm.

Table 2.11: Calvada Valley Potable Water Supply Wells and Capacities

Well #	Casing Diameter (in)	Capacity (gpm)	Total Dynamic Head (feet)	Backup Generator
Well 1	12"	850	300	None
Well 2	16"	1,050	450	Permanent
Well 9	16"/10" liner	1,000	300	None
Well 11	16"	1,300	270	Permanent
Well 12(1)	14"	704	545	None
Total		4,904		
Note: (1) Well 12 was formerly Well 8, which was redrilled in 2017				

2.2.2.1 Water Supply Well Existing Conditions Assessment

Well 1

Well 1, originally drilled in 1944, was constructed with nominal 12-inch diameter steel casing to a depth of 900 feet below ground level ("bgl"). The well casing is perforated from 288 to 692 feet bgl. The original static water level is unknown. Currently the static water level in the well is 33.86 feet bgl. The well is equipped with a Berkley, submersible turbine pump (model 8T75-600) with a 75-horsepower ("hp") Franklin submersible motor with a soft start. The pump and motor were installed in 2013. The well does not have backup power. There is chlorination equipment at the well site. A video log of the well was unavailable for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 73 years old. For all sense of purpose, this well has reached the end of its useful life.

Well 2

Well 2, originally drilled in 1960, was constructed with nominal 16-inch diameter steel casing to a depth of 783 feet bgl. The well casing is perforated from 230 to 783 feet bgl. The original static water level was 25 feet bgl. Currently the static water level in the well is 46.11 feet bgl. The well is equipped with an American Marsh, submersible turbine pump with a 125-hp Franklin submersible motor with a soft start. The pump and motor were installed in 2011. The well does have backup power in the form of a 300-kilowatt ("kW") generator. There is chlorination equipment at the well site. A video log of the well was unavailable for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 57 years old. For all sense of purpose, this well has reached the end of its useful life.

Well 9

Well 9, originally drilled in 1958, was constructed with nominal 16-inch diameter steel casing with a 10-inch liner to a depth of 430 feet bgl. The well casing is perforated from 50 to 430 feet bgl. The original static water level is unknown. Currently the static water level in the well is 34.31 feet bgl. The well is equipped with a Grundfos, submersible turbine pump with a 100-hp Hitachi submersible motor on a variable frequency drive ("VFD"). The pump was installed in 2015 and motor installed in 2016. The well does not have backup power. There is chlorination equipment at the well site. The well was videoed in October 2015 and the liner was found to be in poor condition. The liner was rigged up, place to the bottom of well and welded to top of casing. The existing casing is completely deteriorated. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 59 years old. For all sense of purpose, this well has reached the end of its useful life.

Well 11

Well 11, originally drilled in 1979, was constructed with nominal 16-inch diameter steel casing to a depth of 600 feet bgl. The well casing is perforated from 275 to 600 feet bgl. The original static water level is 86.5 feet bgl. Currently the static water level in the well is 46.11 feet bgl. The well is equipped with a Berkeley, submersible turbine pump (model 10T150-1600) with a 150-hp Franklin submersible motor with a soft start. The pump and motor were installed in 2007. The well does have backup power in the form of a 300-kW generator. There is chlorination equipment

at the well site. Currently there is emergency work being performed on Well 11 due to motor failure. Well 11 will be videoed, swabbed and then re-videoed. A video log of the well was not available for review at this time, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 38 years old. For all sense of purpose, this well has reached the end of its useful life.

Well 12

Well 12, which was previously designated Well 8, was recently redrilled in early 2017 to a total depth of 990 feet bgl. The well was constructed with nominal 14-inch diameter steel casing and louvered screen intervals from 480'-620'; 780'-960' bgl. The static water level after completion is 43 feet bgl. The well is equipped with a Goulds 9RCLC 3 stage submersible turbine pump with a 125-hp Hitachi submersible motor on a VFD. The well does not have backup power. There is chlorination equipment at the well site. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is less than one year old and has 40 more years of useful life.

2.2.3 Storage

The Calvada Valley system has three storage tanks. There are two Low Zone reservoirs and one High Zone reservoir as detailed in Table 2.12 and as shown in the maps located in Appendix D. All tanks are on SCADA.

Table: 2.12: Calvada Valley Water Storage Tanks

Tank	Volume (MG)	Base Elevation (ft amsl)	Diameter (ft)	Height (ft)	Material
CV Low Zone Tank 1	750	2,812	64	32	Welded Steel
CV Low Zone Tank 2(1)	1,600	2,940	90	34	Welded Steel
CV High Zone Tank 1	1,000	2,965	92	24	Welded Steel
Total	3,350				
Notes: (1) Also referred to as Mesquite Tank					

2.2.3.1 Storage Tank Existing Condition Assessment

CV Low Zone Tank 1

CV Low Zone Tank 1 is a nominal 750,000 gallon welded steel storage tank constructed in 1988 by Resource Development Co. The tank was last inspected in April 2013, where the inspection report (provided in Appendix F) states that the exterior of the tank and base of the tank was in good/excellent condition with moderate surface corrosion observed. The interior of the tank was also found to be in good condition with some minor surface corrosion also noted. Other than some epoxy repairs and installing a gasket on the access hatch, there were no major recommendations made in this inspection report. According to the operators, this tank does not contain cathodic protection. The tank is estimated to have 16 years of nominal useful life. This

estimate of the remaining useful life is based on a storage tanks nominal life expectancy of 45 years.

CV Low Zone Tank 2 (Mesquite Tank)

CV Low Zone Tank 2 (Mesquite Tank) is a nominal 1,600,000 gallon welded steel storage tank constructed in 2010 by Paso Robles Tank Inc. The most recent tank inspection report from December 2015 (provided in Appendix F) details the interior and exterior of the tank as being in good/excellent condition. There were no major recommendations made in this inspection report. The tank has cathodic protection installed by Corrpro Companies. The tank is estimated to have 38 years of nominal useful life. This estimate of the remaining useful life is based on a storage tanks nominal life expectancy of 45 years.

CV High Zone Tank 1

CV High Zone Tank 1 is a nominal 1,000,000 gallon welded steel storage tank constructed in 1997 by Resource Development Co. In April 2013, a tank inspection was conducted that found most interior/exterior components in good/excellent condition. The report is provided in Appendix F. The only recommendation that was made in the report was to install a gasket on the access hatch. According to the operators, this tank does not contain cathodic protection. The tank is estimated to have 25 years of nominal useful life. This estimate of the remaining useful life is based on a storage tanks nominal life expectancy of 45 years.

2.2.4 Booster Pumps

Water is boosted from the Lower Zone to the Upper Zone and to the High Zone Tank via the booster pumps located on Alfalfa Street near Underbrush Avenue. The booster pump station keeps the High Zone Tank filled to pressurize the High Zone. This pump station is known as the Alfalfa Booster Station.

There is a second booster pump station (Mesquite Booster Station) which fills the Low Zone Tank 2 (which can also support the high zone), known as the Mesquite Tank, near CoreCivic, which was formerly known as Corrections Corporation of America ("CCA") on Mesquite Ave. These booster pumps run on VFD's and are designed to keep the Low Zone Tank 2 filled to provide backup storage and pressures in the northern portion of the Low Zone. This booster station is a component of the water system which ties the Low Zone and High Zone together. Both pump stations are on SCADA.

The pump design for each pump at each booster station is provided in Table 2.13.

Table: 2.13: Calvada Valley Booster Pump Stations

Pumps	Design Flow (gpm)	Horsepower (HP)
Alfalfa Street Booster Pump Station		
Pump 1	450	40
Pump 2	450	40
Mesquite Avenue Booster Pump Station		
Pump 1	930	75
Pump 2	930	75

2.2.4.1 Pump and Motor Existing Condition Assessment

Alfalfa Booster Station

The Alfalfa Booster Station has two pumps. Pump 1 is manufactured by Franklin and Pump 2 is manufactured by Consolidated Pump. The Franklin pump (model 40HC5475) with a 40 hp, 3500 RPM Baldor motor was installed in 2004 and the Consolidated Pump was recently replaced in 2017. The recently installed Consolidated Pump (Pump 2), model B3ZPLS, has a 40 hp, 3510 RPM Baldor motor. Both pumps have mag starters. The pumps are assembled in a parallel configuration. The new pump installed in 2017 has increased previous pumping capacity of two pumps above 900 gpm. Together these pumps appear to pump 957 gpm at approximately 280 feet Total Dynamic Head ("TDH"). According to the asset registry, the older booster pump and motor installed in 2004 has approximately 2 years of nominal remaining life. The new pump and motor installed in early 2017 has 15 years of nominal remaining life. The booster pumps are housed in a small building with a permanent generator on site. The 175-kW permanent generator is manufactured by Cummins.

Mesquite Booster Station

The Mesquite Booster Station has two Goulds pumps that were installed in 2010. Both pumps have 75 hp, 1800 RPM Baldor motors on VFD's. These pumps were designed for 930 gpm at 200 feet TDH. The pumps are assembled in a parallel configuration. Together these pumps can pump 1,800 gpm at approximately 200' TDH. According to the asset registry, these booster pumps and motors installed in 2010 have approximately 8 years of nominal remaining life. The booster pumps are housed in an air-conditioned building with a permanent generator on site. The 250 kW generator is manufactured by Cummins. The Mesquite PRV is also located within the building.

2.2.5 Back-Up Power Supply

The Calvada Valley system has permanent back-up power at Wells 2 and 11. Both booster pump stations – Alfalfa Booster Pump Station and Mesquite Booster Pump Station – also have permanent back-up power available.

2.2.6 System Operation and Control

Low Zone Tank 1 floats on the system and is fed by the wells. This tank is designed to maintain a constant pressure in the low zone and controls the wells in order to maintain a minimum level

in the tank. Low Zone Tank 2 (Mesquite Tank) is located on Mesquite Road east of the correctional facility (CoreCivic), on the north end of the system. This tank provides storage and pressure to the northern portion of the Calvada Valley service area. This tank has the capability to feed both the high and low zones through booster pumps at the Mesquite Booster Pump Station by alternating valves and feeds the low zone via a PRV located at the Mesquite Booster Pump Station. In the location it was installed, the new 6-inch PRV on Highway 160 and Mesquite only allows for flow direction to the low zone from the Mesquite Tank. This PRV was designed with a 1-inch bypass that allows 40 gpm continuous flow through to maintain water quality within standards.

High Zone Tank 1 is fed by Well 12 (formerly designated Well 8) and the Alfalfa Street booster pump station. The level in the storage tank controls the operation of the Alfalfa booster pumps and Well 12. The High Zone Tank 1 maintains the minimum pressure in the high zone. In the event of a pressure drop to 43 psi or a fire flow condition, the booster station will shut down and Well 12 will be called to run (if not already running).

2.2.6.1 SCADA Existing Conditions Assessment

SCADA is installed at all tanks, wells and at the two booster pump stations within the GBWC-PD Calvada Valley service area. The SCADA system was originally installed in 2008 and monitors the following aspects: storage tank level with trends over time, well pump start/stop status, well pump run times, booster pump start/stop status, and booster pump motors run time. Pressure Reducing Valves (PRV's) are currently not monitored through SCADA. 900 Megahertz ("MHz") radio is used to communicate with the receiving equipment. The entire SCADA system is accessible via operator's laptops, cell phones and tablets through the internet.

2.3 Calvada North/Country View Estates (CN/CVE) Water System

2.3.1 Distribution Piping (Pressure Zones)

The Calvada North/Country View Estates ("CN"/"CVE") system is currently one pressure zone. The maps in Appendix D shows the location and details of this system. There is approximately 18 miles of 6-inch, 8-inch, 10-inch, 12-inch, 14-inch and 16-inch diameter piping in this service area. The approximate lengths of piping for each diameter are presented in Table 2.14.

Table 2.14: Calvada North/Country View Estates Pipe Sizes and Lengths

Pipe Size (inches)	Pipe Length (feet)
6-inch	9,260
8-inch	36,343
10-inch	19,004
12-inch	20,054
14-inch	3,213
16-inch	6,345
Total	94,219

2.3.1.1 Distribution Piping Existing Conditions Assessment

An asset management condition assessment matrix can be developed to better categorize the condition of the existing distribution piping. To develop the matrix, the distribution piping would be divided into segments and a numerical value would be assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand ("ADD"). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe.

Since GBWC-PD acquired the system in 2002, the year segments of piping were installed is not documented and is therefore not logged in GIS. Based on fire hydrant reports, approximate age of distribution piping in Calvada North/Country View Estates can be determined. The fire hydrant reports suggest a range of 30 years where the majority of piping was installed in the mid 1980's, mid 1990's, and early 2000's. On average, there is approximately 1 main break and 4 service line breaks per year based on data from 2010 through November 2017. Plotting the approximate addresses of main breaks and service line breaks shows that these breaks tend to be located in the southwest (along Linda Street, south of Leslie Street) and southeast (south of the Country View Estates Well 48-1, 48-2 and storage tank site) within the service territory.

At this time, GBWC-PD does not currently have breaks or installation years logged in the GIS database system for the water piping of linear assets, so a more in-depth condition assessment of the distribution system will need to be conducted in the future. The intent of the future condition assessment will be to conduct a more comprehensive assessment to help identify areas of piping which may need repairs and replacement.

2.3.1.2 Pressure Zone Condition Assessment

Currently, a WaterCAD model of the Country View Estates/Calvada North service area does not exist. For this reason, the Comprehensive Hydraulic Model of GBWC-PD System Project has been included as part of the Preferred Plan in Section 7.0.

2.3.1.3 Pressure Reducing Valve Existing Condition Assessment

There are three PRV's in the Calvada North/Country View Estates service area detailed in Table 2.15.

Table 2.15: Calvada North/Country View Estates Pressure Reducing Valves

Location	Size (in)	Elevation (Feet)	Downstream Pressure Setting (psi)
Park Retiro PRV	12	2,675	45
Park Retiro PRV Bypass	8	2,675	45
Black Rock PRV	6	2,705	Not in Use(1)
Notes: (1) Due to looping projects, the Black Rock PRV is no longer in operation			

The Park Retiro PRV and Park Retiro PRV Bypass were installed in 2015. The Black Rock PRV was installed in 2006. All valves are Cla-Val valves and are serviced annually.

2.3.2 Water Supply

There are three active wells in this system. There are two wells in the Country View Estates subdivision (CVE 48-1 and CVE 48-2) and one in the Calvada North area (CN 1) as detailed in Table 2.16. The system has an overall pumping capacity of 740 gpm. The wells are on SCADA.

Table 2.16: Calvada North/Country View Estates Potable Water Supply Wells and Capacities

Well #	Casing Diameter (in)	Capacity (gpm)	Total Dynamic Head (feet)	Backup Generator
CVE 48-1	8.625″	190	140	Permanent
CVE 48-2	10.75″	300	140	Permanent
CN 1	10.75″	250	140	None
Total		**740**		

2.3.2.1 Water Supply Well Existing Conditions Assessment

Well CVE 48-1

Well CVE 48-1, originally drilled in 1984, was constructed with nominal 8.625-inch diameter steel casing to a depth of 365 feet bgl. The well casing is perforated from 265 to 365 feet bgl. The original static water level is 215 feet bgl. Currently the static water level in the well is 219.28 feet bgl. The well is equipped with a Grundfos, submersible turbine pump (model GF2305200-6) with a 25-hp Grundfos submersible motor on a mag starter. The pump and motor were both installed in 2015. Through the combined well, tank and booster pump station site, the well has backup power in the form of a 175-kW generator. There is chlorination equipment for this well. The pump and motor were pulled due to check valves leaking. In 2015, the well was videoed and there were no deficiencies found with the well casing though the pump, motor and check valves were replaced at this time. The standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 33 years old.

Well CVE 48-2

Well CVE 48-2, originally drilled in 1997, was constructed with nominal 10.75-inch diameter steel casing to a depth of 815 feet bgl. The well casing is perforated from 395 to 815 feet bgl. The original static water level is 210 feet bgl. Currently the static water level in the well is 219.28 feet bgl. The well is equipped with a Wolf, submersible turbine pump (model 6MM8V 6STG) with a 40-hp Franklin submersible motor on a mag starter. The pump and motor were installed in 2013. Through the combined well, tank and booster pump station site, the well has backup power in the form of a 175-kW generator. There is chlorination equipment for this well. A video log of the

well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 20 years old.

Well CN 1

Well CN 1, originally drilled in 1987, was constructed with nominal 10.75-inch diameter steel casing to a depth of 230 feet bgl. The well casing is perforated from 150 to 230 feet bgl. The original static water level is 104 feet bgl. Currently the static water level in the well is unknown. The well is equipped with a Webtrol, submersible turbine pump (model WS50050DL) with a 40-hp Hitachi submersible motor on a VFD. The pump and motor were installed in 2015. The well does not have backup power. There is chlorination equipment at the well site. A video log of the well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 30 years old.

2.3.3 Storage

There is one storage tank located in the Country View Estates (CVE) area adjacent to the wells. This tank is filled by the two CVE wells (CVE 48-1 and CVE 48-2). Further, the tank supplies the CVE booster pumps which maintain pressures in the system. The storage tank is a 755,500-gallon welded steel tank, 74.5 feet in diameter and 24 feet high. The tank provides water to the system as well as emergency backup water supply. This tank is on SCADA.

2.3.3.1 Storage Tank Existing Conditions Assessment

The Country View Estates storage tank is a nominal 755,500-gallon welded steel storage tank constructed in 2005 by Resource Development. A tank inspection was conducted in December 2015. The inspection report (provided in Appendix F) documented the interior/exterior elements to be in good/excellent condition, with the only recommendation to remove the clear coating that has failed on the support column. The tank has cathodic protection installed by Corrpro Companies. This tank is estimated to have 33 years of nominal useful life. The remaining useful life is based on a storage tanks nominal life expectancy of 45 years.

2.3.4 Booster Pumps

There are three booster pumps located at the CVE facility with the wells and storage tank. There is one pump in standard service with two fire pumps for emergencies. The booster pumps are controlled by system pressures. The booster pump details are shown in Table 2.17.

Table: 2.17: Calvada North/Country View Estates Booster Pump Station

Pumps	Design Flow (gpm)	Horsepower (HP)
Pump 1	180	10
Pump 2 (Fire Pump)	550	25
Pump 3 (Fire Pump)	550	25

2.3.4.1 Pump and Motor Existing Condition Assessment

The Country View Estates Booster Pump Station has three pumps, which are all manufactured by Consolidated Pumps. All three pumps were installed in 2007. The two larger pumps have 3 phase, 3520 RPM, 25 hp U.S Motors. The smaller pump rated for 180 gpm at 140' TDH has a 3 phase, 3450 RPM, 10 hp Baldor motor. The pumps are assembled in a parallel configuration. According to the asset registry, all three booster pumps installed in 2007 have approximately 5 years of nominal remaining life. The booster pumps are housed in a small building with a permanent generator on site. The 175-kW generator is manufactured by Cummins.

2.3.5 Back-Up Power Supply

The CN/CVE Booster Pump Station and Wells 48-1 and 48-2 are all located on the same site and have backup power in the form of a 175-kW permanent generator manufactured by Cummins. The GBWC-PD Calvada North/Country View Estates system has no permanent back-up power at CN Well #1.

2.3.6 System Operation and Control

Wells 48-1 and 48-2 fill the CVE storage tank adjacent to the wells. The tank then supplies the CVE booster pumps which maintain pressures in the system. The CN Well No. 1 pumps directly into the distribution system. The CVE Booster Pump Station, CVE Well 48-1 and 48-2 and CVE Storage Tank are on SCADA, which was installed at the site in 2008. The CN Well No. 1 is also on SCADA.

2.3.6.1 SCADA Existing Conditions Assessment

SCADA is installed at the storage tank, three wells and at the booster pump station within the GBWC-PD Country View Estates/Calvada North service area. The SCADA system was originally installed in 2008 and monitors the following aspects: storage tank level with trends over time, well pump start/stop status, well pump run times, booster pump start/stop status, and booster pump motors run times. Pressure Reducing Valves (PRV's) are currently not monitored through SCADA. 900 MHz radio is used to communicate with the receiving equipment. The entire SCADA system is accessible via operator's laptops, cell phones, and tablets through the internet.

2.4 Calvada Meadows Water System

The Calvada Meadows ("CM") system is located south of the Calvada North/Country View Estates system. The service area is adjacent to and south of the Country View Estates subdivision. There are currently only 32 customers in this service area and only the one pressure zone which can be seen in the maps in Appendix D.

2.4.1 Distribution Piping (Pressure Zones)

The distribution piping in the Calvada Meadows water system currently serves 32 connections. The piping is composed of 4-inch, 8-inch, and 10-inch pipe. There is just over 1 mile of piping in the Calvada Meadows service area. Table 2.18 below details the lengths of pipe for each diameter.

Table 2.18: Calvada Meadows Pipe Sizes and Lengths

Pipe Size (inches)	Pipe Length (feet)
4-inch	1,590
8-inch	2,350
10-inch	1,800
Total	5,740

2.4.1.1 Distribution Piping Existing Conditions Assessment

An asset management condition assessment matrix can be developed to better categorize the condition of the existing distribution piping in Calvada Meadows. To develop the matrix, the distribution piping would be divided into segments and a numerical value would be assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand (ADD). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe.

Since GBWC-PD acquired the system in 2002, the year segments of piping were installed is not documented and is therefore not logged in GIS. There are also no fire hydrant reports to indicate approximate age of the distribution piping in Calvada Meadows. On average, there are rarely any water main or service line breaks in the service area, where data from 2010 through November 2017 indicates that the maximum observed is one or two main or service break per year.

At this time GBWC-PD does not currently have breaks or installation years logged in the GIS database system for the water piping of linear assets, so a more in-depth condition assessment of the water distribution system will need to be conducted in the future. The intent of the future condition assessment will be to conduct a more comprehensive assessment to help identify areas of piping which may need repairs and replacement.

2.4.1.2 Pressure Zone Condition Assessment

Currently, a WaterCAD model of the Calvada Meadows service area does not exist. For this reason, the Comprehensive Hydraulic Model of GBWC-PD System Project has been included as part of the Preferred Plan in Section 7.0.

2.4.2 Water Supply

There is one active well in this system. The well has a 250 gpm capacity. This well is on SCADA.

2.4.2.1 Water Supply Well Existing Conditions Assessment

The Calvada Meadows Well 1, originally drilled in 1989, was constructed with nominal 10.75-inch diameter steel casing to a depth of 500 feet bgl. The well casing is perforated from 119' to 159' bgl; 199' to 500' bgl. The original static water level is 115 feet bgl. Currently the static water level in the well is 94.12 feet bgl. The well is equipped with a Grundfos, submersible turbine pump (model A15B7007) with a 25-hp Franklin submersible motor. The pump and motor were installed in 2013. The well does not have backup power. There is chlorination equipment at the well site. A de-sander device was installed on the well discharge line at the site due to the well pumping small quantities of sand through the line. A video log of the well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 28 years old.

2.4.3 Storage

There is one 3,000-gallon hydropneumatic tank located at the Calvada Meadows well site used to control the well and maintain steady pressures within the service area.

2.4.3.1 Storage Tank Existing Conditions Assessment

The existing 3,000-gallon hydropneumatic storage tank was installed in 2013. The hydropneumatic tank was purchased from RECO Tanks South Carolina. Based on maintenance guidelines, this hydropneumatics tank will be inspected in 2018. This hydropneumatic tank does not meet requirements for fire flow or significant supply storage in the event that the single well in the GBWC-PD Calvada Meadows system is out of service. The tank is estimated to have 16 years of nominal useful life. The remaining useful life is based on a storage tanks nominal life expectancy of 20 years.

2.4.4 Booster Pumps

There are no booster pumps in the Calvada Meadows water system.

2.4.5 Back-Up Power Supply

The Calvada Meadows system currently does not have any back-up power supply. The system has a manual transfer switch and can use one of the two 100-kW portable generators in the event of significant power failure.

2.4.6 System Operation and Control

The Calvada Meadows well site was added to SCADA in 2008.

2.4.6.1 SCADA Existing Conditions Assessment

SCADA is installed at the Calvada Meadows well. The SCADA system was originally installed in 2008 and monitors the following aspects for this service area: well pump start/stop status and well pump run times. The hydropneumatic tank is also monitored through SCADA. 900 MHz radio

is used to communicate with the receiving equipment. The entire SCADA system is accessible via operator's laptops, cell phones and tablets through the internet.

2.5 Mountain View Estates Water System

The Mountain View Estates system is located at the western end of the Calvada Valley system. There is only one pressure zone due to the small size of the service area - there are only 27 service connections in the service area. The service area is considered built out and can be seen in the figures located in Appendix D.

2.5.1 Distribution Piping (Pressure Zones)

The Mountain View Estates ("MVE") service area is composed of approximately 2,364 feet of 3-inch water pipe and 87 linear feet of 12-inch pipe.

2.5.1.1 Distribution Piping Existing Conditions Assessment

An asset management condition assessment matrix can be developed to better categorize the condition of the existing distribution piping in Mountain View Estates. To develop the matrix, the distribution piping would be divided into segments and a numerical value would be assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand (ADD). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe.

Since GBWC-PD acquired the system in 2002, the year segments of piping were installed is not documented and is therefore not logged in GIS. There are also no fire hydrant reports to indicate approximate age of the distribution piping in Mountain View Estates. However, it is known from the development history of the utility, much of the piping was installed in the 1970s and '80s. MVE had its water rights appropriated in 1975. On average, there are rarely any water main or service line breaks in the service area, where data from 2010 through November 2017 indicates that the maximum observed is one or two main or service breaks per year typically on the far north side and far south side of Bunch Street.

At this time GBWC-PD does not currently have breaks or installation years logged in the GIS database system for the water piping of linear assets, so a more in-depth condition assessment of the water distribution system will need to be conducted in the future. The intent of the future condition assessment will be to conduct a more comprehensive assessment to help identify areas of piping which may need repairs and replacement.

2.5.1.2 Pressure Zone Condition Assessment

Currently, a WaterCAD model of the Mountain View Estates service area does not exist. For this reason, the Comprehensive Hydraulic Model of GBWC-PD System Project has been included as part of the Preferred Plan in Section 7.0.

2.5.2 Water Supply

There is one active well in this system. The well has a capacity of 50 gpm. The well site is on SCADA. Neither the well nor the water rights to provide service to 27 connections are owned by GBWC.

2.5.2.1 Water Supply Well Existing Conditions Assessment

The Mountain View Estates Well, originally drilled in 1989, was constructed with nominal 8-inch diameter steel casing to a depth of 220 feet bgl. The well casing is perforated from 80' to 100' bgl; 120' to 140' bgl; 160' to 180' bgl; 200' to 220' bgl. The original static water level is 49 feet bgl. Currently the static water level in the well is 61.25 feet bgl. The well is equipped with a Webtrol, submersible turbine pump (model WT5550L) with a 5-hp Franklin submersible motor with a mag starter. The pump and motor were installed in 2016. The well does not have backup power. There is chlorination equipment at the well site. A video log of the well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 28 years old.

2.5.3 Storage

There is one 4,000-gallon hydropneumatic tank located at the well site used to control the well and maintain steady pressures within the service area. This hydropneumatic tank is on SCADA.

2.5.3.1 Storage Tank Existing Conditions Assessment

The existing 4,000-gallon hydropneumatic storage tank was installed in 2011 by Resource Development. The inspection of this tank is scheduled for 2018. This hydropneumatic tank does not provide significant storage for fire flow or supply storage in the event that the single well in the Mountain View Estates system is out of service. The tank is estimated to have 14 years of nominal useful life. The remaining useful life is based on a storage tanks nominal life expectancy of 20 years.

2.5.4 Booster Pumps

There are no booster pumps within the Mountain View Estates service area.

2.5.5 Back-Up Power Supply

The Mountain View Estates system currently does not have any back-up power supply.

2.5.6 System Operation and Control

The Mountain View Estates system operates with the single well supplying water and hydropneumatic tank maintain pressures throughout the distribution system.

2.5.6.1 SCADA Existing Conditions Assessment

SCADA is installed at the Mountain View Estates well. The SCADA system was originally installed in 2008 and monitors the following aspects for this service area: well pump start/stop status and well pump run times. The hydropneumatic tank is also monitored through SCADA. 900 MHz radio is used to communicate with the receiving equipment. The entire SCADA system is accessible via operator's laptops, cell phones and tablets through the internet.

2.6 Mountain Falls Water System

The Mountain Falls ("MF") system is located on the southern end of the Calvada Valley system. The system is located wholly on the southwestern side of Highway 160. The service area elevations drop to the west, but not enough to divide the system into separate pressure zones. This system can be seen in the maps provided in Appendix D.

2.6.1 Distribution Piping (Pressure Zones)

The distribution piping in Mountain Falls is composed of primarily of 8-inch and 12-inch distribution pipe, though there is also 10-inch and 18-inch piping in the system. There is approximately 16 miles of piping in the Mountain Falls service area. Table 2.19 below details the approximate lengths of pipe for each diameter.

Table 2.19: Mountain Falls Pipe Sizes and Lengths

Pipe Size (inches)	Pipe Length (feet)
8-inch	53,226
10-inch	1,172
12-inch	22,809
18-inch	5,230
Total	82,437

2.6.1.1 Distribution Piping Existing Conditions Assessment

An asset management condition assessment matrix can be developed to better categorize the condition of the existing distribution piping in Mountain Falls. To develop the matrix, the distribution piping would be divided into segments and a numerical value would be assigned to each segment based on the number of breaks experienced and hydraulic pressures at average day demand ("ADD"). The higher the numerical value calculated for a segment of pipe, the more severe the condition for that segment of pipe.

Because GBWC-PD acquired the system in 2002, the year segments of piping were installed is not documented and is therefore not logged in GIS. Fire hydrant reports suggest a range of approximately 20 years where the majority of piping was installed in the mid 2000's (2005-2007) with the earliest fire hydrant installation dating back to 1999. On average, there is approximately 1 main break and 5 service line breaks per year based on data from 2010 through November 2017. The majority of the service leaks have occurred in the northwest (along Gressa Way) and

northeast (along Jacksboro Drive and Badlands Lane) portions of the service area. At this time GBWC-PD does not currently have breaks or installation years logged in the GIS database system for the water piping of linear assets, so a more in-depth condition assessment of the water distribution system will need to be conducted in the future. The intent of the future condition assessment will be to conduct a more comprehensive assessment to help identify areas of piping which may need repairs and replacement.

2.6.1.2 Pressure Zone Condition Assessment

Currently, a WaterCAD model of the Mountain Falls service area does not exist. For this reason, the Comprehensive Hydraulic Model of GBWC-PD System Project has been included as part of the Preferred Plan in Section 7.0.

2.6.1.3 Pressure Reducing Valve Existing Condition Assessment

There is one pressure reducing valve in the Mountain Falls service area. The PRV is a 12-inch valve located on Mountain Falls Parkway. The PRV is set to open at 75 psi. The PRV is serviced annually.

2.6.2 Water Supply

There are two active wells in this system. The two wells are identical in design, designed to be redundant and designed to pump up to 1,250 gpm independently of each other. The system has an overall theoretical design pumping capacity of 2,500 gpm, if the wells were required to operate simultaneously and there has not been noted significant interference between the two wells, when pumping. (Tests would have to be run to determine long-term effects of running both wells at the same time.) The wells are both on SCADA.

2.6.2.1 Water Supply Well Existing Conditions Assessment

Well MF 1

The Mountain Falls Well 1, originally drilled in 1946, was constructed with nominal 14-inch diameter steel casing to a depth of 704 feet bgl. The well casing is perforated from 300 to 520 feet bgl. The original static water level is unknown. Currently the static water level in the well is 16.27 feet bgl. The well is equipped with a National, submersible turbine pump (model SJ11LC single stage) with a 125-hp Franklin submersible motor with a soft start. The pump and motor were installed in 2007. In 2006, the well was provided with backup power in the form of a 230-kW emergency generator; however, this generator is currently out of service due to catastrophic alternator failure. There is chlorination equipment at the well site. The well and discharge header are housed within a small building. There is a pump to waste for this well that is controlled by a Cla-Val valve to waste for a period of time before discharging into the distribution system. A video log of the well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 71 years old. For all sense of purpose, this well has reached the end of its useful life.

Well MF 2

The Mountain Falls Well 2, originally drilled in 1972, was constructed with nominal 14-inch diameter steel casing to a depth of 707 feet bgl. The drilling report was not available for review to obtain screening intervals. The original static water level is unknown. Currently the static water level in the well is 7.17 feet bgl. The well is equipped with a National, submersible turbine pump (model SJ11LC single stage) with a 125-hp Franklin submersible motor with a soft start. The pump and motor were installed in 2007. In 2006, the well has provided with backup power in the form of a 230-kW emergency generator however, this generator is currently out of service due to catastrophic alternator failure. There is chlorination equipment at the well site. The well and discharge header are housed within a small building. There is a pump to waste for this well that is controlled by a Cla-Val valve to waste for a period of time before discharging into the distribution system. A video log of the well was not available for review, but the standard nominal useful life of a well with good quality construction is roughly 40 (±5) years. Currently, this well is 45 years old. For all sense of purpose, this well has reached the end of its useful life.

