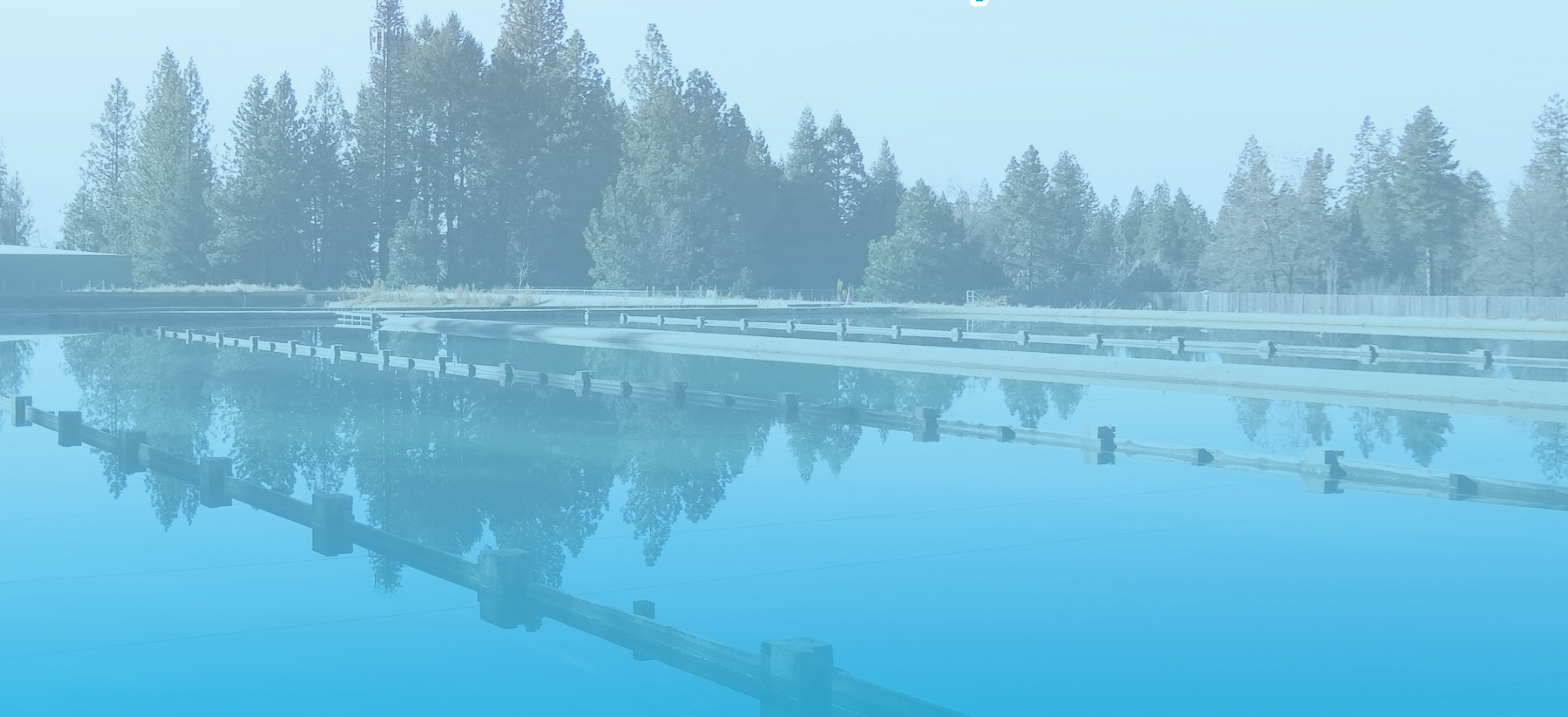
City of Grass Valley
Water System Master Plan



May 2016

Prepared for:
City of Grass Valley

Prepared by:
Stantec Consulting Services Inc.
101 Providence Mine Road, Suite 202
Nevada City, California 95959

Stantec

City of Grass Valley
Water System Master Plan

Prepared for:
City of Grass Valley

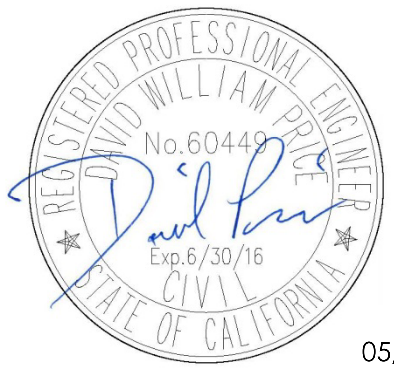
Prepared by:
Stantec Consulting Services Inc.
101 Providence Mine Road, Suite 202
Nevada City, CA 95959

May 20, 2016

Sign-off Sheet

This document entitled City of Grass Valley Water System Master Plan was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of City of Grass Valley (the “Client”). The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by:
David Price, P.E.



05/20/2016

Reviewed by:
Gabe Aronow, P.E.

05/20/2016

Stantec

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

The City of Grass Valley (City) Water System Master Plan (Master Plan) is intended to provide guidance to the City on the management of their existing water transmission, distribution, storage, and treatment facilities. It also provides recommended improvements to accommodate future growth scenarios. The scope of this master planning effort includes the following major elements:

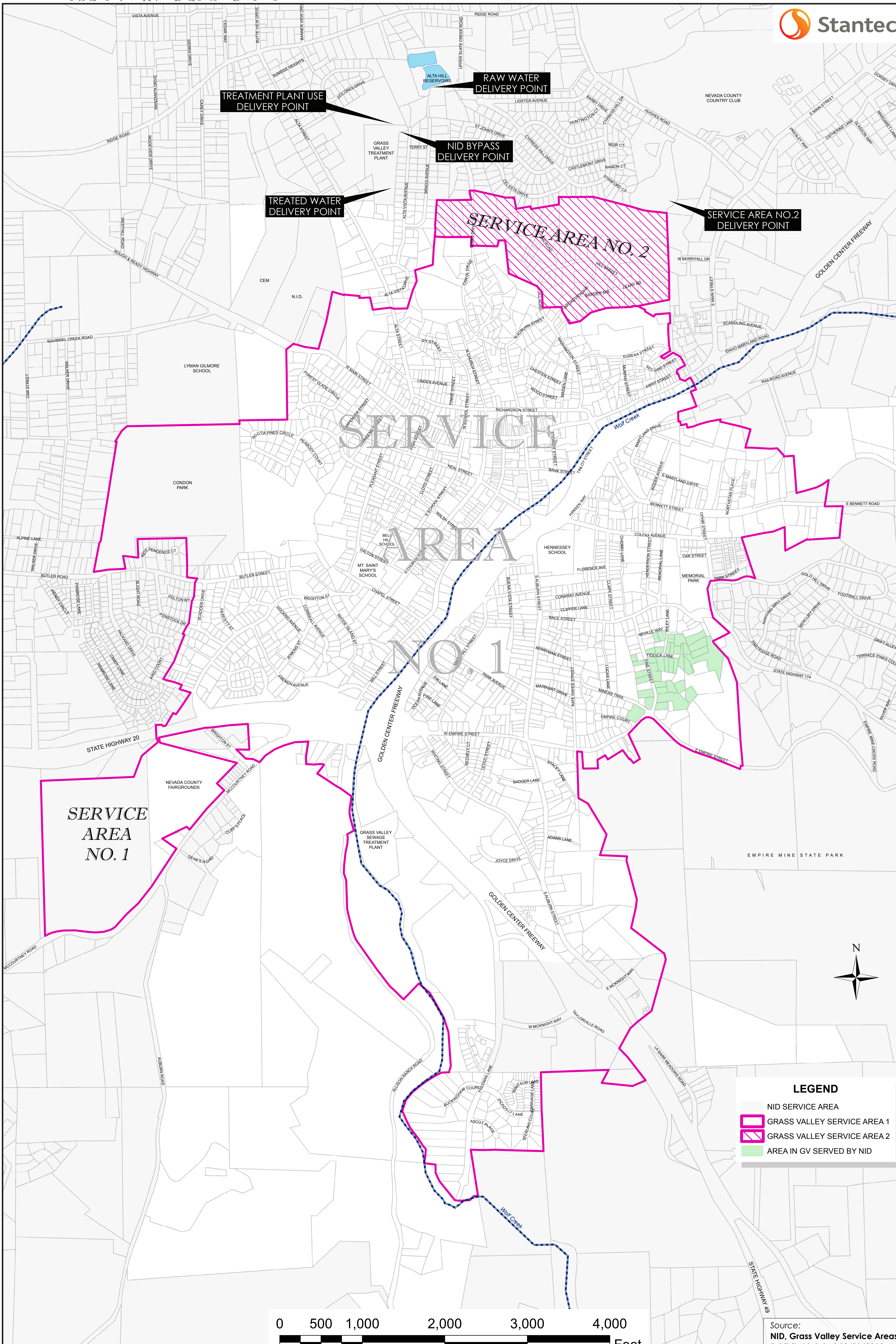
- Review of existing reports, drawings, land use and zoning maps, and other relevant information.
- Evaluation of existing facilities and operational data.
- Projection of future water demands based on historical water use and land use as defined in the City's 2020 General Plan.
- Development of a list of system assets, incorporation of those assets into an electronic database to project repair and replacement costs for the system over time.
- A list of recommended improvement projects

ES-1 Overview

The City of Grass Valley is located in western Nevada County about 60 miles northeast of Sacramento, California in the foothills of the Sierra Nevada at an elevation of approximately 2,500 feet. The City's existing water distribution, storage and treatment system serves approximately 2,450 accounts, of which slightly less than 1,900 are residential accounts and just over 550 are commercial/industrial accounts. The City's service area comprises the "old town" portion of the City and areas to the south and east as shown in **Figure ES-1**. The City's existing facilities include a water treatment plant, 31 miles of pipeline, and 3 storage tanks.

Existing and future water demands have been developed using land uses established in the Grass Valley 2020 General Plan. A projection of potential development through build-out of property within the existing City Service Area using the current land use designations was made to estimate the future maximum amount of water demand that could result on a parcel. Redevelopment of existing developed parcels within the City's Service Area was not considered as part of the analysis presented. An evaluation of historical water use was used to develop water demand factors for various types of services (e.g. residential, commercial and industrial, etc.). A maximum day to average annual peaking factor of 2.5 was established to estimate the maximum day demand (MDD). A factor of 1.7 was used to estimate peak hour demand as a ratio of MDD within the City. The land uses and development projections were combined with the water demand and peaking factors to project future water demands within the City.

V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-1_gv_wmp_existing_water_service_area.ai mlm 4-2-2015



City of Grass Valley
Water System Master Plan

Figure ES-1
City of Grass Valley - Existing Water Service Area

There are two special development areas that lie adjacent to the City's service area boundary which may be served one day by the City. These two properties, commonly referred to as Northstar, and Berriman Ranch, are shown in **Figure ES-2**. Future water demand estimates for these areas were developed based on the Draft EIR for the Southern Sphere and the City's 2020 General Plan.

The City's water transmission, distribution, and storage systems were modeled using Bentley WaterCAD v8.i. The hydraulic model was calibrated with field data provided by the City, such as customer demand and fire hydrant pressure testing data. The model was used to assess the response of the water system to existing demands and to assess water system performance relative to different demand parameters. In addition, the model was used to evaluate water system response to potential future growth scenarios and to predict what improvements may be needed to meet future demand.

Several different scenarios were modeled for existing and build-out conditions to assess the ability of the existing system to meet the existing and proposed demands. The modeled scenarios included three sub-scenarios: average day demand (ADD), max day demand (MDD) and peak hour demand. Additionally the ability to deliver adequate fire flow was tested throughout the system for existing and future scenarios.

Three future demand scenarios were modeled based on three different stages of development within the service area. The first stage of development includes in-fill development of the current service area, the addition of service to the Broadview Heights area by the City (currently served by NID), and service for a small portion of the Berriman Ranch area. The second stage of future development includes expanded service to the remainder of Berriman Ranch, and service for 50% of the Northstar special development area. The third stage of development is the expansion of service to the remainder of the Northstar special development area. To be conservative in determining possible future improvements, the entire 760-acre area of the Northstar special development area was used in generating future demands in the third stage of the future growth scenario. The City's current and projected future water demands are presented in **Table ES-1** below. In the table projected future demands within the City's service area are presented separately from the water demand of the full build-out of the special development areas.

Table ES-1 Water Demands

Demand Type	Existing Demand	Projected Future Demand [(a)]	Special Development Areas
Average Day Demand, MGD	0.92	1.06	0.51
Maximum Day Demand, MGD	2.4	2.8	1.2
Peak Hour Demand, MGD	4.1 (2,825 gpm)	4.6 (3,225 gpm)	
Fire Flow [(b)]	1,000 gpm - 4,000 gpm for 4 hours	1,000 gpm - 4,000 gpm for 4 hours	1,000 gpm - 4,000 gpm for 4 hours

(a) Existing service areas only; does not include additional possible demand from build-out of Berriman Ranch or the proposed Northstar project.

(b) Fire flow requirements vary based on location and building type.

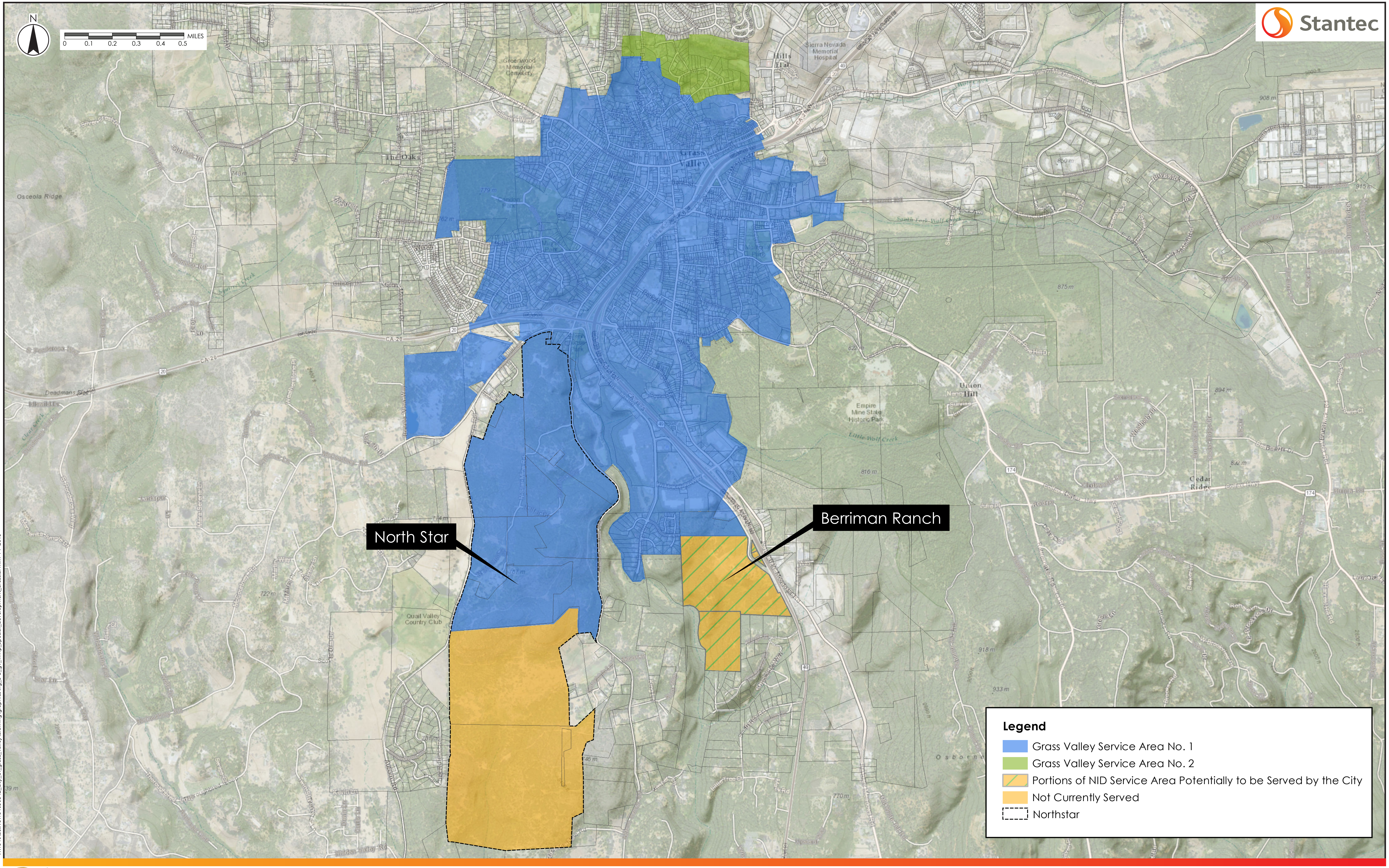


Figure ES-2
Special Development Areas

ES-2 Distribution System Improvements

Model Results for Existing Conditions

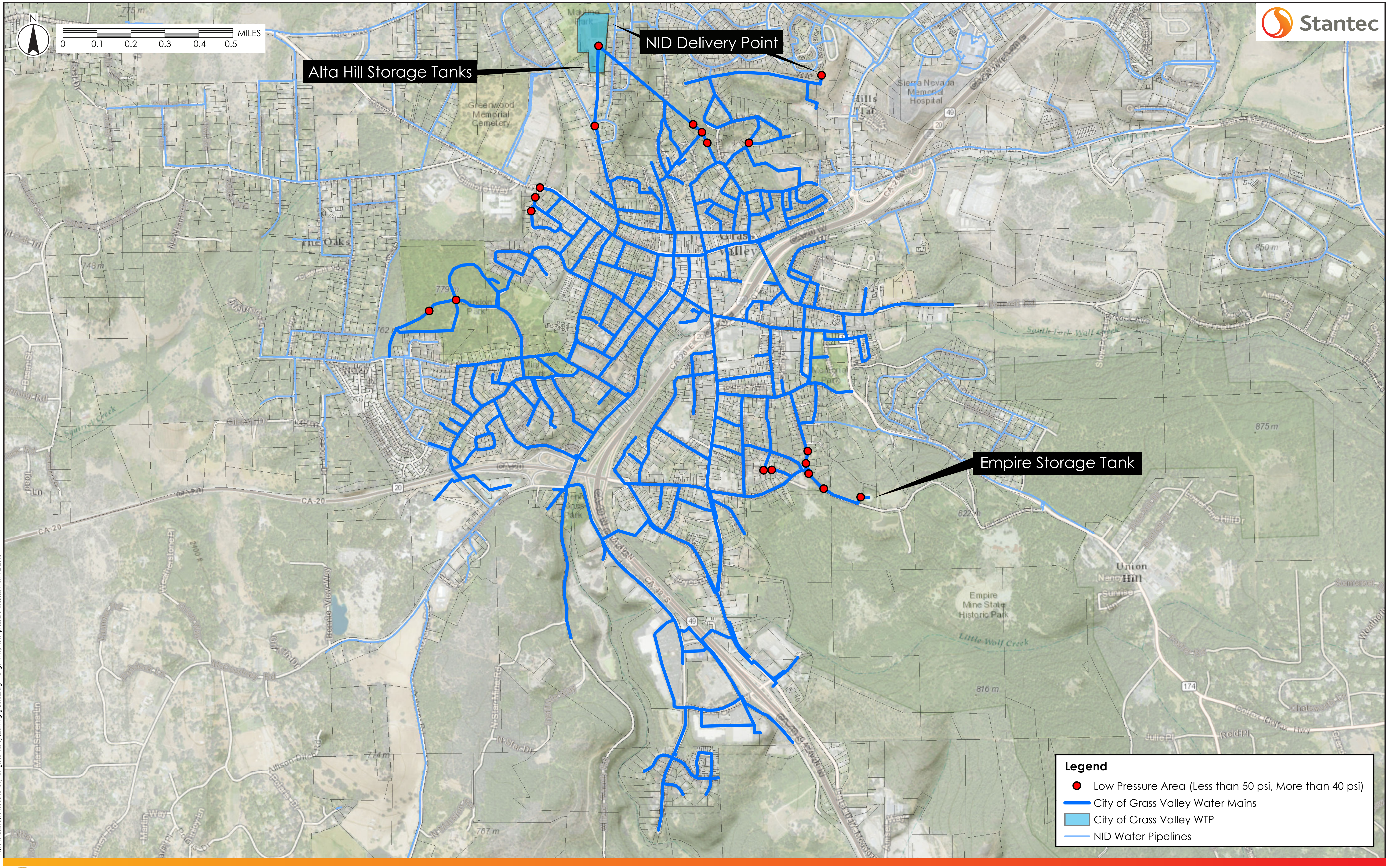
The existing system model results revealed certain areas of low pressure (less than 50 psi but greater than 40 psi) (**Figure ES-3**). These areas included the Empire Court area down gradient of the Empire Tank, Condon Park, the Forest Glade area north of Condon Park, and the intersection of Broadview Ave and Bawden Ave. These low pressures are more a result of higher elevations than deficiencies in the system grid layout. All of these locations meet minimum pressure and fireflow requirements and there are no projects are planned to address the low pressures at this time. Areas with even lower pressures (less than 40psi) existed along the Empire tank and Alta Hill transmission lines, but there are no homes receiving service off of these lines. During peak hour demands, the low pressure in the Forest Glade area expanded to include locations in the system between Forest Glade and Condon Park. The remainder of the system met the pressure and velocity requirements of the City.