2.6.3 Storage

There is one storage tank located in the Mountain Falls area. This tank is filled by the two wells. The storage tank is a 1,200,000-gallon welded steel tank 92 feet in diameter and 24 feet high. The tank provides pressure to the lower elevations in the service area and controls the operation of the wells. This tank is on SCADA.

2.6.3.1 Storage Tank Existing Conditions Assessment

The Mountain Falls storage tank was constructed in 2000 by Resource Development. The most recent tank inspection was conducted in April 2013, where the exterior components were found to be in good condition. The inspection of the interior noted that the interior walls were in poor condition with moderate oxidation, corrosive staining, and de-lamination in two quadrants. For this reason, it was recommended that the interior of the tank be blasted and recoated. Aside from this recommendation, there were no other major recommendations. The inspection report is provided in Appendix F. Following the inspection of this tank, the interior of the Mountain Falls Tank was sandblasted and recoated as part of the Mountain Falls Tank Painting Project. During this project, additional structural review and inspection was performed and recommended repairs were made while the tank was empty. The tank does not have cathodic protection. The tank is estimated to have 28 years of nominal useful life. The remaining useful life is based on a storage tanks nominal life expectancy of 45 years.

2.6.4 Booster Pumps

There are no booster pumps within the Mountain Falls water system.

2.6.5 Back-Up Power Supply

The two Mountain Falls wells permanent generators are currently out of service due to catastrophic alternator failure, so Mountain Falls is not equipped with a back-up power supply.

2.6.6 System Operation and Control

SCADA was added to the Mountain Falls Tank in 2008.

2.6.6.1 SCADA Existing Conditions Assessment

SCADA is installed at the storage tank, three wells and at the booster pump station within the GBWC-PD Mountain Falls service area. The SCADA system was originally installed in 2008 and monitors the following aspects in Mountain Falls service area: storage tank level with trends over time, well pump start/stop status and well pump run times. The Pressure Reducing Valve (PRV) is currently not monitored through SCADA. 900 MHz radio is used to communicate with the receiving equipment. The entire SCADA system is accessible via operator's laptops, cell phones, and tablets through the internet.

2.7 Spring Mountain Motorsports Ranch Water System

The Spring Mountain Motorsports Ranch ("SMMR") water system is expected to have its infrastructure dedicated to GBWC-PD in early 2018 and become a new water system owned and operated by GBWC-PD. This service area is bounded on the west side of the property by Nevada State Route 160 and is located northeast of the Mountain Falls service area. The Spring Mountain Motor Race Way project involves the construction of an entire new water system including new water pipe, two wells, two storage tanks and a booster pump station. Many components in the water system are still in construction. The service area includes residential and commercial development on property surrounding the existing SMMR racetrack facilities in Pahrump, Nevada. A design report titled "Water System Design Spring Mountain Motorsports Ranch" (April 29, 2016) was prepared by Golder Associates Inc. This design report is included in Appendix M. A map of the service area designating water system components is included in Appendix M.

2.7.1 Distribution Piping (Pressure Zones)

The distribution piping is still in construction; however, a map showing the proposed piping is located in Appendix D. Fire hydrants, isolation valves and air/vacuum valves will be installed along the pipelines as shown in this drawing. From the booster pump station, the pipeline will transition from 12-inch ductile iron pipe to 12-inch PVC pipe. This pipe will then split in two directions. The north 10-inch distribution line will be directed east around the north edge of the facility. The 12-inch south distribution line will flow around the south end of the site. These distribution lines will be connected to the residential water mains.

2.7.1.1 Distribution Piping Existing Conditions Assessment

Because the distribution piping is still in construction, a conditions assessment is not necessary at this time. New pipeline installation regulations, as well as oversight and will be approved Nye County, NDEP and GBWC-PD will ensure that the piping is properly installed.

2.7.1.2 Pressure Zone Condition Assessment

Because the distribution piping is still in construction, a conditions assessment of the pressure zone is not necessary at this time. The system is designed so that the pressures should match the pressure requirements set by the NAC. Golder Associates Inc. has developed a hydraulic model of the distribution pipeline to ensure the proper pressures in the system.

2.7.2 Water Supply

There are two wells that will be operated in the Spring Mountain Motorsports Ranch that will deliver water to the two storage tanks. The locations are in the northwest corner of the site. Only one well has been drilled at this time. The system is designed to operate with only one well and the second well is designed to provide redundancy. The wells will have sodium hypochlorite disinfection. Table 2.20 details the known information for the wells.

Table 2.20: Spring Mountain Motorsports Ranch Potable Water Supply Wells and Capacities

Well #	Location	Casing Diameter (in)	Depth (feet)	Screen Interval (feet bgl)	Capacity (gpm)	Total Dynamic Head (feet)	Backup Generator
1	NW corner of SMMR site	12	700	400-700	500	UNK(1)	None
2	NW corner of SMMR site	UNK(1)			UNK(1)	UNK(1)	None
Total					UNK(1)		
Notes: (1) Unknown until well drilling reports have been obtained.							

2.7.2.1 Water Supply Well Existing Conditions Assessment

The wells are not yet in operation, so a conditions assessment is not necessary at this time. Well 1 was drilled in 2015 and has been equipped with a pump and motor. The wells are to be constructed in accordance with NAC standards.

2.7.3 Storage

The design report prepared by Golder Associates states a service area storage requirement of approximately 1,100,000 gallons. Two storage tanks are in the process of being constructed within the Spring Motor Race Way, each with a 550,000-gallon storage capacity. The details for

each storage tank are provided in Table 2.21. The tanks will be equipped with level transducers that will control the well pumps and monitor tank levels in the SCADA system.

Table: 2.21: Spring Mountain Motorsports Ranch Water Storage Tanks

Tank	Volume (MG)	Base Elevation (ft amsl)	Diameter (ft)	Height (ft)	Material
1	0.550	2,831	60	28	Welded Steel
2	0.550	2,831	60	28	Welded Steel
Total	1.100				

2.7.3.1 Storage Tank Existing Conditions Assessment

Because the storage tanks are still in construction, a conditions assessment is not necessary at this time. The storage tanks are to be designed and constructed pursuant to AWWA D100.

2.7.4 Booster Pumps

The booster pumps will pump water from the storage tanks to the distribution system. The pumps will be designed to meet supply demands as well as required fire flow. Five duty pumps are needed for the maximum day and fire flow condition equal to 2,720 gpm. An additional pump will be provided for redundancy. These pumps will be variable speed and capable of meeting very low flow.

The pumps will operate with a bypass loop to re-circulate water to allow the pump(s) to operate at all times. The booster pumps will be located inside a building to protect from flood, fire, and other hazards and will include a discharge flowmeter to measure flow to the distribution system. Two small 185-gallon expansion tanks will be included to support the system in low-to-zero flow conditions.

2.7.4.1 Pump and Motor Existing Condition Assessment

The pumps specified are 25 hp Paco Series LC, Model 3070-7 with VFD. The package system will include six pumps with VFD's. Because the pumps have not yet been installed, a conditions assessment is not necessary at this time.

2.7.5 Back-Up Power Supply

At this time there is no information on the back-up power supply to be implemented in the SMMR system.

2.7.6 System Operation and Control

The system is set to operate with the two wells providing supply to the two storage tanks. Following the storage tanks, the booster pumps would pump into the distribution system. The exact details of operation are unknown at this time.

2.7.6.1 SCADA Existing Conditions Assessment

At this time, there is no information on the SCADA to be implemented in the SMMR system, though GBWC-PD would like this system included on the overall SCADA system.

2.8 Wastewater Collection, Treatment and Disposal

2.8.1 Collection Systems

Within the GBWC-PD service area there are four permitted and three active wastewater service areas: the Central system in the Calvada Valley area, the Northern system in the Calvada North area, and the Southern system in the Mountain Falls area and SMMR area, which is under construction but not yet dedicated to GBWC-PD. The remainder of the water service area is served by individual septic systems which are owned and maintained by the property owners, other than the two septic systems serving a total of three customers owned and maintained by GBWC-PD. There is a septic system on 121 West Calvada serving one customer, and a system on 2350 East Feather Street serving two customers. These are all located within the Calvada Valley system. The three GBWC-PD wastewater systems are shown in the wastewater collection system maps located in Appendix D.

The north-south slope of the terrain throughout the service area is very shallow and therefore incurs the need for pumping. The east-west slope on the east side of Highway 160 is relatively steep and easily accommodates gravity flow. The east-west slope of terrain west of Highway 160 is relatively shallow and requires pumping if gravity pipe runs are longer than 1 to 2 miles.

2.8.1.1 Northern Area – Calvada North

Plant F is located in the northwestern-most portion of the GBWC-PD service area. It is located in the narrower, northern portion of Pahrump Valley and is generally at a higher elevation than the southern and larger part of the town of Pahrump. Development is on both the west and east side of Highway 160.

The service area of Plant F is relatively flat, falling only 50 feet from the east to the west. The area east of Highway 160 has much greater slope.

This area has developed somewhat slowly. While some parcels are relatively large, being small ranchettes or horse properties, most are less than ½ acre. There are nearly 5,400 parcels in the Plant F service area.

2.8.1.1.1 Collection Piping Existing Conditions Assessment

The collection system is relatively small and only contains one lift station. The collection system is comprised of approximately 51,054 linear feet ("lf") (approximately 10 miles) of 8-inch PVC material gravity main. The collection system was installed starting approximately mid 1980's to mid 1990's. A portion of the service area discharges into the sole lift station (Lift Station No. 4 North) that then pumps north via a segment of forcemain to a manhole that then gravity feeds to the Plant F onsite lift station. The segment of forcemain from Lift Station No. 4 North to the manhole is the only forcemain in the system. No major blockages have been observed in the sewer collection system and there are no areas in the collection system that require frequent preventative maintenance. As in the other wastewater collection systems, I/I is observed during heavy rain events at the Plant F Wastewater Treatment Plant. GBWC seeks to reevaluate the video inspection performed in the mid-2000's to assess needed replacement of sewer main.

2.8.1.1.2 Lift Stations Existing Conditions Assessment

There is a single lift station located in the Calvada North wastewater system designated as Lift Station No. 4 North. This lift station does not have odor control or any standby power; however, GBWC-PD owns a portable generator in the case of power outage. The lift station structure was installed in 1996 and is approximately 21 years old. The lift station structures are estimated to have 50 years of nominal useful life, indicating that this lift station structure will not need replacement at this time.

2.8.1.2 Central Area – Calvada Valley

Plant 3 is designated to serve the Calvada Valley development, which lies generally to the south of Nevada Route 372, east of Blagg Road, west of Highway 160, and north of Jaybird Road. The service area of Plant 3 slopes east to west falling 240 feet from the east to the west.

There are approximately 11,500 parcels within the reasonable service area of Plant 3. Of the 11,500 serviceable parcels, approximately 6,600 are currently designated as parcels to receive central sewer service. These 6,600 service connections would generate an average daily flow of 11.65 million-gallons-per-day ("MGD").

2.8.1.2.1 Collection Piping Existing Conditions Assessment

The collection system in the Calvada Valley area is comprised of over 282,569 lf (approximately 54 miles) of 6-inch, 8-inch, 10-inch, 12-inch, 15-inch, 18-inch, and 21-inch Polyvinyl Chloride ("PVC") material gravity mains and is also composed of force main. No major blockages have been observed in the sewer collection system, though there is one area on Dandelion Street that requires preventative maintenance (through jetting) every 3 months due to dips in the line. As in the other wastewater collection systems, I/I is observed at the Plant 3 Wastewater Treatment Plant.

2.8.1.2.2 Lift Stations Existing Conditions Assessment

The collection system is composed of 10 lift stations (LS). Lift Stations 1, 2, and 3 pump directly to Plant 3. The remaining lift stations are re-pumped by one or more of these stations. Table 2.22 details each lift station in the GBWC-PD Calvada Valley service area.

Table: 2.22: Calvada Valley Wastewater Collection System Lift Stations

Lift Station	Year of Lift Station Structure	Discharges To	Capacity (MGD)
1	1996	Plant 3	0.662
2	1995	Plant 3	0.576
3	1995	Plant 3	0.792
4	2010	LS 3	0.808
5	1999	LS 1	0.199
6	2002	LS 2	0.324
7	2001	LS 4	0.288
8	2016	LS 3	0.051
10	2010	LS 4	0.764
11	2010	LS 10	0.764

The locations of the lift stations are shown in the service area maps in Appendix D. Lift stations 10 and 11 receives flow from the correctional facility on East Mesquite.

Lift Stations 3, 4, 10, and 11 also have odor control in the form of carbon scrubbers. Lift station 4 also has odor control in the form of ozone infusion. In addition, there is SCADA at Lift Station 3, 4, 10 and 11.

Lift Stations 3, 4, 10, and 11 have backup power. These are permanent backup power generators. Lift Stations 1, 2, 5, 6, and 7 all have manual transfer switches to accept connection to a portable generator. Lift Station 8 is the only lift station that does not have the capability to connect to a portable generator upon power failure. With GBWC-PD only possessing one portable generator designated for water (and, one for wastewater), there are multiple facilities at risk in case of a major power outage. However, there are several features to prevent overflows in the case of power outage at lift stations 1 and 2. Lift station 1 can overflow to lift station 2, which can then

overflow to lift station 3. In addition, the high-level alarm at lift station 2 is wired into the SCADA at lift station 3.

All lift station structures have been installed in the last 25 years. The lift station structures are estimated to have 50 years of nominal useful life, indicating that no lift station structures will need replacement at this time.

Each lift station is a duplex lift station containing two pumps. For more information regarding each pump/motor and major piece of equipment as well as an assessment of remaining useful life, refer to the asset registry in Appendix A.

2.8.1.3 Southern Area – Mountain Falls

The Mountain Falls Wastewater Treatment Plant ("MF WWTP") is designated to serve the Mountain Falls development, which lies generally to the south of Gamebird Road, east of Homestead Road, west of Highway 160, and north of Manse Road. The service area of the MF WWTP is relatively flat, falling only 70 feet from the east to the west. There will be approximately 8,300 parcels within the reasonable service area of MF WWTP.

2.8.1.3.1 Collection Piping Existing Conditions Assessment

The area is comprised of approximately 82,043 lf (approximately 16 miles) of 8-inch, 10-inch and 12-inch PVC gravity mains which convey the wastewater directly to Mountain Falls Wastewater Plant for treatment. There is no force main in the Mountain Falls wastewater collection system. No major blockages have been observed in the sewer collection system and there are no areas in the collection system that require frequent maintenance. As in the other wastewater collection systems, I/I is observed at the Mountain Falls Wastewater Treatment Plant.

2.8.1.3.2 Lift Stations Existing Conditions Assessment

There are no lift stations in the Mountain Falls wastewater collection system. The wastewater flows by gravity to the treatment plant.

2.8.1.4 Spring Mountain Motorsports Ranch

The SMMR wastewater collection system is planned to have gravity sewer collection system and force main. The collection system is currently under construction, so an assessment of current conditions cannot be performed; however, the following sections provide a description of the collection system design as provided in the "Wastewater Lift Station and Force Main Spring Mountain Motorsports Ranch" design report prepared by Golder Associates Inc (April 29, 2016). This design report is included in Appendix M. The design report states that the force main and lift station are to be designed in accordance with regulations set by NDEP and in accordance with relevant NRS and NAC provisions. According to the design report in Appendix M, the collection system design flow is based on Las Vegas Valley Water District ("LVVWD") design code.

2.8.1.4.1 Collection Piping Existing Conditions Assessment

The collection system will include both gravity pipe and force main. Gravity sewers will be combined into a manhole upstream of the wet well.

The design of the collection system will include approximately 0.5 mile of 6-inch diameter HDPE force main to convey sewage from the lift station to the package wastewater treatment plant. The force main will cross beneath the race track near the WWTP, which will require a casing pipe be bored and jacked under the track.

2.8.1.4.2 Lift Stations Existing Conditions Assessment

The sewage lift station will be located at the low point of the development, which is the southeast corner of the SMMR project as shown in the map in Appendix D. The lift station discharge force main will convey the sewage to the package wastewater treatment plant.

The lift station will include two 15-hp Flygt (Model NP3153HT3~464) submersible pumps operating in lead-lag that are capable of passing 3-inch solids with each rated for estimated peak flow of 287 gpm. The 5-ft diameter wet well will include level transducers and three-float system. This lift station discharge line will be equipped with all necessary valves and appurtenances. The lift station will also be equipped with a standby generator in the event of power loss. A control building will be located nearby. The design includes space in the control building for the addition of odor control if deemed necessary.

2.8.2 Wastewater Treatment and Disposal

2.8.2.1 Northern Area – Plant F

The Northern service area has one facility – Plant F. Plant F is a 50,000 gpd package plant. Treatment includes a lift station, biological treatment and a chlorine contact tank for disinfection. Solids are treated in an aerobic digester and stored for hauling off-site. Existing flows to the facility are approximately 22,000 gpd (based on the average monthly 2016 influent flow). This facility has onsite backup power.

2.8.2.1.1 Treatment System Existing Conditions Assessment

The Plant F WWTP equipment was evaluated in the asset registry provided in Appendix A. This asset registry details each piece of major equipment with information including the year the equipment was procured/installed and remaining useful life. The majority of the equipment is in "very good" or "fair" condition based on age.

2.8.2.1.2 Effluent Disposal Methods

Effluent disposal at this facility is currently through on-site spray irrigation site.

2.8.2.2 Central Area – Plant 3

Plant 3 is the wastewater facility for the Central service area. Plant 3 is a 1.50 MGD sequencing batch reactor ("SBR") facility. The facility includes a surge tank, biological treatment, travelling bridge tertiary filters, and an ultraviolet and chlorine disinfection system. Solids are treated by aerobic digestion and dewatering prior to hauling off-site for ultimate disposal. The facility currently treats approximately 636,000 gpd (based on the average monthly 2016 influent flow). This facility has onsite backup power.

2.8.2.2.1 Treatment System Existing Conditions Assessment

The Plant 3 WWTP equipment was evaluated in the asset registry provided in Appendix A. This asset registry details each piece of major equipment with information including the year the equipment was procured/installed and remaining useful life. The majority of the equipment is in "good" or "fair" age-based condition.

Equipment that is not in poor condition, but requires considerable maintenance are the three travelling bridge (sand) filters. The sand filter backwashing pumps require frequent replacement. In addition, the filter maintenance includes replacement and addition of sand media that is lost over relatively short periods of time.

The solids handling equipment at Plant 3 consists of two sludge feed pumps, two screw press dewatering units, a polymer feed system and haul off container. The equipment is located in a building at Plant 3. Currently, the equipment is only producing 50 gpm, which is undersized for the volume of solids to be treated, especially in the winter, which has resulted in the need to maximize use of the existing abandoned Marwood tanks for sludge storage to thicken solids. The process requires turning off air frequently to the tanks to decant and thicken solids, which continues to slow down the output of the existing dewatering unit. Operations staff work overtime during the winter months in order to keep up with the sludge treatment while performing their other regular duties. There are also certain components associated with the system which are difficult to obtain and have a long lead time. Regular replacement of expensive components is required to maintain a fully functional system. The staff has found that the screens, sludge pump VFD, and polymer feed pump parts require replacement every 1 to 7 years, depending upon the component. Replacement of the current technology with a more efficient, higher capacity solids handling unit would assist the operations staff in reducing operations and maintenance costs.

2.8.2.2.2 Effluent Disposal Methods

Effluent disposal is through reclaim water provided to the adjacent 160 acres Discovery Park and the Lakeview Executive Golf Course (Lakeview). (Additionally, GBWC has proposed the use of reclaim water at a nearby public school complex.) The effluent is first diverted to a nearby holding pond where it is subsequently re-pumped for distribution to Lakeview and the other ponds and irrigation. RIBs as approved in Docket No. 15-01029, are pending in the Fifth District Judicial Court.

2.8.2.3 Southern Area – Mountain Falls

Mountain Falls is the wastewater facility in the Southern service area. This is a facility similar in treatment to Plant 3. The treatment facility includes a lift station, SBR for biological treatment, filtration, and disinfection. Solids are treated by aerobic digestion and dewatered prior to hauling off-site for ultimate disposal. The facility currently treats approximately 72,000 gpd (based on the average monthly 2016 effluent flow) and has a rated capacity of 750,000 gpd. This facility has onsite backup power.

2.8.2.3.1 Treatment System Existing Conditions Assessment

The Mountain Falls WWTP equipment was evaluated in the asset registry provided in Appendix A. This asset registry details each piece of major equipment with information including the year the equipment was procured/installed and remaining useful life. The majority of the equipment is in "good" or "fair" age-based condition.

2.8.2.3.2 Effluent Disposal Methods

The effluent is used at the golf course for irrigation.

2.8.2.4 Spring Mountain Motorsports Ranch

The SMMR WWTP will be a pre-manufactured (packaged) plant that has been designed and purchased, but is not yet constructed. The design report prepared by Golder Associates Inc. entitled "Wastewater Treatment Plant Spring Mountain Motorsports Ranch" (May 4, 2016) details the design. This design report is provided in Appendix M.

The WWTP is sized for approximately 108,000 GPD influent flow with wastewater loading detailed in the design report in Appendix M. The packaged treatment plant will be manufactured by FAST® and will utilize both suspended and fixed growth processes with anoxic denitrification. A clarifier will be provided for settling. Sludge will be pumped to an aerobic digester/holding tank and hauled to an offsite facility operated by GBWC-PD that has capacity for sludge dewatering and disposal. The plant will also include an equalization (EQ) basin and an influent flowmeter. Odor control will also be present at the facility in the form of a bio-filter.

The WWTP will include a standby generator for backup power sized to operate all components at the WWTP.

2.8.2.4.1 Treatment System Existing Conditions Assessment

The package plant has not been constructed, so a conditions assessment cannot be performed at this time.

2.8.2.4.2 Effluent Disposal Methods

Effluent will be disposed of through Rapid Infiltration Basins ("RIBs") with design criteria provided in the design report in Appendix M.

2.9 Asset Management Analysis

In December 2016, an Asset Management workshop was conducted with the GBWC-PD Staff on specific assets and subsystems of the water and wastewater utility for vulnerabilities. The agenda of the workshop consisted of the following:

- Asset Management Refresher
- Asset Registry Analysis
- Review of Condition and Consequence of Failure Assessment Guidelines
- Level of Service Analysis
- Review of 5-Year Capital Plan
- System Summary
- Conclusions and Next Steps

David Kitching of Corix and Stephani Jackson of Water Service Corporation headed the workshop and provided a presentation with the asset management results that were based on the asset registry. The results were based on analyzing the assets based on the current age of the asset and remaining useful life.

The subsystems asset assessment included the water system - water supply, storage tanks, booster systems, PRV and backup power throughout the utility. The subsystems assessment also included the wastewater collection and treatment systems – lift stations, wastewater treatment plant equipment and extended power outages in both the collection system and at wastewater treatment facilities. At this time, an assessment of wastewater collection and water distribution piping was not conducted.

This workshop also briefly touched on a modified FMEA. A "Failure Mode" is the way(s) or "mode(s)" in which a component might fail. The "Effects Analysis" is the study of the consequences of those failures. This part of the workshop focused on getting the core team (GBWC-PD Staff) to assess the major assets and subsystems within the utility to analyze the consequences if failure occurs. The purpose of the FMEA exercise is to take action to eliminate or reduce failures, starting with the highest-priorities. A FMEA also documents current knowledge and actions about the risks of failures for use in continuous improvement. GBWC-PD should continue the FMEA process to identify and document all failure mode effects in their systems.

SECTION 3.0: HISTORICAL DATA AND FORECASTING

3.1 Planning Period

The planning period for this 2018 IRP is from 2018-2038 with an emphasis on the full three years' of data compilation from 2014, 2015, and 2016. Demand projections and buildout estimates will extend to 2038.

3.2 Existing Service Area

The GBWC-PD service area is largely residential with light commercial and industrial areas. The commercial area is primarily in downtown Pahrump south of Basin Street along Highways 160 and 372. The commercial base is a mix of retail stores, restaurants, casinos, and hotels. Most of the Pahrump Valley has been platted for residential development, with the majority of the lots now owned by individual lot owners as opposed to a single developer. As such, development does not typically occur within defined 'planned communities,' but rather develops on a piecemeal basis as an individual lot owner decides to construct a home on his or her parcel.

Prospective homeowners, in order to connect to the system, must first comply with GBWC-PD's Tariff Rule 9 ("Rule 9") (among other tariff provisions), which governs the extension or modification of the existing system to serve a new customer. The provisions of Rule 9 are animated generally by the historical public policy in Nevada that requires new growth to pay for itself. Accordingly, under Rule 9, an applicant for new service from GBWC-PD has historically been responsible for the cost of constructing and installing any new water (except the first fire hydrant) or sewer infrastructure (except the deepest manhole) needed to serve his or her proposed development. In addition, such an applicant is also responsible for capacity and connection fees under the tariff (also referred to as "tap fees"). At this time, approximately 34% of the people who live in Pahrump are connected to the GBWC-PD water system. As the population increases this percentage is anticipated to increase with expanding infrastructure and thereby, increasing proximity of the infrastructure with new backbone infrastructure to future development. However, as previously noted, the extent of the existing infrastructure is limited, and many parcels are located long distances from GBWC-PD's water and sewer lines. In such cases, the costs for such a new applicant can be substantial. As noted in this filing, the proliferation of new domestic wells is a concern for the sustainability of the water source.

3.3 Projections

The "Nevada County Population Projections 2017 to 2036" report prepared by the State Demographer's Office dated October 1, 2017, was used to develop the future population in the service area. The report estimates the Nye County 2016 population (with additional factors) at 45,737 people. Nye County also tracks the population and the Pahrump population through the planning department and posts the documents on their website. In the 2015 third quarter report (which is the most recent report posted to the website), Nye County lists their County 2015 population as 47,319 people and the Pahrump population as 39,312. This is a difference of 3.4%

from the State Demographer. This report uses the more local Nye County quarterly data as historical data for estimating the historical proportion of the Pahrump population in Nye County to be used in projecting the Pahrump population for years 2016 forward (as the 2015 third quarter report is the latest report on the website). The report utilizes the State Demographer's data for 2016 Nye County data and projected Nye County populations starting from 2017 and then applies the average historical proportion of Pahrump population to Nye County population to achieve the projected Pahrump population. The historical data and projections are presented in Table 3.01.

Table: 3.01: GBWC-PD Population Projections

Year	Nye County Population Projections[1]	Pahrump Population Projections[2]	Pahrump % of Nye County Population[3]
2012	44,292	38,153	86.14
2013	44,749	38,543	86.13
2014	45,456	38,793	85.34
2015	46,050	39,312	85.37
2016	45,737	39,219	85.75
2017	46,059	39,496	85.75
2018	46,337	39,734	85.75
2019	46,503	39,876	85.75
2020	46,642	39,996	85.75
2021	46,741	40,080	85.75
2022	46,801	40,132	85.75
2023	46,837	40,163	85.75
2024	46,860	40,182	85.75
2025	46,888	40,206	85.75
2026	46,906	40,222	85.75
2027	46,913	40,228	85.75
2028	46,896	40,213	85.75
2029	46,853	40,176	85.75
2030	46,795	40,127	85.75
2031	46,741	40,080	85.75
2032	46,696	40,042	85.75
2033	46,670	40,020	85.75
2034	46,662	40,013	85.75
2035	46,662	40,013	85.75
2036	46,677	40,026	85.75
2037	46,725	40,067	85.75
2038	46,773	40,108	85.75

Notes:

(1) Nye County Population Projections are based on the "Nevada County Population Projections 2017 to 2036" prepared by the Nevada State Demographer's Office, October 1, 2017, for years 2016 forward. Nye County population projections indicate a 0.10% average annual population increase. 2014 data is based on the fourth quarter Nye County Population estimates, 2015 data is based on the third quarter Nye County Population estimate.

(2) Pahrump population projections for years 2016 forward are based on 85.75% of the Nye County projected population. Historical data from the Nye County Quarterly Population Estimates that includes the estimated Pahrump population for each quarter was utilized to estimate the Pahrump population as a percentage of the Nye County population. 2014 data is

based on the fourth quarter estimated population ratio of Pahrump to Nye County, 2015 data is based on the third quarter estimates for Pahrump and Nye County.

(3) Historical data from the Nye County Quarterly Population Estimates that includes the estimated Pahrump population for each quarter was utilized to estimate the Pahrump population as a percentage of the Nye County population. 2012 through 2014 data are based on the fourth quarter estimated population ratio of Pahrump to Nye County, 2015 data is based on the third quarter estimates for Pahrump and Nye County. The average % calculated for 2012-2015 (85.75%) was utilized in the projections for years 2016 forward.

The State Demographer projects the Nye County 2036 population to be 46,677 people, an increase of 940 people from 2016. This equates to a 20-year annual average growth rate of 0.10%. This annual average growth rate was then applied to the years 2037 and 2038 to provide projection estimates for these years. The estimated Nye County population in 2038 is 46,773.

The City of Pahrump is approximately 85.75% of the Nye County population yielding a population of 40,026 people in 2036. This is an increase of 807 people in the State Demographer's report 20-year analysis period. The projected Pahrump total population in 2038 is estimated to be 40,108 people.

GBWC-PD currently serves approximately 34% of the people in Pahrump based on an occupancy rate of 2.37 persons per unit. The occupancy rate of 2.37 persons per unit is based on 2007-2011 US Census Bureau Quick Census data and as a conservative estimate provides a reasonable projection of actual future connections to the systems. Since the projected growth rate is so low, this percentage can be anticipated to be constant during the planning period. It is anticipated that as the growth continues this percentage will gradually increase, however due to the low 20-year projection at this time no appreciable difference is anticipated.

Table 3.02 displays the historical 2014, 2015 and 2016 projected residential and commercial connections as well as the residential users per year, which is based on the occupancy rate of 2.37 persons per unit. The percentage of the GBWC-PD residential users was compared to the historical and projected Pahrump population for each year. The table does not include the impact of the Spring Mountain Motorsports Ranch, as the rate of connections added per year to GBWC-PD over the next 20 years is unknown.

Table: 3.02: GBWC-PD Residential and Commercial Connection Projections

Year	Pahrump Pop.(1)	% Change in Pop.(2)	New Res. Service Conn.(3)	Res. Service Conn.(4)	Res. Users(5)	GBWC-PD % of Pahrump Pop.(6)	Comm. Conn. (7)	Total GBWC-PD Conn.(8)
2014	38,793			5,351	12,682	33	330	5,681
2015	39,312		45	5,396	12,789	33	320	5,716
2016	39,219		208	5,604	13,281	34	332	5,936
2017	39,496	0.70	39	5,643	13,375	34	334	5,978
2018	39,734	0.60	34	5,678	13,456	34	336	6,014
2019	39,876	0.36	20	5,698	13,504	34	338	6,035
2020	39,996	0.30	17	5,715	13,544	34	339	6,053
2021	40,080	0.21	12	5,727	13,573	34	339	6,066
2022	40,132	0.13	7	5,734	13,590	34	340	6,074
2023	40,163	0.08	4	5,739	13,601	34	340	6,079
2024	40,182	0.05	3	5,742	13,608	34	340	6,082
2025	40,206	0.06	3	5,745	13,616	34	340	6,085
2026	40,222	0.04	2	5,747	13,621	34	340	6,088
2027	40,228	0.01	1	5,748	13,623	34	341	6,089
2028	40,213	-0.04	-2	5,746	13,618	34	340	6,086
2029	40,176	-0.09	-5	5,741	13,606	34	340	6,081
2030	40,127	-0.12	-7	5,734	13,589	34	340	6,073
2031	40,080	-0.12	-7	5,727	13,573	34	339	6,066
2032	40,042	-0.10	-6	5,722	13,560	34	339	6,060
2033	40,020	-0.06	-3	5,718	13,552	34	339	6,057
2034	40,013	-0.02	-1	5,717	13,550	34	339	6,056
2035	40,013	0.00	0	5,717	13,550	34	339	6,056
2036	40,026	0.03	2	5,719	13,554	34	339	6,058
2037	40,067	0.10	6	5,725	13,568	34	339	6,064
2038	40,108	0.10	6	5,731	13,582	34	340	6,070

Notes:

(1) Pahrump population projections for years 2016 forward are based on 85.75% of the Nye County projected population (calculated in Table 3.1). Historical data from the Nye County Quarterly Population Estimates that includes the estimated Pahrump population for each quarter was utilized to estimate the Pahrump population as a percentage of the Nye County population. 2014 data is based on the fourth quarter estimated population ratio of Pahrump to Nye County, 2015 data is based on the third quarter estimates for Pahrump and Nye County.

(2) The % change in population is based on calculating the change in population from the previous year and dividing by the previous year's population.

(3) The new residential service connections are calculated by subtracting the previous year's residential service connections from the new residential service connections, where the residential service connections for each year are calculated based on the % Change in Population as discussed in Note 4 below.

(4) The GBWC-PD residential connections for 2014, 2015 and 2016 are based on actual data. The connection count includes residential and multi-residential connections and is the total number of meters in the service territory. The GBWC-PD residential connections from years 2018 forward are based on multiplying by the % Change in Population. Note 2 above defines how the % Change in Population was determined.