Distribution system fire flow requirements were tested using an analysis of system pressures and velocities in the model during MDD. The analysis set a minimum required flow of 1,000 gallons per minute (gpm) for the junctions at fire hydrants, with a required minimum pressure of 20 psi in the system during the fire flow withdrawal. This analysis did not include the Empire tank and Alta Hill transmission lines because there are no hydrants receiving service on these lines. The fire hydrants in the model that flowed at less than 1,000 gpm during the MDD are located on:

1. the Cornwall Avenue cul-de-sac,
2. the dead end line at East Main Street near Eureka Street,
3. the dead end line at the west end of Linden Avenue off Alta Street, and
4. the dead end line at Stacey Lane off of South Auburn Street south of Empire Street.

All of these hydrants are identified in **Figure ES-4**.

Although the minimum fire flow was 1,000 gpm for the majority of the city service area a few select areas were analyzed with a higher fire flow requirement. The highest fire flow requirement for the City service area, as defined by the City of Grass Valley Fire Department, is a discharge of 4,000 gpm for 4 hours. This is the fire flow demand required on McKnight Way at the shopping center and eastward near the Diamond Pacific construction supply store as shown in **Figure ES-4**. The existing layout of the system cannot deliver that flow and maintain a residual pressure of 20 psi.



V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-5_gv_wmp_low_pressure_areas.ai mlm 4-2-2015

Figure ES-3
Location of Low Pressure Areas

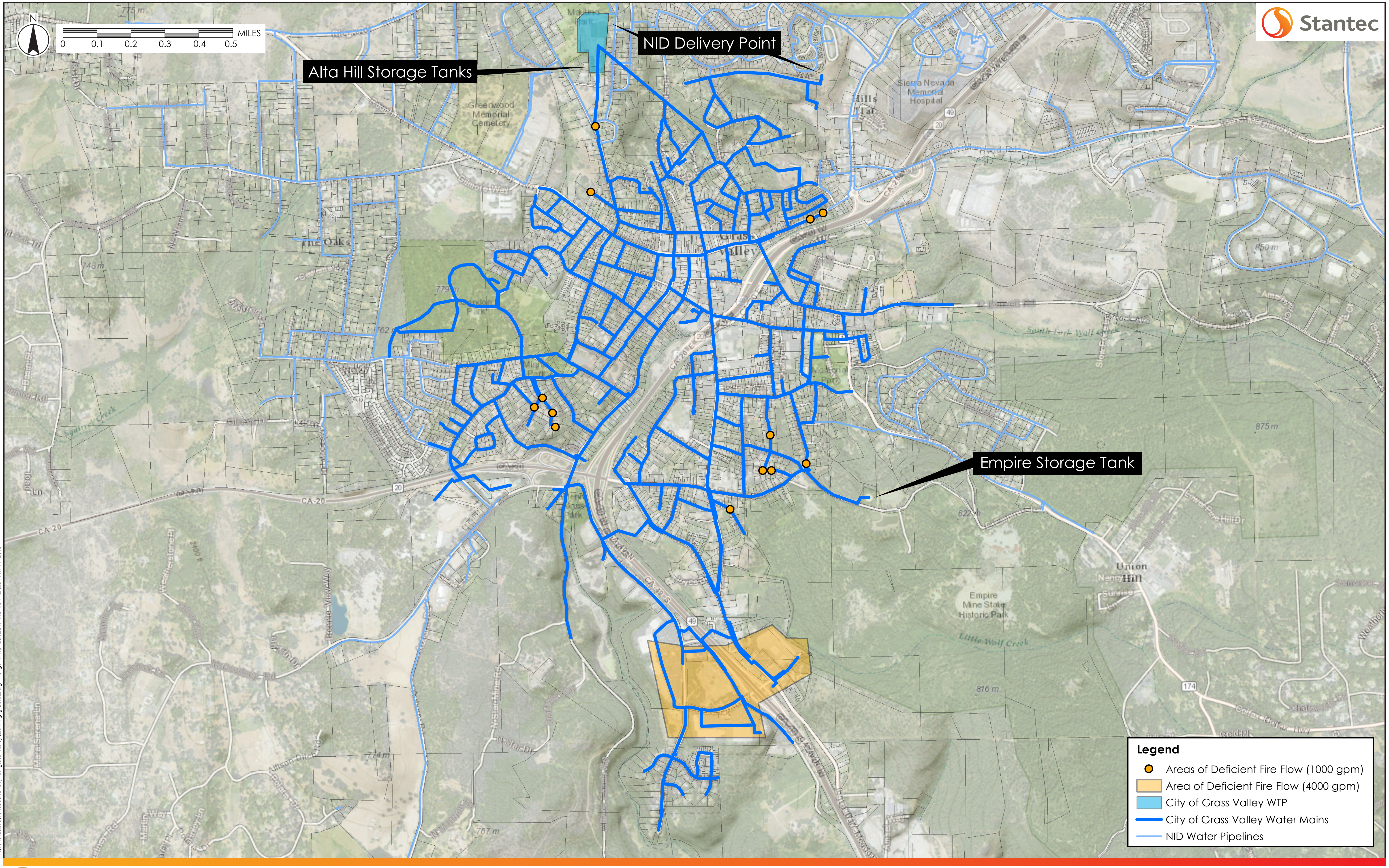


Figure ES-4
Areas of Deficient Fire Flow

Model Results for Future Development

In all three stages of future development, pressure and velocity requirements were met except in those areas of low pressure identified in the existing system. The model predicted that the existing layout of the system can accommodate the future growth as defined in this report. **Figure ES-5** identifies junctions with pressures less than 50 psi in the final stage of build-out during MDD. Future fire flow requirements for the future development areas are unknown at this time, and were not considered in the analysis. Prior to development in these areas, it is recommended that the system's ability to meet future fire flow requirements be reassessed. All future condition scenarios were modeled with the recommended improvements as described below.

Distribution System Improvements

Empire Tank

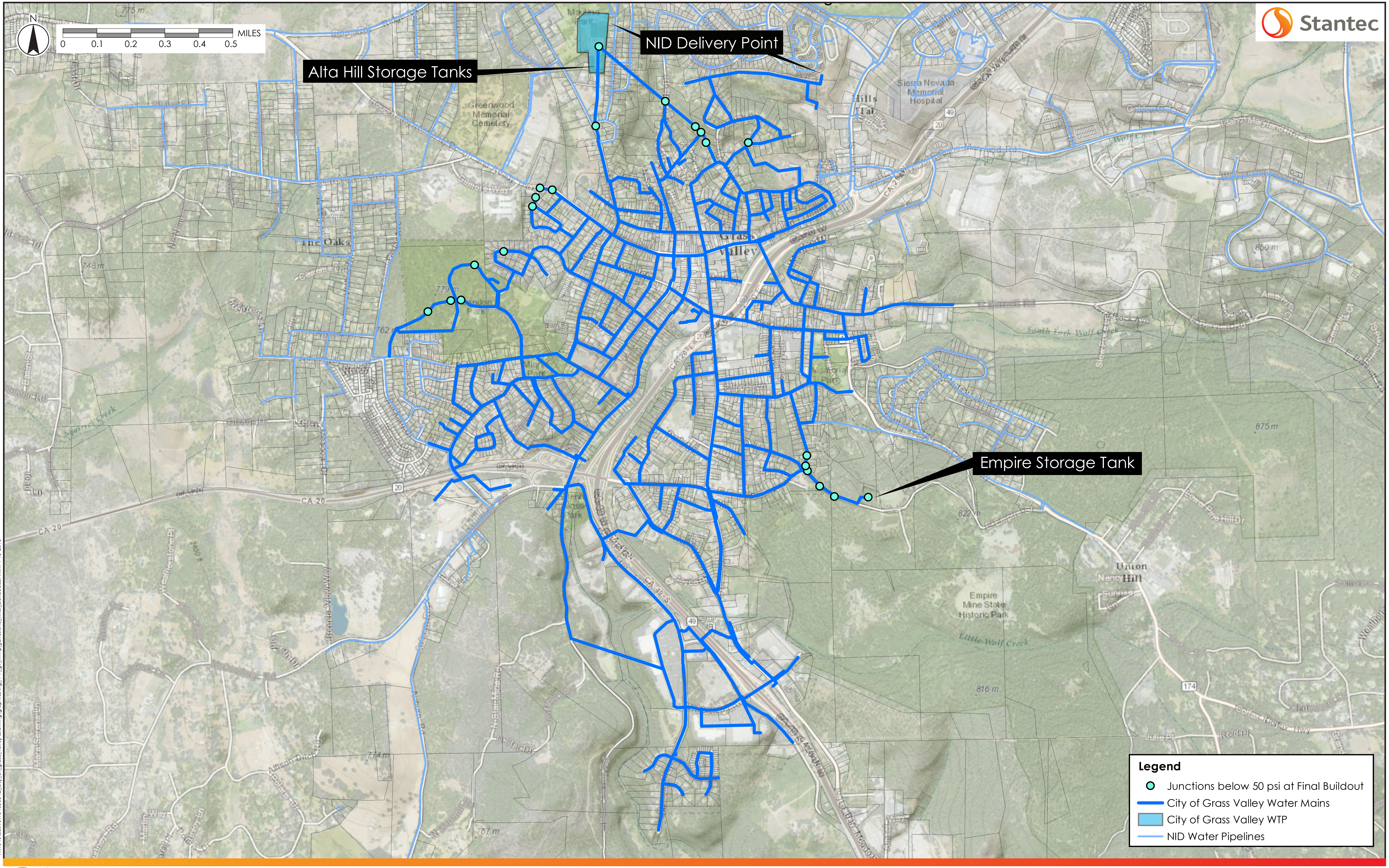
Empire tank was constructed at an elevation below the hydraulic grade of the Alta Hills treatment plant and will only drain during fire flow conditions, and then, only in the vicinity of the tank. This causes long residence times in the tank, and the water tends to lose its chlorine residual. The preferred alternative for improving operation is to reverse the direction of the existing booster pump station for Empire Tank, pumping water from the tank into the system. In modeling this scenario, during MDD and ADD, the pump flow remained approximately the same. The system met all velocity and pressure parameters set by the City except for those areas previously identified as deficient in the existing system. Although pressure deficiencies are not remedied by simply reversing the pumps, the use of the pumps would provide multiple benefits including: improving the tanks ability to drain and refill, more completely utilizing the tank storage, as well as mitigating water quality, chlorine residual, and corrosion issues.

Empire Court Booster Pumps

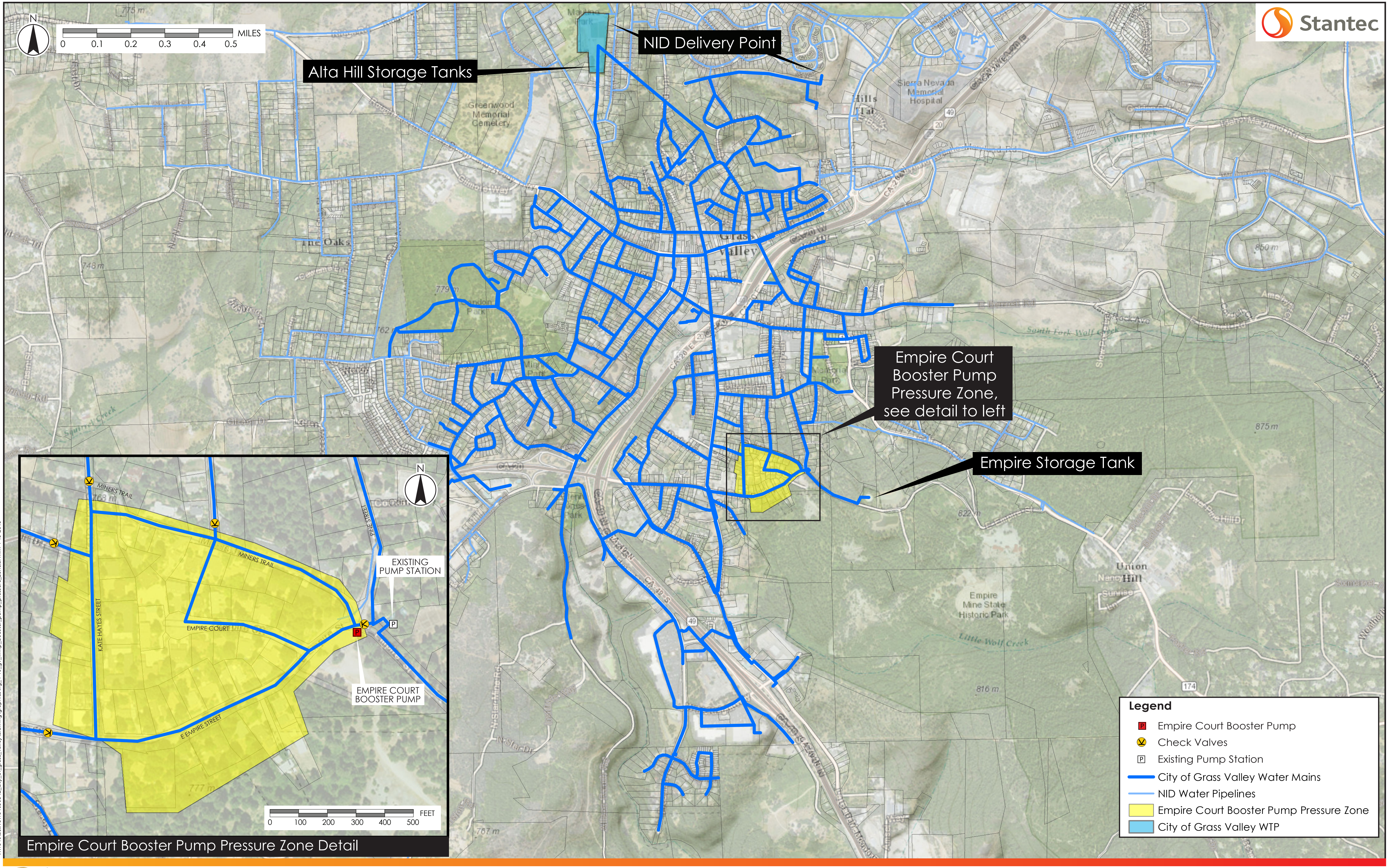
The preferred alternative for mitigating the low pressure in the Empire Court area involves the use of a 3 to 5 hp booster pump near the intersection of East Empire Street and Pine Street/Miners Trail. Five check valves create a pressure zone in the East Empire Street, Kate Hayes Street and Miners Trail area depicted in **Figure ES-6**. The booster pump and check valves were predicted by the model to provide additional pressure to the Empire Court area, eliminating the low pressure zone.

Providing Service to Broadview Heights

The preferred alternative for providing service to the Broadview Heights subdivision, which is within the City Service Area No. 2 but is currently served by NID, involves installing a 5 to 7.5 hp booster pump near the intersection of Broadview Avenue and Bawden Avenue. Due to fire flow requirements in the area an emergency supply agreement may be necessary with NID if this alternative is pursued.



V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-7_gv_wmp_junctions_final_buildout.ai mlm 4-15-2015



Stantec
MILES
0 0.1 0.2 0.3 0.4 0.5
NID Delivery Point
Alta Hill Storage Tanks
Empire Court Booster Pump Pressure Zone, see detail to left
Empire Storage Tank
MINERS TRAIL
EXISTING PUMP STATION
EMPIRE COURT
KATE HAYES STREET
E EMPIRE STREET
EMPIRE COURT BOOSTER PUMP
FEET
0 100 200 300 400 500
Empire Court Booster Pump Pressure Zone Detail
Legend
Empire Court Booster Pump
Check Valves
Existing Pump Station
City of Grass Valley Water Mains
NID Water Pipelines
Empire Court Booster Pump Pressure Zone
City of Grass Valley WTP

Fire Flow Improvements
Low fire flow (less than 1,000 gpm at a residual pressure of 20 psi) in various areas of the City as identified in **Figure ES-4** can be mitigated by looping dead end lines in the proximity of the deficient hydrants, and upsizing pipe sizes at dead end lines. These improvements are shown on **Figure ES-7**. They include an additional 400 feet of 6-inch pipe to complete a loop at East Main Street and Eureka Street, 420 feet of 6-inch pipe to complete loop on the end of the Cornwall cul-de-sac line, upsizing the existing 4-inch pipe on the dead end line on Linden Avenue with 380 feet of 8-inch pipe, and upsizing the existing 4-inch pipe on the dead end line on Stacey Lane with 330 feet of 8-inch pipe. **Figure ES-7** also identifies improvements which allow the system to deliver the 4,000 gpm, 4 hour fire flow at 20 psi to the southern portion of the system, i.e., McKnight Way/Freeman Lane. Recommended improvements shown include 550 feet of 12-inch pipeline along the McKnight Way overpass from South Auburn Street to Taylorville Road, a 700 foot extension of 12-inch pipeline on Freeman Lane to McKnight Way, and a 1,600 foot extension of 12-inch pipeline along Allison Ranch Road connecting to Freeman Lane. An emergency intertie connection with NID in the area could be investigated as an alternative way of increasing the fire flow in this area and/or as a reasonable redundancy in this portion of the system.

ES-3 Water Treatment Plant Improvements

The City's Water treatment plant is considered a conventional treatment plant, utilizing flocculation and sedimentation pretreatment processes followed by filtration and disinfection to provide treatment. The existing treatment facility produces excellent quality water, and the facilities are well maintained.

The City is currently in compliance with existing federal, state and municipal regulations, and the improvements outlined in this master plan are intended to enhance the function of the WTP from an operations perspective, and to improve worker safety.

The City intends to construct improvements in phases, beginning with high priority upgrades, which will be determined by City Staff.

Higher Priority Improvements

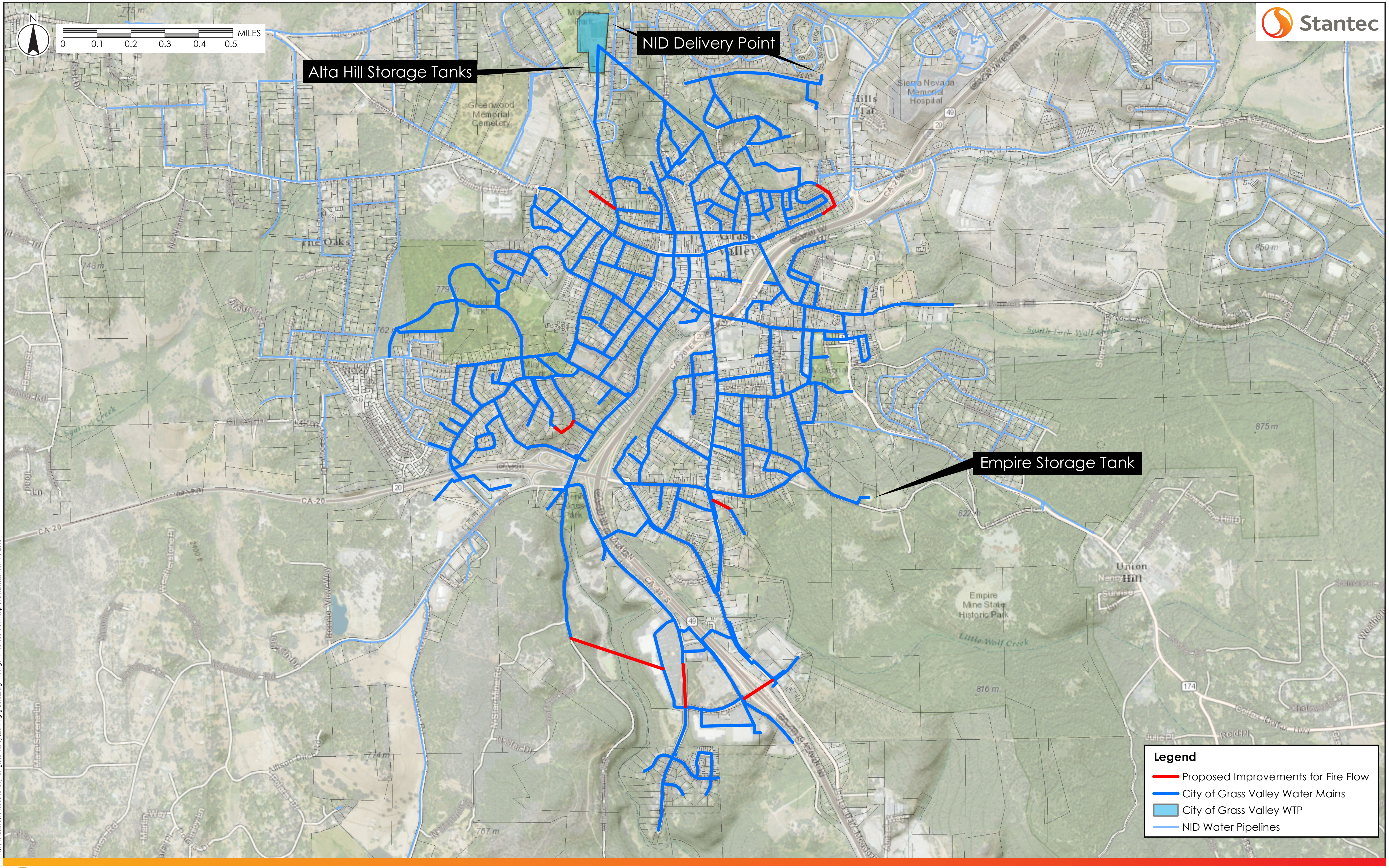
- Streaming current monitor
- Repair existing catwalk between flocculation and sedimentation basins
- Drain sedimentation basin and inspect concrete floor
- Inspect filter basin underdrains, overflow wash troughs, concrete walls
- Repair filter basin concrete walls

- Replace filter media
- Inspect plant water supply system and replace/upgrade if required
- Determine plant water supply capacity for irrigation and plant use to determine if system is sufficient to serve all current needs
- Relocate sodium hypochlorite storage tank closer to filters and replace, if necessary
- Repair storage tank control valve damaged by flooding
- Address drainage issues around storage tanks
- Eliminate paper chart recorders with paperless recorders
- Continue ongoing generator maintenance program
- Evaluate the existing and future electrical loading on the WTP to determine the necessary transformer sizing, and if upsizing is warranted, confirm emergency generator remains sufficient

Lower Priority or Maintenance Improvements

- Install a flow control valve on raw water line from Alta Hill Reservoir (This is not an improvement solely within the discretion or control of the City as NID supplies raw water via their facilities)
- Replace horizontal flocculators with vertical flocculators
- Install a sunshade structure above chemical storage tanks
- Redirect storage tank overflow to the old storage basin
- Pump the water accumulated in the old storage basin to the influent channel of the WTP
- Provide SCADA/Operator interface improvements to allow remote access and control of the WTP systems
- Upgrade power supply to the storage tank area with 240V cable

Prior to implementing any of the suggested improvements included herein the City will comply with the California Environmental Quality Act (CEQA) and prepare the necessary documentation. The City may also be subject to the National Environmental Protection Act (NEPA) and other Federal regulations depending on the nature of the project and funding sources.



City of Grass Valley
Water System Master Plan

Figure ES-7
City of Grass Valley - Fire Flow Improvements

ES-4 Recommended Improvements and Opinion of Probable Cost

Summaries of recommended improvements as well as planning level estimates for individual project costs are presented in the tables below. Additional cost details are included in **Appendix A.**

Table ES-2 Opinions of Capital Cost to Address Distribution System Deficiencies

Label	Location	Description	Additional Capacity	Total Base Project Costs [(a)]
CIP-001	East Main St	Replace 350 LF of 4" CIP with 6" C900 on East Main Street between Murphy Street and Eureka Street. Install 520 lf of new 6-inch pipeline to complete loop at East Main and Eureka. Replace existing hydrant with new hydrant.	X	$260,000
CIP-002	Cherry Ln	Replace approximately 200 lf of dead end 2" steel line on Cherry Lane.		$80,000
CIP-003	Depot St	Replace 113 LF of 2" and 4" water main with an 8" water main on Depot Street east of Kidder (Biggs?) Street to the intersection of Kidder (Biggs?) Street and Depot Street. Extend 140 lf of 2" water line to west end of Depot Street, and install 8 services. Connect two parcels on Lincoln to water line on Colfax Ave.	X	$140,000
CIP-004	Florence Ave	Replace 1-1/2" steel with 2" pvc approximately 240 feet on Florence Avenue. No hydrant, replace 3 services.	X	$80,000
CIP-006	Grey Ave	Abandon 2" steel line on Grey Avenue, and construct 4 new services with meters off of Le Duc.		$30,000
CIP-007	Kendall St	Eliminate dead end system on Kendall Street, east of Memorial Park. Project requires trenching through park.		$210,000
CIP-008	Kidder Ave	Replace 353 LF of 4" CIP along Kidder Avenue from Bennett Street to Maryland Drive. Tie in to 6" CIP at Kidder and Bennett and tie in to 6" at intersection of Kidder and Maryland Drive		$130,000
CIP-009	Linden Ave	Replace 2" steel line with 8" line in Linden Street west of Alta	X	$230,000

Label	Location	Description	Additional Capacity	Total Base Project Costs [a]
CIP-010	Valley View	Replace 350 LF of 2" steel on Valley View. Tie in to 12" DIP at intersection of Valley View and Maryland Drive.		$230,000
CIP-011	Maryland Dr.	Replace 590 LF of 1-1/2" steel pipe replace with 6" pipe along Maryland Drive, north of Valley View.	X	$250,000
CIP-012	N. Church	Replace 4" CIP with 6" C900 on North Church Street between Richardson Street and Doris Drive. On the south end of North Church Street, tie into new 6" line installed by Habitat for Humanity. On the north end, tie into existing 6" line at the intersection of North Church Street and Doris Drive.	X	$250,000
CIP-013	Temby St	Replace 2" steel with 6" on Temby Street. Connect to 8" CIP at Intersection of Temby and Pleasant. At the other end, connect to 6" at Temby and Columbia.	X	$160,000
CIP-014	Wood St	Reroute existing line so that new alignment goes from Wood Street, through private property, to N. Auburn. Service 2 residences with new services from Chester Street.		$90,000
CIP-015	McKnight Wy	Install new pipelines to increase fire flow at McKnight Way (~550 lf, 12-inch pipe, crossing Highway 49 at McKnight Way; ~700 lf, 12-inch pipe, connecting Freeman Lane main to McKnight Way; ~1,650 lf, 12-inch pipe, connecting main along Allison Ranch Road to Freeman Lane)	X	$1,100,000
CIP-016	Cornwall Ave	Install ~420 lf of new 6-inch pipeline to complete loop at Cornwall Ave cul de sac to increase fire flow.		$100,000
CIP-017	Stacy Ln	Pipe upgrades at the dead end section of Stacy Ln from 4-inch to 8-inch (~700 lf of 8-inch pipe, including replacement of ~700 lf of 4-inch pipe)	X	$300,000
CIP-018	Broadview Heights	Install new booster pump and check valves to serve the Broadview Heights neighborhood.		$260,000
			Subtotal	**$3,900,000**

Label	Location	Description	Additional Capacity	Total Base Project Costs [(a)]
EMP-001	Empire Tank	Rehabilitate Empire Tank coating systems		$1,060,000
EMP-002	Empire Tank	Remove and waste existing booster pumps		$10,000
EMP-003	Empire Tank	Piping upgrades to allow new pumps to be installed with reverse discharge		$40,000
EMP-004	Empire Tank	Install flow control valve on new pump discharge		$20,000
EMP-005	Empire Tank	Install new tank booster pumps and associated electrical upgrades		$260,000
EMP-006	Empire Tank	Upsize downstream main (940 lf 12-inch; 130 lf 6-inch)		$270,000
EMP-007	Empire Court	Install new booster pump for Empire Court area		$260,000
EMP-008	Empire Court	Booster pump check valves (2, 12-inch; 3, 6-inch)		$110,000
			Subtotal	**$2,030,000**

(a) All Costs have been rounded to the nearest $10,000. Cost basis, ENR CCI, July 2015 = 10,037

Table ES-3 Opinions of Capital Cost to Address WTP Deficiencies

Label	Description	Total Base Project Costs [(a)]
WTP-001	Install streaming current monitor in influent channel [(b)]	$60,000
WTP-002	Install flow control valve on raw water influent line	$140,000
WTP-003	Replace Flocculator Paddles	$550,000
WTP-004	Replace catwalks between flocculation and sedimentation basins	$480,000
WTP-005	Repair cracks in sedimentation basin	$200,000
WTP-006	Replace filter media (sand, anthracite, and gravel drain), and repair filter basin walls	$230,000
WTP-007	Replace filter underdrain and overflow troughs (potential future project – requires inspection of existing facilities)	$350,000
WTP-008	Upgrade plant water system – pumps, hydropneumatic tank, etc. (potential future project – requires inspection of existing facilities)	$590,000
WTP-009	Replace sodium hypochlorite tank	$100,000
WTP-010	Install sunshade structure over chemical storage tanks	$200,000
WTP-011	Stormwater sump improvements at treated water storage tanks	$200,000
WTP-012	Water recycle pumps in storage basin	$280,000

Label	Description	Total Base Project Costs [a]
WTP-013	Ongoing Generator maintenance program [c]	$40,000
WTP-014	Install paperless recorders to replace chart recorders	$130,000
WTP-015	Upgrade plant SCADA system	$240,000
	Subtotal	**$3,790,000**

(a) All costs have been rounded to the nearest $10,000. Cost basis, ENR CCI, July 2015 = 10,037

(b) Installation of a flow control valve on the raw water line is not an improvement solely within the discretion of the City; NID supplies the raw water via their facilities.

(c) This is an ongoing maintenance program performed by a third party. The total base project cost reflects the annual costs for this program.

1.0 INTRODUCTION

The City of Grass Valley currently serves approximately 2,450 accounts with treated water, of which slightly less than 1,900 are residential accounts and just over 550 are commercial/industrial accounts. The City's service area comprises the "old town" portion of the City and areas to the south and east. **Figure 1-1** illustrates the City's existing water service area.

The purpose of this master plan is to allow for the identification of needed system improvements and development of a program that prioritizes those improvements. The improvements recommended herein include extensions of water mains to improve fire flow and upgrades to storage facilities that will allow their use in a way which is more protective of public health and enhances the ability of the system to supply water under critical fire flow conditions.

1.1 SCOPE

The scope of this master planning effort includes the following major elements:

- Review existing reports, drawings, land use and zoning maps, and other relevant information.
- Evaluate existing facilities and operational data.
- Project future water demands based on historical water use and land uses as defined in the City's 2020 General Plan.
- Develop a list of system assets, incorporate those assets into an electronic database and use software tools to project repair and replacement costs for the system over time.

V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-1_gv_wmp_existing_water_service_area.ai mlm 4-2-2015

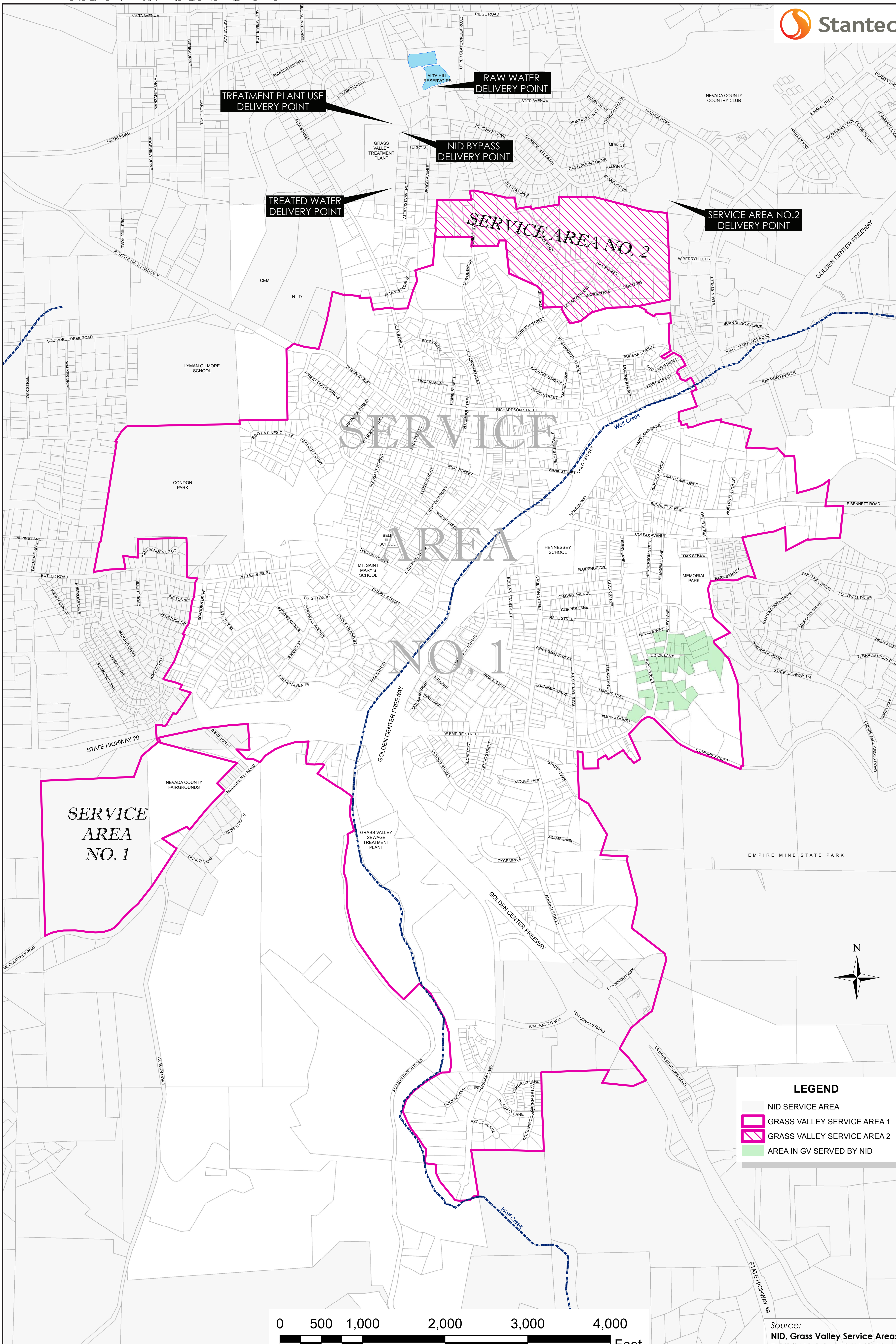


Figure 1-1
City of Grass Valley - Existing Water Service Area

2.0 REGULATORY REQUIREMENTS AND COMPLIANCE

2.1 INTRODUCTION

The purpose of this chapter of the Master Plan is to provide an overview of the current and future Federal and State municipal drinking water regulations that will affect the design and operation of the Grass Valley Water Treatment Plant (WTP) and potable water distribution system.

2.2 EPA AND CDPH DRINKING WATER REGULATIONS

The Federal regulations providing the requirements for public water systems (PWS) are outlined in the Environmental Protection Agency's (EPA) Safe Drinking Water Act (SDWA). The federal regulations include:

- Surface Water Treatment Rule (SWTR), promulgated in 1989
- Interim Enhanced Surface Water Treatment Rule (IESWTR), promulgated in December 1998
- Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR), promulgated in January 2002
- Long Term 2 Enhanced Surface Water Treatment Rule (LT2EASWTR), promulgated in January 2006
- Stage 1 Disinfectants/Disinfection Byproducts Rule (D/DBPR), promulgated in December 1998
- Stage 2 Disinfectants/Disinfection Byproducts Rule (D/DBPR), promulgated in January 2006
- Filter Backwash Recycling Rule (FBRR), promulgated in June 2001
- Total Coliform Rule (TCR), promulgated in 1989

Until recently (July 1, 2014), California Department of Public Health Department (CDPH) regulated and enforced Federal and State drinking water standards through the California Code of Regulations (CCR). As of July 2014, the responsibilities of the CDPH for regulating and enforcing drinking water standards were transferred to the State Water Resources Control Board (State Board) Division of Drinking Water (DDW). It should be noted that there are frequent references to CDPH in this document, some relating to historical information (inspection reports) and existing regulations, although the responsible agency is now the State Board DDW. The

California drinking water regulations meet or exceed the regulations set forth by the EPA. The State regulations include:

- California Code of Regulations, Titles 17 and 22 – California Regulations Related to Drinking Water

The Federal and State regulations identified above are organized into four categories: source supply, treatment processes, distribution system, and water quality sampling requirements. The City of Grass Valley 2012 Inspection Report, administered by the CDPH, summarizes the findings of an evaluation of the City's WTP for compliance with Federal and State regulations. Reference to the Inspection Report results is included in the following sections.

2.2.1 Source Supply Requirements

The primary regulation that governs source supply for California is identified in the CDPH regulations, Title 22, Chapter 16 of the California Waterworks Standards.

Section §64554 of Title 22 indicates that "at all times, a public water system's water source(s) shall have the capacity to meet the system's maximum day demand (MDD)."

Currently, the Grass Valley WTP is supplied with raw water via the Nevada Irrigation District's (NID) canal distribution system. This source water canal system is reliable and has the capacity to deliver water necessary to meet the City's MDD of approximately 2.5 million gallons per day (MGD). Grass Valley is under contract with NID to receive up to 5.0 million gallons per day of raw water.

2.2.2 Treatment Processes Requirements

A series of requirements outlined by the EPA and the CDPH must be met for treatment of raw water at the Grass Valley WTP.

2.2.2.1 *Giardia*, *Legionella*, Virus and Coliform Requirements

The following regulations outlined in the EPA's and CDPH's drinking water programs identify the requirements regulating *Giardia*, *Legionella*, viruses and coliform bacteria.

Surface Water Treatment Rule (SWTR)

The SWTR applies to all public water systems using surface water or groundwater under the direct influence (GWUDI) of surface water as water sources. It establishes maximum contaminant level goals (MCLG) of zero for *Giardia*, viruses and *Legionella*. It includes the following treatment technique requirements to reduce exposure to these pathogenic microorganisms:

1. Filtration, unless specific avoidance criteria are met;

2. Removal and/or inactivation of 3-log (99.9%) of *Giardia* (i.e. filter will have to physically remove 99.9% of the constituent or inactivate 99.9% of the constituent during disinfection process) and 4-log (99.99%) of viruses (i.e. filter will have to physically remove 99.99% of the constituent or inactivate 99.99% of the constituent during disinfection process);

Treatment under the SWTR is required to be accomplished through a combination of filtration and disinfection. The regulation allows a treatment credit of 99.7% (2.5 log) removal of *Giardia* cysts and a 99% (2 log) removal of enteric viruses, if the filtered water turbidity is equal to or less than 0.5 NTU for 95% of the time.

Disinfection is to be used to achieve the remainder of the removal/inactivation requirement, 0.5-log of *Giardia* and 2-log for viruses. Appropriate disinfection is based upon the product of the disinfectant residual concentration and the effective disinfectant contact time (CT). The CT required is a function of the type of disinfectant, residual concentration of disinfectant, water temperature, pH and time.

Based on the 2012 Inspection Report provided by CDPH for the Grass Valley WTP, the plant meets the goal for its removal and/or inactivation credit of 3-log for *Giardia* and 4-log for viruses.

CDPH Treatment Guidelines

CDPH treatment guidelines require additional log removal/inactivation of both *Giardia* and viruses as shown in **Table 2-1** based on raw water total coliform concentrations.

Table 2-1 CDPH Source Water Quality Guidelines for Log Removal/Inactivation

Total Coliform Concentration (Median Monthly MPN/100 mL)	Log Removal Requirements	
	Giardia	Virus
< 1,000	3	4
>1,000 – 10,000	4	5
>10,000 – 100,000	5	6

Total Coliform Rule (TCR)

The TCR addresses all Public Water System (PWS) monitoring and testing requirements, for total coliform, including fecal coliforms (e.g. *E. Coli*). The TCR also establishes an MCL for total coliform, based on the presence or absence of the bacteria. Compliance with the TCR is determined each calendar month that the PWS is supplying water to the public. Monthly monitoring of total coliform is required and the number of samples taken is dependent on the population served by the PWS. Each positive total coliform result must be tested for the presence of fecal coliform or *E. Coli*. If any of these samples is positive, then a repeat sample and analysis is required. The TCR requires that PWS's serving populations between 4,101 and

4,900 take a minimum of 5 samples per month. Grass Valley's water service area falls within this range having a population of 4,453, according to the 2012 Inspection Report.