(5) The GBWC-PD residential users were determined by taking the residential connections for each year and multiplying by the average number of people per household. The 2007 - 2011 US Census Quickfacts for Pahrump were utilized to determine the 2.37 persons per household factor. This household factor is also stated in the Nye County 2015 Third Quarter population estimate.
(6) The percent of the Pahrump population served by GBWC-PD each year is based on the GBWC-PD residential users divided by the Pahrump population.
(7) The GBWC-PD commercial connections for 2014, 2015 and 2016 is based on actual data and is the total number of meters in the service territory. The GBWC-PD commercial connections projected for years 2018 forward is based upon multiplying by the % Change in Population. Note 2 above defines how the % Change in Population was determined.
(8) The GBWC-PD total connections for 2014, 2015 and 2016 are based on actual data and is the sum of actual residential and commercial connections. The GBWC-PD total connections projected for years 2018 forward is based upon summing the projected residential and commercial connections for each year.

3.3.1 Future Development

The GBWC-PD service territory will soon include the Spring Mountain Motorsports Ranch ("SMMR"). The proposed development is designed for 80 single-family residential lots and 62 acres of commercial development that would include a movie theater, hotel, restaurants, retail shops, race track facilities and an RV Park. The growth in GBWC-PD connections per year cannot be analyzed at this time because the rate of development for this service area is unknown.

In addition, there are several other developments with lots that have been permitted by NDEP and are expected to be connected within the 20-year forecast. There are several developments within the Calvada Valley main system as well as continued development in the Mountain Falls service area that are estimated to be completed within the next three to five years.

The Calvada Valley main system is expected to connect to a development within the 20-year projection period, which is known as the Winery development and is proposed to include 160 single family homes, 120-room senior center and 900 square feet of senior condos.

The Mountain Falls development lots that have been approved with will-serve letters are as follows:

- Area-6: 224 lots
- Area-7: 166 lots
- Area-4C: 105 lots
- Area 32B: 113 lots

With the information provided, it would not be possible to project the exact annual growth rate of the development, though the new developments suggest significantly higher population growth rates than the State Demographer's population projections. The State Demographer's population projections for Clark County (in which Las Vegas is located) has a higher average annual growth rate than Nye County. This average annual growth rate for Clark County is 0.5% as compared to

0.1% for Nye County. It is possible that some spill over from the major nearby city of Las Vegas to Pahrump will occur.

3.4 Water System Forecasting

3.4.1 Water System Connections Projections

GBWC-PD had an average of 5,936 total water connections as of December 2016. Of those, 332 were commercial and 5,604 were residential. In the three-year planning period, by 2021, the total residential and commercial connections is projected to increase to 6,066. Then, by 2038, the total residential and commercial connections is projected to increase to 6,070, a net increase of 4 connections from 2021 to 2038. The residential connection growth rate was developed on the table to mirror the annual County population growth rate from 2016-2036. *See* Table 3.1 and associated notes (where 2037 and 2038 population estimates were based on the 20-year average annual County population growth (0.1%)).

The commercial connection growth rate was projected to match the annual County population growth rate from 2016-2036, where 2037 and 2038 population estimates were based on the 20-year average annual County population growth (0.1%). This showed an overall growth of 1 commercial connections over 20 years (from 2021 to 2038) to a total of 340. Table 3.02 shows the 20-year projection and a three-year history.

Table 3.03 displays the historical and projected residential and commercial connections in each service area within GBWC-PD. The historical 2014, 2015, and 2016 service area percentages of the total connection count for that year were determined. The average percentage for the three years for each service area was applied to the total count for the projected years (from Table 3.02) for each of the five service areas, with the exception of the Mountain View Estates area which is currently built out.

Table 3.03: GBWC-PD Residential Water Connection Projections Per Service Area

Year[1]	Calvada Valley[2]	Calvada North/Country View Estates[2]	Calvada Meadows[2]	Mountain View Estates[2]	Mountain Falls[2][3]	Total
2014	4,022	412	30	23	864	5,351
2015	3,999	392	34	27	943	5,395
2016	4,063	407	34	25	1,075	5,604
2017	4,172	418	34	26	993	5,643
2018	4,197	421	34	27	999	5,678
2019	4,212	422	34	27	1,003	5,698
2020	4,225	423	34	27	1,006	5,715
2021	4,234	424	34	27	1,008	5,727
2022	4,239	425	34	27	1,009	5,734
2023	4,243	425	34	27	1,010	5,739
2024	4,245	425	34	27	1,011	5,742
2025	4,247	426	34	27	1,011	5,745
2026	4,248	426	34	27	1,012	5,747
2027	4,249	426	34	27	1,012	5,748
2028	4,248	426	34	27	1,011	5,746
2029	4,244	425	34	27	1,011	5,741
2030	4,239	425	34	27	1,009	5,734
2031	4,234	424	34	27	1,008	5,727
2032	4,230	424	34	27	1,007	5,722
2033	4,227	424	34	27	1,006	5,718
2034	4,226	424	34	27	1,006	5,717
2035	4,226	424	34	27	1,006	5,717
2036	4,228	424	34	26	1,007	5,719
2037	4,232	424	34	27	1,008	5,725
2038	4,237	425	34	26	1,009	5,731

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data in each service area.

(2) Total residential GBWC-PD water connections for years 2018 forward are per Table 3.02 projections for 2018 forward. The average percentage of the total based on the historical 2014, 2015, and 2016 data for each service area was applied to the projected total connections for the year in order to estimate connections in each service area, with the exception of Mountain View Estates which is already built out. Calvada Valley average percent of total connections based on historical data was 74.3%, Country View Estates/Calvada North was 7.4%, Calvada Meadows was 0.6% and Mountain Falls was 17.7%.

(3) Due to this method of calculation described in Note 2 and Population Projections prepared by the State Demographer, Mountain Falls service area shows a decrease in water connections. However, GBWC-PD expects Mountain Falls connections to increase significantly as discussed in Section 3.3.1 "Future Development".

3.4.2 Water Usage

3.4.2.1 Recorded Water Production

GBWC-PD has been filing IRPs for several years, and hereby incorporates relevant historical system data contained in those IRPs in addition to the data provided in this filing. Table 3.04 summarizes the historical water production for the currently owned five individual water systems as part of the GBWC-PD. The SMMR is not yet constructed and therefore is not included in the table. The water production listed in the table is the sum of the historical water production for the wells in each service area (*See* Section 2.0 for the description of wells in each service area) from monthly production reports.

Total annual water production during the three-year analysis period of 2014 through 2016 ranged from 2.845 MGD in 2015 to a high of 3.274 MGD in 2016. In 2016, there is a large increase in observed water production compared to the other two years.

Table 3.04: GBWC-PD Historical Water Production in MGD

Year	Calvada Valley[1]	Calvada North/Country View Estates[2]	Calvada Meadows[3]	Mountain View Estates[4]	Mountain Falls[5]	Total[6]
2006	3.038	0.135	0.004	0.011	0.601	3.789
2007	3.273	0.163	0.004	0.013	1.307	4.760
2008	2.392	0.146	0.005	0.013	1.122	3.678
2009	2.191	0.137	0.005	0.010	1.007	3.350
2010	2.065	0.122	0.005	0.009	1.035	3.236
2011	1.936	0.122	0.004	0.006	1.045	3.113
2012	1.958	0.125	0.004	0.004	1.112	3.203
2013	1.814	0.162	0.004	0.005	1.098	3.083
2014	1.967	0.135	0.004	0.006	0.738	2.850
2015	1.920	0.128	0.006	0.004	0.787	2.845
2016	2.070	0.131	0.007	0.003	1.063	3.274

Notes:
(1) Total annual production from Calvada Valley Wells 1, 2, 9, 11 and 12 (previously designated as Well 8)
(2) Total annual production from Calvada North Well 1, Country View Estates Wells 48-1 and 48-2
(3) Total annual production from Calvada Meadows Well 1
(4) Total annual production from Mountain View Estates Well
(5) Total annual production from Mountain Falls Well 1 and Mountain Falls Well 2
(6) Total sum of all well production in the GBWC-PD service area

In order to determine maximum day demand ("MDD"), monthly consumption data was analyzed. Using the maximum month production, the average day of the maximum month ("ADMM") was calculated. The ADMM calculation relates to the estimated MDD value. MDD was calculated by multiplying the ADMM by 1.25 -- a standard of the American Water Works Association ("AWWA"). The ratio of ADD to MDD is typically referred to as the Peaking Factor ("PF"). According to the

AWWA criteria, the peaking factor typically ranges from 1.2 to 3.0. The three-year average PF derived from the data (2014–2016) equates to 1.9, which is within the typical range. Maximum months observed were generally June, July or August. A peaking factor was also applied to the MDD to calculate the system's peaking hourly demand (PHD). Table 3.05 show the ADD, ADMM, MDD, PF, and PHD values for 2014-2016. Tables 3.05a - 3.05e show ADD, ADMM, MDD, PF, and PHD values for each of the service areas for 2014-2016.

Table 3.05 GBWC-PD Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM/ADD**	**MDD/ ADMM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	2.85	4.37	1.53	1.25	5.46	1.92	1.75	9.56	6,638
2015	2.85	4.39	1.54	1.25	5.49	1.93	1.75	9.60	6,669
2016	3.27	4.94	1.51	1.25	6.18	1.89	1.75	10.81	7,504
MDD/ADD Average for 2014, 2015 & 2016						**1.91**			

Table 3.05a Calvada Valley Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM/ADD**	**MDD/ ADMM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	1.97	2.63	1.34	1.25	3.28	1.67	1.75	5.74	3,989
2015	1.92	2.60	1.35	1.25	3.25	1.69	1.75	5.68	3,946
2016	2.07	2.76	1.33	1.25	3.45	1.67	1.75	6.04	4,194
MDD/ADD Average for 2014, 2015 & 2016						**1.68**			

Table 3.05b Country View Estates/Calvada North Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM/ADD**	**MDD/ ADMM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	0.14	0.19	1.4	1.25	0.24	1.75	1.75	0.41	287
2015	0.13	0.17	1.34	1.25	0.21	1.67	1.75	0.37	260
2016	0.13	0.18	1.34	1.25	0.22	1.68	1.75	0.39	267
MDD/ADD Average for 2014, 2015 & 2016						**1.70**			

Table 3.05c Calvada Meadows Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM /ADD**	**MDD/AD MM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	0.004	0.006	1.5	1.25	0.008	1.88	1.75	0.013	9.1
2015	0.006	0.01	1.67	1.25	0.013	2.08	1.75	0.022	15.2
2016	0.007	0.009	1.29	1.25	0.011	1.61	1.75	0.020	13.7
MDD/ADD Average for 2014, 2015 & 2016						**1.86**			

Table 3.05d Mountain View Estates Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM /ADD**	**MDD/AD MM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	0.006	0.008	1.33	1.25	0.010	1.67	1.75	0.018	12.5
2015	0.004	0.006	1.5	1.25	0.008	1.88	1.75	0.013	9.1
2016	0.003	0.005	1.67	1.25	0.006	2.08	1.75	0.011	7.6
MDD/ADD Average for 2014, 2015 & 2016						**1.88**			

Table 3.05e Mountain Falls Historical Maximum Daily Consumption, Peaking Factors and Maximum Day Demand/PHD (MGD)

								Peak Hour Demand (PHD)	
Year	**ADD**	**ADMM**	**ADMM /ADD**	**MDD/ADMM**	**MDD**	**MDD/ADD**	**PHD/MDD**	**MGD**	**gpm**
2014	0.738	1.541	2.09	1.25	1.93	2.61	1.75	3.37	2,340
2015	0.787	1.605	2.04	1.25	2.01	2.55	1.75	3.51	2,438
2016	1.063	1.989	1.87	1.25	2.49	2.34	1.75	4.35	3,021
MDD/ADD Average for 2014, 2015 & 2016						**2.50**			

These maximum daily flows are also related to the seasonal changes in the system. As previously stated, the maximum flows all occurred in the summer when usage is the highest. The higher flows typically occur in the summer between May and October. When averaged, the flows for the summer months are approximately double the winter flows (sum of production during all other months). This GBWC-PD seasonal data for years 2014, 2015, and 2016 is summarized in Table 3.06. In addition, the table presents the seasonal peaking factor and peaking factor based on the peak month and average annual month. For the whole GBWC-PD service territory, the average seasonal peaking factor for 2014-2016 is 1.7 and the average peaking factor is 1.51. Years 2014 through 2016 were also analyzed based on data provided for each service area (Tables 3.06a through 3.06e). These values are used later in this report to determine projected seasonal peaks.

Table 3.06: GBWC-PD Historical Seasonal Average Flows

Year	**Annual Production (12 months total MG)**	**Peak Seasonal Production (May-October), MG**	**Winter Production, MG**	**Seasonal Peaking Factor** (Seasonal Peak/Winter Production)	**Peak Month Production, MG**	**Peaking Factor** (Peak Month/Average Annual Month)
2014	1,040.25	661.47	378.78	1.75	131.11	1.51
2015	1,038.31	657.16	381.15	1.72	131.69	1.52
2016	1,195.40	758.94	436.46	1.74	148.17	1.49

Table 3.06a: Calvada Valley Historical Seasonal Average Flows

Year	**Annual Production (12 months total MG)**	**Peak Seasonal Production (May-October), MG**	**Winter Production, MG**	**Seasonal Peaking Factor** (Seasonal Peak/Winter Production)	**Peak Month Production, MG**	**Peaking Factor** (Peak Month/Average Annual Month)
2014	717.98	424.27	293.71	1.44	78.78	1.32
2015	700.87	420.68	280.19	1.50	77.93	1.33
2016	755.73	446.34	309.38	1.44	82.83	1.32

Table 3.06b: Country View Estates/Calvada North Historical Seasonal Average Flows

Year	**Annual Production (12 months total MG)**	**Peak Seasonal Production (May-October), MG**	**Winter Production, MG**	**Seasonal Peaking Factor** (Seasonal Peak/Winter Production)	**Peak Month Production, MG**	**Peaking Factor** (Peak Month/Average Annual Month)
2014	49.22	30.07	19.15	1.57	5.67	1.38
2015	46.54	26.96	19.58	1.38	5.12	1.32
2016	47.66	27.64	20.02	1.38	5.28	1.33

Table 3.06c: Calvada Meadows Historical Seasonal Average Flows

Year	**Annual Production (12 months total MG)**	**Peak Seasonal Production (May-October), MG**	**Winter Production, MG**	**Seasonal Peaking Factor** (Seasonal Peak/Winter Production)	**Peak Month Production, MG**	**Peaking Factor** (Peak Month/Average Annual Month)
2014	1.62	0.89	0.73	1.21	0.19	1.38
2015	2.23	1.20	1.02	1.18	0.29	1.57
2016	2.71	1.44	1.27	1.13	0.26	1.14

Table 3.06d: Mountain View Estates Historical Seasonal Average Flows

Year	Annual Production (12 months total MG)	Peak Seasonal Production (May-October), MG	Winter Production, MG	Seasonal Peaking Factor (Seasonal Peak/Winter Production)	Peak Month Production, MG	Peaking Factor (Peak Month/Average Annual Month)
2014	2.08	1.20	0.89	1.35	0.24	1.36
2015	1.56	0.83	0.73	1.13	0.19	1.43
2016	1.20	0.61	0.59	1.05	0.14	1.40

Table 3.06e: Mountain Falls Historical Seasonal Average Flows

Year	Annual Production (12 months total MG)	Peak Seasonal Production (May-October), MG	Winter Production, MG	Seasonal Peaking Factor (Seasonal Peak/Winter Production)	Peak Month Production, MG	Peaking Factor (Peak Month/Average Annual Month)
2014	269.36	205.04	64.31	3.19	46.24	2.06
2015	287.12	207.49	79.62	2.61	48.15	2.01
2016	388.11	282.91	105.20	2.69	59.67	1.84

3.4.2.2 Recorded Consumption

Table 3.07 summarizes the historical metered water use data for the years 2014 through 2016. Total annual water use supplied by GBWC-PD during the analysis period ranged from 2.345 MGD metered in 2015 to 2.828 MGD metered in 2016. The increase is nearly a 20% increase in metered usage as compared to the water production increase of 15% over the same period. The data presented in Table 3.07 are a summary of the data presented in Tables 3.08 and 3.09.

Table 3.07: GBWC-PD Historical Metered Water in MGD

Year	Billed Municipal Usage(1)	Utility Usage(2)	Total Metered(3)
2014	2.388	0.018	2.406
2015	2.345	0.101	2.346
2016	2.811	0.016	2.828

Notes:
(1) Billed Municipal Usage is the total residential, commercial, public authority, temporary connections, and multi-residential metered flow from meter consumption data.
(2) Utility usage for years 2014, 2015 and 2016 is from the well pump reports for each year and accounts for WWTP water meters. The unbilled utility usage is considered authorized consumption.
(3) Total metered is the sum of billed municipal usage and unbilled utility usage.

The metered data can be broken down further to show the historical metered water use by class of service. Table 3.08 summarizes the consumption data by class of service for the period from 2014 through 2016. Tables 3.08a through 3.08e summarize the historical consumption data by class of service for each of the five service areas.

Table 3.08: GBWC-PD Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	411,694,911	47.2	401,679,554	46.1	32,556,200	3.7
2015	402,847,970	47.1	399,725,345	46.7	33,228,770	3.9
2016	418,752,363	40.8	558,237,456	54.4	28,912,810	2.8
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08 (cont.): GBWC-PD Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	18,433,840	2.1	7,131,900	0.8
2015	15,766,970	1.8	4,510,200	0.5
2016	14,896,260	1.5	5,456,600	0.5
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Table 3.08a: Calvada Valley Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	320,101,520	56.8	199,451,869	35.4	18,448,420	3.3
2015	310,935,250	57.2	195,000,845	35.9	17,303,050	3.2
2016	320,340,356	55.1	225,632,750	38.8	15,480,450	2.7
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08a (cont.): Calvada Valley Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	18,433,840	3.3	7,131,900	1.3
2015	15,766,970	2.9	4,510,200	0.8
2016	14,896,260	2.6	5,456,600	0.9
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Table 3.08b: Country View Estates/Calvada North Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	31,109,951	75.8	9,917,380	24.2	0	0
2015	30,212,530	83.4	6,002,120	16.6	0	0
2016	31,738,920	80.8	7,519,240	19.2	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08b (cont.): Country View Estates/Calvada North Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Table 3.08c: Calvada Meadows Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	658,780	98.2	12,060	1.8	0	0
2015	908,110	99.9	870	0.1	0	0
2016	1,123,570	99.6	4,900	0.4	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08c (cont.): Calvada Meadows Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Table 3.08d: Mountain View Estates Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	1,504,960	99.5	7,730	0.5	0	0
2015	1,162,690	98.8	13,820	1.2	0	0
2016	805,550	97.1	24,280	2.9	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08d (cont.): Mountain View Estates Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Table 3.08e: Mountain Falls Historical Consumption by Class of Service

	Residential		Commercial		Irrigation	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	58,319,700	22	192,290,515	72.6	14,107,780	5.3
2015	59,629,390	21.7	198,707,690	72.5	15,925,720	5.8
2016	64,743,967	16.1	325,056,286	80.6	13,432,360	3.3
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.						

Table 3.08e (cont.): Mountain Falls Historical Consumption by Class of Service

	Public Authority		Miscellaneous	
Year	Annual Consumption (Gallons)	% of Total	Annual Consumption (Gallons)	% of Total
2014	0	0	0	0
2015	0	0	0	0
2016	0	0	0	0
Notes: Years 2014, 2015 and 2016 are the annual consumption by category from meter consumption data.				

Calvada Valley has an average of 56.3% of metered water use as residential, an average of 36.7% commercial metered water use, an average 3.1% irrigation metered water use, an average of 2.9% public authority metered water use an average of 1% miscellaneous water use. The Country View Estates/Calvada North service had an average of 80% of metered water use as residential and 20% of metered water use as commercial. Calvada Meadows average residential metered water use was 99%, while the average commercial metered water use was 1%. The average residential metered water use in Mountain View Estates was 98.5% and the commercial metered water use was 1.5%. In the Mountain Falls service area, average residential metered

water use was 20%, average commercial metered water use was 75.2% and average irrigation metered water use was 4.8%.

3.4.2.3 Non-Revenue Water

Non-revenue water ("NRW") is a term used to reflect the distributed volume of water which is not reflected in customer billings. More specifically, NRW is calculated as the total pumped water less metered consumption plus authorized consumption (firefighting, utility plant use, etc.), plus 2.5% for system leakage. NRW is made up of apparent losses (customer meter inaccuracies, data handling errors, unauthorized consumption, etc.) and real losses (system leakage, main breaks and storage tank overflows, etc.).

No water system is 100% tight. There is a point at which it doesn't make sense economically to try to reduce leakage. Recoverable leakage is the amount of leakage which can be economically avoided through real loss control measures which balances costs against the savings from reducing the level of leakage. The American Water Works Association ("AWWA") Water Audit Committee has not yet completed the new version of the Water Audit software which includes a recoverable leakage component; however, it is a generally accepted industry estimate that 75% of real losses can be economically recovered.

Table 3.09 shows the difference (water loss) between historical water production and known usage during the last three years in the GBWC-PD service area. This compares the production data summarized in Table 3.04 with the metered uses summarized in Table 3.07 and includes some authorized water use (water used that is not billed). For example, fire-fighting would be considered an authorized water use.

Table 3.09: GBWC-PD Historical Water Losses

Year	Average Water Produced (MGD)[1]	Average Water Metered and Authorized Water Use (MGD) [2]	Water Lost (MGD) [3]	Water Lost Percentage[4]
2014	2.850	2.406	0.444	15.6
2015	2.845	2.364	0.481	16.9
2016	3.274	2.828	0.447	13.7

Notes:

(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

The average NRW (real and apparent water losses) percent for the three years is 15.4%. Tables 3.09a through 3.09e provide a summary of non-revenue quantities in each service area for the last three years (2014 through 2016).

Table 3.09a: Calvada Valley Historical Water Losses

Year	Water Produced (MGD)[1]	Water Metered (MGD)[2]	Water Lost (MGD)[3]	Water Lost Percentage[4]
2014	1.967	1.556	0.411	20.9
2015	1.920	1.585	0.335	17.5
2016	2.070	1.605	0.465	22.5

Notes:
(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

Table 3.09b: Country View Estates/Calvada North Historical Water Losses

Year	Water Produced (MGD)[1]	Water Metered (MGD)[2]	Water Lost (MGD)[3]	Water Lost Percentage[4]
2014	0.135	0.116	0.019	14.3
2015	0.128	0.101	0.026	20.7
2016	0.131	0.109	0.021	16.3

Notes:
(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

Table 3.09c: Calvada Meadows Historical Water Losses

Year	Water Produced (MGD)[1]	Water Metered (MGD)[2]	Water Lost (MGD)[3]	Water Lost Percentage[4]
2014	0.0044	0.0026	0.0019	42.2
2015	0.0061	0.0033	0.0028	46.2
2016	0.0074	0.0041	0.0034	45.3

Notes:
(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

Table 3.09d: Mountain View Estates Historical Water Losses

Year	Water Produced (MGD)[1]	Water Metered (MGD) [2]	Water Lost (MGD) [3]	Water Lost Percentage[4]
2014	0.0057	0.0048	0.0010	16.7
2015	0.0043	0.0041	0.0002	5.2
2016	0.0033	0.0030	0.0003	7.8

Notes:
(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

Table 3.09e: Mountain Falls Historical Water Losses

Year	Water Produced (MGD)[1]	Water Metered (MGD) [2]	Water Lost (MGD) [3]	Water Lost Percentage[4]
2014	0.738	0.727	0.011	1.5
2015	0.787	0.753	0.034	4.3
2016	1.063	1.106	-0.043	-4.1

Notes:
(1) Years 2014, 2015, and 2016 are from GBWC-PD Report 29.
(2) Average water metered is total meter consumption from provided consumption data and includes authorized utility water use from Report 29.
(3) Water lost is the difference between water produced and water metered.
(4) Water percentage lost is the difference between water produced and water metered divided by the water produced.

The average percent water lost was 20.3% in Calvada Valley, 17.1% in Country View Estates/Calvada North, 44.6% in Calvada Meadows, 9.9% in Mountain View Estates, and 2.9% in Mountain Falls (excluding the negative percent in 2016).

The water lost is attributable to apparent losses (meter inaccuracies, unauthorized consumption, systematic data handling errors, etc.) and real losses (system leakage and tank overflows, etc.). The following measures are taken by GBWC-PD as an ongoing effort to limit water losses from the water production process to the water delivery point:

- Reservoirs are thoroughly inspected at regular intervals to assure integrity against leakage.
- All pipeline leaks are fixed as soon as possible with water losses estimated.
- Customer meters are reviewed and monitored for consumption anomalies.
- Asset Management programs should be continued to help identify and replace old infrastructure and portions of infrastructure susceptible to leaks.
- Well production meters are calibrated and tested annually for accuracy.

Based on the analysis per service area in Tables 3.09a through 3.09e, it is recommended that these practices be continued and that investigations are performed to determine the cause of high NRW, particularly for the Calvada Meadows, Calvada Valley, and Country View Estates/Calvada North service areas.

3.4.3 Water Usage Forecasting

The existing service area is largely platted but development proceeds haphazardly throughout the service area. This is largely due to the fact that there are few planned (and actually developed) subdivisions. In addition, infrastructure was haphazardly installed throughout the systems prior to GBWC-PD ownership. This is further complicated by water rights allocations morphing through demands of the current environment throughout time. Zoning and boundary lines change over time as well. These factors (among others) cause due diligence in the valley to be difficult for the average single-family home owner and even commercial enterprises. It also makes GBWC-PD's duty to support these developers often challenging and time consuming.

Rather, development will likely occur in a dispersed, random manner. Therefore, the future development is assumed to be spread out proportionally throughout the five service areas. This is illustrated in Section 3.4.1 and the projection service connections in Table 3.03. Table 3.10 summarizes the 5-year projections over the 20-year planning period.

Table 3.10: GBWC-PD Water Connection Projection Summary Per Service Area

Year[1]	Calvada Valley[2]	Calvada North/Country View Estates[2]	Calvada Meadows[2]	Mountain View Estates[2]	Mountain Falls[2][3]	Total
Historical						
2014	4,022	412	30	23	864	5,351
2015	3,999	392	34	28	943	5,396
2016	4,063	407	34	25	1,075	5,604
Projected						
2018	4,197	421	34	27	999	5,678
2023	4,243	425	34	27	1,010	5,739
2028	4,248	426	34	27	1,011	5,746
2033	4,227	424	34	27	1,006	5,718
2038	4,237	425	34	26	1,009	5,731

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data in each service area.

(2) Total residential GBWC-PD water connections for years 2018 forward are per Table 3.02 projections for 2018 forward. The average percentage of the total based on the historical 2014, 2015, and 2016 data for each service area was applied to the projected total connections for the year in order to estimate connections in each service area, with the exception of Mountain View Estates which is already built out. Calvada Valley average percent of total connections based on historical data was 74.3%, Country View Estates/Calvada North was 7.4%, Calvada Meadows was 0.6% and Mountain Falls was 17.7%.

(3) Due to this method of calculation described in Note 2 and Population Projections prepared by the State Demographer, Mountain Falls service area shows a decrease in water connections. However, GBWC-PD expects Mountain Falls connections to increase significantly as discussed in Section 3.3.1 "Future Development".

The historical daily residential water demands for GBWC-PD are summarized in Table 3.11, which is based on the active number of connections (active for 10 or more months of the year) for each service area and the total flows for the active connections. Tables 3.11a through 3.11e provide the historical daily water demands in each service area.

Table 3.11: GBWC-PD Historical Daily Residential Water Demands in MGD

Year	Annual Metered Water Use[1] (Gallons)	Number of Active Connections[2]	Average GPD/Connection
2014	371,595,441	3,645	279
2015	366,913,536	3,779	266
2016	379,575,701	3,835	271

Notes:

(4) Total metered water use for all connections that had 10 months or more of observed metered water.

(5) Total number of connections with 10 months or more of observed metered water.

Table 3.11a: Calvada Valley Historical Daily Residential Water Demands in GPD

Year	Annual Metered Water Use[1] (Gallons)	Number of Active Connections[2]	Average GPD/Connection
2014	289,001,820	2,696	294
2015	285,043,206	2,781	281
2016	291,272,234	2,802	285

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.11b: Country View Estates/Calvada North Historical Daily Residential Water Demands in GPD

Year	Annual Metered Water Use[1] (Gallons)	Number of Active Connections[2]	Average GPD/Connection
2014	29,318,331	306	262
2015	28,650,600	318	247
2016	30,186,180	319	259

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.11c: Calvada Meadows Historical Daily Residential Water Demands in GPD

Year	Annual Metered Water Use[1] (Gallons)	Number of Active Connections[2]	Average GPD/Connection
2014	606,340	18	92
2015	840,040	24	96
2016	1,097,140	24	125

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.11d: Mountain View Estates Historical Daily Residential Water Demands in GPD

Year	Annual Metered Water Use[1] (Gallons)	Number of Active Connections[2]	Average GPD/Connection
2014	1,445,520	16	248
2015	1,083,590	18	165
2016	609,760	16	104

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.11e: Mountain Falls Historical Daily Residential Water Demands in GPD

Year	Annual Metered Water Use[(1)] (Gallons)	Number of Active Connections[(2)]	Average GPD/Connection
2014	51,223,430	609	230
2015	51,296,100	638	220
2016	56,410,387	674	229

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Within the whole GBWC-PD service territory, the average residential gallons per day per connection ("gpdpc") is 272 gpdpc. Calvada Valley has an average residential water usage of 287 gpdpc, Country View Estates/Calvada North has an average water usage of 256 gpdpc, Calvada Meadows has an average water usage of 104 gpdpc, Mountain View Estates has an average water usage of 172 gpdpc, and Mountain Falls has an average water usage of 226 gpdpc.

Tables 3.12, 3.13 and 3.14 summarize the average daily demand per connection for commercial connections, irrigation and public authority connections.

Table 3.12: GBWC-PD Historical Daily Commercial Water Demands in GPD

Year	Metered Water Use (Gallons)	Average Number of Connections	Average GPD/Connection
2014	385,083,612	276	3,823
2015	396,202,267	266	4,081
2016	538,472,156	269	5,484

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.13: GBWC-PD Historical Daily Irrigation Water Demands in GPD

Year	Metered Water Use (Gallons)	Average Number of Connections	Average GPD/Connection
2014	28,189,890	43	1,796
2015	31,192,340	47	1,818
2016	26,255,210	41	1,754

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

Table 3.14: GBWC-PD Historical Daily Public Authority Water Demands in GPD.

Year	Metered Water Use (Gallons)	Average Number of Connections	Average GPD/Connection
2014	18,433,840	8	6,313
2015	15,765,210	8	5,399
2016	14,838,530	7	5,808

Notes:
(1) Total metered water use for all connections that had 10 months or more of observed metered water.
(2) Total number of connections with 10 months or more of observed metered water.

The average gpdpc for commercial connections is 4,461 gpdpc, 1,789 gpdpc for irrigation connections, and 5,840 gpdpc for public authority connections, where all public authority connections are in Calvada Valley.

Table 3.15 provides both average day and maximum day projected future water demand for the GBWC-PD Service Territory and for each service area. The actual demands for base year 2016 were used as the beginning points for both average day demands ("ADD") and maximum day demands ("MDD"), and the same growth rates from the Nevada Demographer's population projections were integrated into the forecast. The Peaking Factors (MDD/ADD) calculated for each of the service areas were used in the projected future forecast. These factors were derived from actual consumption figures and ADD in the maximum months. Refer to Tables 3.05 (3.05a through e) and 3.06 (3.06a through e) for the average historical Maximum Daily Consumption and Peaking Factors used.

The projected future water demands do not account for system-wide losses, or continued savings associated with Water Conservation Plan. Future water system demands should be reduced as the system NRW is reduced.