A monthly MCL violation occurs when the PWS, collecting fewer than 40 samples per month, has greater than one routine or repeat sample per month that is total-coliform positive. An acute MCL violation occurs when the PWS has any fecal coliform- or *E. Coli*-positive repeat sample.

2.2.2.2 Turbidity

The following regulations outlined in the EPA's and CDPH's drinking water programs identify the requirements regulating turbidity.

Interim Enhanced Surface Water Treatment Rule (IESWTR)

The IESWTR identifies that any PWS serving fewer than 10,000 people and using surface water sources, requires sanitary surveys conducted by the State.

Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)

The LT1ESWTR applies to any PWS serving fewer than 10,000 people and using surface water, or groundwater under the influence of surface water, as a source. Key provisions established by the LT1ESWTR include the following:

1. Stringent combined filter effluent turbidity performance standards of 1.0 NTU as a maximum and 0.3 NTU or less at the 95th percentile monthly for treatment plants using conventional treatment or direct filtration;

2. Requirements for individual filter turbidity monitoring, including turbidity not to exceed 1.0 NTU in 2 consecutive measurements (at 15 minute intervals), and be less than 0.5 NTU after the first 4 hours of filter operation after a backwash;

CDPH *Cryptosporidium* Action Plan

In 1995, the California Department of Health Services adopted a *Cryptosporidium* Action Plan intended to facilitate comprehensive compliance with the California SWTR. Some of the information in the Action Plan is now only of historical interest. Since 1995, federal rules have been adopted to address *Cryptosporidium*, including the IESWTR, LT1ESWTR, and LT2ESWTR. Key provisions of the Action Plan as they relate to optimizing treatment at a WTP include:

- Effluent turbidity goal of 0.1 NTU;

- Establishing procedures for optimizing the coagulation/flocculation/sedimentation processes to enable maximum turbidity removal with a turbidity goal of 1 to 2 NTU in the effluent of the sedimentation basins at all times;

- Turbidity monitoring of individual filters;
- Set an operational goal of 0.3 NTU or less following a backwash;
- Optimizing the performance of filter backwash recycle and setting an operational goal of less than 2.0 NTU for the effluent of a plant's reclaimed backwash water and sludge reclamation systems.

The 2012 CDPH Inspection Report identified that, based on results of monthly filter effluent turbidity monitoring from 2007-2012, the WTP's combined filter effluent met the 95% less than 0.3 NTU turbidity requirement. The WTP also provides an 80% raw water turbidity reduction for surface water treatment plants (22 CCR §64660). Both raw water turbidity and treated water turbidity (combined filter effluent and individual filter effluent) are monitored on a monthly basis in accordance with CDPH regulations.

2.2.2.3 *Cryptosporidium*

The following regulations outlined in the EPA's and CDPH's drinking water programs identify the requirements regulating *Cryptosporidium.*

Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)

The LT1ESWTR establishes the following treatment requirements for *Cryptosporidium*:

1. A maximum contaminant level goal (MCLG) of zero for *Cryptosporidium*;
2. *Cryptosporidium* physical removal requirements of 2-log (99 percent) for filtered PWS's.

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

The LT2ESWTR supplements existing SWTR regulations and targets PWSs with a higher potential risk from *Cryptosporidium*. The LT2ESWTR was developed in conjunction with the Stage 2 D/DBPR.

As Grass Valley serves fewer than 10,000 people, it is considered a Schedule 4 System for purposes of LT2ESWTR requiring the following:

1. Filtered systems must conduct 12 months of source water monitoring for *E. Coli*. If the *E. Coli* trigger level is exceeded, the system must conduct an additional 12 to 24 months of source water monitoring for *Cryptosporidium*. The PWS may use previously collected data.
2. Systems providing at least 5.5 log of treatment for *Cryptosporidium*, or those systems that intend to install this level of treatment are not required to conduct source water monitoring.

3. Additional treatment may be required for *Cryptosporidium* based on the bin classification, as seen in **Table 2-2** below.

Table 2-2 Bin Classification for Filtered Systems

Cryptosporidium Concentration (oocysts/L)	Risk Bin Classification	Additional *Cryptosporidium* Treatment Required
		Conventional Filtration
< 0.075	Bin 1	No additional treatment required
0.075 to < 1.0	Bin 2	1 log (total 4-log)
1.0 to < 3.0	Bin 3	2 log (total 5-log)
≥ 3.0	Bin 4	2.5 log (total 5.5-log)

4. A second round of monitoring beginning six years after the initial system classification.

5. If any system plans to make a significant change in its disinfection process, development of disinfection profiles of microbial inactivation levels for Giardia and viruses are required along with calculation of a disinfection benchmark required. Consultations with the State are to be made prior to making any changes.

Based on the CDPH's 2012 Inspection Report, raw water bacteriological monitoring was completed in accordance with EPA's LT1ESWTR and LT2ESWTR requirements. The coliform monitoring results showed that monitoring for *Cryptosporidium* is not required and that the City's raw water source qualifies for a Bin 1 classification.

A series of critical deadlines and requirements set forth by the CDPH to ensure that all PWSs comply with the LT2ESWTR Schedule 4 (for PWSs that use surface water and serve fewer than 10,000 people) are identified in **Table 2-3** below:

Table 2-3 LT2ESWTR Critical Deadlines

Critical Date	Compliance Description
July 1, 2017	System must submit their sampling schedule that specifies the dates of sample collection and location of sampling for second round of *E. coli* source water monitoring to the state.
October 1, 2017	Systems are required to begin conducting a second round of *E. coli* source water monitoring. Based on the results, systems must re-determine their bin classification and provide additional treatment, if necessary.
January 1, 2019	Systems must submit their sampling schedule that specifies the dates of sample collection and location of sampling for second round of *Cryptosporidium* source water monitoring to the state.

Critical Date	Compliance Description
April 1, 2019	Systems are required to begin conducting a second round of *Cryptosporidium* source water monitoring. Based on the results, systems must re-determine their bin classifications (filtered systems) or mean *Cryptosporidium* level (unfiltered systems) and provide additional treatment, if necessary.

2.2.2.4 Filtration

The City of Grass Valley's existing WTP filtration system is summarized in **Table 2-4** below:

Table 2-4 Grass Valley WTP Filter Cells

Number of Filters	Four (4)
Media Type	Dual Media – Anthracite and Sand
Loading Rate	3.9 gpm/sf
Filter Capacity	5 MGD Total (3.75 MGD Reliable)

The following regulations outlined in the EPA's drinking water programs identify the requirements for regulating filtration.

Surface Water Treatment Rule (SWTR)

Section §64660 of the SWTR requires that the filtration rates for direct and conventional filtration processes not exceed 3.0 gpm/sf for single media filters and 6.0 gpm/sf for deep bed, dual or mixed media gravity filters. The Grass Valley WTP dual media filters rated at 5 MGD (3,500 gpm), equivalent to a loading rate of 3.9 gpm/sf, well under the 6.0 gpm/sf regulations.

The CDPH 2012 Inspection Report notes indicate there are no concerns with filter operation.

2.2.2.5 Backwashing

The following regulations outlined in the EPA's and CDPH's drinking water programs identify the requirements for regulating backwashing of the filter basins.

Filter Backwash Recycling Rule (FBRR)

The FBRR addresses filter backwash water and two additional recycle streams of concern: sludge thickener supernatant and liquids from dewatering processes. The FBRR also establishes reporting and record keeping requirements for recycle practices that allow regulators to better evaluate the impact of recycle practices on overall treatment plant performance. The FBRR does not specifically state a maximum return flow based on a percentage of the plant's approved operating capacity. The FBRR consist of three distinct components:

1. The FBRR Requires a water system to notify the State about its recycle practices if it operates a conventional or direct filtration plant to include the following information:
    a. A plant schematic showing the origin of all recycle streams, the hydraulic conveyance used to transport the streams, and the location where the recycled streams enter the treatment process;
    b. Typical recycle flow, highest observed plant flow experienced the previous year, and design flow for the plant;
    c. The State approved operating capacity for the plant, if the State has made such a determination.
2. To obtain the Cryptosporidium removal credit as indicated in the LT1ESWTR and LT2ESWTR, the FBRR requires that spent filter backwash water, thickener supernatant, or liquids from dewatering processes be returned through all the processes of a system's conventional or direct filtration system.
3. A system must collect and retain the following information for review and evaluation by the State per the FBRR:
    a. A copy of the Recycle Notification Form;
    b. A list of all recycle flows and the frequency at which they are returned;
    c. Average and maximum backwash flow rates through the filters, and the average and maximum duration of the filter backwash process;
    d. Typical filter run length and a written summary of how filter run length is determined (e.g. headloss, turbidity, time, etc.);
    e. If applicable, the type of treatment provided for the recycle stream before it re-enters the filtration process; and
    f. If applicable, data about the physical dimensions of the equalization and/or treatment units, typical and maximum hydraulic loading rates, types of treatment chemicals used, average dose of chemicals, frequency of chemical addition, and frequency of solids removal.

California FBRR

California's regulations regarding filter backwash recycle are included in §64653.5 of the SWTR. The California regulation is equivalent to the EPA's FBRR as presented in this section.

As documented in the CDPH's 2012 Inspection Report, the Grass Valley WTP returns reclaimed filter backwash water to the headworks of the plant, after the backwash water has settled in a settling pond.

2.2.3 Distribution System Requirements

A series of requirements applicable to Grass Valley's distribution system have been established by the EPA and the CDPH.

2.2.3.1 Disinfectant Residual

The following regulations outlined in the EPA's and CDPH's drinking water programs identify the requirements for regulating disinfectant residual in Grass Valley's distribution system.

CDPH Surface Water Treatment Rule (SWTR)

The SWTR requires that systems demonstrate, by continuous monitoring and recording, that a disinfectant residual of at least 0.2 mg/L is continuously maintained in water delivered throughout the system.

Chlorine is injected post-filtration to boost the free chlorine residual entering the storage tanks to approximately 0.7 mg/L. According to the 2012 CDPH Inspection Report, the WTP has measured a disinfectant residual entering the distribution system between 0.5 and 0.7 mg/L. This is above the CDPH's minimum requirement of 0.2 mg/L. The WTP currently monitors chlorine residual levels in three locations post-filtration. An on-line analyzer monitors the combined post-filter chlorine residual, while each 1 MG storage tank is equipped with an on-line chlorine residual analyzer.

EPA Stage 1 Disinfectants and Disinfection Byproducts Rule (D/DBPR)

The Stage 1 D/DBPR applies to any PWS that adds a disinfectant to any part of the treatment process. The purpose of the Stage 1 D/DBPR is to reduce public exposure to DBPs, specifically four trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform), bromate, chlorite, and five haloacetic acids (monochloroacetic, dichloroacetic, trichloroacetic, bromoacetic and dibromoacetic acids). The Stage 1 D/DBPR includes the following requirements:

1. MCLs for some known DBPs to be determined on a system-wide running annual average (RAA):
    a. Revised MCL for total trihalomethanes (TTHMs) of 80 µg/L. TTHM defined as the sum of the concentrations for chloroform, bromodichloromethane, dibromochloromethane and bromoform.

   b. New MCL for five of the nine haloacetic acids (HAA5) of 60µg/L. HAA5 is defined as the sum of concentrations for monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, bromoacetic acid and dibromoacetic acid.

2. A maximum residual disinfectant level (MRDL) for chlorine (4.0mg/L). However, the federal regulations indicate that chlorine MRDL may be exceeded in the distribution system "for a time necessary to protect public health, to address specific microbiological contamination problems (e.g. cross contamination events or raw water contamination caused by circumstances such as, but not limited to, distribution line breaks, storm runoff events, source water contamination events, or cross-connection events).

3. A treatment technique requirement for removal of DBP precursor material to reduce formation of DBPs. Water systems using conventional treatment are required to remove specific percentages of natural organic materials, as measured by total organic carbon (TOC) that may react and form DBPs unless the water system complies by meeting one of six alternative criteria:

   a. The system's source water TOC level is less than 2.0 mg/L calculated quarterly as a RAA;

   b. The system's treated water TOC is less than 2.0 mg/L calculated quarterly as a RAA;

   c. The system's:

      i. Source water TOC level is less than 4.0 mg/L, calculated quarterly as a RAA

      ii. Source water Alkalinity is greater than 60 mg/L (as $CaCO_3$) calculated quarterly as a RAA.

      iii. Levels of TTHM or HAA5 RAAs are no greater than 40 µg/L and 30 µg/L respectively, or prior to the effective date for compliance, the system has made a clear and irrevocable financial commitment to use technologies to limit levels of TTHMs and HAA5 to no more than 40 µg/L and 30 µg/L respectively.

   d. The TTHM and HAA5 RAAs are no greater than 40 µg/L and 30 µg/L, respectively, and the system uses only chlorine for primary disinfection and maintenance of a residual in the distribution system.

   e. The system's source water Specific Ultraviolet Absorption (SUVA) at 254 nanometers prior to any treatment and measured monthly is less than or equal to 2.0 L/mg-m calculated quarterly as a RAA.

   f. The system's finished water SUVA is less than or equal to 2.0 L/mg-m calculated quarterly as a RAA.

4. Monitoring, reporting, and public notification for the constituents subject to the new MCLs and MRDLs.

EPA Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 D/DBPR alongside the LT2ESWTR, applies to all systems that utilize a disinfectant other than UV light or deliver water that has been treated with a disinfectant other than UV. The Stage 2 D/DBPR includes a new method of determining compliance with TTHMs and HAA5s. In addition to compliance with the system-wide RAA MCLs in the Stage 1 Rule, compliance will also be required at each monitoring location based on locational running annual average (LRAA).

Under the Stage 2 Rule, PWSs are required to perform an initial distribution system evaluation (IDSE). An IDSE consists of either a standard monitoring program or a system-specific study.

The purpose of the IDSE is to determine the compliance monitoring locations that contain high TTHM and HAA5 levels. Systems that have extensive TTHM and HAA5 data, or a hydraulic model of the system, can conduct a system specific study to determine the monitoring locations.

In addition, the Stage 2 DBP Rule requires that Grass Valley comply with:

- An LRAA MCL for TTHMs of 80 μg/L at each monitoring location identified in the IDSE (in addition to the system-wide RAA MCL of 80 μg/L under the Stage 1 DBP Rule).
- An LRAA MCL for HAA5 of 60 μg/L at each monitoring location identified in the IDSE (in addition to the system-wide RAA MCL of 60 μg/L under the Stage 1 DBP Rule).

CDPH D/DBPR

The California D/DBPR is defined in Title 22, Chapter 15.5 of the CCR. California D/DBPR compliance is based on the same criteria as the Stage 1 D/DBPR as presented above, including monitoring locations and frequencies, treatment techniques for control of DBP precursors, and reporting and recordkeeping.

Monitoring for systems serving between 500 and 9,999 people requires a minimum of one sample per quarter per treatment plant. The monitoring locations shall be taken at points representing maximum residence time in the water distribution system. Systems may reduce monitoring if one year's worth of monitoring results indicate TTHM ≤ 0.040 mg/L (40 μg/L) and HAA5 ≤ 0.030 mg/L (30 μg/L) based on running annual averages. Systems shall take daily samples at the entrance to the distribution system and analyze the samples the same day the samples are taken.

Based on the 2012 CDPH Inspection Report, the City's TTHM and HAA5 averages were 24.5 μg/L and 8.4 μg/L, respectively. These levels are in compliance with the current EPA Stage 2 D/DBPR regulations. In addition, since the DBP values are not greater than half the MCL for TTHM and HAA5 (40 μg/L and 30 μg/L, respectively), CDPH has approved the City to reduce its monitoring from monthly to quarterly. This reduction in monitoring has occurred since 2006 since the City's DBP levels continue to be less than half their respective MCLs.

2.2.3.2 California Waterworks Standards

The regulatory requirements of the Title 22, Chapter 16 California Waterworks Standards define the design standards for the distribution system of a water system. The significant components of these requirements are as follows:

- Newly installed water mains in a community water system shall have a nominal diameter of at least four (4) inches. (22 CCR §64573)
- Each distribution system shall be operated in a manner to assure that the minimum operating pressure in the water main at the user service line connection throughout the distribution system is not less than 20 pounds per square inch (psi) at all times. (22 CCR §64602)
- New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally and one foot vertically above, any pipeline conveying sewage. (22 CCR §64572)
- A flushing valve shall be installed at the end of a water main and shall be designed to maintain the minimum continuous velocity of 2.5 ft/s in the pipeline. (22 CCR §64575)
- Newly installed or out-of-service water mains and reservoirs shall be disinfected and sampled for bacteriological quality to ensure that readings of total coliform are negative prior to putting the water main or reservoir back into service. (22 CCR §64580)

The City of Grass Valley's design standards require that these standards be met.

2.2.3.3 Cross-Connection Program

Title 17, Section §7584 of the CDPH drinking water standards indicates that the water supplier shall protect the public water supply from contamination by implementation of a cross-connection control program. The program shall evaluate the existence of cross-connections and the probability of backflow occurring. Based on this evaluation, the type of protection required to prevent backflow into the water supply shall be determined based on the criteria outlined in Section §7604. **Table 2-5** provides the minimum degree of backflow prevention to be administered based on the scenarios identified:

Table 2-5 Type of Backflow Protection Required

Hazard	Required Level of Protection
Premises where there are sewage pumping and/or treatment plants and there is no interconnection with the potable water system. Also where hazardous substances are handled in a manner in which substances may enter the potable water system. A reduced pressure principle backflow prevention (RP) device may be provided in lieu of an AG if approved by CDPH.	Air Gap (AG)
Unapproved auxiliary supply that is interconnected with a piping system connected to the PWS.	Air Gap
Unapproved auxiliary supply that is not interconnected with a piping system connected to the PWS and has piped water conveyed under pressure in a piping system less than 200 feet from the piping system connected to the PWS.	Reduced Pressure (RP)
A fire protection system interconnected with a piping system connected to the PWS and an onsite auxiliary water supply for firefighting.	Air Gap
A fire protection system supplied by the PWS with an interconnection to onsite storage facilities and pumps, or combined fire and industrial water.	Reduced Pressure
Premises with multiple service connections to the PWS.	Reduced Pressure
Systems that produce, or collect and distribute gray water and is interconnected to a piping system connected to the PWS.	Air Gap
Systems that produce, or collect and distribute gray water and is not interconnected to a piping system connected to the PWS.	Reduced Pressure
Water storage facility not under control of the PWS.	Air Gap

Section §7605 indicates that all backflow preventers shall be tested at least annually or more frequently if determined to be necessary by the CDPH.

The City of Grass Valley has a cross-connection program in place, identified as the Grass Valley Code of Ordinances, Title 13, Chapter 13.08 "Backflow Prevention Devices". The 2012 annual inspection identifies the following areas of suggested improvement:

1. All backflow prevention devices shall be tested annually; and

2. The City's wastewater system has a service connection to the municipal water supply. This service connection is protected by an RP device. Two additional RP devices within the wastewater plant further protect the potable water supply for consumers at the plant. Title 17, Section § 7604 requires air gaps when connecting municipal water supply to sewerage works. However, the City has received conditional approval to use the RP devices, in lieu of an air gap, from CDPH. In a letter from CDPH dated February 18, 2004 the City was provided this approval to use the RP devices on the condition that they regularly (at least annually) inspect "the backflow potentials at the wastewater plant." A copy of this CDPH letter is provided in **Appendix B**.

2.2.3.4 Emergency Response Program

The US EPA Safe Drinking Water Act (SDWA), Title 4, Section 1433 identifies the regulations to be adhered to with relation to "Terrorist and other Intentional Acts". The regulation states that "each community water system with a population of greater than 3,300 persons shall conduct an assessment of the vulnerability of its system to a terrorist attack or other intentional acts intended to substantially disrupt the ability of the system to provide a safe and reliable supply of drinking water". In addition, each water system shall prepare an emergency response plan that incorporates the results of the vulnerability assessment.

Based on the 2012 CDPH Inspection Report, the City of Grass Valley has prepared an overall emergency response plan and is in compliance with the SDWA.

2.2.4 Water Quality Sampling Requirements

A number of EPA and California regulations address maximum concentrations of contaminants and sampling frequency procedures for numerous water quality parameters such as bacteriological, inorganic and organic constituents. In addition to water quality, mandatory consumer confidence reports are described within these regulations.

2.2.4.1 Bacteriological Quality Sampling

The bacteriological quality sampling requirements are identified in CCR Title 22, Chapter 15, Sections §64421 through 64423. Based on these regulations, a number of significant requirements should be highlighted:

- The WTP shall develop and submit to the CDPH a siting plan for the routine collection of samples for total coliform. In addition, every ten years and at any time the existing plan no longer ensures representative monitoring of the system, the WTP shall submit an updated sample siting plan to the CPDH.

- Based on the population served by the WTP, a minimum number of routine total coliform samples shall be collected and tested each month. Table 64423-A in the Title 22, Chapter 15 document identifies the number of samples to be collected that correspond to the population served. Grass Valley WTP serves a population of approximately 4,450. Based on this population, the WTP is to collect a minimum of five (5) samples per month.

According to the 2012 CDPH Inspection Report, the City has submitted a sample siting plan in 1997, 2004 and in 2011. In addition, the report indicates the City has been collecting eight (8) routine bacteriological samples each month (two samples per week). This exceeds the minimum number of samples to be collected each month.

2.2.4.2 Inorganic and Organic Sampling

The WTP must sample for inorganic and organic constituents, in addition to the bacteriological sampling program identified above. Tables 64431-A and 64444-A of CDPH's Title 22, Chapter 15 identify the maximum contaminant levels (MCL) for inorganic and organic chemicals, respectively. Based on the 2012 Consumer Confidence Report provided by the City, all reported inorganic and organic constituents sampled are below the MCL's identified by CPDH and EPA; therefore the City is in compliance.

In addition to meeting the MCL's, Section §64432 provides monitoring requirements to be executed by the WTP. The regulation states the following:

- Water sampling of inorganic chemicals identified in Table 64431-A, except for asbestos, nitrate/nitrite and perchlorate, shall be conducted annually, unless more frequent monitoring is required. Nitrate shall be monitored on a quarterly basis, while nitrite shall be monitored once every three (3) years so long as the analytical results are 50 percent of the MCL. Asbestos shall be monitored once every nine (9) years, while perchlorate shall be monitored on an annual basis.

- Sampling for lead and copper require additional monitoring procedures. Section §64673 indicates that any system with levels of lead and copper below the action level (AL) are required to follow the general requirements for tap sampling [Section §64675 (a)]. The system shall conduct standard tap sampling for two consecutive periods for a minimum of 40 sites, and if the system has levels below the AL, but above CDPH's 90th percentile levels for lead and copper of 0.005 mg/L and 0.65 mg/L, respectively, then sampling can be reduced to annually for a minimum of 20 sites. The number of sites is based on population served, as displayed in Table 64675-A.

- Water sampling of volatile organic chemicals (VOC) identified in Table 64444-A shall be monitored on an annual basis, as long as there are no detections. Synthetic organic chemicals (SOC) shall be monitored a minimum of twice per year, as long as there are no detections. If either VOC's or SOC's are detected, monitoring shall be conducted on a more frequent basis.

Based on the CDPH's 2012 Inspection Report, the City has received approval from CDPH to reduce lead and copper sampling from 40 to 20 samples as 90% of annual samples tested have been less than half of the action level (10 µg/L).

2.2.4.3 Consumer Confidence Reporting

Title 22, Chapter 15, Section §64480 of the CDPH regulations identifies the requirements of each PWS generating and providing to its customers a Consumer Confidence Report of the water system. The reports are to be generated annually, documenting the water source and water quality data found within the system. The report provides a list of common biological, inorganic and organic contaminants, identifying concentrations detected in the system, their MCLs, the public health goal, and common sources of the contaminants. The Grass Valley WTP has been producing annual Consumer Confidence Reports and is in compliance with CDPH regulations in this regard.

2.3 EMERGING CONTAMINANTS

The following section provides a summary of emerging contaminants established in the EPA's contaminant candidate list, and provides a description of two new state regulated contaminants.

2.3.1 EPA Contaminant Candidate List 3 (CCL 3)

The EPA has developed a list of contaminants that are to be researched to determine whether these contaminants should be regulated as part of the drinking water program. The list is known as the Contaminant Candidate List (CCL) and since its inception in 1998, three (3) lists have been published. In 1998, the first CCL (CCL1) was published and included 60 contaminants. In 2005, CCL2 included 51 contaminants, and in 2009 a third CCL (CCL3) was published and includes 116 contaminants.

CCL3 includes 104 chemicals or chemical groups and 12 microbiological contaminants. The list includes chemicals used in pesticides, disinfection byproducts, biological toxins and waterborne pathogens. These contaminants are currently unregulated by existing national primary drinking water regulations; however they may be regulated in the future. After the contaminants are listed, they are evaluated to determine if the contaminant has sufficient data to meet regulatory criteria established by the EPA's Safe Drinking Water Act (SDWA).

The EPA is continuing to review and update its contaminants that are regulated. A fourth list is currently being developed to include either new contaminants, or further information on the existing contaminants identified in CCL3.

2.3.2 Perchlorate

As indicated above, perchlorate is currently listed in the CCL3. Recently the EPA has decided to regulate perchlorate under the SDWA, based on the contaminant potentially having an adverse health effect and the finding that there is a substantial likelihood that perchlorate occurs with frequency at levels of health concern in public water systems. At this time, the EPA is not requiring public water systems to address perchlorate; however this will likely be a contaminant to be federally regulated in the future.

Perchlorate is however now regulated in California under the CDPH Drinking Water Program. In 2007, perchlorate was given a maximum concentration limit (MCL) of 6 µg/L. As per Title 22, Chapter 15, Section §64432 and Section 2.4.2 of this document, the frequency of monitoring of perchlorate is completed annually, unless Perchlorate is measured above the detection limit, whereby then quarterly monitoring shall be completed. Based on water quality data collected in January 2014, Perchlorate was not detected in water produced at the WTP.

2.3.3 Chromium-6 (Hexavalent Chromium)

On August 23, 2013, CDPH established a maximum concentration limit (MCL) for chromium-6 in drinking water of 10 µg/L (10 parts per billion). The regulation issued by CDPH specifically regulates the hexavalent form of chromium, whereas previously only total chromium was regulated. The current state MCL for total chromium is 50 µg/L, which is five times more than the new MCL of chromium-6. Enforcement of the chromium-6 MCL has been initiated effective July 1, 2014.

An amendment to Title 22, Chapter 15, Section §64432 (DPH-11-005, issued August 2013) indicates that "for routine monitoring required, total chromium monitoring may be used in lieu of hexavalent chromium monitoring if the chromium results are less than the total chromium detection limit used for reporting of 10 µg/L. As per Title 22, Chapter 15, Section §64432, the frequency of monitoring of chromium-6 and total chromium shall be completed annually.

Based on 2013 water quality data for the WTP, total chromium was found to be below the detection limit used for reporting of 10 µg/L. Therefore, Grass Valley currently complies with the amendment to Section §64432 of the CDPH regulations.

2.4 PROPOSED LEGISLATION

The following section describes proposed changes to both federal and state regulations. The EPA and the CDPH constantly monitor their respective regulations and regularly update them to provide additional contaminants to monitor, provide enhanced monitoring requirements, and more stringent regulations in order to ensure that all public water systems deliver the safest and cleanest drinking water possible.

2.4.1 EPA - Revisions to Total Coliform Rule (RTCR)

In 2013, the EPA produced revisions to the Total Coliform Rule (TCR), originally promulgated in 1989. The key provisions of the RTCR are the following:

- Provides more stringent criteria that systems must meet to qualify for and remain on reduced monitoring.
- Requires public water systems to investigate and correct any sanitary defects found when monitoring results show the system may be vulnerable to contamination.

- Systems must conduct a basic self-assessment or an assessment by a qualified party. A failure to assess the system is a treatment technique violation. The treatment techniques are based on total coliform and *E. Coli*. An MCL is to be based on *E. Coli*.

- An acute violation is based on *E. Coli* only.

- All water systems must take 3 repeat samples for every positive total coliform sample

- Public shall be notified within 24 hours if a system confirms fecal contamination (*E. Coli*).

- The public shall be notified within 30 days if the PWS does not investigate and fix the identified problems. The annual consumer confidence report shall include monitoring, reporting and record keeping violations.

2.4.2 CDPH – Title 22, Chapter 17 Revisions

In February 2012, CDPH issued proposed updates to Title 22, Chapter 17 of the California regulations related to drinking water (DPH-09-014). The following identify some of the proposed updates:

- The PWS shall monitor raw water, settled water and recycled filter backwash water for the following:
  - Turbidity at least once per day;
  - Total coliform at least once per month;
  - Turbidity of the settled water, if using conventional filtration, at least once per day;
  - Turbidity monitoring of individual conventional filters shall be recorded at least once every 15 minutes.

- The PWS's individual filters shall adhere to the following actions for a turbidity performance trigger exceedance:
  - If the individual filter effluent (IFE) turbidity is 2.0 NTU or greater for the first four hours of operation, the PWS shall take the filter out of service to inspect it.
  - If the IFE turbidity is equal to or greater than 1.0 NTU for the first four hours of operation, and following at least 90 percent of interruption events, the PWS shall take the filter out of service to inspect it.
  - If the IFE turbidity is equal to or greater than 0.5 NTU for four hours of operation, the PWS shall take the filter out of service to inspect it.

2.4.3 CDPH - Chapter 18 Backflow Prevention and Cross Connection Control – December 2005

Currently the backflow prevention and cross-connection control program is identified in CDPH's Title 17, Chapter 5, Section §7583 to §7605. The proposed legislation identified as of December 2005 will provide a new chapter to Title 22, identifying the requirements for backflow prevention and cross connection control. The following items provide updates to the existing cross connection control regulation identified in Sections §7583 to §7605:

1. A reduced pressure principle or double check valve backflow prevention device (installed after effective date of new regulation) shall have a minimum side clearance of 12 inches, except for the side of the assembly that has the test cocks that shall have a minimum side clearance of 24 inches.

2. The PWS shall ensure that backflow prevention devices are field tested and visually inspected at least annually. The PWS shall ensure that backflow prevention devices that fail a field test are repaired or replaced within 30 days.

3. Each PWS shall implement a cross-connection control program that includes operating rules of service to ensure that the PWS:

    a. Complies with the regulatory requirements;

    b. Discontinues a water user's service if the regulatory criteria is not met;

    c. Prevents cross connections; and

    d. Provides protection against backflow.

4. The PWS shall notify CDPH of any known backflow into the PWS within 24 hours of the incident, and shall maintain records of all current hazards and information pertaining to each backflow prevention device.

2.5 CITY OF GRASS VALLEY MUNICIPAL CODES AND STANDARDS

The City of Grass Valley's municipal code contains requirements that are related to its water system. More specifically, Chapters 13.04 (Water Service System) and 13.08 (Backflow Prevention Devices) of Title 13 (Public Services) offer various administrative and infrastructure requirements related to Grass Valley's water system.

Chapter 13.04, entitled "Water Service System", contains administrative requirements such as billing, violations and penalties, service conditions and fees, financial responsibilities, application requirements, water rates, and customer and owner responsibilities.

Chapter 13.08, entitled “Backflow Prevention Devices”, contains the administrative requirements related to the installation and use of backflow prevention devices, as well as outlining some technical requirements related to the devices. These technical guidelines are aligned with EPA and CDPH regulations.

The City also maintains design and construction standards for the water system. Section 7 of the City Design Standards addresses water system design criteria including references to applicable EPA and CDPH regulations. Section 4 of the City Construction Standards establishes requirements for construction of water system components.

3.0 LAND USE AND WATER DEMANDS

Land uses and water demands within the City's water service area are developed in this section. Existing water demands are used to identify existing system deficiencies and associated improvements to mitigate them. Improvements necessary to expand the treatment and distribution system to meet future growth within the City's service area are based on predicted water demands, which are also developed in this section.

3.1 PURPOSE AND SCOPE

This section provides a summary of land uses and water demands within the City's water service boundary. Water demands have been developed based on historical water use data for existing customers and projections of future water demands. Future demand includes currently vacant land anticipated to be developed within the current City service boundary using approved land uses as defined by the existing General Plan. The water demand projections will be used for planning purposes including water supply, treatment, distribution and storage discussed in subsequent sections of this master plan document.

3.2 LAND USE

Existing water demands have been developed using existing land uses established in the Grass Valley 2020 General Plan. Water demands within the City service area were most recently updated in November 2009. Projections of future water demands, including the magnitude and location, are necessary to plan future water system improvements. Land uses were evaluated within the City's water service area as shown on **Figure 3-1**. The City Limits extend beyond the City's water service area and overlap with the Nevada Irrigation District (NID) service area. NID provides water service to most of the parcels outside of the City's water service area boundary. The land uses described in this Water Master Plan are limited to the City's water service boundary, except as noted.

3.2.1 Existing Land Uses

Existing land uses within the City are established in the 2020 General Plan. The parcel data used for this master plan analysis was obtained from the City of Grass Valley. The existing land uses within the current City water service area boundary are shown on **Figure 3-1** and summarized in **Table 3-1**. The estimates of developed acreages listed in **Table 3-1** are based on parcel data provided by the City. Property indicated as vacant was considered undeveloped.

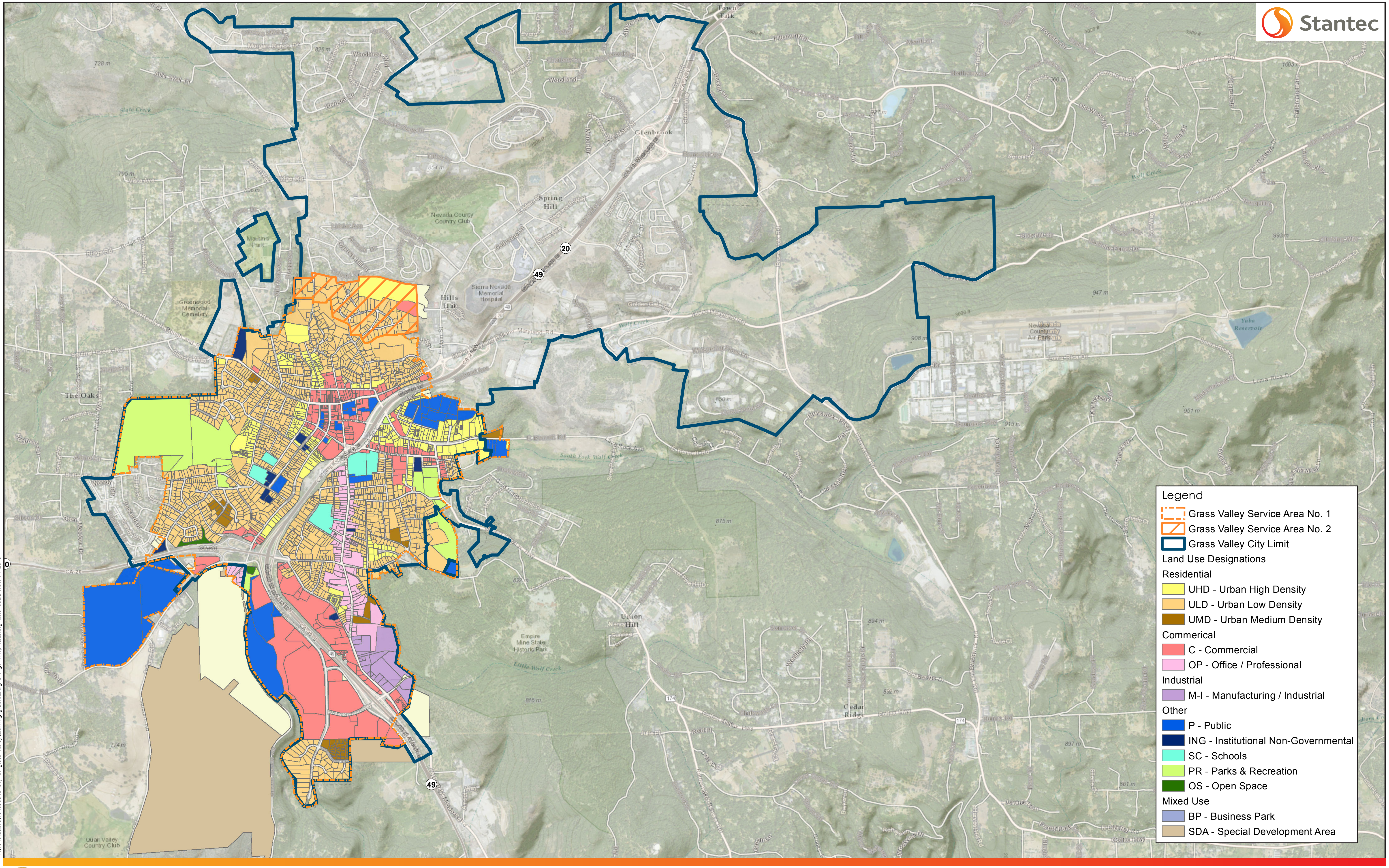


Figure 3-1
Existing Land Use and Water Service Area Boundary

Table 3-1 Existing Land Use (a)

Land Use	Est. Developed Acreage Within City Service Boundary	Est. Vacant Acreage Within City Service Boundary	Total Acres Within the City Service Boundary
Urban Low Density	349	50	399
Urban Medium Density	12.5	3.44	15.9
Urban High Density	85	18.8	104
Commercial	169	1.76	171
Institutional Non-Governmental	10.6	0	10.6
Manufacturing – Industrial	18.6	8.32	26.9
Office and Professional	44.6	8.25	52.8
Open Space	0.75	0	0.75
Parks & Recreation	96.4	0	96.4
Public	129	0	129
Schools	18.6	0	18.6
Special Development Area	79.9	0	79.9
Total	**1,014**	**91**	**1,105**

(a) Source: City of Grass Valley GIS data.

3.2.2 Future Land Use

Future growth within the City's service area boundary is estimated based on the land use designations in the 2020 General Plan. Almost 90 percent of the land within the City's water service area boundary is developed. Future increases in water demand will result as vacant and/or underutilized lands develop. A projection of potential development through build-out of property, within the existing City service area using the current land use designations was made to estimate the future maximum amount of water demand that could result on a parcel. Redevelopment of existing developed parcels with the City's water service area was not considered as part of the analysis presented here.

A summary of existing land use within the City's water service area is presented in **Table 3-1** above. This information was used as the basis for determining the maximum number of units that could be developed on undeveloped (vacant) lands within the water service area.

The density of future commercial, industrial and high density land uses was assumed to maintain current service density and the equivalent water demand on a per acre basis as discussed in Section 3.6. **Table 3-2** includes the estimated number of services at build-out for various land uses.

Table 3-2 Estimated Water Services – Current and Build-Out [a]

Water Service (by Land Use Type)	Current Services (g)	Build-Out Services (h)	Build-out Units (i)
Residential (b)	1,510	1,741	1,741
Multi-family Residential (c)	376	395	658
Commercial Institutional (d)	372	374	734
Manufacturing Industrial	13	20	31
Open Space/Public (e)	51	51	102
Office Professional (f)	131	137	264
Total	**2,453**	**2,718**	**3,530**

(a) Represents the potential number of services that could be added through build-out. Residential services in build-out projections based on maximum density in 2020 General Plan developed on remaining vacant parcels within the City Limits. All water service based on future development at current density.

(b) Includes Urban Low and Medium Density residential land uses.

(c) Multi-family build-out projections represent total number of High Density Residential services based on current density. Future services are based on the total number of High Density Residential parcels reported as vacant (i.e. each parcel is assumed to have only one service).

(d) Includes Commercial, Institutional Non-Governmental and School land uses.

(e) Includes Open Space, Parks & Recreation and Special Development Area land uses.

(f) Includes Office/Professional and Business Park land uses.

(g) The number of current services was estimated based on information provided by Global Water.

(h) The number of build-out services was based on vacant parcels with the City Limits, parcels located within the City's various Spheres of Influence, and the following assumptions: 1) for low and medium density residential units (see note b), this number was calculated based on the acreage of these land uses divided by the maximum number of units allowed per acre, 2) for all other land uses, one service is assumed here for each vacant parcel.

(i) Build-out equivalent dwelling units (EDUs). One EDU is equivalent to a single family residence with an average day demand of 300 gpd.

3.3 HISTORICAL WATER USE AND WATER DEMAND FACTORS

A summary of the historical water use evaluation is presented in this section. The results are used to develop water demand factors for various types of services (e.g. residential, commercial and industrial, etc.). Water demand factors represent the expected unit demands based on historical water use for the various types of development. The water demand factors coupled with land use data developed in this section will be used to project future water demands along with appropriate peaking factors. The information developed in this section will be used to assess water supply and treatment, distribution, and storage requirements.