Table 3.15: GBWC-PD Projected Peak Water Demand in MGD

	GBWC-PD Total Required Water Production (MDD=ADD*1.91)		Total ADD Production Required (AFA)	Calvada Valley (MDD=ADD*1.68)		Country View Estates/Calvada North (MDD=ADD*1.70)		Calvada Meadows (MDD=ADD*1.86)		Mountain View Estates (MDD=ADD*1.88)		Mountain Falls (MDD=ADD*2.50)		% Change
Year	ADD	MDD		ADD	MDD	ADD	MDD	ADD	MDD	ADD	MDD	ADD	MDD	
2014	2.850	5.46	3192	1.97	3.28	0.14	0.24	0.004	0.008	0.006	0.01	0.738	1.93	
2015	2.845	5.49	3187	1.92	3.25	0.13	0.21	0.006	0.013	0.004	0.008	0.787	2.01	
2016	3.274	6.18	3667	2.07	3.45	0.13	0.22	0.007	0.011	0.003	0.006	1.063	2.49	
2017	3.297	6.30	3693	2.08	3.50	0.13	0.22	0.007	0.013	0.003	0.006	1.070	2.68	0.7
2018	3.317	6.33	3715	2.10	3.52	0.13	0.22	0.007	0.013	0.003	0.006	1.077	2.69	0.6
2019	3.329	6.36	3729	2.10	3.54	0.13	0.22	0.007	0.013	0.003	0.006	1.081	2.70	0.36
2020	3.339	6.38	3740	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.084	2.71	0.3
2021	3.346	6.39	3748	2.12	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.086	2.72	0.21
2022	3.350	6.40	3752	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.088	2.72	0.13
2023	3.353	6.40	3755	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.089	2.72	0.08
2024	3.354	6.41	3757	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.089	2.72	0.05
2025	3.356	6.41	3760	2.12	3.57	0.13	0.23	0.007	0.013	0.003	0.006	1.090	2.72	0.06
2026	3.358	6.41	3761	2.12	3.57	0.13	0.23	0.007	0.013	0.003	0.006	1.090	2.73	0.04
2027	3.358	6.41	3761	2.12	3.57	0.13	0.23	0.007	0.013	0.003	0.006	1.090	2.73	0.01
2028	3.357	6.41	3760	2.12	3.57	0.13	0.23	0.007	0.013	0.003	0.006	1.090	2.72	-0.04
2029	3.354	6.41	3757	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.089	2.72	-0.09
2030	3.350	6.40	3752	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.088	2.72	-0.12
2031	3.346	6.39	3748	2.12	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.086	2.72	-0.12
2032	3.342	6.38	3744	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.085	2.71	-0.1
2033	3.340	6.38	3742	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.085	2.71	-0.06
2034	3.340	6.38	3741	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.084	2.71	-0.02
2035	3.340	6.38	3741	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.084	2.71	0
2036	3.341	6.38	3742	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.085	2.71	0.03
2037	3.344	6.39	3746	2.11	3.55	0.13	0.23	0.007	0.013	0.003	0.006	1.086	2.71	0.1
2038	3.347	6.39	3749	2.12	3.56	0.13	0.23	0.007	0.013	0.003	0.006	1.087	2.72	0.1

Table 3.16 shows the existing well capacity available for each of the service areas based on current well production. When comparing Table 3.16 (current well production for each service area) to Table 3.15 (existing and future projected demands for each service area), the well production in all service areas meet the ADD and MDD and will meet the 20-year projected demand.

Table 3.16: GBWC-PD Existing Well Capacity

Calvada Valley		Country View Estates/Calvada North		Calvada Meadows		Mountain View Estates		Mountain Falls		GBWC-PD Total (gpm)
Well	Capacity (gpm)	Well	Capacity (gpm)	Well	Capacity (gpm)	Well	Capacity (gpm)	Well	Capacity (gpm)	
1	850	48-1	190	1	250	1	50	1	1,250	8,444
2	1,050	48-2	300					2	1,250	
9	1,000	CN 1	250							
11	1,300									
12	704									
Total	**4,904**		**740**		**250**		**50**		**2,500**	

The projected future water demands do not account for system-wide losses, or continued savings associated with the Water Conservation Plan. Future water system demands should be reduced even further as the system NRW is reduced. Since the NRW system losses averaged 20.3% in Calvada Valley, 17.1% in Country View Estates/Calvada North, 44.6% in Calvada Meadows, 9.9% in Mountain View Estates, and 2.9% in Mountain Falls over the past three years, GBWC-PD's water production must be able to accommodate for real losses in order to ensure the system averages are met. The amount of realized NRW is a product of the amount of water delivered. In order to calculate the total amount of water that needs to be delivered, an adjustment to recognize NRW is needed per standard engineering evaluation. This "gross-up" adjustment is intended to provide the total amount of production water required to be delivered in order to compensate for both consumption and NRW. The well production required was inflated by a factor of 20.3% in Calvada Valley, 17.1% in Country View Estates/Calvada North, 44.6% in Calvada Meadows, 9.9% in Mountain View Estates, and 2.9% in Mountain Falls.

Both the existing and future water demand (averages) were provided/projected based on the calculated water demand factors for residential, commercial, irrigation, and public authority service class for each pressure zone. Tables 3.17A identified existing demands as provided by meter data. Table 3.17B identified the grossed-up well production required to provide anticipated service and accommodated for NRW losses.

Tables 3.18A and 3.18B, future demands for 2038, also include the minimum well production required in order to accommodate for these unaccounted-for losses. Note that by using this same demand-average throughout the system and projected into the future, water demand in Tables 3.18A and 3.18B for the service areas are higher than shown in the projected future water production shown in Table 3.15, in order to accommodate for system losses. The projected future water demand and production well capacity required in Tables 3.18A and 3.18B, demonstrates that there will be sufficient production well capacity in all service areas except for Mountain Falls. In the Mountain Falls service area, the projected maximum daily demand ("MDD") exceeds the total production well capacity by approximately 1,500 gpm. While the average daily demands for the commercial customer class is a significantly high number, even without projecting future increases in customer connections results in exceedance of the peak hourly demand. The Mountain Falls existing peak hourly demand is already exceeding the peak hourly demand as shown in Table 3.17B.

Table 3.17A: Existing Demand

GBWC-PD - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total GBWC-PD Average Demands per Day (GPD)	Average Daily Demand Total GBWC-PD (GPM)
Residential	3,835	271	1,039,285	722
Commercial	269	5,484	1,475,196	1,024
Irrigation	41	1,754	71,914	50
Public Authority	7	5,808	40,656	28
TOTALS	4,152	13,317	2,627,051	1,824

Calvada Valley - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	2,802	285	798,570	555
Commercial	247	2,284	564,086	392
Irrigation	33	1,065	35,131	24
Public Authority	7	5,808	40,656	28
TOTALS	3,089	9,441	1,438,444	999

Country View Estates/Calvada North - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	319	259	82,621	57
Commercial	3	6,852	20,556	14
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	322	7,111	103,177	72

Calvada Meadows - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	24	125	3,000	2.08
Commercial	0	0	0	0
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	24	125	3,000	2.08

Mountain View Estates - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	16	104	1,664	1.16
Commercial	1	67	67	0.05
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	17	171	1,731	1.20

Mountain Falls - Existing Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	674	229	154,346	107
Commercial	18	49,475	890,550	618.44
Irrigation	8	4,600	36,800	25.56
Public Authority	0	0	0	0
TOTALS	700	54,304	1,081,696	751

Table 3.17B: Well Production Required

GBWC-PD - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 15.4% system losses)	System MDD Required (GPM) (ADD x 1.91)	System PHD Required (GPM) (MDD x 1.75)
Residential	833	1,591	2,784
Commercial	1,182	2,258	3,952
Irrigation	58	110	193
Public Authority	33	62	109
TOTALS	2,105	4,021	7,037

Calvada Valley - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 20.3% system losses)	System MDD Required (GPM) (ADD x 1.68)	System PHD Required (GPM) (MDD x 1.75)
Residential	667	1,121	1,961
Commercial	471	792	1,385
Irrigation	29	49	86
Public Authority	34	57	100
TOTALS	1,202	2,019	3,533

Country View Estates/Calvada North - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 17.1% system losses)	System MDD Required (GPM) (ADD x 1.70)	System PHD Required (GPM) (MDD x 1.75)
Residential	67	114	200
Commercial	17	28	50
Irrigation	0	0	0
Public Authority	0	0	0
TOTALS	84	143	250

Calvada Meadows - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 44.6% system losses)	System MDD Required (GPM) (ADD x 1.86)	System PHD Required (GPM) (MDD x 1.75)
Residential	3.01	5.60	9.81
Commercial	0	0	0
Irrigation	0	0	0
Public Authority	0	0	0
TOTALS	3.01	5.60	9.81

Mountain View Estates - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 9.9% system losses)	System MDD Required (GPM) (ADD x 1.88)	System PHD Required (GPM) (MDD x 1.75)
Residential	1.27	2.39	4.18
Commercial	0	0	0
Irrigation	0	0	0
Public Authority	0	0	0
TOTALS	1.32	2.48	4.35

Mountain Falls - Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

Customer Class	ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 2.9% system losses)	System MDD Required (GPM) (ADD x 2.50)	System PHD Required (GPM) (MDD x 1.75)
Residential	110	276	483
Commercial	636	1,591	2,784
Irrigation	26	66	115
Public Authority	0	0	0
TOTALS	773	1,932	3,382

Table 3.18A: Future Water Demand (2038). Table 3.18B: Future Well Production Req. (2038)

GBWC-PD - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total GBWC-PD Average Demands per Day (GPD)	Average Daily Demand Total GBWC-PD (GPM)
Residential	5,731	271	1,553,101	1,079
Commercial	340	5,484	1,864,560	1,295
Irrigation	41	1,754	71,914	50
Public Authority	7	5,808	40,656	28
TOTALS	6,119	13,317	3,530,231	2,452

GBWC-PD - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 15.4% system losses)	System MDD Required (GPM) (ADD x 1.91)	System PHD Required (GPM) (MDD x 1.75)
1,245	2,377	4,160
1,494	2,854	4,994
58	110	193
33	62	109
2,829	5,404	9,456

Calvada Valley - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	4,237	285	1,207,545	839
Commercial	274	2,059	564,086	392
Irrigation	33	1,065	35,131	24
Public Authority	7	5,808	40,656	28
TOTALS	4,551	9,216	1,847,419	1,283

Calvada Valley - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 20.3% system losses)	System MDD Required (GPM) (ADD x 1.68)	System PHD Required (GPM) (MDD x 1.75)
1,009	1,695	2,966
471	792	1,385
29	49	86
34	57	100
1,543	2,593	4,537

Country View Estates/Calvada North - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	425	259	110,075	76
Commercial	25	6,852	171,451	119
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	450	7,111	281,526	196

Country View Estates - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 17.1% system losses)	System MDD Required (GPM) (ADD x 1.70)	System PHD Required (GPM) (MDD x 1.75)
90	152	266
139	237	415
0	0	0
0	0	0
229	389	681

Calvada Meadows - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	34	125	4,250	2.95
Commercial	0	0	0	0
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	34	125	4,250	2.95

Calvada Meadows - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 44.6% system losses)	System MDD Required (GPM) (ADD x 1.86)	System PHD Required (GPM) (MDD x 1.75)
4.27	7.94	13.89
0	0	0
0	0	0
0	0	0
4.27	7.94	13.89

Mountain View Estates - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	26	104	2,704	1.88
Commercial	1	67	67	0.05
Irrigation	0	0	0	0
Public Authority	0	0	0	0
TOTALS	27	171	2,771	1.92

Mountain View Estates - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 9.9% system losses)	System MDD Required (GPM) (ADD x 1.88)	System PHD Required (GPM) (MDD x 1.75)
2.06	3.88	6.79
0	0	0
0	0	0
0	0	0
2.11	3.98	6.96

Mountain Falls - Projected Future Demands

Customer Class	Total No. of Customers	Average Daily Demands (gpdpc)	Total Average Demands per Day (GPD)	Average Daily Demand (GPM)
Residential	1,009	229	231,061	160
Commercial	40	49,475	1,980,088	1,375.06
Irrigation	8	4,600	36,800	25.56
Public Authority	0	0	0	0
TOTALS	1,057	54,304	2,247,949	1,561

Mountain Falls - Future Well Production Required (to Accommodate for demands and anticipated System-Wide Losses

ADD Required (GPM) including Unaccounted for Losses (grossed up to accommodate for 2.9% system losses)	System MDD Required (GPM) (ADD x 2.50)	System PHD Required (GPM) (MDD x 1.75)
165	413	722
1,415	3,537	6,190
26	66	115
0	0	0
1,606	4,016	7,028

3.4.4 Wastewater Usage

While currently, there are five of the GBWC-PD water systems, only three of them have centralized sewer service. Sewer service exists in the Calvada Valley area, the Calvada North area, and the Mountain Falls area. In addition, only a portion of the Calvada North area has sewer service available. The Country View Estates portion of the service area is currently water service only. This was taken into account in the projection of the sewer service connections.

Currently, approximately 68% of the water customers have sewer service. The determination that 68% of water customers is based on the comparison of actual water and wastewater connections to water service only connections for the partial 2017 data provided. For the purposes of the projection, approximately 68% of future water connections are estimated to also have sewer connections. This brings the total connections up by 41 connections, from 4,277 sewer connections in 2018 to 4,318 sewer connections in 2038.

Table 3.19: GBWC-PD Wastewater Connection Projections

Year[1]	Plant 3 - Calvada Valley[2]	Plant F - Calvada North[2]	Plant MF - Mountain Falls[2][3]	Total[4]
2014	2,981	157	866	4,004
2015	2,964	156	943	4,063
2016	3,018	159	1,076	4,253
2017	3,094	163	994	4,252
2018	3,113	164	1,000	4,277
2019	3,124	165	1,004	4,293
2020	3,134	165	1,007	4,306
2021	3,140	165	1,009	4,315
2022	3,144	166	1,010	4,320
2023	3,147	166	1,011	4,324
2024	3,149	166	1,012	4,326
2025	3,150	166	1,012	4,328
2026	3,151	166	1,013	4,330
2027	3,152	166	1,013	4,331
2028	3,151	166	1,012	4,329
2029	3,148	166	1,012	4,326
2030	3,144	166	1,010	4,320
2031	3,140	165	1,009	4,315
2032	3,137	165	1,008	4,311
2033	3,135	165	1,007	4,308
2034	3,134	165	1,007	4,307
2035	3,134	165	1,007	4,307
2036	3,136	165	1,008	4,309
2037	3,139	165	1,009	4,313
2038	3,143	166	1,010	4,318

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data in each service area. Data provided for 2014 broke out wastewater connections for each of the three service

areas. Data provided for 2015 and 2016 broke out the connections for Mountain Falls, but grouped together connections in Calvada Valley and Calvada North, so 2015 and 2016 data is based on the 2014 more accurate ratio of Calvada Valley and Calvada North to the total of both applied to the 2015 and 2016 sum of the Calvada Valley and Calvada North connections.

(2) Total residential GBWC-PD water connections for years 2018 forward are based on the average 2014, 2015, and 2016 ratio of wastewater connections to total water and wastewater connections in Calvada Valley (74% of water connections have sewer service), Calvada North (39% of water connections have sewer service) and Mountain Falls (101% of water connections have sewer service). The average percentage based on the historical 2014, 2015 and 2016 data for each service area was applied to the applicable service area projected total water connections for the year listed in Table 3.03 in order to estimate connections in each wastewater service area.

(3) Due to this method of calculation described in Note 2 and Population Projections prepared by the State Demographer, Mountain Falls service area shows a decrease in wastewater connections. However, GBWC-PD expects Mountain Falls wastewater connections to increase significantly as discussed in Section 3.3.1 "Future Development".

(4) The total wastewater connections are the sum of the wastewater connections in Calvada Valley, Calvada North and Mountain Falls wastewater service areas.

3.4.4.1 Recorded Wastewater Flows and Disposal

GBWC-PD has three wastewater treatment facilities, Plant F in the Calvada North service area, Plant 3 in the Calvada Valley service area, and Mountain Falls in the Mountain Falls service area. Table 3.20 shows recorded flows in the wastewater service areas. The total GBWC-PD average wastewater daily flow between the three wastewater treatment facilities was 0.671 MGD in 2014, 0.692 MGD in 2015 and 0.723 in 2016.

Plant 3 has a rated capacity of 1.5 MGD and currently treats around 638,000 gallons per day (0.638 MGD). Plant F has a rated capacity of 50,000 gpd and currently treats approximately 21,000 gpd. Mountain Falls has a rated capacity of 750,000 gpd and is only treating about 63,000 gpd. The overall rated capacity of 2.3 MGD is only utilized up to approximately 660,000 gpd.

Table 3.20: GBWC-PD Recorded Wastewater Flows

Treatment Facility	Average Daily Flow, ADF (MGD)			Average Flow Maximum Month, AFMM (MGD)		
	Plant 3 - Calvada Valley (1.5 MGD)	Plant F - Calvada North (0.05 MGD)	Plant MF - Mountain Falls (0.75 MGD)	Plant 3 - Calvada Valley	Plant F - Calvada North	Plant MF - Mountain Falls
Year						
2006	0.610	0.009	Not Constructed	0.673	0.012	Not Constructed
2007	0.563	0.014	Not Constructed	0.627	0.018	Not Constructed
2008	0.579	0.015	0.053	0.622	0.021	0.061
2009	0.579	0.017	0.060	0.618	0.021	0.109
2010	0.559	0.020	0.055	0.616	0.027	0.077
2011	0.601	0.022	0.060	0.615	0.026	0.080
2012	0.582	0.005	0.070	0.608	0.024	0.093
2013	0.567	0.022	0.069	0.584	0.023	0.089
2014	0.581	0.022	0.068	0.607	0.023	0.089
2015	0.607	0.023	0.062	0.656	0.028	0.063
2016	0.638	0.021	0.063	0.653	0.024	0.078
3 Year Average (2014-2016)	0.609	0.022	0.064	0.638	0.025	0.077

When the 30-day average daily influent flow rate equals or exceeds 85% of design treatment capacity, GBWC must prepare a letter that describes how the utility will increase the capacity of the treatment plant and to provide a schedule for construction that will ensure that the improvements are made before the existing plant reaches design capacity. The three existing facilities are sufficiently below their rated capacity that none of the capacities are anticipated to reach 85% of design capacity within the 20-year planning period.

Tables 3.21a through 3.21c show the projected wastewater flow at the three wastewater facilities. This projection is based on the growth projections established by the State Demographer's office and as summarized in Table 3.19. Specifically, the wastewater connection growth rate cannot exceed the water connection growth rate.

Table 3.21a provides projected wastewater connections and flows through 2038 for Plant 3. The projected connections were estimated using the same methodology as used in Section 3.3.1 - Water System Connection Projections using the Nevada State Demographer's Office growth rates. For Calvada Valley Plant 3, an average daily flow ("ADF") per connection of 204 gpdpc and an average daily maximum month per average daily flow ("ADMM/ADF") peaking factor of 1.05 were used to estimate projected flows based on 2014-2016 wastewater flow data (see Section 2.4).

The Calvada Valley Plant 3 anticipated maximum month flow of 0.672 MGD (672,000 GPD) in 2038 equates to 45% of the treatment system design capacity. The anticipated flows will likely not be close to exceeding the design flow of 1.5 MGD within the planning period or exceed 85% of the design capacity, which is approximately 1.28 MGD.

Table 3.21a: Calvada Valley Plant 3 Wastewater Flow Projections

Year[1]	Connections	% Change in Connections	Projected WWTP Flow ADF (MGD)[2]	Projected WWTP Flow ADMM (MGD)[3]
2014	2,981	-	0.581	0.607
2015	2,964	-	0.607	0.656
2016	3,018	-	0.638	0.653
2017	3,094	2.52	0.630	0.662
2018	3,113	0.61	0.634	0.666
2019	3,124	0.35	0.636	0.668
2020	3,134	0.32	0.638	0.670
2021	3,140	0.19	0.640	0.671
2022	3,144	0.13	0.640	0.672
2023	3,147	0.10	0.641	0.673
2024	3,149	0.06	0.641	0.673
2025	3,150	0.03	0.642	0.674
2026	3,151	0.03	0.642	0.674
2027	3,152	0.03	0.642	0.674
2028	3,151	-0.03	0.642	0.674
2029	3,148	-0.10	0.641	0.673
2030	3,144	-0.13	0.640	0.672
2031	3,140	-0.13	0.640	0.671
2032	3,137	-0.10	0.639	0.671
2033	3,135	-0.06	0.639	0.670
2034	3,134	-0.03	0.638	0.670
2035	3,134	0.00	0.638	0.670
2036	3,136	0.06	0.639	0.671
2037	3,139	0.10	0.639	0.671
2038	3,143	0.13	0.640	0.672

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data. Data provided for 2014 broke out wastewater connections for each of the three service areas. Data provided for 2015 and 2016 broke out the connections for Mountain Falls, but grouped together connections in Calvada Valley and Calvada North, so 2015 and 2016 data is based on the 2014 more accurate ratio of Calvada Valley and Calvada North to the total of both applied to the 2015 and 2016 sum of the Calvada Valley and Calvada North connections.

(2) Projected wastewater flow is based on multiplying the number of connections by the average historical (2014, 2015, and 2016) average daily flow (ADF) gallons per day per connection (gpdpc) determined from Tables 3.19 and 3.20. The ADF for Plant 3 is 204 gpdpc.

(3) The projected average daily maximum month (ADMM) flows were determined by multiplying the average daily flow (ADF) by the average historical (2014, 2015 and 2016) peaking factor (ADMM/ADF). The average Plant 3 peaking factor is 1.05.

Table 3.21b provides projected wastewater connections and flows through 2038 for Plant F. The projected connections were estimated using the same methodology as used in Section 3.3.1 - Water System Connection Projections using the Nevada State Demographer's Office growth rates. An ADF per connection of 140 gpdpc and an ADMM/ADF peaking factor of 1.14 were used to estimate projected flows based on 2014-2016 wastewater flow data (see Section 2.4).

The Calvada North Plant F anticipated maximum month flow of 0.026 MGD (26,000 GPD) in 2038 equates to 52% of the treatment system design capacity. The anticipated flows will likely not be close to exceeding the design flow of 0.05 MGD (50,000 GPD) within the planning period or exceed 85% of the design capacity, which is approximately 0.425 MGD (42,500 GPD).

Table 3.21b: Calvada North Plant F Wastewater Flow Projections

Year[1]	Connections	% Change in Connections	Projected WWTP Flow ADF (MGD)[2]	Projected WWTP Flow ADMM (MGD)[3]
2014	157	-	0.022	0.023
2015	156	-	0.023	0.028
2016	159	-	0.021	0.024
2017	163	2.52	0.023	0.026
2018	164	0.61	0.023	0.026
2019	165	0.61	0.023	0.026
2020	165	0.00	0.023	0.026
2021	165	0.00	0.023	0.026
2022	166	0.61	0.023	0.026
2023	166	0.00	0.023	0.026
2024	166	0.00	0.023	0.026
2025	166	0.00	0.023	0.026
2026	166	0.00	0.023	0.026
2027	166	0.00	0.023	0.026
2028	166	0.00	0.023	0.026
2029	166	0.00	0.023	0.026
2030	166	0.00	0.023	0.026
2031	165	-0.60	0.023	0.026
2032	165	0.00	0.023	0.026
2033	165	0.00	0.023	0.026
2034	165	0.00	0.023	0.026
2035	165	0.00	0.023	0.026
2036	165	0.00	0.023	0.026
2037	165	0.00	0.023	0.026
2038	166	0.61	0.023	0.026

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data. Data provided for 2014 broke out wastewater connections for each of the three service areas. Data provided for 2015 and 2016 broke out the connections for Mountain Falls, but grouped together connections in Calvada Valley and Country View Estates/Calvada North, so 2015 and 2016 data is based on the 2014 more accurate ratio of Calvada Valley and Country View Estates/Calvada North to the total of both applied to the 2015 and 2016 sum of the Calvada Valley and Calvada North connections.

(2) Projected wastewater flow is based on multiplying the number of connections by the average historical (2014, 2015, and 2016) average daily flow (ADF) gallons per day per connection (gpdpc) determined from Tables 3.19 and 3.20. The ADF for Plant F is 140 gpdpc.

(3) The projected average daily maximum month (ADMM) flows were determined by multiplying the average daily flow (ADF) by the average historical (2014, 2015, and 2016) peaking factor (ADMM/ADF). The average Plant F peaking factor is 1.14.

Table 3.21c provides projected wastewater connections and flows through 2038 for Plant Mountain Falls. The projected connections were estimated using the same methodology as used in Section 3.3.1 - Water System Connection Projections using the Nevada State Demographer's

Office growth rates. An ADF per connection of 68 gpdpc and an ADMM/ADF peaking factor of 1.19 were used to estimate projected flows based on 2014-2016 wastewater flow data (see Section 2.4).

The Mountain Falls Plant MF anticipated maximum month flow of 0.068 MGD (68,000 GPD) in 2038 equates to 9.7% of the treatment system design capacity. The anticipated flows will likely not be close to exceeding the design flow of 0.75 MGD (750,000 GPD) within the planning period or exceed 85% of the design capacity, which is approximately 0.638 MGD (638,000 GPD).

Table 3.21c: Mountain Falls Plant MF Wastewater Flow Projections

Year[1]	Connections[2]	% Change in Connections	Projected WWTP Flow ADF (MGD)[3]	Projected WWTP Flow ADMM (MGD)[4]
2014	866	-	0.068	0.089
2015	943	-	0.062	0.063
2016	1,076	-	0.063	0.078
2017	994	-7.62	0.067	0.080
2018	1,000	0.60	0.068	0.080
2019	1,004	0.40	0.068	0.081
2020	1,007	0.30	0.068	0.081
2021	1,009	0.20	0.068	0.081
2022	1,010	0.10	0.068	0.081
2023	1,011	0.10	0.068	0.081
2024	1,012	0.10	0.068	0.081
2025	1,012	0.00	0.068	0.081
2026	1,013	0.10	0.068	0.081
2027	1,013	0.00	0.068	0.081
2028	1,012	-0.10	0.068	0.081
2029	1,012	0.00	0.068	0.081
2030	1,010	-0.20	0.068	0.081
2031	1,009	-0.10	0.068	0.081
2032	1,008	-0.10	0.068	0.081
2033	1,007	-0.10	0.068	0.081
2034	1,007	0.00	0.068	0.081
2035	1,007	0.00	0.068	0.081
2036	1,008	0.10	0.068	0.081
2037	1,009	0.10	0.068	0.081
2038	1,010	0.10	0.068	0.081

Notes:

(1) 2014, 2015, and 2016 is provided based on historical total meter count data. Data provided for 2014 broke out wastewater connections for each of the three service areas. Data provided for 2015 and 2016 broke out the connections for Mountain Falls, but grouped together connections in Calvada Valley and Calvada North, so 2015 and 2016 data is based on the 2014 more accurate ratio of Calvada Valley and Calvada North to the total of both applied to the 2015 and 2016 sum of the Calvada Valley and Calvada North connections.

(2) Due to this method of calculation described in Note 2 of Table 3.19 and Population Projections prepared by the State Demographer, Mountain Falls service area shows a decrease in water connections. However, GBWC-PD expects Mountain Falls connections to increase significantly as discussed in Section 3.3.1 "Future Development". *See* Note 3 in Table 3.19.

(3) Projected wastewater flow is based on multiplying the number of connections by the average historical (2014, 2015, and 2016) average daily flow (ADF) gallons per day per connection (gpdpc) determined from Tables 3.19 and 3.20. The ADF for Plant MF is 68 gpdpc.

(4) The projected average daily maximum month (ADMM) flows were determined by multiplying the average daily flow (ADF) by the average historical (2014, 2015, and 2016) peaking factor (ADMM/ADF). The average Plant MF peaking factor is 1.19.

3.4.4.2 Reclaimed Water Sold or Used

Plant F does not produce reclaimed water; all of its effluent is disposed of through on-site spray irrigation. Plant 3 disposes of its reclaimed water to a holding pond at the Willow Creek Golf Course. The reclaimed water is pumped from the receiving pond to spray irrigation at Willow Creek and, also, to another receiving pond at the Lakeview Golf Course approximately a mile away. Mountain Falls disposes of its reclaimed water to the Mountain Falls Golf Course.

SECTION 4.0: Water Supply and Wastewater Treatment Needs

4.1 Water Supply

The water supply was evaluated based on the GBWC-PD well and storage tank capacity versus the projected water demands. This provides a timeline for the existing capacity of the wells and allows for a projection to determine when new wells will need to be developed. Projected water demands are presented in Table 3.18A. The water supply plan is based on the production and storage facilities defined previously in Section 2.0 of this report.

4.1.1 Water Rights

The water in Nevada on the surface and underground belongs to the people of the State. Entities within the State can apply for the right to use that water. Nevada Water Law is founded on the doctrine of prior appropriation - "first in time, first in right." Under the appropriation doctrine, the first user of water from a water source acquired a priority right to the use and to the extent of its use.

The GBWC-PD owns over 182 water right permits/certificates in the Basin 162 Hydrographic Groundwater Basin with a total combined duty of approximately 28,546.99 AFA. What this means is that GBWC-PD has the right to pump up to 28,546.99 AFA from its potable supply wells in support of customer demand. All the water rights are in good standing with the State Engineers Office. Appendix B contains a hydrographic summary of the water right manner of uses for Basin 162.

4.1.2 Water Supply Evaluation

Each system was evaluated for the available well capacity as compared to the current and projected system demands. As the five existing water systems in GBWC-PD are currently not interconnected, they were all evaluated separately. The criteria for evaluating adequate supply capacity is based on NAC 445A.6672, which requires a system that relies exclusively on wells to provide a total well capacity sufficient to meet the MDD when all the wells are operational, or the ADD with the most productive well out of service. This provides a higher level of reliability should a well be undergoing a major rehabilitation or have a failure for any reason.

This analysis does not consider the useful life of the wells; and, should they require replacement within the planning period, the replacement well(s) should meet or exceed the capacity of the wells which are being replaced. According to the Asset Registry in Appendix A, many of the wells in the GBWC-PD service areas are over 40 years old. Since the existing condition of several wells is not known, GBWC-PD should consider a well rehabilitation and assessment program which evaluates the integrity of each well through camera inspection and provides a road map for well cleaning and/or replacement.

4.1.2.1 Calvada Valley Water Supply

The water system has five active potable wells with a total pumping capacity of 4,904 gallons per minute (gpm). The largest well is Well 11 with a capacity of 1,300 gpm. Therefore, the total well capacity with Well 11 out of service is 3,604 gallons per minute.

In order to accommodate for the 20.3% system NRW, the water supply demand was grossed up by the 20.3%, a standard engineering practice, which results in a total ADD of 1,202 gpm for existing conditions and an anticipated 1,543 gpm by 2038. Refer to Tables 3.17B and 3.18B for the well production requirement figures. MDD is 1.68 times the ADD for the water system and is 2,019 gpm for existing and an anticipated 2,593 gpm by 2038. As Table 4.01 shows, the water system can meet existing and future (2038) demands. The existing well capacity with the largest well out of service also exceeds the peak daily demands.

However, since the condition of several of these Calvada Valley wells is unknown, capacity could be diminished should a well go out of service indefinitely. For this reason, it is recommended that GBWC-PD perform a well assessment of the wells in this service area to determine their integrity and useful life.

Table 4.01: Calvada Valley Well Capacity

Well	Capacity[1] (gpm)	Adjusted Capacity (gpm)	Year	Projected Average Daily Demand, ADD (gpm)[2]	Projected Peak Daily Demand, MDD (gpm)[3]
1	850	850			
2	1,050	1,050			
9	1,000	1,000	2018	1,202	2,019
11	1,300	OFF	2038	1,543	2,593
12[4]	704	704			
Total	**4,904**	**3,604**			

Notes:
(1) Capacities are based on the most recent review conducted in 2017 by Valentine staff
(2) Well supply figures were grossed up to accommodate for NRW losses.
(3) Total well supply must be able to accommodate MDD.
(4) Drilled Well 12 replaced Well 8 in early 2017.

4.1.2.2 Country View Estates/Calvada North (CVE/CN) Water Supply

CVE/CN has three active wells with a total pumping capacity of 740 gpm. Well CVE 48-2 is the largest well, so the capacity with the largest well out of service is 440 gpm.

In order to accommodate for the 17.1% NRW, the water supply demand was grossed up by the 17.1%, a standard engineering practice, which results in a total ADD of 84 gpm for existing conditions and an anticipated 229 gpm by 2038. Refer to Tables 3.17B and 3.18B for the well

production requirement figures. MDD is 1.70 times the ADD for the water system and is 143 gpm for existing and an anticipated 389 gpm by 2038. As Table 4.2 shows, the Country View Estates/Calvada North water system can meet existing and future (2038) demands. The existing well capacity with the largest well out of service also exceeds the peak daily demands.

However, since the condition of the wells are unknown, capacity could be diminished should a well go out of service indefinitely. For this reason, it is recommended that GBWC-PD perform a well assessment of the wells in this service area to determine their integrity and useful life. It should be noted that the wells are not adequate for fire flow supply of 1,500 gpm.

Table 4.02: Country View Estates/Calvada North Well Capacity

Well	Capacity(1) (gpm)	Adjusted Capacity (gpm)	Year	Projected Average Daily Demand, ADD (gpm)(2)	Projected Peak Daily Demand, MDD (gpm)(3)
CVE 48-1	190	190			
CVE 48-2	300	OFF	2018	84	143
CN 1	250	250	2038	229	389
Total	**740**	**440**			

Notes:
(1) Capacities are based on the most recent review conducted in 2017 by Valentine staff
(2) Well supply figures were grossed up to accommodate for NRW losses.
(3) Total well supply must be able to accommodate MDD.

4.1.2.3 Calvada Meadows Water Supply

Calvada Meadows has one active potable well with a pumping capacity of 250 gpm. The low growth rate (without the Calvada Meadows Improvement Project) over the planning period yields no additional connections in this area over the next 20 years. Calvada Meadows currently has an MDD of 5.6 gpm and a future (2038) MDD of 7.94 gpm, which is significantly below the well pumping capacity. However, since the condition of the well is unknown, there would be no GBWC-PD water supply to Calvada Meadows should this well go out of service indefinitely. For this reason, it is recommended that GBWC-PD perform a well assessment of the wells in this service area to determine their integrity and useful life. Additionally, there is no redundancy in the water supply within Calvada Meadows and another source of water would need to be provided to the service area prior to taking the well offline for rehabilitation.