3.3.1 Summary of Water Production and Peaking Factors

The City's water service area's primary source of treated water supply is from their water treatment plant (WTP). Raw water is purchased from NID, treated at the WTP and conveyed through the City's distribution and storage systems to customer's homes. The City also purchases treated water from NID. Purchased water is utilized as an emergency backup in the event the

City cannot provide enough treated water from the WTP due to maintenance activities or an emergency at the WTP. Purchased water is also provided from a connection near West Berryhill Drive, which is used to serve the Broadview Heights subdivision on a routine basis due to hydraulic limitations in the City's distribution system, which are discussed in Chapter 4 of this master plan.

Review of the City's historical production/purchased water data is useful to establish annual average water demands within the system, peaking factors, and determine the amount of water unaccounted for when compared to the volume of water sold to customers.

3.3.2 Annual Production

The annual volume of water produced at the WTP and purchased water volume is presented in **Table 3-3**. These figures represent total annual water production, including backwash water used to clean the filters, which amounts to approximately 5 million gallons (MG) annually, but depends on the frequency and duration of backwashes. A varying amount of backwash water is returned to the headworks for treatment, but for the purposes of this master plan a conservative assumption is made that all backwash is lost as unaccounted water. The 5 MG estimate assumes 60,000 gallons of water is used per backwash cycle, with 86 backwash cycles occurring in a typical year.

Table 3-3 Annual Water Produced and Purchased

Year	WTP Production, MG [(a)]	Additional Purchased Water, MG [(b)]	Annual Rainfall Total (in) [(c)]
2010	387.6	17	69.58
2011	384.4	34	44.24
2012	372.8	29	73.87

(a) Source: WTP production data from City of Grass Valley.

(b) Source: Purchased water data from Water Statistics Reports 2010-2012, City of Grass Valley.

(c) Source: National Climatic Data Center (NCDC), Climatic Data Online Annual Summary, Grass Valley #2 CA US Station, (COOP#043573). Precipitation reported per calendar year. Average rainfall for the Grass Valley #2 station is approximately 53.72 inches (CDEC, station ID – GSV).

The additional water identified in **Table 3-3** was purchased by the City from NID to serve the Broadview Heights area and to serve the balance of the City when treatment plant outages necessitated.

Monthly water production patterns from 2010 through 2012 are shown graphically in **Figure 3-2**. As expected, production rates increase during the warmer weather months then tail off from September through the winter. The monthly water production has been relatively stable over this time frame, with minor changes associated with the timing and amounts of seasonal rainfall.

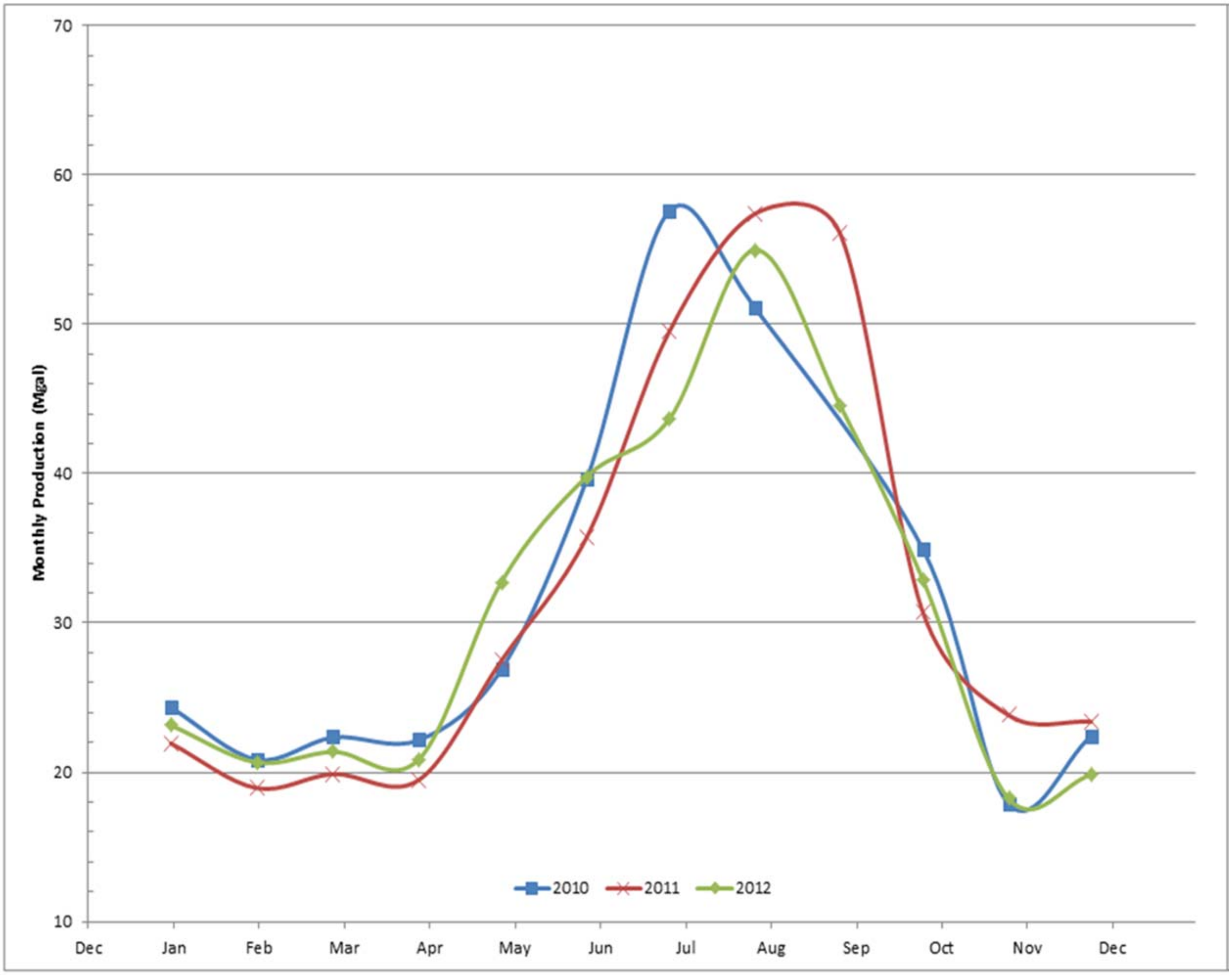


Figure 3-2 Monthly Water Production Data

3.3.3 Unaccounted Water

Unaccounted for water represents the amount of water that enters the distribution system, but is not recorded through meters. Unaccounted water is expressed as a percentage and calculated as:

$$\frac{\text{Total Volume Produced - Metered Water}}{\text{Total Volume Produced}}$$

Total volume produced, includes water produced at the WTP. Metered water includes the total volume of water metered at customer sites. All of the City's water customers have water meters.

Sources of unaccounted water include:

- Leaks
- Theft
- Fire protection
- Un-metered construction water used for flushing pipelines

Table 3-4 includes a summary of historical production and metered water data. The backwash water and other water used at the treatment plant is included as unaccounted water shown in the table.

Table 3-4 Unaccounted Water Calculation

Year	Total Volume Produced (MG) [(a)]	Annual Metered Water (MG) [(b)]	Unaccounted Water (%)
2010	383	334	13
2011	379	323	15
2012	368	324	12

(a) Total volume produced includes water produced at the WTP. From WTP production records, as reported on Department of Water Resources Public Water Statistics Report. Does not include water used in backwash at WTP (approximately 5 MG/year).

(b) Annual metered water includes water delivered to customers from Department of Water Resources Public Water Statistics Report.

The average unaccounted for water based on the 2010-2012 data ranged from 12 to 15 percent and is considered average for an older system such as Grass Valley's. Unaccounted for water must be included in future water demand projections used for sizing the WTP capacity. For the purpose of estimating the water supply's capacity needed to meet future water demands, an unaccounted water factor of 15 percent is used. This is a fairly typical percentage used in other planning documents for other Sierra Foothill water agencies/municipalities.

3.3.4 Peaking Factors

Peaking factors are necessary to size treatment, storage and distribution system improvements. Key peaking factors expressed as multiples of the average annual flow include the maximum day and peak hour water demands.

3.3.4.1 Maximum Day Water Demand

Maximum day demand (MDD) is important to determine the required treatment plant capacity and storage requirements. Production data is typically the only daily data available because individual service meters are typically only read on a monthly basis. In the case of the City, the maximum daily production would be expected to occur during mid to late summer, as is the case with most systems in California. Maximum daily and monthly data is summarized in **Table 3-5.**

Table 3-5 Maximum Daily and Monthly Production [(a)]

Maximum Daily Water Production, MGD [(b)]	Maximum Monthly Water Production, MGD [(b)]
2.31 (July 2010)	1.86 (July 2010)
2.53 (September 2011)	1.87 (September 2011)
2.08 (August 2012)	1.77 (August 2012)

(a) Production data from WTP Monthly Reports;
(b) Million gallons per day (MGD)

Maximum daily flow conditions were determined from plant production data. The ratio of maximum day to average annual flow ranged from 2.0 to 2.4, which are within the typical range. **Table 3-6** shows the calculation used to determine the average annual peaking factors from 2010 to 2012. A maximum day to average annual peaking factor of 2.5 (a typical planning value) is used to ensure future maximum day demands are conservatively estimated.

3.3.4.2 Peak Hour

Peak hour demands are necessary for sizing distribution and pumping facilities. Hourly production and distribution flow data is not recorded at the WTP, therefore a peak hour factor must be used to determine this value. Peak hour water demands typically range between 1.5 and 1.7 times the maximum daily flow. To be conservative, a peak hour factor of 1.7 is used to estimate a peak hour demand for the City.

3.3.4.3 Summary of Peaking Factors

The peaking factors developed in this section are used for predicting future water demands and are summarized in **Table 3-6**. The various peaking factors are important for sizing facilities.

Table 3-6 Water Use Peaking Factors

Year	Max. Day/Annual Average (a)	Peak Hour/Max. Day (b)
2010	2.313 / 1.059 = 2.2	-
2011	2.53 / 1.051 = 2.4	-
2012	2.08 / 1.017 = 2.0	-
Average	2.2	1.5 – 1.7
Value Used (c)	2.5	1.7

(a) Based on Maximum Daily production, and Annual Average Daily production, with units of MGD.

(b) Peak hour flows are not recorded and typical values from published data are used.

(c) Peaking factor used for projecting future flows in this report.

3.4 WATER DEMAND FACTORS

Improvement to the water supply system necessary to serve future growth depends on the magnitude and location of the water demands throughout the system. For master planning purposes, it is convenient to express demands for each type of development based on a unit demand factor such as gallon per day per acre (gpd/ac), gallon per capita per day, or gallon per day per service connection (gpd/sc). The water demand factors are then applied to land uses throughout the service area to project water demands. Water demand factors are developed in this section.

The City's Public Water System Statistics Annual Reports to the State use billing records to identify monthly metered flow for three major land use groups: Single Family Residential; Multi-family Residential; and Commercial/Institutional. Beginning in 2012, the City's metered water use data was collected and stored by a private company. Parcel information data was used to identify 2012 metered data with twelve different land use groups generally consistent with the City's 2020 General Plan. The 2012 water use data represented amongst these three groups is consistent with historic use presented in the Annual Reports. The breakdown of water service/land use types as presented in **Table 3-2** is somewhat different than in the Annual Reports, with more categories encompassing the Commercial/Institutional category. In addition, the Residential users were broken down slightly differently than in the Annual Reports. Due to similar usage patterns, Low Density and Medium Density Residential users were combined in the Residential Category, as reported in **Table 3-2**, while High Density Residential users represent the Multi-Family Residential category. Based on the available information, water demand factors were developed for the major land use groups identified in the General Plan, using the 2012 metered data.

Annual average water demands were developed for each type of consolidated land use summarized below, and the resulting demand factors are shown in **Table 3-7**.

- *Residential.* Represents single-family dwellings consistent with urban low and medium density land use designations identified in the 2020 General Plan.

- *Multi-family Residential.* Represents urban high density land use designation identified in the 2020 General Plan.
- *Commercial Institutional.* Represents commercial and non-governmental institutional land uses, including schools.
- *Manufacturing Industrial.* Represents industrial land uses allowed by the 2020 General Plan land use regulation.
- *Office Professional.* Represents office and professional land uses, including planned employment center land use designation identified in the 2020 General Plan.
- *Public.* Represents public and semi-public land use designations, as well as parks, open space, and recreational land use designations.

Table 3-7 Recommended Water Demand Factors [(a)]

Water Service Type	Demand Factor	Units
Residential (Urban Low and Medium Density)	300	gpd/sc
Multi-family Residential (High Density)	1900	gpd/ac
Office Professional	1500	gpd/ac
Commercial Institutional	1100	gpd/ac
Manufacturing Industrial	350	gpd/ac
Parks/Public	100	gpd/ac

(a) Derived from 2012 annual average water use data.

Residential water demand has historically been low in the City's water service area, with an average demand of 138 gpd/sc reported in the City's 2020 General Plan. Growth since that time has generally been outside of the City center and allowed for larger homes and lots, resulting in increased home and outdoor water use. The residential demand factor of 300 gpd/sc recommended here reflects the combination of water use data from the historic city center and more recent development, consistent with average annual metered usage from 2008-2012.

3.5 PROJECTED WATER DEMANDS

The land uses and development projections discussed in prior sections were combined with the water demand and peaking factors to project future water demands within the City. Projected water demands are summarized in **Table 3-8** based on the build-out projections discussed in Section 3.4.

Table 3-8 Water Demand Estimates

Demands	Current (gpd)	Build-Out (gpd)
Residential [a]	453,000	522,300
Multi-family Residential [a]	161,600	197,300
Office Professional [a]	51,100	79,200
Commercial Institutional [a]	218,400	220,300
Manufacturing Industrial [a]	6,500	9,400
Parks Public [a]	30,600	30,600
Average Day Demand (ADD) [b]	921,200	1,059,000
Production	**Current**	**Build-Out (gpd)**
Unaccounted Water [c] (UA)	138,250	158,750
Total Avg. Day w/UA [d]	1,059,450	1,217,850
Max. Day Demand [e]	2,441,250	2,806,500
Peak Hour [f], gpm	2,825	3,225

(a) Rounded to the nearest 100 gpd
(b) Based on demands calculated from land uses and water demand factors.
(c) Unaccounted water calculated at 15-percent of demands. Rounded to nearest 250 gpd
(d) Based on ADD + UA.
(e) MDD for build-out estimated based on (2.5 x ADD) + UA.
(f) Peak hour demand estimated based on (1.7 x MDD) + UA and rounded to nearest 25 gpm.

The current average daily production demand is approximately 1 MGD, including unaccounted water. At build-out, the average daily demand is projected to be approximately 1.2 MGD, including unaccounted water.

Current water services were estimated using data provided by Global Water. The parcels were sorted by land use type in GIS. Build-out services were estimated by taking the number of current water services plus the number of vacant lots with the assumption that each parcel will have only one connection. For example, currently there are 376 multi-family residential water services plus 19 vacant parcels; assuming each parcel has only one connection the estimated build-out services is equal to 395. The build-out units were calculated by taking the sum of the current demand for each land use (e.g. number of acres per occupied parcels multiplied by the corresponding demand factor in **Table 3-7**) plus the sum of the build-out demand (e.g. number of acres per vacant parcels multiplied by the corresponding demand factor in **Table 3-7**) divided by 300 gpd/EDU, for all land uses accept single residential. For single residential current and build-out demands are calculated by multiplying each service connection by the demand factor.

The City water service area is unlikely to expand significantly due to the NID service area surrounding it, therefore no attempt is made in this master plan to project a date certain by which the ultimate, build-out water demand will be exerted. One of the goals of this master plan is to identify specific development areas as requiring service extensions or enhancements in the near term (5 to 10 years). This is discussed in more detail in Chapters 4 and 5 where future system improvements are described, as well as in Chapter 6 where a capital improvement program is presented.

Unaccounted water, which is based on 15 percent of the daily demand, must be included for planning water supply and treatment plant capacity. This water is relatively constant and peaking factors do not apply; therefore unaccounted for water was added to the maximum day and peak hour demand values (not multiplied).

To conveniently express development as it relates to water demands within the City, the concept of an equivalent dwelling unit (EDU) is introduced. For the purposes of this Master Plan, an EDU represents the demand placed on the system by a single family residential unit, and is not necessarily representative of the number of service connections.

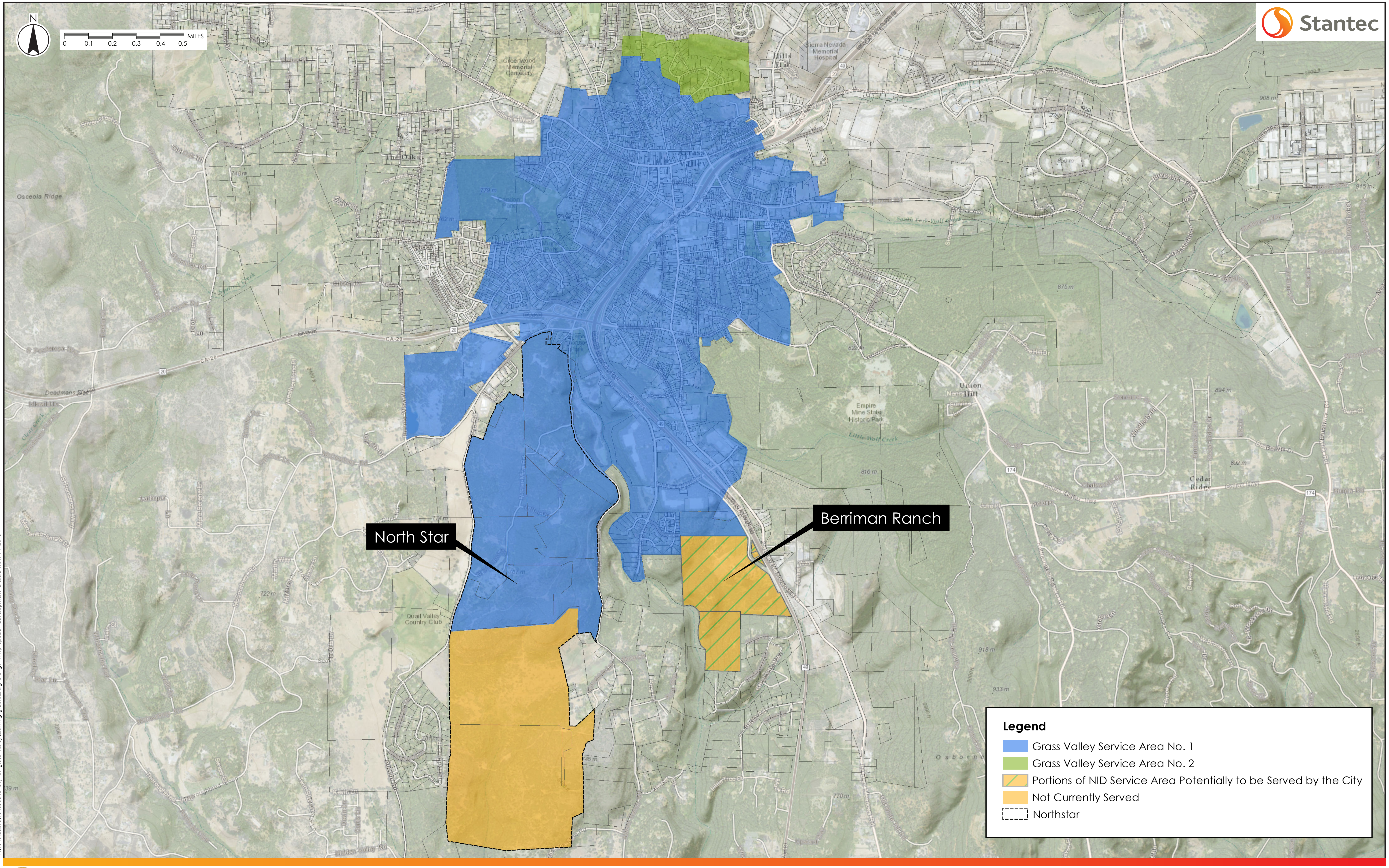
The number of EDUs is calculated by dividing the total water production by the single family residential usage rate, including unaccounted water. The estimated number of EDUs under current and build-out scenarios is summarized below, and calculated based on 300 gpd demand plus 15-percent unaccounted water (345 gpd/EDU). By this calculation there are currently 3,071 EDU's in the cities service area. An additional 459 EDU are estimated to be possible through build-out for a total of 3,530 EDU's at build-out.

- Current: 3,071 EDU
- Build-out: 3,530 EDU

The approximate estimated annual water demand based on the average daily demand, including unaccounted water, under current and future demand conditions within the City boundary are as follows:

- Current: 1,187 acre-ft (387 MG)
- Build-out: 1,364 acre-ft (445 MG)

The numbers above are strictly limited to the areas within the City's currently established potable water service area. There are two special development areas that lie adjacent to the City's service area boundary which may be served one day by the City. These include the property west of Wolf Creek and the City's wastewater treatment plant, commonly referred to as the Northstar property. The second is located south of McKnight Way and the existing shopping center west of Highway 49, referred to at different times by different names, but referred to here as Berriman Ranch (reference the Southern Sphere of Influence Planning and Annexation Project Draft EIR, PMC, October 2013). **Figure 3-3** identifies the location of these two special development areas.



City of Grass Valley
Water System Master Plan

Figure 3-3
Special Development Areas

Based on information contained in the Draft EIR for the Southern Sphere and from "Table 2-1: Land Use and Housing Allocations Per Annexation Agreements," of the 2020 General Plan, the estimates of land use type, number of units and acreages are presented in **Table 3-9** along with estimates of water demand anticipated from these areas.

Table 3-9 Water Demand Estimates Northstar and Berriman Ranch

Demands	North Star			Berriman Ranch		
	Area	Demand Factor (gpd/unit)	ADD (gpd)	Area	Generation Rate (gpd/unit)	ADD (gpd)
Residential	312 ac	-	-	48.6 ac	-	-
Housing Unit Allocation	(363 EDU)	300	108,900	(190 EDU) [(a)]	300	57,000
Commercial	20 ac	1100	22,000	27.7 ac	1100	30,470
Office Professional	123 ac	1500	184,500	0 ac	1500	0
Mfg. / Processing / Distribution	117 ac	350	40,950	0 ac	350	0
Public/Schools	13 ac	100	1300	0 ac	100	0
Open Space Opportunity	175 ac	0	0	45.9 ac	0	0
Total	**760 ac[(b)]**		**357,700**	**122.2 ac**		**87,470**

(a) Approximation based on 7 acres Urban Estate Density @ 1 EDU/acre, 16.4 acres Urban Low Density @ 2 EDU/acre, and 25.2 acres Urban Medium Density @ 6 EDU/acre.

(b) The City may only be required to serve the 440 acres of Northstar that are currently being served. Demand estimates for that portion are described below.

Applying factors for unaccounted for water and maximum day demand, the estimated average annual and maximum day demand for these two special development areas is:

- AAD, w/UA: 511,900 gpd
- MDD, w/UA: 1,179,550 gpd

This is a significant increase in the City's current demand and will have a corresponding increase in the peak hourly demand, estimated to be 4,905 gpm compared to 3,530 gpm reported for build-out of the existing service area in **Table 3-8**.

Note that the acreage for the Northstar development presented in **Table 3-9** (and the estimates of ADD and MDD above) includes the entire area proposed for development at the time of the update of the City's General Plan. The City may only be required to serve the 440 acres of Northstar currently identified in **Figure 3-3** as served by the City. In this case the ADD with UA for Northstar and Berriman Ranch combined would be 338,570 gpd, and the MDD with UA would be 780,400 gpd, with a corresponding total peak hourly demand of 4,430 gpm for the City. These alternative demand values for Northstar are based on a proportion of the total demand for Northstar presented in **Table 3-9**, with the remainder not served. This was done because a more detailed breakdown of the land uses within the Northstar development was not available, beyond Table 2-1 in the 2020 General Plan.

The estimated demands for Berriman Ranch in **Table 3-9** were developed using City GIS data including APN numbers and acreages found in the Southern Sphere of Influence Planning and Annexation Project Draft EIR. It is not certain that the City will ultimately serve either the portion of Northstar described above (and shown in **Figure 3-3**), all of the Northstar project, or the Berriman Ranch area. However, it is prudent for the City to plan for these potential water demands.

Possible options for serving these special development areas are considered further in Chapters 4 and 5 where improvements to the distribution and treatment facilities, respectively, are discussed.

4.0 WATER DISTRIBUTION AND STORAGE SYSTEM

The City's water transmission, distribution and storage systems are discussed in this Chapter. It includes a description of the existing distribution system, results of an analysis of the existing system using a computer model, its response to future growth scenarios, and recommended improvement alternatives. In addition, findings of limited condition assessments prepared with the assistance of the City are presented in this section.

4.1 PURPOSE AND SCOPE

The purpose of this Chapter is to provide an overview of the City's existing water distribution system, identifying existing capacity and potential future capacity enhancements required to correct existing deficiencies identified as part of the computer modeling analysis and those which may arise due to the anticipated growth described in the Grass Valley 2020 General Plan. Hydraulic modeling performed as part of the system capacity assessment is discussed, including methodologies and assumptions used. The results of the modeling and system assessment have been used to develop recommended system improvements which are summarized within this chapter.

A summary of the system condition is presented, based on information available to the City at the time this master plan was developed. Distribution system assets were catalogued and pertinent summaries of system information are presented herein. Certain asset properties, such as age, material of construction and how critical the asset is to safe, reliable operation of the potable water system are used in Chapter 6 to develop a Capital Improvement Program, including recommendations for a life cycle replacement program.

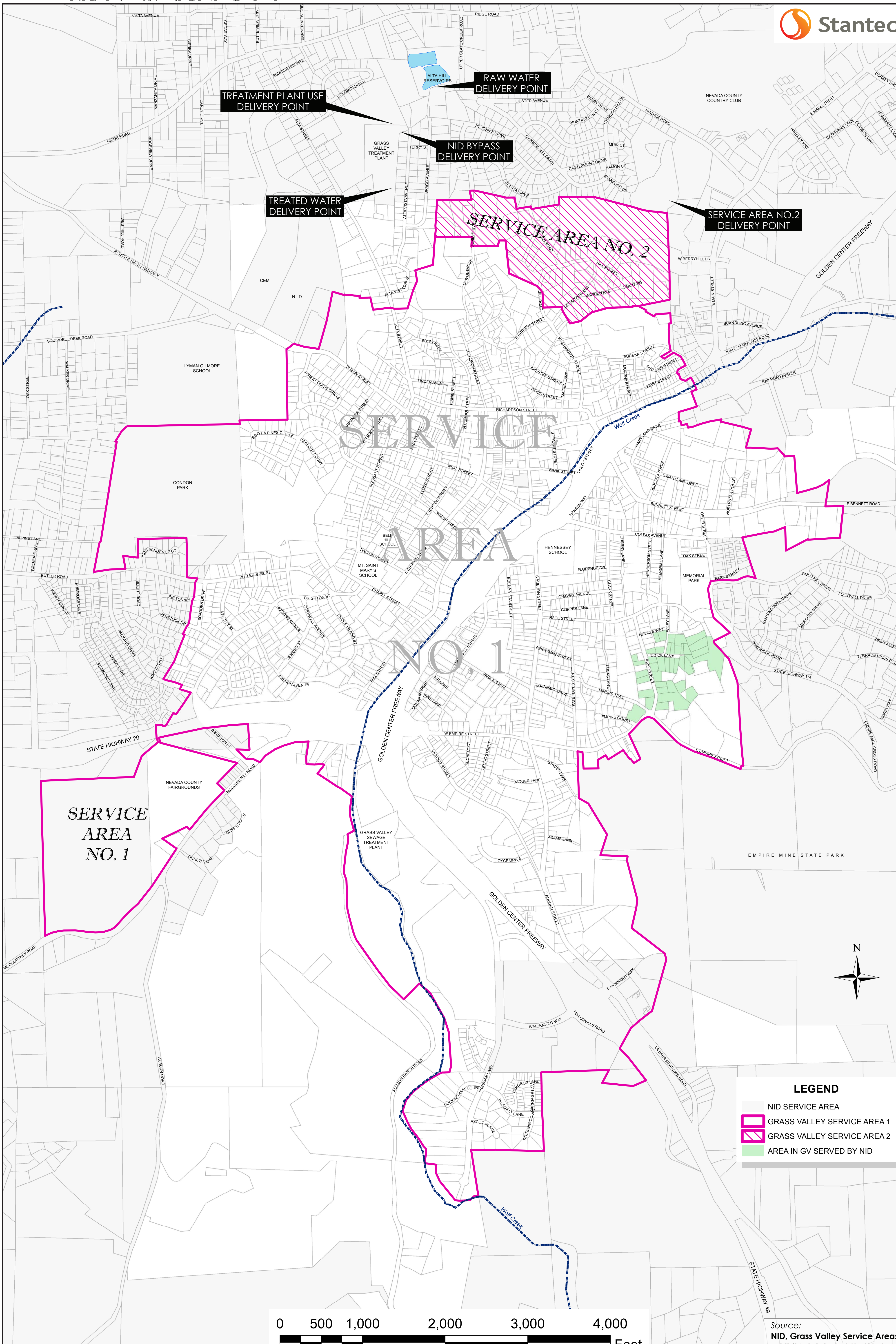
4.2 EXISTING DISTRIBUTION SYSTEM CONDITIONS

The City's existing water distribution system consists of approximately 31 miles of pipeline, one pump station (not currently in operation, located at the Empire Tank), 3 storage tanks, and other appurtenances. An assessment of the system was completed over the period of 2013 through early 2015, using information provided by the City and data collected in the course of master plan development.

4.2.1 Description of Existing Distribution System

The system is comprised of a series of pipelines and storage tanks that convey potable water from the City's Water Treatment Plant to approximately 2,450 active services. **Figure 4-1** identifies the existing system service area. More detailed descriptions of the existing facilities follow.

V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-1_gv_wmp_existing_water_service_area.ai mlm 4-2-2015



4.2.1.1 Service Area

The City has a population of approximately 13,000 individuals, with its potable water supplied by two sources: the Nevada Irrigation District (NID) and the City of Grass Valley Water Treatment Plant (WTP). The City's WTP receives raw water from NID for treatment. Currently there are no other sources of supply available to the City.

NID is a public water agency that services portions of Placer and Nevada counties, supplying both potable and raw water for irrigation, municipal and domestic uses. The District is comprised of a series of water supply reservoirs, conveyance structures and treatment plants that serve approximately 27,000 customers. While the City supplies potable water to approximately 2,450 customer accounts, NID supplies potable water to the remaining balance of users within the City limits.

The City's water distribution system serves the central "Old Town" core and the southern regions of the City. The City's water treatment plant sits within the NID service area and a series of large diameter distribution pipes convey potable water to the Grass Valley service area. **Figure 4-1** identifies the City's service area boundaries and **Figure 4-2** shows the City's existing distribution system.

During discussions with the City, it was identified that there are some streets within the City's service area where both NID and City pipelines supply the area. As can be seen in **Figure 4-1** NID and City service areas overlap in several places.

The City has one area in particular, which falls within their service boundary, which they are not currently able to serve. The Broadview Heights subdivision (identified in **Figure 4-1** as Service Area No. 2), although within the City's service area, is served potable water by NID via a master meter located on West Berryhill Drive.

The only other potable water connection that exists between the NID distribution system and the City's distribution system is the potable water connection at the City's WTP. This connection allows potable water from the NID system to supply the City's distribution system if required during an emergency. This connection is controlled through a series of manual valves, and is used primarily when WTP facilities are taken down for maintenance/cleaning, but is also available for emergency purposes, such as WTP process upset or equipment failure requiring plant shut down for repair. **Figure 4-3** shows the location of the WTP potable water connection and the piping which allows NID treated water to serve the City distribution system.

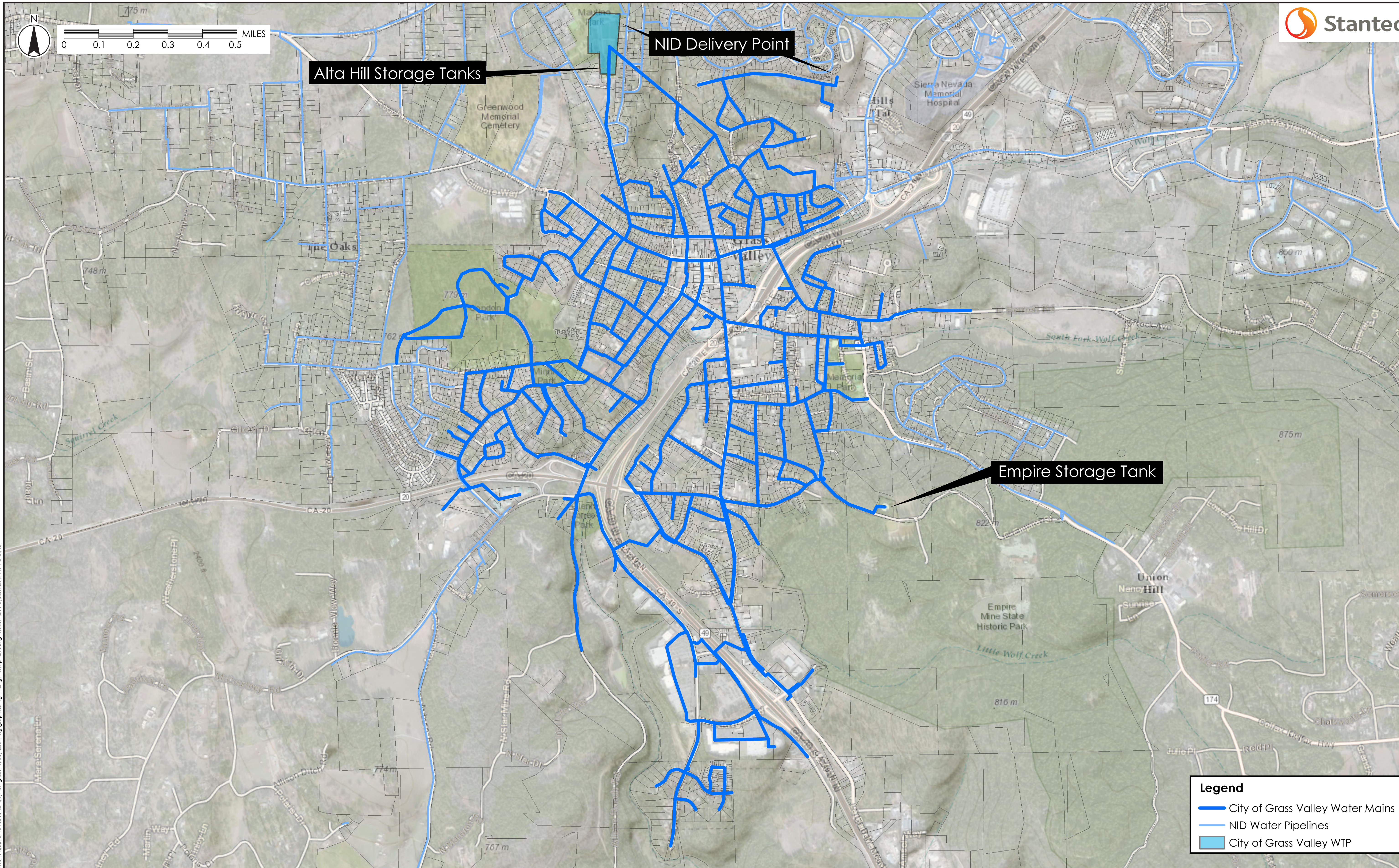
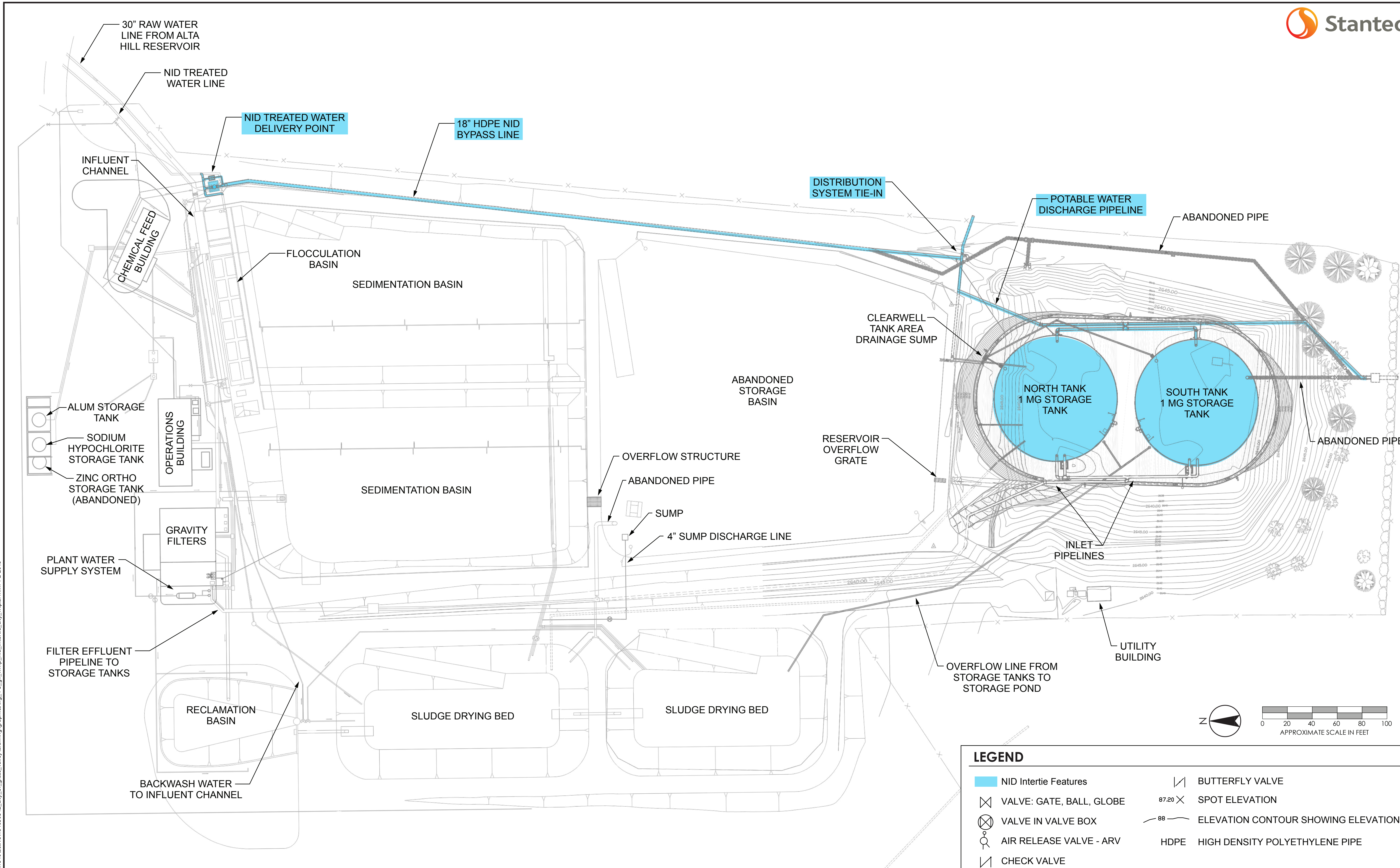


Figure 4-2
City of Grass Valley - Existing Water Distribution System



City of Grass Valley
Water System Master Plan

Figure 4-3
NID Potable Water Intertie at City WTP

In 2004, a report titled *Grass Valley-Nevada Irrigation District Water System Collaboration and Partnering Study* was completed. This report summarizes areas where the City and NID might consider modifications to the servicing schemes in place at that time. Some areas fall outside of the District boundaries, but which are also not in the City's service area. Others are served by the City, but might be more effectively served by NID, and vice versa. Still other areas exhibit lower pressure and are currently served by the City. The areas studied in the 2004 report include:

- The Hills Flat Area (generally the location of the intersection of East Main Street with Idaho Maryland Road).
- Areas along East Bennett Street.
- Forest Glade Circle.
- The area along Fiddick Lane and Empire Street (near the City's Empire Tank, discussed later in this section).
- The Northstar property located west of Wolf Creek and the City's wastewater treatment plant

Not all of these areas were considered specifically in the hydraulic modeling analysis conducted as part of this master plan development. However, many of them were considered in the context of how best the City may address future servicing with their distribution system or address areas of lower than optimal pressures.

4.2.1.2 Pipelines

A summary of the distribution system by pipeline diameter and material is presented in **Tables 4-1** and **4-2**, respectively. The system is made up of approximately 31 miles of pipeline, comprised of 2-inch to 22-inch diameter pipes. The pipelines are composed of various types of materials including asbestos cement, cast iron, ductile iron, PVC, HDPE and steel piping. It should be noted that the City has indicated that there are sections of steel piping that contain leaded joints; however, there is no indication of elevated levels of lead based on recent lead and copper testing results. A reason for this is a possible buildup of minerals and solids within the pipeline that prevent corrosion and subsequent leaching of lead into the water.