Furthermore, customers in this area of Pahrump (as well as the State Engineer) have expressed the desire for the infrastructure to be installed to allow additional connections. There is no backbone infrastructure to support growth. Calvada lots are referred to as unbuildable lots as the

price to provide water to these lots are cost prohibitive for individual lot owners under the policy that growth pays for itself.

GBWC-PD notes that the wells are not adequate for fire flow supply of 1,500 gpm.

4.1.2.4 Mountain View Estates Water Supply

Mountain View Estates has one active potable well with a pumping capacity of 50 gpm. This area is built out and will have no growth over the 20-year planning period. Mountain View Estates currently has an MDD of 2.48 gpm and a future (2038) MDD of 3.98 gpm, which is significantly below the well pumping capacity. Since the condition of this well is unknown, (and the ownership issues regarding the well and water rights) there would not be GBWC-PD supply to MVE should the well go out of service indefinitely. There is no redundancy in the water supply within Mountain View Estates and another source of water needs to be provided to the service area. By connecting this system to the main GBWC-PD water system, a more reliable water and fire supply will be achieved.

4.1.2.5 Mountain Falls Water Supply

Mountain Falls has two active wells with a total pumping capacity of 2,500 gpm. Both wells are of equal size, so the capacity with one well out of service is 1,250 gpm.

Table 4.03: Mountain Falls Well Capacity

Well	Capacity[1] (gpm)	Adjusted Capacity (gpm)	Year	Projected Average Daily Demand, ADD (gpm)[2]	Projected Peak Daily Demand, MDD (gpm)[3]
MF 1	1,250	1,250	2018	773	1,932
MF 2	1,250	OFF	2038	1,606	4,016
Total	2,500	1,250			

Notes:
(1) Capacities are based on the most recent review conducted in 2017 by Valentine staff
(2) Well supply figures were grossed up to accommodate for NRW losses.
(3) Total well supply must be able to accommodate MDD.

As shown in Table 4.03, the existing well capacity does not exceed the 2038 peak daily demand. The projected demands include irrigation use which in the event of an emergency would not be an essential service and thus there is adequate potable water supply should one well be out of service.

Since the condition of the well is unknown, capacity and the sole source of redundancy could be diminished should a well go out of service indefinitely. For this reason, it is recommended that GBWC-PD perform a well assessment of the wells in this service area to determine their integrity

and useful life. Also, both wells currently do not have an operational backup generator as discussed in Section 2.6.5. In the event of a major power outage, neither well would be functional.

4.1.3 Water Storage Evaluation

Water storage is regulated by NAC 445A.6674, 445A.66745, 445A.6675, 445A.6755, and 445A.66755.

The total storage capacity includes; operating storage, emergency reserve, and fire flow storage.

- Operating Storage – Operating Storage is defined under NAC 445A.66745. Operating Storage is provided as MDD. NAC 445A.6611 defines MDD as "the maximum daily demand for water over a yearly period, as determined by historical data." The MDD for each of the five existing service areas in the GBWC-PD water system were calculated from the average ADD, based on meter data provided for years 2014, 2015, and 2016.
- Emergency Reserve — NAC 445A.6655 provides that an existing public water system must maintain an emergency reserve in such an amount as an engineer determines appropriate based on the best available local information. Valentine has provided emergency storage at ADD.
- Fire Flow Storage - For fire flow storage, GBWC-PD uses 1,500 gpm for 2 hours for residential and 2,000 gpm for 2 hours for small commercial areas.

For the purposes of the GBWC-PD 2018 IRP, Valentine has included operating storage of MDD for one day, fire flow storage (depending on the service area highest requirement), and emergency reserves of ADD in it system-wide storage assessment. The storage capacity in the five service areas were analyzed separately based on the approximate number of connections in each service area.

4.1.3.1 Calvada Valley Water Storage

There are three storage tanks (Low Zone Tank, Mesquite Tank, and High Zone Tank) in the Calvada Valley system for a total storage capacity of 3.35 million gallons. This system currently has an MDD of 2.907 MGD and it is projected to increase to 3.734 MGD in 2038.

The Calvada Valley system has a required fire flow capacity of 2,000 gpm for 2 hours due to commercial connections.

Table 4.04 identifies Calvada Valley as meeting existing and projected storage capacity requirements with its existing storage tanks and alternative pumping capacity from Wells 2 and 11.

4.1.3.2 Country View Estates/Calvada North Water Storage

There is one storage tank in the CVE/CN system for a storage capacity of 0.755 million gallons. This system currently has an MDD of 0.206 MGD and it is projected to increase to 0.560 MGD in 2038. The Country View Estates/Calvada North system has a required fire flow capacity of 2,000 gpm for 2 hours due to commercial connections.

Table 4.04 demonstrates that the Country View Estates/Calvada North service area is currently meeting storage capacity requirements and will continue to meet storage capacity requirements in 2038 with its existing storage capacity and alternative pumping capacity from Wells 48-1 and 48-2.

Should the only storage tank in this service area be out of service, there will be no emergency storage for fire flow. It is recommended that the operations team devise an emergency storage plan for this area that could include a temporary bladder tank or use of other large private water storage facilities in the area (for example community pools).

4.1.3.3 Calvada Meadows Water Storage

There is one 3,000-gallon hydropneumatic tank in the Calvada Meadows system. Due to the small size of this service area the standard requirements for storage are excessive. The well and hydro tank are capable of meeting the daily demands of the system, but cannot meet the requirements of emergency situations or provide fire protection. Should there be a well failure these customers would be without water.

4.1.3.4 Mountain View Estates Water Storage

There is one 4,000-gallon hydropneumatic tank in the Mountain View Estates system. Due to the small size of this service area the standard requirements for storage are excessive. The well and hydropneumatic tank are capable of meeting the daily demands of the system, but cannot meet the requirements of emergency situations or fire protection. Should there be a well failure (whether mechanical or legal) these customers would be without water. This service area is directly adjacent to the Calvada Valley area and is recommended that the system be interconnected with this area in the future. The connection of Calvada Valley to Mountain View Estates offers benefits to the Calvada Valley service area in addition to backup service to Mountain View Estates.

4.1.3.5 Mountain Falls Water Storage

There is currently one storage tank in the Mountain Falls system with a storage capacity of 1.20 million gallons. GBWC-PD is in the process of constructing a second tank with 1.4 million gallons capacity, which is planned for construction in 2018. After the tank construction is completed, the total storage capacity will be 2.6 million gallons. This system currently has an MDD of 2.782 MGD and it is projected to increase to 5.783 MGD in 2038.

The Mountain Falls system has a required fire flow capacity of 2,000 gpm for 2 hours due to commercial connections.

Table 4.04 demonstrates that the Mountain Falls service area would be currently meeting storage capacity requirements if both the Mountain Falls Wells 1 and 2 backup generators were in service. As discussed in Section 2.6.5, both backup generators are currently out of service. Without these backup generators as operational, the Mountain Falls service area is not meeting storage capacity requirements. The calculations include the addition of the 1.4 million gallons tank in construction and demonstrate that even with the addition of this tank and assuming both Mountain Falls Wells 1 and 2 backup generators are operational (for alternative pumping capacity), Mountain Falls will not meet storage capacity requirements in 2038. Either additional alternative pumping capacity should be added or additional storage to provide the 2.1 million gallons additional future capacity required.

Table 4.04: GBWC-PD Storage Capacity Analysis

			CURRENT	YEAR (2038)
Calvada Valley			**Existing**	**Projected**
Operational Storage Required	ADD for one day, based on historical usage (2014-2016) [gallons]		1,730,880	2,221,920
	MDD (ADD X 1.68)		2,907,878	3,732,826
Emergency Reserves (ADD) [gallons]			1,730,880	2,221,920
Fire Flows	2000 gpm @ 2 hours - Commercial [gallons]		240,000	240,000
		Total Storage Required	4,878,758	6,194,746
		Existing Storage Capacity	3,350,000	3,350,000
Wells 2 and 11 have backup power.		Alternative Pumping Capacity	3,384,000	3,384,000
Recommendations:	NONE			
		Total Storage Capacity Available	6,734,000	6,734,000
		Meets NAC for Storage?	**YES**	**YES**
Country View Estates/Calvada North			**Existing**	**Projected**
Operational Storage Required	ADD for one day, based on historical usage (2014-2016) [gallons]		120,960	329,760
	MDD (ADD X 1.70)		205,632	560,592
Emergency Reserves (ADD) [gallons]			120,960	329,760
Fire Flows	2000 gpm @ 2 hours - Commercial [gallons]		240,000	240,000
		Total Storage Required	566,592	1,130,352
		Existing Storage Capacity	775,500	775,500
Wells 48-1 and 48-2 have backup power.		Alternative Pumping Capacity	705,600	705,600
Recommendations:	NONE			
		Total Storage Capacity Available	1,481,100	1,481,100
		Meets NAC for Storage?	**YES**	**YES**
Calvada Meadows			**No Major Storage**	
Mountain View Estates			**No Major Storage**	
Mountain Falls			**Existing**	**Projected**
Operational Storage Required	ADD for one day, based on historical usage (2014-2016) [gallons]		1,113,120	2,312,640
	MDD (ADD X 2.50)		2,782,800	5,781,600
Emergency Reserves (ADD) [gallons]			1,113,120	2,312,640
Fire Flows	2000 gpm @ 2 hours - Commercial [gallons]		240,000	240,000
		Total Storage Required	4,135,920	8,334,240
		Existing Storage Capacity	2,600,000	2,600,000
Wells MF 1 and MF 2 currently do not have backup power.		Alternative Pumping Capacity	0	3,600,000
Recommendations:				
Upgrade storage capacity by 2.1 MG in the next 20 years		**Total Storage Capacity Available**	2,600,000	6,200,000
assuming that backup generators are replaced at Mountain Falls		**Meets NAC for Storage?**	**NO**	**NO**

4.2 Water Distribution System

The water distribution system was analyzed by hydraulically modeling the Calvada Valley water system. At this time, the Calvada Valley water system is the only service area that has been hydraulically modelled. The hydraulic model was analyzed on an existing demand basis for ADD, MDD, peak hour demand (PHD), and fire flow conditions. The pipeline network was evaluated based on flow velocities and head losses as they related to pressures throughout the distribution system. Where deficiencies were noted, additional modeling was performed with potential changes to the system to determine the most technically feasible and cost effective solution.

The goal for developing any needed solution to problematic areas of the distribution network was to improve efficiency by making the most cost-effective changes necessary to correct each

deficiency. Consideration was also given to the most pressing problems and those which affect the greatest number of customers. The overall objective was to produce a fully functional and compliant system at the lowest cost to rate payers.

Design criteria are outlined in NAC 445A.6672 and are summarized in Table 4.05.

Table 4.05: Design Criteria

Parameter	Criteria
Minimum Pressure at Peak Hour Demand*	30 psi
Minimum Pressure at Maximum Day Demand*	40 psi
Maximum Pressure*	100 psi
Maximum Flow Velocity in Pipe*	< 8 feet per second
Maximum Head Loss**	10 feet per 1,000 feet
Fire Flow	
Minimum Residual Pressure	20 psi
Minimum Residual Fire Flow	1,500 gpm
Minimum Commercial Fire Flow	2,000 gpm

* Provision of the Nevada Administrative Code.

** American Water Works Association (AWWA)

Model Selection and Development

The GBWC-PD hydraulic water model was analyzed using the Bentley® WaterCAD® CONNECT Edition modeling software. The existing model for the GBWC-PD water system was selected to begin the process from the previously submitted 2014 IRP. The existing model was updated with piping additions as well as pressure relief valve ("PRV") and other infrastructure model updates. The model was updated to fit current conditions, including updating all system demands and addition of new demands due to growth since the last model update. Some spot pressures were taken by operations staff throughout the Calvada Valley service area and compared to the model results. After the updates were performed, over half of the field pressure readings were closer to the WaterCAD model pressures, though a few pressures in some areas of the model were off by more than 10%, signifying that some updates to the model still need to be performed.

Existing Demands Update

Based on available information, the method used in updating the model demands was a multi-step process. The following summary outlines how the models were updated.

- New demands were distributed to account for growth since the models were last analyzed. This process included identification of new service connections between 2015 and 2017. Once identified, these demands were distributed to nodes adjacent to the new service connections, incorporating 2014-2016 water meter billing data.

- The updated average day system demands developed in the previous step were globally adjusted to the existing MDD for each water system. This was done by applying the

MDD/ADD peaking factor based on 2014-2016 well production data. PHD was incorporated into the model by multiplying the MDD by 1.75.

- To adjust the models for the 2038 Future Demand, Calvada Valley was regionally adjusted based on the estimated ADD for each scenario. The ADD was then globally adjusted to the estimated MDD using the MDD/ADD peaking factors.

Table 4.06 presents the existing and anticipated demands used in the hydraulic model.

Table 4.06: Hydraulic Model Loading

Area	ADD (gpm)	MDD (gpm)	PHD (gpm)
Existing Calvada Valley	1,458	2,444	4,277
Future (2038) Calvada Valley	1,472	2,472	4,326

The hydraulic modeling scenarios performed include:

- Existing MDD
- Existing MDD with fire flow
- Existing PHD
- Future (2038) MDD
- Future (2038) MDD with fire flow
- Future (2038) PHD

4.2.1 Distribution System Evaluation

The GBWC-PD Calvada Valley water system was evaluated using Bentley® WaterCAD® CONNECT Edition modeling software and carefully applied data, assumptions, and operating conditions. The objective of the analysis was to identify weaknesses in the distribution network that would lead to unacceptable pressure conditions, reduced fire-flow capacity, and energy waste through high head losses. Several areas within Calvada Valley were found to have high pressures (greater than 100 PSI). High pressures are known to increase the rate of main breaks in a water distribution system as well as the amount of leakage associated with leaks and breaks. There were no distribution areas observed with low distribution pressures (less than 40 PSI).

Calvada Valley is currently divided into two pressure zones – the High Zone and the Low Zone. The majority of the high pressures (greater than 100 PSI) in the system are observed in the High Zone.

Only a handful of 8-inch distribution pipes were observed to exceed the maximum head loss requirement (10 feet/1000 feet). Generally, most nodes in the system demonstrated that the system was able to meet fire flow at those nodes. The distribution piping meets the criteria for velocity, with velocities less than 8 feet per second observed.

Further calibration of the WaterCAD model should be conducted to validate the results of the model described above. The recommended improvements to the GBWC-PD water systems are summarized below.

4.2.2 System Deficiencies and Alternatives for Improvements

The GBWC-PD distribution model was analyzed for Existing Conditions and the Preferred Plan (2038). Please refer to Appendix H for all of the hydraulic modeling scenarios discussed.

Existing Conditions

With the exception of a very few junctions, the hydraulic distribution model for the existing conditions meets the majority of the design criteria described in Table 4.05 with the exception of some nodes that appear to be active distribution nodes with pressures higher than 100 PSI.

Preferred Plan (2038)

The Preferred Plan (2038) hydraulic model appears to satisfy most of the criteria described in Table 4.05 with the exception of some nodes that appear to be active distribution nodes with pressures higher than 100 PSI.

Distribution Pressure

There are currently two pressure zones in the Calvada Valley System (High and Low). A primary issue in the High Zone (and in some nodes located in the Low Zone) is that pressures appear to be above 100 PSI, with pressures as high as 127 PSI in the existing case and approximately 121 PSI in the Preferred Plan (2038) scenario.

Distribution Piping:

There are many dead ends within the Calvada Valley water distribution system. Per NAC 445A.6712, the water system should be designed to the extent possible to eliminate dead ends and form a grid system or system of arterial loops. Looping will help to minimize dead ends, provide fire protection to areas that do not have adequate fire protection and provide more redundancy in the system in the event of main breaks.

Storage

Only the Low Zone Tank 2 (Mesquite Tank) contains cathodic protection. Cathodic protection still needs to be installed on the High Zone Tank and the Low Zone Tank 1 to extend the life of these tanks in Calvada Valley. Similarly, for the Mountain Falls service area the Mountain Falls Tank should also have cathodic protection installed.

Wells and Production

Many wells in the Calvada Valley system and the other service areas are in need of rehabilitation/cleaning to maintain production capacity. In addition, both backup generators in the Mountain Falls service area are out of service and are in need of replacement to provide an

emergency power supply and alternative capacity discussed in Section 4.1.3.5. In Calvada Valley, backup generators exist at Wells 2 and 11, but Well 12 does not have a backup generator.

Non-Revenue Water

Production records and meter readings for the five existing service areas show a greater than desired system water loss. GBWC-PD will need to continue to reduce this water loss through system maintenance and capital improvement projects which reduce system pressures to an acceptable level, through replacement of pipe segments in poor condition and the installation of new AMR meters.

Hydraulic Model

Currently, a comprehensive hydraulic model for all GBWC-PD service areas does not exist. This comprehensive hydraulic model should be considered in order to model future changes to the water distribution system and ensure NAC compliance in all service areas. The Calvada Valley hydraulic model should also be calibrated further.

4.3 Water Transfer Possibilities

There are two other utilities operating in the Pahrump Valley: Pahrump Utilities Company, Inc. ("PUCI") and Desert Utilities, Inc. ("DUI"). GBWC-PD maintains an existing interconnect with PUCI at Manse and Hafen Ranch Road. An interconnect is setup for manual operation only and historically has never been used nor does GBWC have an engineer's evaluation of limitations of this interconnect.

4.4 Water Reliability

The GBWC-PD service area relies entirely on groundwater. Several factors that would affect the reliability of GBWC-PD's groundwater are limited source water through over-pumping or drought, etc., water quality, infrastructure problems, legal issues such as forfeiture of sufficient water rights to serve, and catastrophic interruptions. There are currently no existing or projected water quality problems in the service area.

4.4.1 Historic Effects of Drought

The groundwater source in the Pahrump Valley has been relatively drought-resistant. However, over-pumping of portions of the basin where there is a high density of domestic wells has occurred, causing private wells to fail. (*See* Appendix B., p. 399.) It is highly recommended that GBWC-PD take steps to protect the health and sustainability of the basin for future reliable service.

Reference: http://droughtmonitor.unl.edu/Maps/MapArchive.aspx

Figure 4.01 is an example of the data provided on the website. Over the past year the drought circumstances have been pushed back due to an extremely wet year during the 2016/2017 winter.

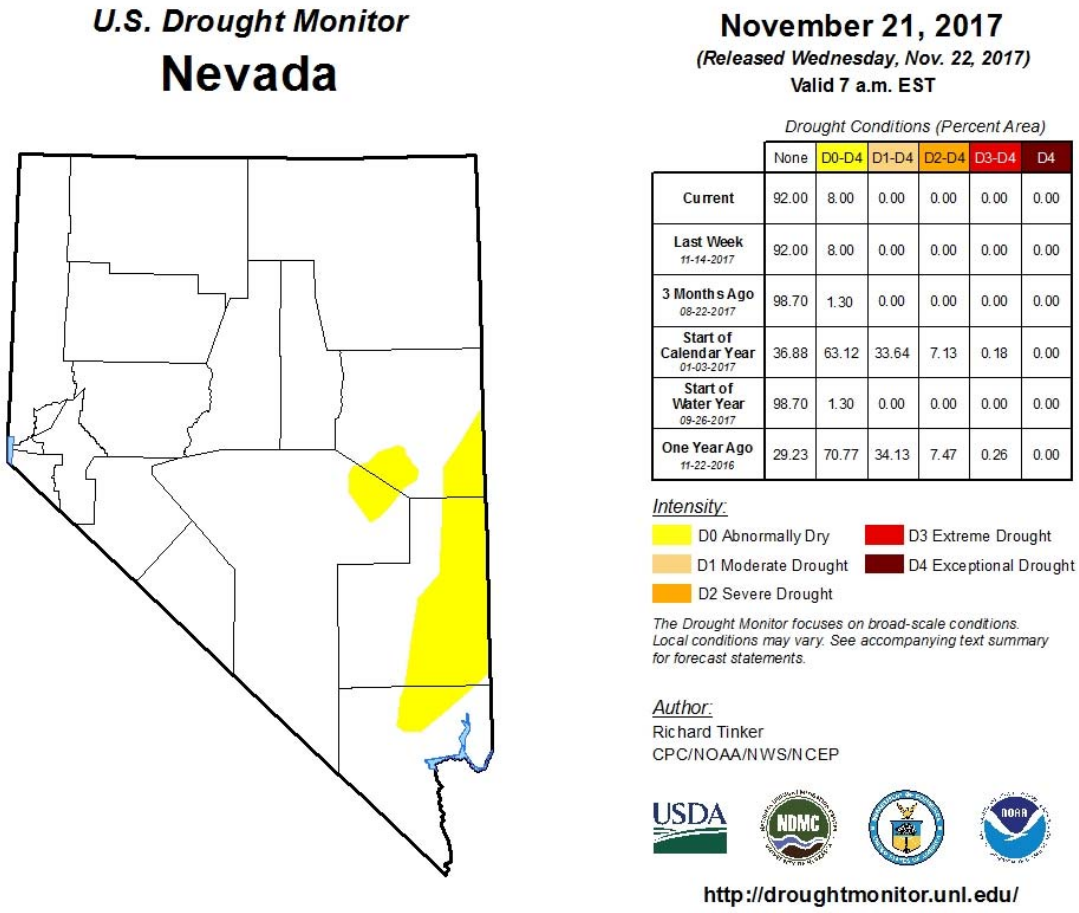

Figure 4.01: Drought Conditions Map for Nevada
(Source: http://droughtmonitor.unl.edu/Maps/MapArchive.aspx)

GBWC-PD has adopted a routine well monitoring plan (provided in Appendix M) which documents water levels in each well to show changes in the aquifer over time. This data provides historical documentation of the rise/drop of aquifer water levels over time and will allow GBWC-PD better control water consumption during times of drought.

4.4.2 Maintenance Program

The third factor affecting reliability is equipment availability. GBWC-PD has an active preventative maintenance program and outages due to equipment breakdowns have not been frequent enough to affect the supply. However, long term maintenance items should be considered, such as reservoir recoating, well casing inspection/cleaning, and replacement of equipment that is beyond its serviceable life. The outage of this equipment while it is being replaced or refurbished and its impact on the reliable service needs to be considered. An asset management framework has

been established and identifies that many wells in the GBWC-PD system are beyond their useful life.

4.4.3 Catastrophic Interruption

GBWC-PD has an Emergency Response Plan ("ERP") discussed in Volume I and provided in Appendix J, and a Vulnerability Assessment ("VA") on file with the State of Nevada Department of Public Safety and Division of Emergency Management. In addition, GBWC-PD also has an Emergency Response Manual. All three of these documents are updated annually. They are kept in the GBWC-PD office and the Area Manager is responsible for updating them as necessary to accommodate new facilities, equipment, and technologies. In addition, all maps and schematics are kept secured at the office. The Emergency Response Manual, backflow program, valve maintenance program, and well and storage site inspection procedures are designed to assure that, in the event of an emergency, an affected location can be isolated and appropriate measures can be taken to minimize the time that a customer may be left without safe drinking water.

The plan, assessment, and manual also provide consolidated access to emergency response teams, public notification partners, county and city officials, 24-hour response contractors, and other local support. The procedures for response are recorded for different categories of emergencies: natural and man-made.

4.4.3.1 Regional Power Outage

Large-capacity storage tanks and back-up generators protect the system from emergencies resulting from power outages. GBWC-PD has permanent emergency generators on Wells 2 and 11 in the Calvada Valley system, on wells 48-1 and 48-2 in Country View Estates/Calvada North and, until recently, on both Mountain Falls wells. The utility owns one portable generator for the water system and one portable generator for the wastewater collection system. The portable generators cannot operate any of the wells or lift stations over 75 hp unless they have VFD's as the 100 kW generators will not handle the inrush current on start-up of larger motors.

Wells 2 and 11 in the Calvada Valley system are the largest producing wells in the system. There are also storage tanks which will help keep the system pressurized in the event of a power outage. The Alfalfa Booster Station is equipped with a permanent generator. In addition, the Alfalfa Booster Station (in conjunction with Well 12 and SCADA) provides fire protection to a portion of the Calvada Valley system. In the event of a significant power outage, only Wells 2 and 11 will be operational. The current production capacities of Wells 2 and 11 will not meet the peak future (2038) MDD. This assessment also does not factor in well rehabilitations or well failures causing the Calvada Valley wells to be out of service. Well 12 was recently drilled and does not have a permanent generator. By constructing another permanent generator in the water supply system, this will promote further redundancy to prevent water supply issues.

The Calvada North/Country View Estates system has three wells, a storage tank, and a booster pumping facility. The two Country View Estates wells are the primary water supply and they fill the storage tank on the same site. The booster pumping facility and wells have a permanent generator. No emergency generation improvements are necessary for this service area.

The Mountain Falls wells currently do not have available emergency backup generator power in the event of an emergency due to premature permanent generator failure. However, there is a storage tank to help maintain pressures during an emergency. Emergency generator replacements for both wells are recommended for the Mountain Falls service area.

The Calvada Meadows and Mountain View Estates wells are not equipped with emergency generators. The portable generator for the water system can be connected to either of these sites to provide emergency power; but, if there is a power outage which spans both service areas, it could cause a water shortage. The Mountain View Estates system has only 27 connections and it currently does not have backup water supply. Mountain View Estates could be fed from the Calvada Valley service area via a new interconnect line. This would also provide fire protection on the Highway 372 business corridor. The Calvada Meadows system is a larger service area but still has few existing connections. There will be a need for a permanent generator in the future, but until the future of development in this area becomes economically feasible (through a beginning with the Calvada Meadows Improvements Infrastructure Project), the portable generator may be sufficient for their 20-year projected customer base of 35 homes in a localized power outage scenario, though this is assuming that there is not significant growth in the area.

The wastewater treatment plants all have permanent emergency generators; however, not all lift stations do. However, all lift stations without standby power are equipped with generator receptacles (manual transfer switches) with the exception of Lift Station #8. A portable generator may be used with all lift station generator receptacles.

The generators are exercised and maintained according to the GBWC-PD Generator Operation and Exercising Standard Operating Procedure which is a part of the Emergency Response Manual. Should a sustained regional power outage occur, generators from other Utilities Inc. ("UI") companies can be brought to GBWC-PD to supplement power needs; however, the closet UI affiliate outside of the Arizona/Nevada business unit is in the Austin, TX area. Additionally, one other portable generator is within approximately 3 hours and another within approximately 8 hours of GBWC-PD. The plan, assessment, and manual also provide consolidated access to emergency response teams, public notification partners, county and city officials, 24-hour response contractors, and other local support. The procedures for response are recorded for different categories of emergencies: natural and man-made.

4.4.3.2 Earthquake or Other Natural Disaster

Earthquakes and severe storms are a possibility for GBWC-PD. In the event of a foreseeable natural disaster, pre-event planning is done with all GBWC-PD operators and other key staff to coordinate the emergency response.

The most likely damage to occur from natural disaster is main breaks. Disruption of service due to main breaks is lessened by having a contractor on call 24 hours a day, 7 days a week for emergency line repairs. Breaks are isolated through the operation of valves and repaired.

If pressure drops below 20 psi, a precautionary boil order is issued as discussed in the Emergency Response Manual (refer to Section 5 of Volume 1) and the repaired main is disinfected and flushed per AWWA Standard C601. Two successive bacti samples are taken to ensure safe drinking water.

Should loss of storage occur from an earthquake (or any other reason) the affected tank can be isolated from the distribution system and the wells can pump directly into the system. Should the loss of a well occur due to the well casing collapsing in an earthquake (or any other reason), GBWC-PD has other wells in service that are available to be called into service.

In the event that GBWC-PD is not able to fulfill all the system requirements with available resources, reduction of non-essential system needs is possible for construction, irrigation, and industrial customers. Procedures for curtailment are in the Emergency Response Manual provided in Appendix J, and is discussed in Section 5, Volume 1 of this 2018 IRP.

4.4.3.3 Man-Made Disaster

Man-made disasters can come in many forms. Fortunately, GBWC-PD has never experienced civil riots or acts of terrorism. Minor acts of vandalism have occurred, such as graffiti and theft. Should a man-made disaster affect the infrastructure, the same procedures are followed with the local law enforcement being notified.

The most likely sources of contamination of water supplies are as a result of backflow loss of pressure in the system, though unprotected cross connection or after a break in a main.

Purposeful intrusion into the system is guarded through fences, lighting, inspections, and locks. Contamination of the water supply is protected by:

- Frequent monitoring and testing of water for bacteria;
- Recording of customer complaints regarding water quality;
- Working chlorinators at the well sites;
- Active backflow prevention requiring routine monitoring of all new customer service applications and backflow prevention assemblies for potential cross connections; and
- Ability to isolate segments of the water distribution system through use of valves.

GBWC has created a Cross-Connection Control program and corresponding manual for all systems in the State of Nevada. Cross-connections between a potable water system and non-potable sources of contamination represent a threat to public health. This program is designed to maintain the safety and quality of the water in the supply and distribution system by preventing the introduction, by backflow, of any foreign liquids, gases or other substances into the supply system. Cross Connection is addressed in GBWC's tariff and Standards and Specifications for new development.

The GBWC proposed Tariff Rule No. 15, Section H provides for Cross-Connection Prevention as follows:

- "Where any water pipe on a consumer's premises is cross-connected to another source or water supply, the Utility may refuse or discontinue service until there shall be installed at the expense of the consumer a suitable protective device, approved by the Utility, to protect against back-flow into the Utility's system, as required by the governmental authorities having jurisdiction. Customer or Applicant will own and maintain said cross-connection protective device(s) and provide to Utility each year the annual inspection report by a licensed cross-connection inspector"

In addition, GBWC has requested the addition of violation fees in their tariff. The addition of violation fees and structure for notifying customers in violation with the Cross Connection Control Program will greatly assist in protecting the potable water system.

GBWC has created a Cross-Connection Control program and corresponding manual for all systems in the State of Nevada. GBWC has a State approved Cross Connection Control Plan. Cross-connections between a potable water system and non-potable sources of contamination represent a threat to public health. This program is designed to maintain the safety and potability of the water in the supply and distribution system by preventing the introduction, by backflow, of any foreign liquids, gases or other substances into the supply system.

4.4.3.4 Conclusion

The best defense against emergencies is to avoid them through daily inspections, routine equipment maintenance, long term equipment maintenance, comprehensive sampling plans, security, usage checks and communication.

In all cases of disaster, whether natural or man-made, the best response to a catastrophic interruption of service is to be prepared. Staff is trained for emergency response in OSHA safety, Electrical Safety, Lock Out / Tag Out, Generator Operation, and recognizing chemicals in an uncontrolled environment.

Public Notification procedures are established with contact numbers. Communication procedures and equipment are in place. Primary and secondary emergency responders are designated.

During a dire emergency, a well not contaminated or damaged will be disconnected from the distribution system and used to distribute water to the public. GBWC-PD will provide staff personnel to work in partnership with the local fire department to distribute drinking water. In the worst-case scenario, where GBWC-PD would have no safe drinking water, bottled water must be provided. Should a catastrophic disaster occur in Pahrump, GBWC-PD has put the plans and resources together to respond quickly and efficiently to ensure safe drinking water.

4.5 Wastewater Collection

The wastewater collection system in the GBWC-PD service area primarily consists of gravity sewer mains with only a few lift stations. This is due to the general topography of the service area. The system was analyzed based on four factors:

1. The capacity and integrity of the gravity collection system;
2. The impact of fats, oils, and greases or industrial wastes to the system;
3. The impact of infiltration and inflow on the system;
4. The condition and capacity of the existing lift stations

4.5.1 Gravity Collection System

The collection system has largely been sufficient to handle the wastewater flows of the service area.

4.5.2 Fats, Oils and Greases (FOG)

GBWC-PD continues the FOG Control Plan on a routine basis. Both the GBWC-PD and Spring Creek Division provide wastewater and require a FOG Control Plan, which have been approved

NDEP and incorporated into the GBWC Tariff 1-S with Commission approval. The GBWC consolidated FOG Control Plan is attached as Appendix M.

4.5.3 Infiltration and Inflow

GBWC-PD monitors the infiltration and inflow through a routine maintenance program to inspect and retrofit the manhole covers with Inflow Rainstoppers inserts. The vactor truck and video van are valuable tools in assessing needed manhole repairs.

4.5.4 Lift Stations

Two primary lift stations (Lift Stations 3&4) were upgraded as part of the CCA (now CoreCivic) development project. Odor control technology was installed at Lift Station 4 which has reduced Hydrogen Sulfide levels an average of approximately 80% downstream.

4.6 Wastewater Treatment and Disposal

4.6.1 Wastewater Treatment System Design Criteria

GBWC-PD has three wastewater service areas as previously described. Each service area has one wastewater treatment facility located in it. Each facility was evaluated based on its capacity, operations, condition, and effluent disposal. The available capacity is based on the per connection wastewater production which is then extrapolated using the growth projections. This provides a timeline when additional facilities will need to be developed.

The facilities effluent disposal systems were evaluated for their effectiveness and compliance with State regulatory requirements. Per NAC 44A.275 regulations, the effluent quality required for reuse is secondary treatment defined as meeting 15 mg/L TSS, 15 mg/L BOD, 10mg/l Total Nitrogen, pH ranging between 6-9, and a varying bacteriological quality based on intended use.

Each facility's effluent disposal was evaluated based on the applicable criteria to determine the long-term feasibility of meeting the Regulatory requirements. Unreliable treatment or historical problems were investigated to determine their cause and potential solutions were evaluated based on technical and financial feasibility.

4.6.1.1 Plant 3

Plant 3 is operating at approximately 42.5% capacity and has been in service since approximately 1992 with upgrades and expansion completed in March of 2006. The facility consistently meets its permit quality parameters, and has sufficient plant 3 capacity through 2038, assuming construction of the RIBs, which both the Commission and NDEP have approved, and which has been delayed solely by the County Board of County Commissioners ("BOCC") decision to uphold an appeal for the Planning Commission's approval of the project.

Portions of the facility require rehabilitation or upgrades. Rehabilitation or upgrades are required to reduce maintenance and operations costs associated with repair and inefficient operation of existing equipment. Some of the systems that are in need of rehabilitation or upgrade are the solids handling equipment, effluent filters, and the SBR submersible aerator mixers.

The solids handling equipment at Plant 3 consists of two sludge feed pumps, two screw press dewatering units, a polymer feed system and haul off container. The equipment is located in a building at Plant 3. The solids handling equipment is undersized for the volume of solids to be treated, especially in the winter, which has resulted in the need to maximize use of the existing abandoned Marwood tanks for sludge storage. In addition, operations staff work overtime during the winter months to keep up with the sludge treatment while performing their other regular duties. There are also certain components associated with the system which are difficult to obtain and have a long lead time. Regular replacement of expensive components is required to maintain a fully functional system. The staff has found that the screens, sludge pump VFD, and polymer feed pump parts require replacement every 1 to 7 years, depending upon the component. Replacement of the current technology with a more efficient, higher capacity solids handling unit would assist the operations staff in reducing operations and maintenance costs.

The effluent filters, which are traveling bridge sand filters, are an outdated and an operations and maintenance intensive technology. Operations and maintenance items of concern are sand replacement (which is costly and laborious), regular replacement of the backwash pumps, and regular maintenance on the chain mechanisms for the continuous backwash system. The traveling bridge sand filters do not respond well to higher solids loadings, which sometimes happen when the plant is not operating at optimum and should be diverted so as not to inundate the plant with high backwash flows. Replacement of the traveling bridge technology with an alternative technology such as the cloth media technology would assist the operations staff in reducing operations and maintenance costs associated with media replacement, chain mechanism maintenance and repair, and backwash pump replacement. The cloth media technology is a proven technology and utilities throughout the Country are replacing their traveling bridge filters with this type of filter.

The sequencing batch reactors (SBRs) provide biological treatment and sludge settling, the heart of the wastewater treatment process. There are currently three SBRs at the plant and each is equipped with one submersible aerator mixer (SAM) which is a key piece of equipment in the SBR system. The SAM units provide the process air and mixing necessary to promote biological activity, and hence treatment of the sewage. A spare SAM unit is available in the event that a SAM unit is out of service.

Additional emergency storage would also help the facility. As mentioned above, the filters can become overloaded with suspended solids when the SBRs aren't operating properly. This typically happens twice per year as temperature changes and the biology in the basins is adjusting. Once the filters become overloaded, the backwash volumes increase significantly and cause further negative impacts to the SBRs. It can take up to two weeks to recover from these types of process

issues. It is recommended that some type of emergency storage or diversion of the filters be installed in the future to alleviate this process issue and potential impact to meeting permit limits.

4.6.1.2 Plant F

The facility is currently running at approximately 42% capacity. No capacity related improvements are projected to be necessary in the 20-year flow projection.

4.6.1.3 Mountain Falls

The facility is currently running at approximately 8.4% capacity. The existing SBR facility at Mountain Falls is operating well within its capacity and is not projected to need to be expanded during the 20-year projection. The facility is reported to be operating well with no necessary repairs or improvements required. The current Plant 3 SOMAT will be relocated to Mountain Falls WWTP for increased redundancy and efficiency at the Plant.

4.7 Reclaimed Water

Both Plant 3 and Mountain Falls produce reclaimed water and it historically has been used for golf course and park irrigation. Plant F is too small to cost effectively produce reclaimed water at this time. When the facility gets larger, there is sufficient land for expansion to dispose of reclaimed water. Mountain Falls sends all of its flow to the Mountain Falls golf course, and the golf course can take all of the reclaimed water the facility can deliver and then some.

Plant 3 sends its reclaimed water to a receiving pond at the Discovery Park property, which will soon come under the legal management of GBWC-PD. From the Discovery Park receiving pond, there is a pump station which distributes irrigation water throughout the park and a second pump station which sends some of the flow to the Lakeview Golf Course (Lakeview) approximately one mile away. RIBs were approved in Docket No. 15-01029 and are pending before the Fifth Judicial District Court.

As the system grows, the reclaimed and disposal system should be expanded to make the most efficient use of this resource possible. Based on the current growth projections, there should be no need for additional expansion during the projected planning period.

SECTION 5.0: EMERGENCY RESPONSE PLAN

Volume 1 of this IRP provides a generalized explanation of the Emergency Response Plan for the four divisions, and the Emergency Response Plan for GBWC-PD is provided in Appendix J.

SECTION 6.0: WATER CONSERVATION PLAN

The Water Conservation Plan is discussed in Section 6 in Volume I of this IRP, and the full Water Conservation Plan is included as Appendix K. GBWC-PD has no deviations from the Water Conservation Plan provided in Volume 1.

SECTION 7.0: PREFERRED PLAN

The purpose of a utility's preferred plan is to set forth the "utility's selection of its preferred options for meeting the demand for water and requirements for wastewater treatment for the term of the resource plan." NAC 704.5674. The preferred plan must "include an explanation of the criteria that the utility used to select its preferred options" in "sufficient detail to enable the Commission to determine whether the utility's selection is justified." NAC 704.5674. Note that the improvements later called out in the Utility Action Plan are for recommended improvements to be implemented within the next three years and are not reviewed in this section. This plan is a planning level guideline based on current growth projections and should be reviewed periodically and updated.

The 2018 IRP preferred plan for GBWC-PD is intended to provide a list of necessary projects over the next 20 years planning period in order for GBWC-PD to continue to provide the current level of service to their customers. With the integration of an asset management plan in to the 2018 IRP, the preferred plan also makes recommendations associated with monitoring, maintenance, and inspections for several of the more critical assets of the water system. The purpose for these recommendations is to extend the useful life of the assets prolonging the need for replacement or refurbishment. A condition assessment of several assets over the past year have identified some of the larger assets which have reach the end of their useful lives and will need to be replaced and/or refurbished. The capital projects provided in this preferred plan are at a planning level guideline based on current demand and growth projections and should be reviewed periodically and updated in future IRPs.

The preferred plan addresses the system, compliance, environmental, and conservation needs at a capital spending and monitoring schedule, which GBWC-PD staff believes are prudent. The asset maintenance, monitoring, and smaller capital recommendations are provided in the plan with the goal of extending the assets' useful lives beyond their nominal life expectancies. This will help to push out some of the larger capital projects for replacement or refurbishing of specific assets.

With this strategy in mind, the objective of this preferred plan is to make the necessary investments to at least maintain the customer's existing level of service while ensuring NAC compliance of the GBWC-PD water and wastewater systems.

7.1 CIP Organization and Description

The Capital Improvement Projects ("CIP") describe capital improvements, maintenance, and monitoring recommendations to the system to maintain the customer's existing level of service while ensuring NAC 445A compliance. The timing for the project improvements has been assessed extensively by GBWC-PD staff and their engineers to ensure the most cost-effective results are captured for the rate payers, while sustaining their existing level of service. The scheduling for the capital improvements were designed in a manner that brings about the least cost with the highest benefit to the company and its customers. The following CIPs have been developed based on the best information available.

It should be noted that the CIPs are conceptual plans, and no survey routes, site inspections, or other field investigations have been conducted at this time. It should also be noted that no easements or sites have been obtained for facilities which are planned outside the public right of way. It is possible that when such investigations are conducted at the time of design, changes in pipe alignments, lengths, facility siting or other changes may be required. All estimated costs in the 2018 IRP were developed from actual costs from third parties and do not include items such as allowance for funds used during construction ("AFUDC").

A detailed breakdown of the construction and non-construction costs for each of the CIP can be found in Appendix I.

7.2 Water System CIP

The following sections describe the capital improvement projects, monitoring, maintenance, and inspection recommendations necessary to maintain the customer's level of service for the GBWC-PD water and wastewater systems, while ensuring NAC 445A compliance. All of the recommendations are provided to:

1. Replace assets that are at the end of their useful lives;
2. Extend the useful life of an asset;
3. Improve the monitoring of major assets;
4. Ensure that a reliable supply of water is conveyed to the customers; and
5. Provide looping of the system to reduce dead ends and provide fire protection.

The 2018 IRP preferred plan includes a project that focuses on the GBWC-PD system as a whole and projects located in Calvada Valley. The project for the entire GBWC-PD system is described below:

Comprehensive Hydraulic Model of GBWC-PD System.
An updated comprehensive hydraulic model of the entire GBWC-PD water system is needed. Within this updated model, all recent projects will need to be included along with updated demands at each node, pump controls, water storage tank set points, water main additions and recent valve additions. This will ensure that all modifications and improvements are up to date in the model for future planning. The use of an accurate model will provide the design team of potential projects with useful information about the system in the locations considered for new projects. The study is estimated to cost $135,000 with GBWC Capital Time estimated to cost $17,472 for a total cost of $152,472. The completion of this study is planned for 2022.

- Comprehensive Hydraulic Model of GBWC-PD System
  Estimated Cost: $152,472
  Project Year: 2022

7.2.1 Calvada Valley Water System CIP

All preferred plan projects within the Calvada Valley Water System are for looping the system to minimize areas with dead ends, provide reliable fire protection and provide redundancy.

East Street to Hwy 372 Loop.
Installation of approximately 500 linear feet of 10-inch pipe to connect the existing 10-inch pipe on East Street to the main on Highway 372. This project will provide an additional loop to the system and will increase redundancy and fire protection to the area. This project will eliminate dead ends per NAC 445A.6712, which says that the water system should be designed to the extent possible to eliminate dead ends. Eliminating dead ends is beneficial to customers because water age and water quality in the distribution system will be improved.

Hydraulic modelling was performed to confirm fire flow benefits from this looping project. The modelling (that included recent calibration efforts) indicated that the loop would improve both fire flow rates and pressures during a fire flow event. Under existing conditions, local nodes are modelled to be only able to achieve 1,000 gpm at 20 psi. However, with the loop, the local nodes will be able to achieve fire flow of approximately 1,460 gpm at 20 psi. With the loop, steady-state pressures did not significantly change (change was less than 1 psi) and were within the 40 psi to 100 psi range per NAC 445A.6672. Design and permitting is estimated at $52,248 and construction is estimated at $146,376. GBWC Capital Time is estimated at $20,967. This yields a total project cost of $219,591. Design and construction of this project is planned for 2023.

- East Street to Hwy 372 Loop
  Estimated Cost: $219,591
  Project Year: 2023

Pahrump Valley Blvd to Mountain View Casino Loop.
Installation of approximately 500 linear feet of 12-inch pipe to connect the existing 12-inch pipe on Pahrump Valley Blvd. to the 8-inch pipe currently serving the Mountain View Casino. This project will eliminate dead ends per NAC 445A.6712, which says the water system should be designed to the extent possible to eliminate dead ends. Eliminating dead ends is beneficial to customers because water age and water quality in the distribution system will be improved.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the loop. The modeling results indicated that the loop would improve both fire flow rates and pressures during a fire flow event. Design and permitting is estimated at $56,808 and construction is estimated at $172,596. GBWC Capital Time is estimated at $20,967. This yields a total project cost of $250,371. Design and construction of this project is expected to occur in 2023.

- Pahrump Valley Blvd to Mountain View Casino Loop
  Estimated Cost: $250,371
  Project Year: 2023

Pocahontas to Moccasin St Water Connection.
Installation of approximately 900 linear feet of 8-inch pipe to connect to the existing 8-inch pipe on Moccasin. It was discovered that the existing GBWC 8-inch water line is interconnected to the privately-owned Saddle West Casino fire line. As a result, when Saddle West turns an onsite water valve to the off position, the strip mall across the street housing a dry cleaners and an auto parts store is without water and without fire protection. To resolve this issue, GBWC-PD should separate the GBWC-PD water main from the Saddle West fire line. The GBWC-PD water main should be connected to the existing water main along Moccasin. This will remove the water supply for the area along the strip mall from being dependent of the private Saddle West fire line. This project will provide a looped system to the Saddle West facility as well as the strip mall.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the interconnect. Modelling of this proposed project indicated that without the interconnection, the commercial fire flow capabilities (2,000 gpm at 20 psi) at the Saddle West site would not be met, which is not acceptable for commercial fire flow requirements per the NAC. With the Firebird Circle Loop (which is proposed for construction before this interconnect and is discussed in Section 8.0) and the Pocahontas to Moccasin Street Water Connection, the model indicates that the fire flow capabilities at the Saddle West Site are in excess of 2,000 gpm and maintain the 20 psi pressure requirement. With the Pocahontas to Moccasin Street Water Connection, steady-state (non-fire flow) pressures are also decreased to less than 100 psi in the area near the Saddle West facility to meet the maximum pressure requirement in NAC 445A.6672. Design and permitting is estimated at $66,648 and construction is estimated at $218,826. GBWC Capital Time is estimated at $20,967. This yields a total project cost of $306,441. Design and construction of this project is planned for the year 2023.

- Pocahontas to Moccasin St. Water Connection
  Estimated Cost: $306,441
  Project Year: 2023

Fifth Street to East Street Interconnect.
Installation of approximately 1,200 linear feet of 10-inch pipe to connect the existing 10-inch pipe on Fifth St. to the water main on Highway 372. This project will provide an additional loop to the system and will increase redundancy for potable water service and fire protection to the area. This project will eliminate dead ends per NAC 445A.6712, which says the water system should be designed to the extent possible to eliminate dead ends. Eliminating dead ends is beneficial to customers because water age and water quality in the distribution system will be improved.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the interconnect. With the loop, steady-state pressures did not significantly change (change was less than 1 psi) and were within the 40 psi to 100 psi range per NAC 445A.6672. The modeling results indicated that the loop would improve both fire flow rates and pressures during a fire flow event. Design and permitting is estimated at $86,160 and construction is estimated at $313,770. GBWC Capital Time is estimated at $20,967. This yields a total project cost of $420,897. This project is expected to be completed in 2023.

- Fifth Street to East Street Interconnect
  Estimated Cost: $420,897
  Project Year: 2023

Kaibab to Tiawah and Iroquois Loop.
Installation of approximately 910 linear feet of 8-inch pipe and 950 linear feet of 16-inch pipe to connect the existing 16-inch pipe on Kaibab to the 8-inch pipes on Tiawah and Iroquois. By adding the two segments of piping, the area will receive an increase in redundancy and fire protection in the area. This project will eliminate dead ends per NAC 445A.6712, which says the water system should be designed to the extent possible to eliminate dead ends. Eliminating dead ends is beneficial to customers because water age and water quality in the distribution system will be improved.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the loop. When the area was modeled with a 1,500 gpm residential fire demand along Iroquois, the pre-loop pressures were adequate and the post loop pressures remained adequate. There was a noticeable increase in system pressures in the model as a result of the interconnects. Design and permitting is estimated at $134,400 and construction is estimated at $608,400. GBWC Capital Time is estimated at $20,967. This yields a total project cost of $763,767. Design and construction of this project is planned for the year 2023.

- Kaibab to Tiawah and Iroquois Loop
  Estimated Cost: $763,767
  Project Year: 2023

7.2.2 Country View Estates/Calvada North Water Supply CIP

There are no water supply preferred plan projects in the Country View Estates/Calvada North service area.

7.2.3 Calvada Meadows Water Supply CIP

There are no water supply preferred plan projects in the Calvada Meadows service area.

7.2.4 Mountain View Estates Water Supply CIP

There are no water supply preferred plan projects in the Mountain View Estates service area.

7.2.5 Mountain Falls Water Supply CIP

There are no water supply preferred plan projects in the Mountain Falls service area.

7.3 Wastewater System CIP

The following sections describe the capital improvement projects, monitoring, maintenance, and inspection recommendations necessary to maintain the customer's level of service for the GBWC-PD wastewater systems, while ensuring NAC 445A compliance. All of the recommendations are provided to:

1. Replace assets that are at the end of their useful lives;
2. Extend the useful life of an asset;
3. Improve the monitoring of major assets;

7.3.1 Wastewater Treatment Plant 3 CIP

Plant 3 Filtration Upgrades Phase II.
Converting a second traveling bridge sand filter to a cloth disc media filter. This project will provide redundancy to the filter upgrade from Phase 1 and will allow one cloth disc filter to be out of service. This will further decrease O&M costs and allow the new cloth disc media technology to act as primary and standby and no longer need to divert for maintenance to the traveling bridge sand filters. The construction cost of this project is estimated at $646,128 with the engineering and permitting estimated to be $66,240. GBWC Capital Time is estimated to be $20,967. The total project cost is estimated to be $733,335 and is planned to be implemented in 2022.

- Plant 3 Filtration Upgrades Phase II
  Estimated Cost: $733,335
  Project Year: 2022

Plant 3 Emergency Storage.
Convert a portion of the existing digester capacity at Plant 3 to surge/emergency storage capacity. This will prevent slugs of solids making their way to the filters. When the solids get to the filter, backwashes are required much more frequently and it slows down the operations of the plant. With this emergency storage capacity, the increased flows will be stored and high solids will not impact filters. Design and permitting is estimated at $44,400. Construction is estimated at $225,600. GBWC Capital Time is estimated at $20,967 for a total project cost of $290,967. Design and construction is planned to be implemented in 2022.

- Plant 3 Emergency Storage
  Estimated Cost: $290,967
  Project Year: 2022

7.3.2 Wastewater Treatment Plant F CIP

There are no wastewater treatment preferred plan projects for Wastewater Treatment Plant F.

7.3.3 Mountain Falls Wastewater Treatment Plant CIP

There are no wastewater treatment preferred plan projects for the Mountain Falls Wastewater Treatment Plant.

7.4 Wastewater Collection and Disposal System CIP

There is one wastewater collection CIP in the preferred plan, which is described below:

Replace Sewer Mains in Calvada North.
Historical video may show degradation in the Calvada North sewer mains. The video should be re-evaluated and segments of sewer mains can be re-videoed to determine the extent of degradation and length of pipe needed for replacement. GBWC-PD is requesting a budget of $300,000 to re-video sewer mains and replace degraded pipe as necessary. This project is planned for 2023.

- Replace Sewer Mains in Calvada North
  Estimated Cost: $300,000
  Project Year: 2023

7.5 Other Fixed Assets – Future Potential Replacement Needs

Table 7.01 is a list of additional assets that may need replacement or refurbishing base on their age and expected nominal useful lives. The goal for many of these assets, through proper monitoring and maintenance, is to extend their useful lives beyond the nominal useful life expectancy for replacement. Many of the recommended monitoring, maintenance, and inspection recommendations have been designed for this reason.

Table 7.01: Major Assets Expected Replacement/Refurbish Years

Asset	Year	Cost	Comments
Mesquite Booster Pump Station Pumps 1 and 2	2026	$31,000	Replacement
Country View Estates Pumps 1, 2 and 3	2023	$32,000	Replacement
Lift Station 1 Pumps 1 and 2	2018	$15,000	Replacement
Lift Station 2 Pumps 1 and 2	2018	$19,000	Replacement
Lift Station 3 Pumps 1 and 2	2018	$19,000	Replacement
Lift Station 4 Pumps 1 and 2	2026	$19,000	Replacement
Lift Station 5 Pumps 1 and 2	2018	$10,000	Replacement
Lift Station 6 Pumps 1 and 2	2018	$6,000	Replacement
Lift Station 7 Pumps 1 and 2	2030	$14,000	Replacement
Lift Station 8 Pump 1	2032	$7,000	Replacement
Lift Station 8 Pump 2	2018	$7,000	Replacement
Lift Station 10 Pumps 1 and 2	2023	$15,000	Replacement
Lift Station 11 Pumps 1 and 2	2023	$15,000	Replacement
Plant F Lift Station Pumps 1 and 2	2018	$15,000	Replacement
Plant F Calvada North 4 Lift Station	2018	$8,000	Replacement
Plant 3 WWTP Equipment	Varies between 2018 and 2038	$7,136,500	Replacement
Plant F WWTP Equipment	Varies between 2018 and 2038	$932,000	Replacement
Plant MF WWTP Equipment	Varies between 2018 and 2038	$6,351,000	Replacement
	Total Asset Cost	**$14,652,000**	

7.6 Preferred Plan Project Timeline

Table 7.02 provides an estimated project schedule timeline for the recommended implementation of the Preferred Plan.

Table 7.02: Scheduled Timeline for Preferred Plan Water CIPs

Year	Projects	Total Annual CIP Cost
2019	See Action Plan Timeline	$3,298,406
2020	See Action Plan Timeline	$5,969,996
2021	See Action Plan Timeline	$6,326,312
2022	Comprehensive Hydraulic Model of GBWC-PD System; Plant 3 Filter Upgrade Phase II; Plant 3 Emergency Storage; Pipeline Replacement and Looping Existing Dead Ends	$2,776,774
2023	Pocahontas to Moccasin Street Water Connection; Fifth Street to East Street Interconnect; Kaibab to Tiawah and Iroquois Loop; Replace Sewer Mains in Calvada North; East Street to Highway 372 Loop; Pahrump Valley Boulevard to Mountain View Casino Loop; Pipeline Replacement and Looping Existing Dead Ends	$3,261,067
Preferred/Action Plan Total		**$21,032,555**

SECTION 8.0: ACTION PLAN

GBWC-PD will focus the next three years on those projects determined to be most critical. GBWC-PD will limit other capital improvements during this time to avoid customer rate impacts. The Preferred Utility Plan is to address all the system, compliance, environmental, and conservation needs at a capital spending schedule which can be tolerated and accepted by their customers. Each of the capital projects to address concerns outside of the immediate three-year Action Plan is addressed in the 2018 IRP.

The recommended action plan projects for GBWC-PD targets the water and wastewater systems in a way that helps maintain (and improve) the customers' current level of service, provide redundancy to the system, free up staff time for added recommended monitoring and maintenance, and ensures compliance with NAC 445A "water works" regulations. In addition to the recommended capital projects, several additional monitoring, maintenance, and inspection recommendations are being proposed with the goal of even greater oversight of assets to further extend the nominal life expectancy for many of the larger assets. Where this action plan provides only a single option for a project, this represents the sole viable option for the project. For every action plan item related to a forecasted demand deficiency, we have considered all relevant and required factors in reaching our determination.

The Water Conservation Plan addresses two projects that have been incorporated into the Action Plan, which are the Water Wagon Project and the Office and Water Education Center at Discovery Park Project. For additional information on these projects, refer to Section IV of the Water Conservation Plan (provided in Appendix K).

8.1 Action Plan Projects

The three-year action plan projects focused on asset concerns that have been identified through the development of the asset management component, failure mode and effects analysis, NAC compliance, and staff recommendations. The project list includes:

1. Wastewater Treatment Plant 3 Dewatering Upgrades;
2. Nye County Reclaim Water Project;
3. Well Rehabilitation Program;
4. Pipeline Replacement and Looping Existing Dead Ends
5. Plant 3 Filter Upgrade Phase I
6. Future Well Location Evaluation
7. Cathodic Protection for Low Zone Tank 1
8. Cathodic Protection for High Zone Tank
9. Cathodic Protection for Mountain Falls Tank
10. SCADA Upgrade Project
11. Well 12 Backup Generator

12. Mountain Falls Well 1 Backup Generator Replacement
13. Mountain Falls Well 2 Backup Generator Replacement
14. Mountain View Estates/Calvada Valley Interconnect
15. Wilson Road to Ishani Ridge Loop
16. Firebird Circle Loop
17. Sagebrush Extension
18. Future Looping Analysis Study
19. Office and Water Education Center at Discovery Park
20. Calvada Meadows Water System Improvements
21. Water Wagon

8.2 Water System CIP

There are several projects that are being considered that will impact the overall GBWC-PD Service Territory. These projects are described below:

Pipeline Replacement and Looping Existing Dead Ends.
This project involves working with Nye County to determine roadways that will be worked on in the upcoming three years to determine if roadway work will be conducted on roadways corresponding with piping alignments that may require replacement or would help loop existing dead ends. By working with Nye County to identify future roadwork, GBWC-PD can take advantage of the construction by replacing existing piping or adding more piping for looping while saving on road repair costs. Taking advantage of this time period when the road is torn up will save GBWC-PD money on asphalt cutting and asphalt replacement, thus saving cost for the rate payers. The roadway work efforts have not been coordinated with Nye County at this time, so an exact construction cost cannot be determined. GBWC-PD is requesting $1,000,000 per year for funds to coordinate with Nye County and implement applicable projects for pipeline replacement and looping existing dead ends.

- Pipeline Replacement and Looping Existing Dead Ends
  Estimated Cost: $1,000,000 per year
  Project Year: 2019 - 2021

Well Rehabilitation Program.
As outlined in Section 2.0, there are currently twelve (12) potable water wells in GBWC-PD. GBWC-PD is not the original owner or installer of these wells. GBWC-PD does not have information about the original condition of the wells or whether the original owner ever rehabilitated the wells. GBWC-PD has recently redrilled/rehabilitated two wells in the Calvada Valley service area (Well 12, previously Well 8, and Well 11). Of the 10 remaining potable water wells, the casing of 5 wells is beyond the serviceable life of 40 years and all 10 wells are beyond the typical rehab timeframe of 10 years recommended by the American Public Works Association ("APWA"). Also, as indicated in the Fixed Asset Registry in Appendix A, many of the well column pipes are approaching or

beyond their serviceable life. The well rehabilitation work will generally consist of removing the well pump and motor and column pipe from the well casing, camera investigation of the well, cleaning the well through acid treatment, brushing, swabbing and bailing. Following cleaning, a follow up investigation is performed to document the well cleaning success as well as the status of the casing and well screen. As observed in other rehabilitated wells, the well capacity may increase after rehabilitation. Hydraulically, the higher flows may result in the determination that the existing pump selection is not an efficient pump under the rehabbed flows. For this reason, it is important to budget for replacement of the pump, motor and VFD, if applicable. The well rehabilitation will include upgrades for level transducer monitoring equipment to provide monitoring of well levels and drawdown, assisting operations with identifying any well issues as well as provide important information for an over-appropriated basin. Each well rehabilitation is estimated to cost approximately $298,483, which includes a GBWC Capital Time of $8,736 per well. GBWC-PD is proposing to rehabilitate two (2) wells per year for a total of six (6) well rehabilitations in Years 2019, 2020 and 2021.

- Well Rehabilitation Program
  Estimated Cost: $586,967 per year
  Project Years: 2019, 2020, 2021

Anticipated Timeline for Each Well Rehab

Bid Document Preparation & Bidding	2 weeks
Capital Projects Team Review	1 weeks
Contract Negotiations	1 weeks
Implement Well Rehab	10 weeks
Close-Out	1 weeks
Total	15 weeks

Future Well Location Evaluation.

The study will be used: (1) to evaluate existing well locations and propose new targets, and (2) develop an improved understanding of Pahrump Basin (Basin 162) hydrology for GBWC-PD planning and resource development. Each element of the study will require gathering relevant hydrologic information about the GBWC-PD wells and other wells in adjoining areas. Examples of the types of information desired include: location, lithology, depth, screen interval, static water levels, pumping water levels, pumping rate, specific capacity, maintenance and development history, ownership, etc. Pump test information regarding transmissivity or hydraulic conductivity would be important and can build on data generated during the well rehabilitations. Published and unpublished reference material will also be sought. Data compilation, assembly, and

hydrologic interpretation will be critical. The study will determine areas that will be best for future wells in the GBWC-PD service area in an attempt to maximize GBWC's water supply capabilities for the benefit of all GBWC-PD customers. The long-term benefit to GBWC-PD, GBWC-PD customers and to all the water users in Basin 162, is GBWC-PD will be able to construct new production wells knowing the wells will not have a negative impact to the basin and will ensure the future reliability of water delivered GBWC-PD customers. In addition, the study will save on future engineering costs during the development of a new or replacement well because the citing of the new well or validation to re-drill a well on an existing site has already been completed. The study is estimated to cost $141,760 and GBWC Capital Time is estimated to cost $21,170 for a total estimated cost of $162,930. The study is planned to be completed in 2020.

- Future Well Location Evaluation
  Estimated Cost: $162,930
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal	5 - 8 weeks
(develop, advertise, review)	
Capital Projects Team Review (develop, review and approve_	1 - 2 weeks
Contract Negotiations	1 - 4 weeks
Study Timeframe	6- 8 months
Project Close-Out	1 – 2 months
Total	35 - 54 weeks

Future Looping Analysis Study.
GBWC-PD has an opportunity to play a key role in protecting the groundwater source by extending its service to areas that a high demand for service within our Certificate of Public Convenience and Necessity ("CPCN"). The Future Looping Analysis would evaluate these areas of high demand using GIS. The evaluation would include Inquiry data, future domestic well potential data, Nye County Planning data, etc. to determine additional priorities for additional main.

In addition, the Future Looping Analysis would update the current *Dead End Looping Analysis of the Existing Water System* from March 2007 (provided in Appendix M) to identify new priorities for looping to improve water quality, reliability, and fire protection throughout the system. Per NAC 445A.6712, the water system should be designed to the extent possible to eliminate dead ends and form a grid system or system of arterial loops.

The map in Appendix D provides an example of the Calvada North GBWC service territory. GBWC-PD has three potable wells servicing this territory. There are over 300 domestic wells within or immediately adjacent to this service territory as shown in Figure 1 of "Volume II Pahrump Division IRP Figures" in Appendix M. GBWC serves 500 customers in this territory. Of the 800 connected water users (either via domestic wells or utility wells) in this area, domestic wells serve over 35%. Another example is the Calvada Valley service territory, with approximately 3600 customers and five (5) utility wells. As shown on Figure 2 of the "Volume II Pahrump Division IRP Figures" in Appendix M, there are 816 registered domestic wells in and immediately adjacent to this service territory. GBWC-PD serves roughly 720 connections per utility well. One can assume that each domestic well would serve one connection. Furthermore, the Future Well Location Evaluation Study will assist in sighting new and replacement wells in locations that are hydrologically feasible and close to existing infrastructure (to the extent possible). In addition, part of the study would analyze providing more looping in each service area to help provide redundancy and/or fire flow capability in the system.

Through these examples, it is evident that there is a need to plan service territory infrastructure with development to reduce the continued drilling of domestic wells in Basin 162 and improve looping in the system. The study is estimated to cost $97,000 and GBWC Capital Time is $17,472 for a total of $114,472. The study is planned for completion in 2021.

- Future Looping Analysis
  Estimated Cost: $114,472
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 - 2 weeks
Contract Negotiations	1 - 4 weeks
Study Timeframe	4 - 6 months
Project Close-Out	1 – 2 months
Total	27 - 46 weeks

SCADA Upgrade Project.
Currently, the twelve (12) Pressure Relief Valves (PRV's) in the GBWC-PD system are not connected to SCADA. Operators would like to see these valves added to SCADA to improve efficient monitoring. Upon completion of construction, the SMMR service area water and

wastewater infrastructure (described in Sections 2.7, 2.8.1.4 and 2.8.2.4) will also need to be added into the GBWC-PD SCADA system. For this reason, upgrades to the existing SCADA system will be warranted. In addition, GBWC-PD's current site for radio is in a poor location, where it is difficult to access towers. As part of the SCADA Upgrades, improved locations for towers that will have site security to protect from vandalism will be evaluated. As part of the evaluation of locations, a radio study will be conducted to determine the most reliable sites to provide uninterruptable communication between GBWC-PD's critical components and GBWC-PD staff, which monitors the GBWC-PD system 24 hours a day to provide service. The SCADA evaluation, radio study and permitting are estimated to cost $198,000. SCADA adjustments and site development/security is estimated to cost $291,000. GBWC capital time is estimated to cost $26,208 for a total project cost of $515,208. The upgrades are planned for completion in 2020.

- SCADA Upgrade Project
  Estimated Cost: $515,208
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 - 2 weeks
Contract Negotiations	1 - 4 weeks
Study/Engineering Design & Permitting/Construction Timeframe	7 - 9 months
Project Close-Out	1 – 2 months
Total	39 - 58 weeks

Water Wagon.
A Water Wagon is a mobile water dispensing unit that can be used for supplying clean, potable water to the public. GBWC would like to have a Water Wagon to serve its customer base while promoting the value of water to the community. The Water Wagon also will be available for use by not-for-profits or charitable events. The Water Wagon would increase the reduction of waste generated from disposable water bottles sold or served at special events and allow community residents and GBWC customers to avoid that cost of purchasing water at these event, serving as a multi-purpose public outreach platform and public relations tool. This double sided, eight station trailer has eight bottle fillers and eight fountains as well as a300-gallon stainless steel potable

water tank. A 130-gallon galvanized grey water tank and two 110 Volt pumps are included to maintain pressure. The pumps, UV/filter system and electric chiller operate off of solar power.

An alternative is a motorized version of the water wagon at an estimated cost of over $146,000. This alternative as has higher O&M costs for fuel, licensing, taxes and requires a CDL class license to operate. Many events in the GBWC divisions are in open spaces with limited space available. The option of a trailer is much more suitable to reaching out to the communities we serve in a more cost-effective manner while still achieving the same goals. Therefore, the preferred alternative is a trailer mounted water wagon, such as the Quench Buggy.

- Water Wagon
  Estimated Cost: $67,200
  Project Year: 2019

Anticipated Timeline

Capital Projects Team Review (develop, review and approve)	1 - 2 weeks
Determine Custom Features of Water Wagon	1 – 3 weeks
Purchase Water Wagon	1 - 4 weeks
Project Close-Out	1 – 4 weeks
Total	4 - 13 weeks

Office and Water Education Center at Discovery Park.
This project involves adding a 5,000-square foot Discovery Park Office and Visitor's Information Center. The new office will create a new office space for GBWC-PD staff as well as add a variety of benefits to the community, including:

- As a WaterSense partner, GBWC-PD can reduce water use by demonstrating and promoting efficient products and practices, can help communities to meet water demands, save energy, and reduce stress on our natural resources.
- Promote and demonstrate strategies for reducing outdoor water use through water efficient landscaping and options for implementing cost-effective methods that utilize alternative sources of water, and rebate information.
- Develop a water efficient best management practices in building design with low flow fixtures, site development for storm water runoff, rainwater harvesting, and capture for demonstration purposes.
- Provide year-round water conservation education with displayed fact sheets.

- Provide volunteer opportunities; internships, and career development in water conservation.
- Centrally located between Great Basin College, J.G. Elementary School, and Pahrump Valley High School for school tours, workshops, and field trips—all of which will aim to promote awareness about water conservation and GBWC practices.
- Landscaped with native and drought tolerant plantings for demonstration.
- Demonstrate drip irrigation and weather-based irrigation controllers through examples and information.
- Future educational tours, exhibits, and demonstrations for all ages for the community. This can be developed with project partners, 501c3 grant monies, and current collaborating partners University of Nevada Cooperative Extension, Red Rock Audubon Society, Friends of Red Rock Canyon, and Nye Communities Coalition.
- Opportunity to demonstrate current rebates- learn how to conserve to preserve
- Improve customer relations by allowing customers to pay their bills on site verses going through third parties. Customers can talk to local representatives in person.
- Provide meeting areas for local non-profits, and partners.
- Indoor/outdoor classroom for youth and adults.
- Encourage the benefits of reclaimed water & alternate sources of water (graywater, rainwater, and storm water, cooling condensate and foundation drain water).
- Encourage permeable paving as a method of paving vehicle and pedestrian pathways that allows for infiltration of fluids.
- Availability to provide an inside event area for Great Basin Water Co. to host educational events, lectures, and meetings.

The Office and Water Education Center at Discovery Park will also eliminate the need to rent office space. The GBWC-PD office has been located in a strip mall for well over a decade and the company has outgrown the space. Placing the office and the visitor center at the same location provides better opportunity to be available to GBWC-PD customers and a forum to provide information about water, conservation, regulated utilities, etc.

The office and visitor's information center is estimated to cost approximately $1,541,799, which includes construction, engineering design and permitting. It is estimated that this project would be completed in 2021.

- Office and Water Education Center at Discovery Park
  Estimated Cost: $1,541,799
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks

Capital Projects Team Review (develop, review and approve)	4 – 8 months
Contract Negotiations	2 - 6 weeks
Engineering Design & Permitting	6 - 8 months
Bid	2 – 3 months
Construction	8 – 12 months
Project Close-Out	1 – 3 months
Total	91 - 150 weeks

8.2.1 Calvada Valley Water System CIP

In the Calvada Valley system, there are multiple projects being considered that will improve water delivery in the event of a main break. These projects are described below:

Cathodic Protection for Low Zone Tank 1.
The Low Zone Tank 1 currently does not have cathodic protection, which is proven to protect storage tanks from corrosion and extend their useful lives, commonly tens of years beyond nominal expected useful life. The intent is to extend the useful life of the storage tank to maximize GBWC-PD's water supply in a manner that ultimately minimizes cost to ratepayers, as the alternative could involve constructing a new storage tank at the end of the nominal expected useful life. For this reason, cathodic protection is being recommended for the Low Zone Storage Tank 1. It is estimated that the total cost of cathodic protection for this tank with design cost included will be approximately $51,495. The estimated GBWC Capital Time cost is $17,472 for a total cost of $68,967. The cathodic protection is planned to be installed on this tank in 2020 in conjunction with cathodic protection on two other storage tanks in GBWC-PD.

- Cathodic Protection for Low Zone Tank 1
  Estimated Cost: $68,967
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks

Contract Negotiations	1 - 4 weeks
Engineering Design	2 - 6 weeks
Cathodic Protection Installation	1 – 2 months
Project Close-Out	1 – 2 months
Total	14 - 32 weeks

It is anticipated that the cathodic protection project for Low Zone Tank 1 would occur at the same time as the cathodic protection projects for the High Zone Tank and Mountain Falls Tank.

Cathodic Protection for High Zone Tank.
The High Zone Tank currently does not have cathodic protection, which is proven to protect storage tanks from corrosion and extend their useful lives, commonly tens of years beyond nominal expected useful life. The intent is to extend the useful life of the storage tank to maximize GBWC-PD's water supply in a manner that ultimately minimizes cost to ratepayers, as the alternative could involve constructing a new storage tank at the end of the nominal expected useful life. For this reason, cathodic protection is being recommended for the High Zone Tank. It is estimated that the total cost of cathodic protection for this tank will be approximately $55,814. The estimated GBWC Capital Time cost is $17,472 for a total of $73,287. The cathodic protection is planned to be installed on this tank in 2020, in conjunction with cathodic protection on two other storage tanks in GBWC-PD.

- Cathodic Protection for High Zone Tank
  Estimated Cost: $73,287
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design	2 - 6 weeks
Cathodic Protection Installation	1 – 2 months
Project Close-Out	1 – 2 months

Total	14 - 32 weeks

It is anticipated that the cathodic protection project for the High Zone Tank would occur at the same time as the cathodic protection projects for the Low Zone Tank 1 and Mountain Falls Tank.

Wilson Road to Ishani Ridge Loop.
Installation of approximately 900 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Wilson Road to the Hydrant at the Ishani Ridge entrance. Currently the area is served via water mains along Red Butte from Bourbon Street to Highway 372 to Bolling Road and up through Ishani Ridge stopping at Wilson Road and has no secondary water source. Should there be a main break along this water main, there will be no domestic water or fire protection to the area, which is approximately a mile of water main. Therefore, this proposed connection promotes system reliability and maximizes beneficial use of existing infrastructure. This connection will also provide Ishani Ridge with a second connection to the main GBWC-PD water system.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the loop. The modeling of the loop indicated that system pressures at the entrance to the Ishani Ridge community are within acceptable pressure ranges (approximately 24 psi when 1,500 gpm of fire flow was applied, and approximately 79 psi without fire flow applied) and did not result in pressures outside of the 40 psi to 100 psi range per NAC 445A.6672. The model results confirm that this loop is a viable solution for reliable flow and pressure to the Ishani Ridge system. However, the project is not specific to Ishani Ridge; it will provide the benefits of looping to a large portion of the GBWC-PD Calvada main system, including commercial property located on Highway 372. Design and permitting is estimated at $73,656 with construction estimated at $259,122. GBWC-PD Capital Time is estimated at $31,450. This yields a total project cost of $364,228. It is estimated that this project would be completed in 2021.

- Wilson Road to Ishani Ridge Loop
  Estimated Cost: $364,228
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	3 - 5 months

Bid	5 – 9 weeks
Construction	4 – 7 months
Project Close-Out	1 – 2 months
Total	44 - 79 weeks

Firebird Circle Loop.
Approximately 3,000 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Well 11 to the 12-inch main just west of Dandelion Street on Firebird Circle. In the event of a main break, isolating the affected piping will be more efficient. Currently, familiarity of the system is required to shut down the system for a main break to prevent causing further damage to the system. By extending the pipe from Well 11 to Dandelion, the west side of Highway 160 will now have fire protection. This eliminates the need for fire fighters to connect to fire hydrants on the east side of the Highway, thus eliminating the possibility of a shutdown of the Highway during a fire flow event.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the loop. The modeling of this looping project indicated that there was a slight decrease in local system steady-state pressures due to the loop, but this did not result in pressures outside of the 40 psi to 100 psi range per NAC 445A.6672. This looping project would also provide fire protection for the commercial district on the west side of Highway 160 without having to cross the highway in the event of a fire. When modelled, the fire flow capability was improved with the loop. Prior to the loop, the worst-case commercial node at the Saddle West site was only able to achieve 1,550 gpm at 20 psi fire flow; however, with the Firebird Circle loop, this commercial node was able to achieve closer to 1,730 gpm at 20 psi fire flow. The fire flow at this node was improved further when the Pocahontas to Moccasin Street Connection (which is discussed in the Preferred Plan in Section 7.0) was added. With both Firebird Circle Loop and Pocahontas to Moccasin Street interconnects, the model indicates that the system will be able to achieve the 2,000 gpm fire flow requirement at 20 psi. Design and permitting is estimated at $103,884 and construction is estimated at $745,524. GBWC Capital Time is estimated at $31,450. This yields a total project cost of $880,858. It is estimated that this project would be completed in 2021.

- Firebird Circle Loop
  Estimated Cost: $880,858
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal	5 - 8 weeks

(develop, advertise, review)	
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	3 - 5 months
Bid	5 – 9 weeks
Construction	4 – 9 months
Project Close-Out	1 – 2 months
Total	44 - 87 weeks

Sagebrush Extension.
Approximately 760 linear feet of 8-inch pipe to connect the existing 8-inch pipes on Sagebrush. This project will provide an additional loop to the system and will increase redundancy to the area. This project will eliminate dead ends per NAC 445A.6712, which says the water system should be designed to the extent possible to eliminate dead ends. Eliminating dead ends is beneficial to customers because water age and water quality in the distribution system will be improved.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the loop. When modeled, the pressures and flow delivery capabilities were not noticeable between the pre-interconnection and post-interconnection model runs and modelling of the extension did not result in pressures outside of the 40 psi to 100 psi range per NAC 445A.6672. Design and permitting is estimated at $62,928 and construction is estimated at $191,040. GBWC Capital Time is estimated at $26,208. This yields a total project cost of $280,176. It is estimated that this project would be completed in 2021.

- Sagebrush Extension
  Estimated Cost: $280,176
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks

Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	3 - 5 months
Bid	5 – 9 weeks
Construction	4 – 7 months
Project Close-Out	1 – 2 months
Total	44 - 79 weeks

Well 12 Backup Generator.

Well 12 was recently drilled in 2017 and replaced Well 8. The Well does not have a backup power source to ensure water production to the system. A backup generator on Well 12 would ensure a reliable source of water is conveyed into Calvada Valley in the event that other wells are offline or an extended power outage affected the area. The recommendation is to equip Well 12 with a backup generator and automatic transfer switch to ensure service is not interrupted. The backup generator, transfer switch and pad is estimated to cost $84,180. Engineering design and permitting is estimated to total $17,146. GBWC Capital Time is estimated at $10,483. The total estimated cost is $111,809. The backup generator design and construction is estimated for 2020.

- Well 12 Backup Generator
  Estimated Cost: $111,809
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	2 - 4 weeks
Backup Generator Installation	2 – 4 weeks
Project Close-Out	1 – 2 months
Total	12 - 26 weeks

8.2.2 Country View Estates/Calvada North Water Supply CIP

No action plan projects are planned for this service area in the next three years.

8.2.3 Calvada Meadows Water Supply CIP

Calvada Meadows Water System Improvements

Calvada Meadows currently has 32 metered water service connections from an existing well and hydropneumatic tank (discussed in Sections 2.4.2 and 2.4.3). The existing well currently has an average production rate that is significantly below the well pumping capacity (approximately 2% of the well's capacity assuming that the 300 gpm well is operating for 12 hours of the day). A de-sander device was installed on the well discharge line at the site due to the well pumping small quantities of sand through the line, which can cause water quality complaints and disrupt sampling results.

The Calvada Aeropark Association is comprised of 354 properties - hangars, home hangars and residential and commercial lots where the majority of lots are located on the east side of the Calvada Meadows airport. Growth in the community is stifled because of the lack of water infrastructure, especially to the east of the runway. GBWC's current infrastructure is on the west side of the runway. In addition, commercial development in Jenny Circle is a desire of the community.

To support current customers and the mitigation of new domestic wells in Calvada Meadows, additional water infrastructure is necessary and should be planned to maximize use/extension of current GBWC water infrastructure to mitigate the proliferation of new domestic wells. Based on the needs of the community, the options for added infrastructure include:

Option 1. Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include). See Figures 3 and 5 (Preferred Alternative) in "Volume II Pahrump Division IRP Figures" in Appendix M.

1.a. Option 1 above and a new well. See Figures 3 and 6 in "Volume II Pahrump Division IRP Figures" in Appendix M.

Option 2. Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (With Fire Flow). See Figures 3 and 7 in "Volume II Pahrump Division IRP Figures" in Appendix M.

2.a. Option 2 above and a new well. See Figures 3 and 8 in "Volume II Pahrump Division IRP Figures" in Appendix M.

Option 3. Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include). See Figures 4 and 5 in "Volume II Pahrump Division IRP Figures" in Appendix M.
3.a. Option 3 above and a new well. See Figures 4 and 6 in "Volume II Pahrump Division IRP Figures" in Appendix M.

Option 4. Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (With Fire Flow). See Figures 4 and 9 in "Volume II Pahrump Division IRP Figures" in Appendix M.
4.a. Option 4 above and a new well. See Figures 4 and 10 in "Volume II Pahrump Division IRP Figures" in Appendix M.

The options were developed based on maximizing the production of the existing well. The number of customers that could be served from the well were determined based upon a 12 hour per day well pump operation. The backbone infrastructure to serve those customers was then determined for each of the scenarios above. A brief description of each scenario is described below.

Option 1. Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include).

This option would extend 6,760 linear feet of 10-inch water line to the east side of the runway that would then run along Cockpit Place and extend north and south along Kittyhawk Drive. The extension to the north and south along Kittyhawk Drive would place backbone infrastructure in place to serve development to the east or west of Kittyhawk. To cross the runway, the construction will likely be bore and jack or horizontal directional drill. Figure 3 (in "Volume II Pahrump Division IRP Figures" in Appendix M) depicts a conceptual plan of the alignment.

In order to serve the residential customers for this option, a 54,000 gallon storage tank and booster pump station are required at the Calvada Meadows #1 well site. The tank and pumps have been sized assuming that service for 600 residential customers would be provided in this phase of work. The tank is sized to store maximum day domestic demand, but not fire flow. Thus a second tank would need to be added in the future to accommodate fire storage for 1,500 gpm at 2 hours. The booster pumps are assumed to be enclosed in a pre-fabricated building and space would be provided for a future high flow pump that would serve during fire demand periods.

It is likely that with the additional electrical load being added to the site, that coordination and installation of additional service from Valley Electric will be required. The addition of a permanent standby generator is preferred, but not currently included in the scope of work.

Figure 5 in "Volume II Pahrump Division IRP Figures" in Appendix M depicts a concept plan for the infrastructure to be added at the well site.

The conceptual construction cost estimate for this option is provided in Table 8.01 at the end of this discussion.

Option 1.a. Option 1 above and a new well.

This option mirrors the water line and well site improvements discussed in Option 1, but also includes the addition of a new well. If the existing well is out of service, the second well will provide a redundant source of water supply. Figure 6 in "Volume II Pahrump Division IRP Figures" in Appendix M depicts a concept plan for the infrastructure to be added at the existing well site for this option.

Option 2. Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (With Fire Flow).
This option would extend 6,760 linear feet of 10-inch water line to the east side of the runway that would then run along Cockpit Place and extend north and south along Kittyhawk Drive. The extension to the north and south along Kittyhawk Drive would place backbone infrastructure in place to serve development to the east or west of Kittyhawk. To cross the runway, the construction will likely be bore and jack or horizontal directional drill. Figure 3 depicts a conceptual plan of the alignment.

In order to serve the residential customers for this option, a 234,000 gallon storage tank and booster pump station are required at the Calvada Meadows #1 well site. The tank and pumps have been sized assuming that service for 324 customers would be provided in this phase of work. The tank is sized to store maximum day domestic demand and fire storage for 1,500 gpm at 2 hours. The booster pumps are assumed to be enclosed in a pre-fabricated building and a high flow pump would serve during fire demand periods.

It is likely that with the additional electrical load being added to the site, that coordination and installation of additional service from Valley Electric will be required. The addition of a permanent standby generator is preferred, but not currently included in the scope of work.

Figure 6 depicts a concept plan for the infrastructure to be added at the well site.

The conceptual construction cost estimate for this option is provided in Table 8.01 at the end of this discussion.

Option 2.a. Option 2 above and a new well.

This option mirrors the water line and well site improvements discussed in Option 2, but also includes the addition of a new well. If the existing well is out of service, the second well will provide a redundant source of water supply. Figure 7 in "Volume II Pahrump Division IRP Figures"

in Appendix M depicts a concept plan for the infrastructure to be added at the existing well site for this option.

Option 3. Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include).
This option would extend a 12-inch water line to the east side of the runway that would then run along Cockpit Place and extend north and south along Kittyhawk Drive. The extension to the north and south along Kittyhawk Drive would place backbone infrastructure in place to serve development to the east or west of Kittyhawk. To cross the runway, the construction will likely be bore and jack or horizontal directional drill. To provide service to commercial development in Jenny Circle, a 12-inch water line would be extended to the west to the Highway 160 Frontage Road within an existing utility easement. The line would then run north along the Highway 160 Frontage Road and along Jenny Circle. Figure 4 in "Volume II Pahrump Division IRP Figures" in Appendix M depicts a conceptual plan of the alignment.

In order to serve the residential and commercial customers for this option, a 54,000 gallon storage tank and booster pump station are required at the Calvada Meadows #1 well site. The tank and pumps have been sized assuming that service for 36 commercial connections and 240 residential connections would be provided in this phase of work. The tank is sized to store maximum day domestic demand, but not fire flow. Thus, a second tank would need to be added in the future to accommodate fire storage for 2,000 gpm at 2 hours. The booster pumps are assumed to be enclosed in a pre-fabricated building and space would be provided for a future high flow pump that would serve during fire demand periods.

It is likely that with the additional electrical load being added to the site, that coordination and installation of additional service from Valley Electric will be required. The addition of a permanent standby generator is preferred, but not currently included in the scope of work.

Figure 5 depicts a concept plan for the infrastructure to be added at the well site.

The conceptual construction cost estimate for this option is provided in Table 8.01 at the end of this discussion.

Option 3.a. Option 3 above and a new well.

This option mirrors the water line and well site improvements discussed in Option 3, but also includes the addition of a new well. If the existing well is out of service, the second well will provide a redundant source of water supply. Figure 6 in "Volume II Pahrump Division IRP Figures" in Appendix M depicts a concept plan for the infrastructure to be added at the existing well site for this option.

Option 4. Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (With Fire Flow).

This option would extend a 12-inch water line to the east side of the runway that would then run along Cockpit Place and extend north and south along Kittyhawk Drive. The extension to the north and south along Kittyhawk Drive would place backbone infrastructure in place to serve development to the east or west of Kittyhawk. To cross the runway, the construction will likely be bore and jack or horizontal directional drill. To provide service to commercial development in Jenny Circle, a 12-inch water line would be extended to the west to the Highway 160 Frontage Road within an existing utility easement. The line would then run north along the Highway 160 Frontage Road and along Jenny Circle. Figure 4 in "Volume II Pahrump Division IRP Figures" in Appendix M depicts a conceptual plan of the alignment.

In order to serve the residential and commercial customers for this option, a 294,000 gallon storage tank and booster pump station are required at the Calvada Meadows #1 well site. The tank and pumps have been sized assuming that service for 36 commercial connections and 240 residential connections would be provided in this phase of work. The tank is sized to store maximum day domestic demand and fire storage for 2,000 gpm at 2 hours. The booster pumps are assumed to be enclosed in a pre-fabricated building and a high flow pump that would serve during fire demand periods.

It is likely that with the additional electrical load being added to the site, that coordination and installation of additional service from Valley Electric will be required. The addition of a permanent standby generator is preferred, but not currently included in the scope of work.

Figure 9 depicts a concept plan for the infrastructure to be added at the well site.

The conceptual construction cost estimate for this option is provided in Table 8.01 at the end of this discussion.

Option 4.a. Option 4 above and a new well.

This option mirrors the water line and well site improvements discussed in Option 4, but also includes the addition of a new well. If the existing well is out of service, the second well will provide a redundant source of water supply. Figure 10 depicts a concept plan for the infrastructure to be added at the existing well site for this option.

Table 8.01: Summary of Calvada Meadows Improvements Alternatives

Option	Description	Conceptual Construction Cost Estimate
1.	Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include). 6,760 linear feet of 10-inch water line to east side of runway and north/south along Kittyhawk. New 54,000-gallon storage tank and booster pump station with provisions for future fire pump. See Figures 3 and 5 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$2,033,783
1.a.	Option 1 above, but with new well. See Figures 3 and 6.	$4,755,676
2.	Provide Backbone Infrastructure for Residential Domestic Demand to East of Runway (With Fire Flow). 6,760 linear feet of 10-inch water line to east side of runway and north/south along Kittyhawk. New 234,000 gallon storage tank and booster pump station with fire flow pump. See Figures 3 and 7 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$2,984,949
2.a.	Option 2 above, but with new well. See Figures 3 and 8 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$5,728,806
3.	Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (Plan for Fire Flow, but not include). 11,580 linear feet of 12-inch water line to east side of runway and north/south along Kittyhawk and to the west within an existing utility easement and north along Highway 160 Frontage Road. New 54,000-gallon storage tank and booster pump station with provisions for future fire pump. See Figures 4	$3,373,488

Option	Description	Conceptual Construction Cost Estimate
	and 5 in "Volume II Pahrump Division IRP Figures" in Appendix M.	
3.a.	Option 3 above, but with new well. See Figures 4 and 6 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$6,082,461
4.	Provide Backbone Infrastructure for Both Commercial (Jenny Circle) and Residential Domestic Demand to East of Runway (With Fire Flow). 11,580 linear feet of 12-inch water line to east side of runway and north/south along Kittyhawk and to the west within an existing utility easement and north along Highway 160 Frontage Road. New 294,000-gallon storage tank and booster pump station future fire pump. See Figures 4 and 9 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$4,639,139
4.a.	Option 4 above, but with new well. See Figures 4 and 10 in "Volume II Pahrump Division IRP Figures" in Appendix M.	$7,394,625

Options 1 and 3, while prepared to provide fire flow in the future, would require additional capital outlay in the future to provide additional storage. Options 2 and 4 would meet fire flow provisions immediately, but until growth catches up with the infrastructure, there will be long detention times in the storage tank.

Option 1 prepares the community for development by providing basic domestic service to the community. It opens the door for future connection to Jenny Circle.

Option 1 has been selected for the improvements project for Calvada Meadows because it provides a solid first step toward supporting development in the area without overbuilding initially.

Design and permitting is estimated at $250,470 and construction is estimated at $2,033,783. GBWC Capital Time is estimated at $62,899. This yields a total project cost of $2,347,152. Design and construction of this project is planned to be completed in 2022.

- Calvada Meadows Water System Improvements (for Option 1)
  Estimated Cost: $2,347,152

Project Year: 2022

Anticipated Timeline (for Option 1)

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks
Contract Negotiations	4 - 6 weeks
Engineering Design & Permitting	4 – 5.5 months
Bid	5 – 8 weeks
Construction	5 – 7 months
Project Close-Out	2 – 4 months
Total	59 - 90 weeks

8.2.4 Mountain View Estates Water Supply CIP

In the Mountain View Estates system, there are multiple projects being considered that will improve water delivery in the event of a main break. These projects are described below:

Mountain View Estates/Calvada Valley Interconnect.
Approximately 7,000 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Blagg Road to the independent system at Bunch Street. This project will add the Mountain View system which is currently served by a well and hydro tank to the main system. By making this connection, 27 additional customers will now have fire protection along with more reliable domestic service.

The Calvada Valley hydraulic model (that included recent calibration efforts) was analyzed with and without the addition of the interconnect and utilizing the peak 2038 demand in MVE. The model runs indicated that this extension would sustain sufficient pressures at the entrance to Mountain View Estates and the addition did not result in local system node steady state pressures outside of the 40 psi to 100 psi range per NAC 445A.6672. When a localized 1,500 gpm fire event for the residential area was simulated at the end of the interconnect (in MVE), the node pressure dropped from 93.9 to 51.6 psi, but the model indicated that the Mountain View Estates would be able to achieve fire flow in excess of the 1,500 gpm requirement. This project would also provide fire protection along Highway 372 where currently none exists. Design and permitting is estimated at $145,910 and construction is estimated at $1,370,452. The GBWC Capital Time is estimated at

$31,450. This yields a total project cost of $1,547,812. It is estimated that this project would be completed in 2021.

- Mountain View Estates/Calvada Valley Interconnect
  Estimated Cost: $1,547,812
  Project Year: 2021

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 - 8 weeks
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	3 - 5 months
Bid	5 – 9 weeks
Construction	4 – 7 months
Project Close-Out	1 – 2 months
Total	44 - 79 weeks

8.2.5 Mountain Falls Water Supply CIP

Cathodic Protection for Mountain Falls Tank.
The Mountain Falls Tank currently does not have cathodic protection, which is proven to protect storage tanks from corrosion and extend their useful lives, commonly tens of years beyond nominal expected useful life. The intent is to extend the useful life of the storage tank to maximize GBWC-PD's water supply in a manner that ultimately minimizes cost to ratepayers, as the alternative could involve constructing a new storage tank at the end of the nominal expected useful life. For this reason, cathodic protection is being recommended for the Mountain Falls Tank. It is estimated that the total cost of cathodic protection for this tank will be approximately $73,287. GBWC Capital Time for this project is estimated at $17,472. The cathodic protection is planned to be installed on this tank in 2020, in conjunction with cathodic protection on two other storage tanks in GBWC-PD.

- Cathodic Protection for Mountain Falls Tank
  Estimated Cost: $73,287
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design	2 - 6 weeks
Cathodic Protection Installation	1 – 2 months
Project Close-Out	1 – 2 months
Total	14 - 32 weeks

It is anticipated that the cathodic protection project for the Mountain Falls Tank would occur at the same time as the cathodic protection projects for the High Zone Tank and Low Zone Tank 1.

Mountain Falls Well 1 Backup Generator Replacement.
Mountain Falls Well 1 was provided with a 230 kW backup generator in 2006, as shown in the asset registry in Appendix A. The backup generator has failed, though the remaining useful life of the generator is 18 years. It is believed that the early failure is due to inferior outdoor construction for the enclosures and protecting the alternator, which allowed for rodent families to take up residence and wreak havoc with wire insulation on the alternator. GBWC-PD took measures to discourage intrusion into the unit, but were not able to prevent the rodents from taking up residency. Currently, both the Mountain Falls Well 1 and Mountain Falls Well 2 backup generators are out of service and the Mountain Falls service area therefore does not have permanent backup power in the event that an extended power outage affected the area and a portable generator would be required in the event of extended power loss. The recommendation is to replace Mountain Falls Well 1 with a backup generator and automatic transfer switch to ensure service is not interrupted. The replacement Mountain Falls Well 1 backup generator will have higher quality construction to ensure that early failure from rodent residency does not occur again. The backup generator, transfer switch, and pad are estimated to cost $97,132. Engineering design and permitting is estimated to total $19,946. GBWC Capital Time is estimated at $8,736. The total estimated cost is $125,815. The backup generator design and construction is estimated for 2020.

- Mountain Falls Well 1 Backup Generator Replacement
  Estimated Cost: $125,815

Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	2 - 4 weeks
Backup Generator Installation	2 – 4 weeks
Project Close-Out	1 – 2 months
Total	12 - 26 weeks

Mountain Falls Well 2 Backup Generator Replacement.
Mountain Falls Well 2 was provided with a 230 kW backup generator in 2006, as shown in the asset registry in Appendix A. The backup generator has failed, though the remaining useful life of the generator is 18 years. The reason believed for the early failure is inferior outdoor construction for the enclosures and protecting the alternator, which allowed for rodent families to take up residence and wreak havoc with wire insulation on the alternator. GBWC-PD took measures to discourage intrusion into the unit, but were not able to prevent the rodents from taking up residency. Currently, both the Mountain Falls Well 1 and Mountain Falls Well 2 backup generators are out of service and the Mountain Falls service area therefore does not have permanent backup power in the event that an extended power outage affected the area and a portable generator would be required in the event of extended power loss. The recommendation is to replace Mountain Falls Well 2 with a backup generator and automatic transfer switch to ensure service is not interrupted. The replacement Mountain Falls Well 2 backup generator will have higher quality construction to ensure that early failure from rodent residency cannot occur again. The backup generator, transfer switch and pad is estimated to cost $97,132. Engineering design and permitting is estimated to total $19,946. GBWC Capital Time is estimated at $8,736. The total estimated cost is $125,815. The backup generator design and construction is estimated for 2020.

- Mountain Falls Well 1 Backup Generator Replacement
  Estimated Cost: $125,815
  Project Year: 2020

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	1 - 2 weeks
Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	2 - 4 weeks
Backup Generator Installation	2 – 4 weeks
Project Close-Out	1 – 2 months
Total	12 - 26 weeks

8.3 Wastewater System CIP

8.3.1 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades.

Plant 3 needs a new dewatering system which will reduce the number of man hours required to operate and maintain the system in a cost-saving manner to ratepayers. As discussed previously, the existing system is undersized for the current volume of solids to be treated, especially in the winter, which has resulted in the need to maximize use of the existing abandoned Marwood tanks for sludge storage. In addition, operations staff works overtime during the winter months in order to keep up with the sludge treatment while performing their other regular duties. There are also certain components associated with the system which are difficult to obtain and have a long lead time. Regular replacement of expensive components is required to maintain a fully functional system. The staff has found that the screens, sludge pump VFD, and polymer feed pump parts require replacement every 1 to 7 years, depending upon the component. Replacement of the current technology with a more efficient, higher capacity solids handling unit would assist the operations staff in reducing operations and maintenance costs. This plan investigated several proven solids handling technologies and it was determined that the existing operations and maintenance costs of $132,703 annually could be reduced to $62,740 through replacement of the existing technology with a low footprint belt filter press type or fan press type technology. The old dewatering press at Plant 3 will then be transported and installed at the Mountain Fall Wastewater Treatment Plant which has significantly less flows. The reduction in operations and maintenance costs is associated with greater percent solids of the dewatered cake, thus reducing hauling and disposal costs, elimination of overtime costs, reduction in energy costs and reduction in parts replacement costs. It is anticipated that energy costs will be reduced because the energy

associated with aerating the entire solids storage basin will be eliminated by approximately one-half. The estimated engineering design and construction management cost is $60,840. The estimated construction cost is $1,238,621. The estimated GBWC Capital Time cost is $13,104. This results in a total construction cost of $1,312,565. It is anticipated that this project would be implemented in 2019.

- Plant 3 Dewatering Upgrades
  Estimated Cost: $1,312,565
  Project Year: 2019

Anticipated Timeline

Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Bid (for Contractor)	5 – 6 weeks
Dewatering Equipment Construction and Moving Existing Dewatering System to Mountain Falls	3 – 3.5 months
Project Close-Out	1 – 2 months
Total	24 - 36 weeks

The engineering design has already been completed. Bids have already also been received and equipment selected.

Plant 3 Filter Upgrade Phase I.

It is recommended that the existing sand filters at Plant 3 be replaced with cloth media or disk filters. The effluent filters, which are traveling bridge sand filters, are an outdated technology and require intensive operation and maintenance. Operations and maintenance items of concern include sand replacement (which is costly), regular replacement of the backwash pumps, and regular maintenance on the chain mechanisms for the continuous backwash system. The traveling bridge sand filters do not respond well to higher solids loadings, which sometimes happen when Sequencing Batch Reactor(s) are not optimally operating and should be diverted so as not to inundate the plant influent with high backwash flows. Replacement of the traveling bridge technology with an alternative technology such as the cloth media technology would assist the operations staff in reducing operations and maintenance costs associated with media replacement, chain mechanism maintenance and repair, and backwash pump replacement. The cloth media technology is a proven effective technology, and utilities throughout the Country are replacing their traveling bridge filters with this type of filter. The existing filters annual operations

and maintenance costs are $53,910 due to the necessity to purchase media, replace the backwash pumps annually, and provide regular preventative maintenance of the chain system associated with the continuous backwash system. It is estimated that implementation of the cloth media filter will reduce operations and maintenance costs to $40,204. For the purposes of this analysis, it was assumed that one traveling bridge filter would be replaced with one cloth media filter. The cloth media filter is sized to handle the plant build-out average and peak day flows, thus the remaining traveling bridge filters could be placed into standby operation and only activated in the event of maintenance on the cloth media filter. The estimated design and permitting cost is $95,760. The estimated construction cost is $655,526. The estimated GBWC Capital Time cost is $17,472 for a total cost of $768,759. This project should be completed in 2020.

- Plant 3 Filter Upgrade Phase I
  Estimated Cost: $768,759
  Project Year: 2020

Anticipated Timeline

Capital Projects Team Review (develop, review and approve)	2 – 4 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	1 - 3 months
Bid	5 – 9 weeks
Cloth Media Filter Construction	2 – 3.5 months
Project Close-Out	1 – 2 months
Total	24 - 51 weeks

8.3.2 Wastewater Treatment Plant F CIP

No action plan projects are planned for Wastewater Treatment Plant F in the next three years.

8.3.3 Mountain Falls Wastewater Treatment Plant CIP

Aside from the dewatering equipment installation included as part of the Plant 3 Dewatering Upgrades, no action plan projects are planned for Mountain Falls Wastewater Treatment Plant in the next three years.

8.4 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project.

Provide approximately 1,410 lf of 4-inch reclaim water line from the main irrigation line in Discovery Park to deliver reclaimed water from Plant 3 to school property that will be used for irrigation for the school. A figure depicting this reclaim water alignment is provided in Figure 11 which is located in "Volume II Pahrump Division IRP Figures" in Appendix M. The extension line will be equipped with a pressure or flow regulating valve so that when the school is taking water, it does not cause a low pressure condition to the Discovery Park irrigation main. Currently, the School District utilizes potable water for irrigation. Plant 3 Wastewater Treatment Plant produces Category B reclaimed water, which is already safely used for turf irrigation at facilities with a high degree of public use – Discovery Park and Lakeview Golf Course. Utilizing the reclaimed water will reduce the reliance on potable water which in turn reduces well production to meet this demand, thereby reducing impact to Basin 162. The reclaim water line will end at the entrance to Pahrump Valley High School, where the school will then be responsible for on-site reclaim water storage and distribution. The School District is also responsible for creating an Effluent Management Plan (EMP) that is approved by NDEP. For NDEP, GBWC will be required to update the existing Plant 3 EMP and O&M Manual to include the reclaim water to the school as well as submit reclaim water pipeline plans to NDEP for review. Permit approvals in Nye County are not well defined and tend to be defined by the County on a case by case basis. As a worst case scenario the scope of work and costs have assumed that a zoning permit application, planning department submittal, and an encroachment permit with traffic control to cross Calvada Boulevard will be required. Design and permitting for this project is estimated to cost $63,120. Construction is estimated to cost $241,082. GBWC Capital Time is estimated at $17,472 for a total estimated project cost of $321,674. This project should be completed in 2020.

- Nye County Reclaim Water Project
  Estimated Cost: $321,674
  Project Year: 2019

Anticipated Timeline

Request for Engineering Services Proposal (develop, advertise, review)	5 – 8 weeks
Capital Projects Team Review (develop, review and approve)	1 – 2 weeks
Contract Negotiations	1 - 4 weeks
Engineering Design & Permitting	2 - 3 months
Bid	5 – 8 weeks

Construction	2 – 3 months
Project Close-Out	1 – 2 months
Total	32 - 54 weeks

8.5 Action Plan Project Timeline

Table 8.02 is a schedule of the project timeline for the water projects proposed for the three-year action plan.

Table 8.02: Scheduled Time Line for Action Plan Water Projects

Year	Projects	Total Annual CIP Cost
2019	Wastewater Treatment Plant 3 Dewatering Upgrades	$1,312,565
	Nye County Reclaim Water Project	$321,674
	Well Rehabilitation Program – 2 Wells	$596,967
	Pipeline Replacement and Looping Existing Dead Ends	$1,000,000
	Water Wagon	$67,200
	2019 CIP Total Cost	**$3,298,406**
2020	Plant 3 Filter Upgrade Phase I	$768,759
	Well Rehabilitation Program – 2 Wells	$596,967
	Future Well Location Evaluation	$162,930
	Cathodic Protection for Low Zone Tank 1	$68,967
	Cathodic Protection for High Zone Tank	$73,287
	Cathodic Protection for Mountain Falls Tank	$73,287
	SCADA Upgrade Project	$515,208
	Well 12 Backup Generator	$111,809
	Mountain Falls Well 1 Backup Generator Replacement	$125,815
	Mountain Falls Well 2 Backup Generator Replacement	$125,815
	Pipeline Replacement and Looping Existing Dead Ends	$1,000,000
	Calvada Meadows Water System Improvements	$2,347,152
	2020 CIP Total Cost	**$5,969,996**
2021	Office and Water Education Center at Discovery Park	$1,541,799
	Mountain View Estates/Calvada Valley Interconnect	$1,547,812
	Wilson Road to Ishani Ridge Loop	$364,228

	Future Looping Analysis Study	$114,472
	Pipeline Replacement and Looping Existing Dead Ends	$1,000,000
	Firebird Circle Loop	$880,858
	Sagebrush Extension	$280,176
	Well Rehabilitation Program – 2 Wells	$596,967
	2021 CIP Total Cost	**$6,326,312**
3-Year Action Plan Total		**$15,594,714**

SECTION 9.0: FUNDING PLAN

The Funding Plan is detailed Volume 1 Section 9 of this IRP filing.

SECTION 10.0: SYSTEM IMPROVEMENT RATE REQUEST

GBWC-PD is requesting a System Improvement Rate ("SIR") based on NRS 704.663(3)(2013) and the implementing regulations adopted by the Commission, for 20 capital investments in the Action Plan of the GBWC-PD 2018 IRP: (i) Wastewater Treatment Plant 3 Dewatering Upgrades Project; (ii) Nye County Reclaim Water Project; (iii) Well Rehabilitation Program; (iv) Pipeline Replacement and Looping Existing Dead Ends Project; (v) Plant 3 Filter Upgrade Phase I Project; (vi) Future Well Location Evaluation Study; (vii) Cathodic Protection for Low Zone Tank 1 Project; (viii) Cathodic Protection for High Zone Tank Project; (ix) Cathodic Protection for Mountain Falls Tank Project; (x) SCADA Upgrade Project; (xi) Well 12 Backup Generator Project; (xii) Mountain Falls Well 1 Backup Generator Replacement Project; (xiii) Mountain Falls Well 2 Backup Generator Replacement Project; (xiv) Mountain View Estates/Calvada Valley Interconnect Project; (xv) Wilson Road to Ishani Ridge Loop Project; (xvi) Firebird Circle Loop Project; (xvii) Sagebrush Extension Project; (xviii) Future Looping Analysis Study; (xix) Office and Water Education Center at Discovery Park; and (xx) Water Wagon.

NAC 704.6339 states that for purposes of reviewing a request included in an action plan submitted pursuant to NRS 704.661, the Commission will consider the following information:

(1) A description of the project.
(2) A statement explaining the necessity of the project.
(3) The resulting benefits of the project to the utility and the customers of the utility upon the completion of the project.
(4) A statement supported by written testimony that the project is not designed to increase revenues by connecting an improvement to a distribution system or wastewater system to new customers.
(5) A statement that the project was not included in the rate base of the utility in its most recent general rate case.
(6) A statement that the project costs for which recovery will be sought represent an investment to be made by the utility and which will not be paid by another funding

source, including, without limitation, a grant, developer contribution or other form of reimbursement.

(7) If submittal to the Commission is not otherwise required by law or regulation, the utility's plan for construction and the proposed schedule for construction. A plan for construction and a proposed schedule for construction submitted pursuant to this paragraph must comply with the provisions of paragraph (a) of subsection 4 of NAC 704.568.

(8) If submittal to the Commission is not otherwise required by law or regulation, a budget of planned expenditures which complies with the provisions of NAC 704.5681.

The following sections will address each requirement under NAC 704.6339 in turn for each SIR project.

10.1 Description of Each SIR Project

10.1.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019, 2020 and 2021
This project involves working with Nye County to identify roadway work planned within the three-year action period that may be coordinated with replacing existing GBWC-PD piping that is either beyond its useful life or has history of frequent breaks. See Sections 2.2.1.1, 2.3.1.1, 2.4.1.1, 2.5.1.1 2.6.1.1 (Distribution Piping Existing Conditions Assessment), and Section 8.2 (Water System CIP).

Well Rehabilitation Program – 2019, 2020 and 2021
This project involves rehabilitating two potable water wells each year over the three-year action plan period. The rehabilitation involves cleaning of each well to remove mineral deposits and bio-fouling from the well screen, inspection and replacement of the well pump and motor if needed, as well as the replacement of VFD (if required). See Sections 2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2 (Water Supply) and Section 8.2 (Water System CIP).

Future Well Location Evaluation
This study involves determining strategic locations for future production wells within GBWC-PD based on available information. See Section 8.2 (Water System CIP).

Future Looping Analysis
This study involves analysis that looks at various sources of information to determine priorities for additional main. This project will allow GBWC-PD to identify areas that had a high demand of service to extend service to. In addition, the future looping analysis will update the existing dead end looping study (provided in Appendix M) to identify new priorities for looping to improve water quality, reliability and fire protection in GBWC-PD. See Section 8.2 (Water System CIP) and *Dead End Looping Analysis of the Existing Water System (March 2007)* in Appendix M.

SCADA Upgrade Project
This project involves SCADA improvements and necessary upgrades to include all PRV's on SCADA as well as bring the SMMR water and wastewater infrastructure onto the main GBWC-PD SCADA

system. See Sections 2.2.6.1, 2.3.6.1, 2.6.6.1, 2.7.6.1 (SCADA Existing Conditions Assessment) and 8.2 (Water System CIP).

Water Wagon
This project involves a mobile water dispensing unit to be used for supplying clean, potable water to the public. See Section 8.2 (Water System CIP).

Office and Water Education Center at Discovery Park
This project involves construction of a 5,000-square foot Discovery Park Office and Visitor's Information Center that will add a variety of benefits to the community and eliminate the need for GBWC-PD to rent office space, as GBWC-PD currently does and has been for over a decade. See Section 8.2 (Water System CIP).

10.1.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
This project involves equipping Low Zone Tank 1 with Cathodic Protection to help extend the useful life of the existing tank. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Cathodic Protection for High Zone Tank
This project involves equipping High Zone Tank with Cathodic Protection to help extend the useful life of the existing tank. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Wilson Road to Ishani Ridge Loop Project
This project involves installation of approximately 900 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Wilson Road to the hydrant at the Ishani Ridge entrance to provide a secondary water source with fire protection in the event of main break. See Section 8.2.1 (Calvada Valley Water System CIP).

Firebird Circle Loop Project
This project involves installation of approximately 3,000 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Well 11 to the 12-inch main just west of Dandelion Street on Firebird Circle. In the event of a main break, isolating the affected piping will be more efficient and provide fire protection to the west side of Highway 160 without requiring shut down of the highway. See Section 8.2.1 (Calvada Valley Water System CIP).

Sagebrush Extension Project
This project involves installation of approximately 760 linear feet of 8-inch pipe to connect the existing 8-inch pipes on Sagebrush. This connection will provide an additional loop to the system that will increase redundancy to the area. See Section 8.2.1 (Calvada Valley Water System CIP).

Well 12 Backup Generator Project
This project involves equipping Well #12 with a backup generator to ensure that customers have a reliable water supply during power outages. See Section 2.2.5 (Back-Up Power Supply) and Section 8.2.1 (Calvada Valley Water System CIP).

10.1.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
This project involves installation of approximately 7,000 linear feet of 12-inch pipe to connect the existing 12-inch pipe at Blagg Rd. to the independent system (Mountain View Estates) at Bunch Street. This project adds the Mountain View Estates system to the Calvada Valley system and provides fire protection along with more reliable domestic service in addition to fire protection along Highway 372, which currently does not exist. See Section 8.2.4 (Mountain View Estates Water Supply CIP).

10.1.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
This project involves equipping Mountain Falls Tank with Cathodic Protection to help extend the useful life of the existing tank. See Section 2.6.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 1 Backup Generator Replacement Project
This project involves replacing the existing Mountain Falls Well 1 backup generator with a functional backup generator to ensure that customers have a reliable water supply during power outages. This backup generator has prematurely failed based on the remaining useful life highlighted in the asset registry in Appendix A. A backup generator replacement is recommended for Mountain Falls Well 1 to help provide additional alternative storage capacity necessary to bring the Mountain Falls service area into compliance with NAC 445A.6674 and NAC 445A.66755 for storage capacity regulations. When Mountain Falls Well 1 and Mountain Falls Well 2 are equipped with backup generators, the production capacity from these two facilities will be considered an alternative storage capacity source for the Mountain Falls service area. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 2 Backup Generator Replacement Project
This project involves replacing the existing Mountain Falls Well 2 backup generator with a functional backup generator to ensure that customers have a reliable water supply during power outages. This backup generator has prematurely failed based on the remaining useful life highlighted in the asset registry in Appendix A. A backup generator replacement is recommended for Mountain Falls Well 2 to help provide additional alternative storage capacity necessary to bring the Mountain Falls service area into compliance with NAC 445A.6674 and NAC 445A.66755 for storage capacity regulations. When Mountain Falls Well 1 and Mountain Falls Well 2 are equipped with backup generators, the production capacity from these two facilities will be considered an alternative storage capacity source for the Mountain Falls service area. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

10.1.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
This project involves replacing the existing dewatering system with a new more efficient, higher capacity dewatering system. The existing system is significantly undersized to handle the current volume of solids to be treated. The addition of this new dewatering system will significantly reduce

operations and maintenance costs. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

Plant 3 Filter Upgrade Phase I Project
This project involves replacing one (1) existing sand (travelling bridge) filter at Plant 3 with a cloth media or disk type filter sized to handle plant build-out average and peak day flows. It is estimated that the addition of the cloth media technology will reduce operations and maintenance costs. The current high operations and maintenance costs are particularly associated with frequent replacement of components in the travelling bridge filter. The travelling bridge filters also do not respond well to higher solids loadings, which sometimes occur at Plant 3 WWTP. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

10.1.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
This project involves installation of approximately 1,410 linear feet of 4-inch reclaim water line from the main irrigation line in Discovery Park to deliver reclaimed water from Plant 3 to school property. See Sections 2.8.2 (Wastewater Treatment and Disposal) and 8.4 (Wastewater Collection and Disposal System CIP).

10.2 Need for Each SIR Project

10.2.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019, 2020 and 2021
This project is needed to replace piping that is beyond its useful life or has a history of frequent breaks. See Sections 2.2.1.1, 2.3.1.1, 2.4.1.1, 2.5.1.1 2.6.1.1 (Distribution Piping Existing Conditions Assessment), and Section 8.2 (Water System CIP).

Well Rehabilitation Program – 2019, 2020 and 2021
This project is needed as many of the wells are beyond their useful life and 10 wells have not been rehabbed within the recommended APWA typical rehab timeframe of 10 years. The well rehabilitation could help restore production capacity and extend useful life of each well. See Sections 2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2 (Water Supply) and Section 8.2 (Water System CIP).

Future Well Location Evaluation
This study is necessary to provide information for identifying future well locations based on groundwater patterns, which will identify areas for future production wells (such as on alluvial fans) which could help limit water level declines and enable siting wells in areas that will allow for more efficient well operations for our current customers. See Section 8.2 (Water System CIP).

Future Looping Analysis
The future looping analysis study is needed to identify priorities for looping to improve water quality, reliability, and fire protection in GBWC-PD. The study will also look at reducing dead ends in the system per NAC 445A.6712, which says the water system should be designed to the extent possible to eliminate dead ends. See Section 8.2 (Water System CIP), Section 4.2.2 (System

Deficiencies and Alternatives for Improvements) and *Dead End Looping Analysis of the Existing Water System (March 2007)* in Appendix M.

SCADA Upgrade Project
This project is needed to provide monitoring of more system components and improve the SCADA system and update software. See Sections 2.2.6.1, 2.3.6.1, 2.6.6.1, 2.7.6.1 (SCADA Existing Conditions Assessment) and 8.2 (Water System CIP).

Water Wagon
This project is needed for public outreach. The mobile potable water unit allows GBWC personnel to be available to customers to answer questions about topics including water conservation, operations and water quality. In addition, the water wagon may be able to provide necessary potable, portable water to areas where there is not any available drinking water in an emergency. See Section 8.2 (Water System CIP).

Office and Water Education Center at Discovery Park
GBWC-PD requires more space for employees. This project is also needed to eliminate GBWC-PD's lease requirement and to provide better relations with GBWC-PD customers. See Section 8.2 (Water System CIP).

10.2.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
This project is necessary to ensure proper operation and maintenance is provided to Low Zone Tank 1 to extend its useful life. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Cathodic Protection for High Zone Tank
This project is necessary to ensure proper operation and maintenance is provided to High Zone Tank to extend its useful life. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Wilson Road to Ishani Ridge Loop Project
This project is needed to provide a secondary water source with fire protection in the event of main break. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Firebird Circle Loop Project
This project is necessary because in the event of a main break, isolating the affected piping will be more efficient and provide fire protection to the west side of Highway 160. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Sagebrush Extension Project
This project is needed to provide an additional loop to the system that will increase redundancy to the area. This project is also needed reduce a dead end in the system. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Well 12 Backup Generator Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.2.5 (Back-Up Power Supply) and Section 8.2.1 (Calvada Valley Water System CIP).

10.2.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
This project is necessary to provide fire protection to Mountain View Estates along with more reliable domestic service. See Section 8.2.4 (Mountain View Estates Water Supply CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

10.2.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
This project is necessary to ensure proper operation and maintenance is provided to Mountain Falls Tank to extend its useful life See Section 2.6.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 1 Backup Generator Replacement Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 2 Backup Generator Replacement Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

10.2.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
This project is necessary to reduce operations and maintenance costs associated with the undersized dewatering unit and provide a dewatering system that is properly sized for Plant 3 volume of solids. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

Plant 3 Filter Upgrade Phase I Project
This project is necessary to reduce operations and maintenance costs associated with the existing filter and reduce issues with higher solids loadings impact on filters. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

10.2.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
This project is necessary to reduce the demand for irrigation potable water use in the over-appropriated Basin 162. See Sections 2.8.2 (Wastewater Treatment and Disposal) and 8.4 (Wastewater Collection and Disposal System CIP).

10.3 Benefits of Each SIR Project

10.3.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019, 2020 and 2021
This project will replace piping that is beyond its useful life or has a history of frequent breaks without the additional cost associated with asphalt demolition and replacement. See Sections 2.2.1.1, 2.3.1.1, 2.4.1.1, 2.5.1.1 2.6.1.1 (Distribution Piping Existing Conditions Assessment), and Section 8.2 (Water System CIP).

Well Rehabilitation Program – 2019, 2020 and 2021
The well rehabilitation could help restore production capacity and extend useful life of each well. See Sections 2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2 (Water Supply) and Section 8.2 (Water System CIP).

Future Well Location Evaluation
This study will help determine locations for future GBWC-PD production wells. This study will allow for more efficient well operations for GBWC-PD current customers. See Section 8.2 (Water System CIP).

Future Looping Analysis
The future looping analysis study is needed to identify priorities for looping to improve water quality, reliability, and fire protection in GBWC-PD. Additional infrastructure may also allow for service of more connections and reduce domestic well proliferation, which has been associated with over appropriation of Basin 162. See Section 8.2 (Water System CIP), Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and *Dead End Looping Analysis of the Existing Water System (March 2007)* in Appendix M.

SCADA Upgrade Project
This project will provide GBWC-PD with more system monitoring capability, improve the SCADA system and update software. See Sections 2.2.6.1, 2.3.6.1, 2.6.6.1, 2.7.6.1 (SCADA Existing Conditions Assessment) and 8.2 (Water System CIP).

Water Wagon
This project is needed for public outreach. The mobile potable water unit allows GBWC personnel to be available to customers to answer questions about topics including water conservation, operations and water quality. In addition, the water wagon may be able to provide necessary potable, portable water to areas where there is not any available drinking water in an emergency. The Water Wagon also supports healthy lifestyles (drinking water instead of sugary drinks) and promotes the reduction of plastic water bottles. See Section 8.2 (Water System CIP).

Office and Water Education Center at Discovery Park
GBWC-PD requires more space for employees. This project is also needed to eliminate GBWC-PD's lease requirement and to provide better relations with GBWC-PD customers. More benefits of this project are described in Section 8.2 (Water System CIP). In addition, the Office and Water Education Center can positively impact employee morale and productivity.

10.3.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
This project is necessary to ensure proper operation and maintenance is provided to Low Zone Tank 1 to extend its useful life. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Cathodic Protection for High Zone Tank
This project is necessary to ensure proper operation and maintenance is provided to High Zone Tank to extend its useful life. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Wilson Road to Ishani Ridge Loop Project
This project is needed to provide a secondary water source with fire protection in the event of main break. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Firebird Circle Loop Project
This project is necessary because in the event of a main break, isolating the affected piping will be more efficient and provide fire protection to the west side of Highway 160. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Sagebrush Extension Project
This project is needed to provide an additional loop to the system that will increase redundancy and fire protection to the area. This project will reduce a dead end in the system. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Well 12 Backup Generator Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.2.5 (Back-Up Power Supply) and Section 8.2.1 (Calvada Valley Water System CIP).

10.3.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
This project is necessary to provide fire protection capabilities to Mountain View Estates along with more reliable domestic service. This project will provide redundancy to the Mountain View Estates service area that currently only has one well to provide supply to the 27 customers. See Section 8.2.4 (Mountain View Estates Water Supply CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

10.3.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
This project is necessary to ensure proper operation and maintenance is provided to Mountain Falls Tank to extend its useful life See Section 2.6.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 1 Backup Generator Replacement Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 2 Backup Generator Replacement Project
This project is needed to ensure that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

10.3.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
This project is of benefit because it reduces operations and maintenance costs associated with the undersized dewatering unit and provides a dewatering system that is properly sized for Plant 3 volume of solids. Another benefit of this project is that the new technology will replace an outdated technology and replaces equipment that will require replacement within the next 20 years based on remaining useful life. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

Plant 3 Filter Upgrade Phase I Project
This project is of benefit because it reduces operations and maintenance costs associated with the existing Plant 3 filter and reduces issues with higher solids loadings impact on filters. Another benefit of this project is that the new technology will replace an outdated technology and replaces equipment that will require replacement within the next 20 years based on remaining useful life. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

10.3.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
This project is of benefit because it reduces the demand for irrigation potable water use in the over-appropriated Basin 162. See Sections 2.8.2 (Wastewater Treatment and Disposal) and 8.4 (Wastewater Collection and Disposal System CIP).

10.4 Project Supports Current Customers

The project support for current customers is also discussed in the direct testimony of Ms. Wendolyn S.W. Barnett.

10.4.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019, 2020 and 2021
This project will benefit existing customers in all service areas by improving water supply reliability and improving fire flow deliveries and pressures. See Sections 2.2.1.1, 2.3.1.1, 2.4.1.1, 2.5.1.1 2.6.1.1 (Distribution Piping Existing Conditions Assessment), and Section 8.2 (Water System CIP).

Well Rehabilitation Program – 2019, 2020 and 2021
This study will allow for more efficient well operations for our current customers. See Sections 2.2.2, 2.3.2, 2.4.2, 2.5.2, 2.6.2 (Water Supply) and Section 8.2 (Water System CIP).

Future Well Location Evaluation
This study will allow for more efficient well operations for our current customers. See Section 8.2 (Water System CIP).

Future Looping Analysis
This project will benefit existing customers in all service areas by improving water supply reliability and improving fire flow deliveries and pressures. See Section 8.2 (Water System CIP), Section 4.2.2 (System Deficiencies and Alternatives for Improvements) and *Dead End Looping Analysis of the Existing Water System (March 2007)* in Appendix M.

SCADA Upgrade Project
This project will benefit existing customers in all service areas by optimizing operations and monitoring of the water system. See Sections 2.2.6.1, 2.3.6.1, 2.6.6.1, 2.7.6.1 (SCADA Existing Conditions Assessment) and 8.2 (Water System CIP).

Water Wagon
The Water Wagon supports customers in multiple ways by providing "programs of public information" and "educational programs in schools" (NAC 704.567 1(a)(7 and 8). The Water Wagon provides opportunities to provide the awareness and education of water in the State and in coordination of events in the communities. The project is not designed to generate new revenue; rather, it is designed for GBWC to positively interact with customers supporting the creation of a water conservation ethic.

Office and Water Education Center at Discovery Park
This project is designed to provide better relations with GBWC-PD customers who will also benefit through customer education opportunities. More customer benefits associated with this project are described in Section 8.2.1 (Calvada Valley Water System CIP).

10.4.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
This project will benefit customers by extending useful life of infrastructure. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Cathodic Protection for High Zone Tank
This project will benefit customers by extending useful life of infrastructure. See Section 2.2.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.1 (Calvada Valley Water System CIP).

Wilson Road to Ishani Ridge Loop Project
This project will benefit customers by providing a secondary water source with fire protection in the event of main break. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Firebird Circle Loop Project
This project will benefit customers by making it more efficient to isolate affected piping in a main break and provide fire protection to the west side of Highway 160 without requiring a highway shutdown. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Sagebrush Extension Project
This project will benefit customers by improving an additional loop to the system that will increase redundancy to the area. See Section 8.2.1 (Calvada Valley Water System CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

Well 12 Backup Generator Project
This project will benefit customers by ensuring that customers have a reliable water supply during power outages. See Section 2.2.5 (Back-Up Power Supply) and Section 8.2.1 (Calvada Valley Water System CIP).

10.4.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
This project will benefit customers in Mountain View Estates by providing fire protection to the area along with more reliable domestic service. See Section 8.2.4 (Mountain View Estates Water Supply CIP) and Section 4.2.2 (System Deficiencies and Alternatives for Improvements).

10.4.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
This project will benefit customers by providing a secondary water source with fire protection in the event of main break. See Section 2.6.3.1 (Storage Tank Existing Condition Assessment) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 1 Backup Generator Replacement Project
This project will benefit customers by ensuring that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 2 Backup Generator Replacement Project
This project will benefit customers by ensuring that customers have a reliable water supply during power outages. See Section 2.6.5 (Back-Up Power Supply) and Section 8.2.5 (Mountain Falls Water System CIP).

10.4.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
This project will provide reliable treatment capacity for existing customers in Calvada Valley by replacing aging infrastructure. This project also reduces operations and maintenance costs. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

Plant 3 Filter Upgrade Phase I Project
This project will provide reliable treatment capacity for existing customers in Calvada Valley by replacing aging infrastructure. This project also reduces operations and maintenance costs. See Sections 2.8.2.2.1 (Treatment System Existing Condition Assessment) and 8.3.1 (Wastewater Treatment Plant 3 CIP).

10.4.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
This project reduces irrigation costs for the Nye County school district. See Sections 2.8.2 (Wastewater Treatment and Disposal) and 8.4 (Wastewater Collection and Disposal System CIP).

10.5 Statement that Each Project is not included in Rate Base

The project list in Section 10.1 *et seq.* were not included in the Company's rate base in its most recent general rate case. See Testimony by Terry J. Redmon.

10.6 Funding by Utility Investment

The project list in Section 10.1 *et seq.* will be funded through traditional funding sources using Great Basin Water Company debt and equity investment and will not be paid by another funding source, including, without limitation, a grant, developer contribution, or other form of reimbursement. See Volume I Section 9 of this filing (Funding Plan).

10.7 Construction Schedule for Each Project

10.7.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019. 2020 and 2021
This project is scheduled for years 2019, 2020 and 2021. See Section 8.2 (Water System CIP) for the anticipated timeline.

Well Rehabilitation Program – 2019, 2020 and 2021
This project is scheduled for years 2019, 2020 and 2021. See Section 8.2 (Water System CIP) for the anticipated timeline.

Future Well Location Evaluation
This study is scheduled for completion in year 2020. See Section 8.2 (Water System CIP) for the anticipated timeline.

Future Looping Analysis
This study is scheduled for completion in year 2021. See Section 8.2 (Water System CIP) for the anticipated timeline.

SCADA Upgrade Project
This project is scheduled for completion in year 2020. See Section 8.2 (Water System CIP) for the anticipated timeline.

Water Wagon
This project is scheduled for completion in year 2019. See Section 8.2 (Water System CIP) for the anticipated timeline.

Office and Water Education Center at Discovery Park
This project is scheduled for construction in year 2021. See Section 8.2 (Water System CIP) for the anticipated timeline.

10.7.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
This project is scheduled for construction in year 2020. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

Cathodic Protection for High Zone Tank
This project is scheduled for construction in year 2020. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

Wilson Road to Ishani Ridge Loop Project
This project is scheduled for construction in year 2021. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

Firebird Circle Loop Project
This project is scheduled for construction in year 2021. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

Sagebrush Extension Project
This project is scheduled for construction in year 2021. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

Well 12 Backup Generator Project
This project is scheduled for construction in year 2020. See Section 8.2.1 (Calvada Valley Water System CIP) for the anticipated timeline.

10.7.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
This project is scheduled for construction in year 2021. See Section 8.2.4 (Mountain View Estates Water Supply CIP) for the anticipated timeline.

10.7.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
This project is scheduled for construction in year 2020. See Section 8.2.5 (Mountain Falls Water System CIP) for the anticipated timeline.

Mountain Falls Well 1 Backup Generator Replacement Project
This project is scheduled for construction in year 2020. See Section 8.2.5 (Mountain Falls Water System CIP) for the anticipated timeline.

Mountain Falls Well 2 Backup Generator Replacement Project
This project is scheduled for construction in year 2020. See Section 8.2.5 (Mountain Falls Water System CIP) for the anticipated timeline.

10.7.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
This project is scheduled for construction in year 2019. See Section 8.3.1 (Wastewater Treatment Plant 3 CIP) for the anticipated timeline.

Plant 3 Filter Upgrade Phase I Project
This project is scheduled for construction in year 2020. See Section 8.3.1 (Wastewater Treatment Plant 3 CIP) for the anticipated timeline.

10.7.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
This project is scheduled for construction in year 2019. See Section 8.4 (Wastewater Collection and Disposal System CIP) for the anticipated timeline.

10.8 Budget of Planned Expenditures for Each Project

10.8.1 GBWC-PD Service Territory (All Service Areas)

Pipeline Replacement and Looping Existing Dead Ends Project – 2019, 2020 and 2021
Project Cost: $3,000,000 ($1,000,000 per year). See Section 8.2 (Water System CIP).

Well Rehabilitation Program – 2019, 2020 and 2021
Project Cost: $1,790,901 ($596,967 per year). See Section 8.2 (Water System CIP).

Future Well Location Evaluation
Project Cost: $162,930. See Section 8.2 (Water System CIP).

Future Looping Analysis
Project Cost: $114,472. See Section 8.2 (Water System CIP).

SCADA Upgrade Project
Project Cost: $515,208. See Section 8.2 (Water System CIP).

Water Wagon
Project Cost: $67,200. See Section 8.2 (Water System CIP).
Office and Water Education Center at Discovery Park
Project Cost: $1,541,799. See Section 8.2 (Water System CIP).

10.8.2 Calvada Valley Water System

Cathodic Protection for Low Zone Tank 1
Project Cost: $68,967. See Section 8.2.1 (Calvada Valley Water System CIP).

Cathodic Protection for High Zone Tank
Project Cost: $73,287. See Section 8.2.1 (Calvada Valley Water System CIP).

Wilson Road to Ishani Ridge Loop Project
Project Cost: $364,228. See Section 8.2.1 (Calvada Valley Water System CIP).

Firebird Circle Loop Project
Project Cost: $880,858. See Section 8.2.1 (Calvada Valley Water System CIP).

Sagebrush Extension Project
Project Cost: $280,176. See Section 8.2.1 (Calvada Valley Water System CIP).

Well 12 Backup Generator Project
Project Cost: $111,809. See Section 8.2.1 (Calvada Valley Water System CIP).

10.8.3 Mountain View Estates Water System

Mountain View Estates/Calvada Valley Interconnect Project
Project Cost: $1,547,812. See Section 8.2.4 (Mountain View Estates Water Supply CIP).

10.8.4 Mountain Falls Water System

Cathodic Protection for Mountain Falls Tank
Project Cost: $73,287. See Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 1 Backup Generator Replacement Project
Project Cost: $125,815. See Section 8.2.5 (Mountain Falls Water System CIP).

Mountain Falls Well 2 Backup Generator Replacement Project
Project Cost: $125,815. See Section 8.2.5 (Mountain Falls Water System CIP).

10.8.5 Wastewater Treatment Plant 3 CIP

Plant 3 Dewatering Upgrades Project
Project Cost: $1,312,565. See Section 8.3.1 (Wastewater Treatment Plant 3 CIP).

Plant 3 Filter Upgrade Phase I Project
Project Cost: $768,759. See Section 8.3.1 (Wastewater Treatment Plant 3 CIP).

10.8.6 Wastewater Collection and Disposal System CIP

Nye County Reclaim Water Project
Project Cost: $321,674. See Section 8.4 (Wastewater Collection and Disposal System CIP).