Table 4-1 Distribution System Summary by Pipeline Diameter [(a)]

Diameter (inch)	Length (miles)	Percentage
2	0.96	2
4	1.50	5
6	10.2	33
8	9.72	31

Diameter (inch)	Length (miles)	Percentage
10	4.58	15
12	1.97	6
14	2.05	7
22	0.25	1
Total	**31.3**	**100**

(a) Data from the City of Grass Valley GIS database.

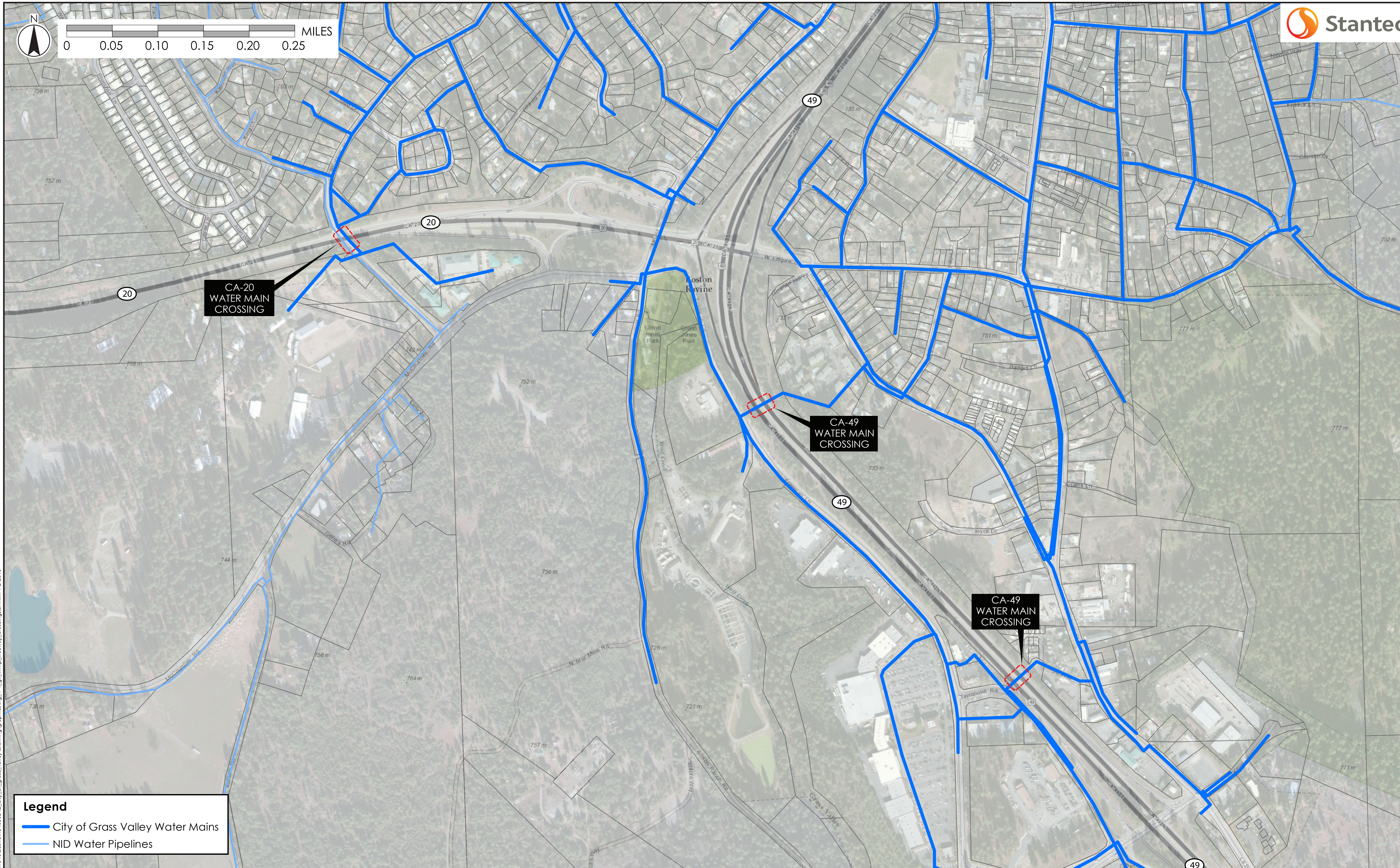
Table 4-2 Distribution System Summary by Pipeline Material (a)

Diameter (inch)	Length (miles)	Percentage
Asbestos Cement	2.14	10
Ductile Iron	11.4	21
Cast Iron	11.4	42
Steel	0.91	6
C900 PVC	4.89	20
HDPE	0.50	1
Total	**31.3**	**100**

(a) Data from the City of Grass Valley GIS database.

A number of pipelines dead end throughout the system, as seen in **Figure 4-2**, which can lead to poorer water quality in these lines, as water is not regularly flushed out and remains stagnant. Some of these dead end pipes also exhibit lower than desirable pressures. This is addressed further in Sections 4.5 and 4.6 of this document.

There are six (6) pipelines that cross under Highways 20 and 49. Half of these pipelines are located within roadways that cross under these highways; however the remainder of these lines, cross directly under these major roadways. These three (3) pipelines are critical, as a break in any of these lines would involve dealing with Caltrans to address repairs. These pipes also represent some risk to the City if a leaking pipe is found to have damaged the highway. Repair solutions are likely to be costly and require significant time to resolve. In addition, at least one of these lines (along the Brighton Street crossing of Highway 20) is not looped, therefore a break in that pipeline can deprive the downstream area of water. These pipe crossings are identified in **Figure 4-4**.



V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-4_gv_wmp_freeway_crossings.ai mlm 4-2-2015

In addition to larger diameter distribution mains, the distribution system is also made up of service laterals connecting to each property being serviced. Existing service laterals are of varying type and materials. All new service stubs installed are to be HDPE (if smaller than 3-inches) or fully restrained ductile iron pipe (City of Grass Valley Design Standards, Section 7, Water, Feb 2014).

With the exception of the Broadview Heights area, the entire distribution system is located within one pressure zone, meaning that the entire system is pressurized by the Alta Hill storage tanks located at the WTP. Pressures vary between 34 and 130 psi throughout the system, and no pump stations are currently used to boost pressures. A pressure reducing station is located at the Carriage House Development south of McKnight Way off of Freeman Lane. This station is used to regulate the high pressures seen in this area due to the low elevation of the development compared to other areas of the City.

4.2.1.3 Treated Water Storage

The Grass Valley water distribution system also includes three (3) treated water storage tanks. Two (2) tanks (the Alta Hill Tanks) are located at the Grass Valley WTP, while a third tank (Empire Tank) is located in the southeast corner of the Grass Valley service area on the east side of East Empire Street a short distance up gradient from that street's intersection with Pine Street. The tank locations are identified in **Figure 4-2**.

The Alta Hill tanks each have a capacity of 1 million gallons (MG). The tanks were installed in 2009 and increase the capacity and reliability of the treatment plant and the distribution system treated water storage. Each tank is constructed of steel and is 86 feet in diameter, and 24 feet in height. The tanks are filled with chlorinated water that is pumped by the booster/backwash makeup water pumps from the filter cells at the WTP. The tanks provide storage sufficient to meet the City's maximum daily demands, and also are used to provide the necessary chlorine contact residence time. The tanks are installed in parallel and connect to a common header that discharges into the water distribution system via a 12-inch and a 22-inch pipeline, which feed different areas within the City. The 22-inch steel pipe proceeds from the WTP southward down Alta Street, while the 12-inch HDPE line proceeds to the southeast and connects with the rest of the distribution system near Bernice Drive and the intersection of North Auburn Street and Washington Street, north of East Main Street.

An intertie with the NID distribution system is located at the WTP and provides the capability of filling the Alta Hill tanks from the NID system, as well as discharge directly into the Grass Valley distribution system. A pressure regulating valve located on the NID line is used to maintain a set pressure in the NID line. This intertie is controlled through a series of manual valves. The intertie and the Alta Hill Tanks are illustrated in **Figure 4-3**.

The City's third treated water storage tank, the Empire Tank, has a storage capacity of 2.5 MG. The welded steel tank was constructed in 1983. The tank is set at an elevation such that the bottom of the Alta Hill tanks is equal to the top of the Empire tank. With a lower elevation and only one line connected to the tank, stagnant conditions can exist in the tank. This leads to quality concerns due to insufficient turnover of water in the tank.

The City has attempted to maintain chlorine residual in the tank by manually adding chlorine tablets. As well, the water level in the tank is below the normal hydraulic grade line of the system and therefore the tank appears to only operate when pressures in the distribution system drop significantly. The tank is equipped with an altitude valve to control the water level in the tank. A pump station is located downstream of the tank and was intended to be used to fill the Empire tank; however due to the elevation of the tank compared to the Alta Hill tanks, there is no need for this pump station to be used to fill the tank. Currently the pump station is out of service.

Even with the Empire Tank out of service, the City is able to meet the State Water Resources Control Board Division of Drinking Water (DDW) storage requirements with the two Alta Hill tanks.

4.2.2 GIS Database

The City's available distribution system information was gathered, and to the extent feasible, input into a Geographic Information System (GIS) database. The majority of the distribution system's geospatial data was provided by Global Water and crosschecked with the City's CAD base map. This database serves multiple purposes in the development of this master plan. The City intends to build on this GIS database going forward, making it more accurate and more complete as time progresses.

The GIS data includes land uses provided by the City for their existing service area (primarily within the City Limits) as well as land uses contained in the Spheres of Influence (SOI) identified in the Grass Valley 2020 General Plan. The land use data forms the basis for estimates of water demand presented in Chapter 3 of this master plan. Estimated water demands and the existing distribution system data form the framework within which the electronic model of the system was developed.

4.2.3 Maintenance Programs

In addition to routine water quality sampling programs, the City has implemented a series of maintenance programs to improve the quality of water in the potable system and improve the operation of the system.

4.2.3.1 Cross Connection Control Plan

The City has implemented a cross connection control program to ensure that the system is protected from any cross contamination that may occur. The City has identified all backflow prevention devices in the system and ensures that these devices are tested on a regular basis by a certified cross-connection control inspector.

4.2.3.2 Flushing Program

The existing water distribution system has a number of dead ends, which cause water to become stagnant and compromise the water quality in these areas. As such, regular flushing of the pipelines is required. The City has implemented a formal flushing program to be administered by the water operations staff.

The program outlines four (4) situations in which flushing of the system will occur.

1. Flushing will occur due to water quality complaints from residents, such as signs of poor taste, odor and/or color. Pipelines that are subject to these complaints are flushed on an as needed basis, and could include weekly flushing.

2. Flushing will occur on a regular basis, when water quality or pressure data suggest. This can include monthly or quarterly flushing of pipelines. It should be noted that in addition to poor water quality, flushing is required to occur when pressures in the system drops below 20 psi.

3. Flushing is required when new discharge sites are installed in the system that were recently accepted by the City.

4. All pipelines are on a schedule intended to meet the City's goal of flushing all pipelines on a fixed schedule basis, if they do not fall into the categories above.

4.2.3.3 Valve Exercising Program

The water distribution system's isolation valves are exercised on a regular basis, based on the 2012/13 inspection report and discussions with operations staff; however there is no formal valve exercising program in place. It has been identified that the valves are exercised biennially.

It should be noted that all isolation valves within the distribution system have been located by GPS and are included in the City's water distribution system atlas maps; however the valves currently do not have an asset tag number associated with them.

4.2.3.4 Leaks/Breaks

Aging infrastructure, such as the older pipelines and valves that make up the Grass Valley distribution system, is prone to experience leaks and/or breaks. In addition to repairing breaks as soon as possible, the City records and reports these leaks and breaks to the DDW on an annual basis.

4.2.3.5 Hydrant Flow Testing

As part of the flushing program described earlier, the City has been recording flows and pressures seen in the fire hydrants used for testing. A spreadsheet has been developed by operations staff and includes all fire hydrants that are included in the City's water distribution system. Parameters that are recorded during flushing of these hydrants are the following:

- Fire hydrant identification number
- Date fire hydrant was flushed/tested
- Street address
- Pitot, static and residual pressures
- Recorded hydrant flow and projected hydrant flow

A copy of the 2011 fire hydrant flow information spreadsheet, provided by City staff, is included in **Appendix C**. This information was used to assist in calibrating the hydraulic model of the distribution system. More pressure testing has been completed since the calibration of the hydraulic model but has not been included here.

4.2.3.6 Water Quality

As described in Chapter 2, the City has been meeting EPA and DDW regulatory requirements with regards to monitoring and testing of water in the distribution system.

The City's primary source of disinfection is sodium hypochlorite and as such, monitoring of disinfection byproducts (DBPs) such as TTHMs and HAA5s in the distribution system, is required. The City has been sampling its finished water at designated locations in the distribution system for these DBPs on a quarterly basis. Based on the results identified in the 2012/13 inspection report included in **Appendix D**, the DBP levels within the City's system are far below the maximum concentration limits identified by the EPA and DDW.

Some of the pipelines in the water distribution system contain some form of lead, whether it is in the steel itself or within the joints. The City has implemented a lead and copper sampling program to meet regulatory requirements. According to the City's 2012/13 inspection report, the City has completed six rounds of lead and copper testing and is currently collecting 20 samples per round of testing. The City's testing results have consistently been below the action level for lead. Samples are collected at fixtures in locations throughout the water distribution system. The City's tap water collection procedure indicates that a minimum six (6) hour period during which there is no water use in the service tested must be achieved prior to sampling. A stagnant sample of water will allow any corrosion of leaded pipes to be represented in the sample.

4.2.4 Condition Assessments

A condition assessment of the Empire Tank was done on June 26th, 2014. Based on this assessment, the controls at the Empire Tank are in need of replacement. In addition, it was found that the tank coating inside and out is deficient and needs to be rehabilitated. The wires and conduit supplying the pump station with 400A, 480vac service are adequate for the existing pumps. Potential improvements at this pump station to correct deficiencies in this portion of the City's system include an option which would modify and utilize the pump station to address pressure and water quality concerns.

The distribution system condition assessment was limited to the tanks. The Alta Hill tanks are relatively new and in good condition. The one issue identified with the tanks has to do with flooding of the area in which they are located, which is lower than the surrounding WTP. Discussion of possible improvements to the tank area drainage are included in Chapter 5.

4.2.5 Asset Cataloging

Available information for the City's water treatment plant and treated water distribution system assets was collected from multiple sources including City maps, City CAD drawings, Global Water GIS database files, previous master plan details, and interviews with City personnel. Asset tags were verified and, where missing, were assigned by consulting with City personnel. This information was then used to build "asset registries" for the WTP and distribution system components. Once completed, the asset registries were organized by asset "class", along with all of the City's wastewater treatment and collection system assets, according to, but not limited to, the following classes: water pipeline, aerators, ATS, blowers, boiler, chemical pumps, clarifier drives and clarifiers, compressors, cranes and hoists, diffusers, digester, fans, filters, flame traps, flowmeters, generators, grit classifiers, headworks elements, instrumentation, MCC's, mixers, PLC, pressure tanks, roll-up doors, sensors of various types, sluice gates, UV disinfection, various valves , various pump types, VFDs, etc.

Where available from existing data sources, manufacturers and vendors, an approximate purchase or replacement cost was assigned to each equipment asset along with the year of approximate installation or in-service placement. Replacement cost of linear assets was estimated based on pipe composition, diameter, and industry cost/foot replacement estimates.

Individual "weighting" was assigned to each asset in the following categories:

- Asset Risk: probability of failure, 0 = lowest risk to 25 = highest risk
- Asset Impact: failure impact to population, environment or finances, 1 = no impact to 5 = major interruption and impact
- Asset Probability: probability of failure over time based on EPA longevity estimates or industry standards, 1 = low to 5 = high

- Asset Condition: where available, condition of an asset was estimated, 1 = excellent (80-100% remaining life) to 5 = poor condition (0 to 20% remaining life).

- Reliability: reliability over time, typically based on completed work orders and/or repairs was not included in the available data.

The completed asset registry with available data in the categories and classes noted in previous paragraphs was uploaded to a Nexgen Asset Management System for in-depth and predictive analysis (see Nexgen Asset Management Software Analysis). This information will form the basis for developing a refurbishment and replacement program for the City, which is discussed in greater detail in Chapter 6 of this Master Plan.

4.2.5.1 Nexgen Asset Management Software Analysis

The Nexgen Asset Management System provides comprehensive analysis of all types of asset data based on and including factors noted in previous paragraphs. All available data compiled in the asset registry, along with estimated or actual installation dates and data-specific asset information was uploaded to a Nexgen Asset Management System database for comprehensive analysis. The analysis available includes the following factors:

- Average life span analysis; expected useful life

- Priority analysis; which assets should be addressed first, refurbish and replace (R&R)

- Refurbish and/or replacement predictions (timing)

- Estimated budget predictions (cost)

Based on a comprehensive analysis of data from available sources, using Nexgen Asset Management software, the cost and timing of refurbishment and/or replacement (R&R) of assets estimated over 5, 10 and 15-year increments has been undertaken. These results are incorporated into the recommended capital improvement program (CIP) presented in Chapter 6 of this document. The asset data presented in this master plan should be used for estimating purposes only due to the ever-changing environments in which these assets are installed, and the possibility of a change in, or the replacement of equipment since this report was filed. The asset cost data available was considerable; however, data short-comings should be accounted for when considering updates to budgets for capital improvements or refurbishments. For all ongoing analysis and maintenance projections of the City's water system it is recommended that a continuously updated asset catalogue be used.

4.3 WATER SYSTEM HYDRAULIC MODEL

4.3.1 Purpose

The purpose of this section is to describe the development and calibration of the hydraulic model used to analyze the City's potable water system. The electronic hydraulic model developed for the City's water system was calibrated with field data provided by City staff such as customer demand and fire hydrant pressure testing data. The model was used to assess the response of the water system to existing demands and to assess the water system performance relative to different demand parameters. In addition the model was used to look at the water system response to potential future growth scenarios and to predict what improvements may be needed to meet future demand.

4.3.2 Modeling Software

The water system modeling for the City of Grass Valley was completed using Bentley WaterCAD v8.i. The Bentley software sits atop an AutoCAD 2011 platform. This software was selected for its ability to meet the following objectives:

- To determine the existing hydraulic capacity of the City's potable water distribution system and its components.
- To identify system limitations such as areas of stagnant flow and infrastructure incapable of accommodating future growth.

Some of the advantages of WaterCAD are:

- CAD integration
- Easy assessment of fire flows
- Robust hydraulic simulation engines

4.3.3 Model Construction

The water system model was developed using GIS data provided by the City's contract utility billing provider, Global Water, as well as maps and water system construction plans supplied by the City. A comprehensive map of the water system, including water demand data, was collected in a GIS database. The map files were then transferred to the WaterCAD platform to perform the modeling analysis.

4.3.4 Model Calibration

The first step in model calibration included synchronizing the demands in the model with the demand data from the City. The model demands were synchronized not only in terms of demand rate and volume but also in terms of demand distribution. This was done using the GIS files of the system that included demand data. Results of fire hydrant testing performed by the City was input into the model and compared to geographically distributed demand estimates. Hydrant testing from 2011 (**Appendix C**) was used to calibrate the model. Earlier testing, from 2002-2005, was not used in the calibration because the testing was performed before construction of the Alta Hill tanks. The model was calibrated until general agreement was reached between system pressures in the model and the hydrant test results. Boundary conditions (demand, water level in the tanks, etc.) during the original hydrant testing are unknown and contribute to a small deviation between model results and field measurements. Static pressures (average day demand) were compared and good agreement was found between the model and field measurements.

4.4 WATER DISTRIBUTION SYSTEM PERFORMANCE

A description of the existing and future water system scenarios evaluated using the computer model is presented in this section. The existing system was modeled to determine any areas of deficiency with regards to pressures, velocities and fire flow requirements. A set of future demand scenarios was also analyzed, based on anticipated growth within the water service area, and potential development within currently undeveloped sections of the water service area. The results from the future demand scenarios were used in determining potential improvements necessary to accommodate the anticipated future growth.

4.4.1 Modeled Scenarios

Several different scenarios were modeled for existing and build-out conditions to assess the ability of the existing system to meet the existing and proposed demands. The modeled scenario for the existing system includes three sub-scenarios:

- an average day demand scenario,
- a max day demand scenario, and
- a peak hour demand scenario.

In addition to modeling the scenarios mentioned above the system's ability to meet fire flow requirements was also tested. The methodology used to calculate the demands in the existing system sub-scenarios is presented in Section 4.3.4 and utilized demand estimates presented in Chapter 3. Future demand scenarios addressed three different stages of development.

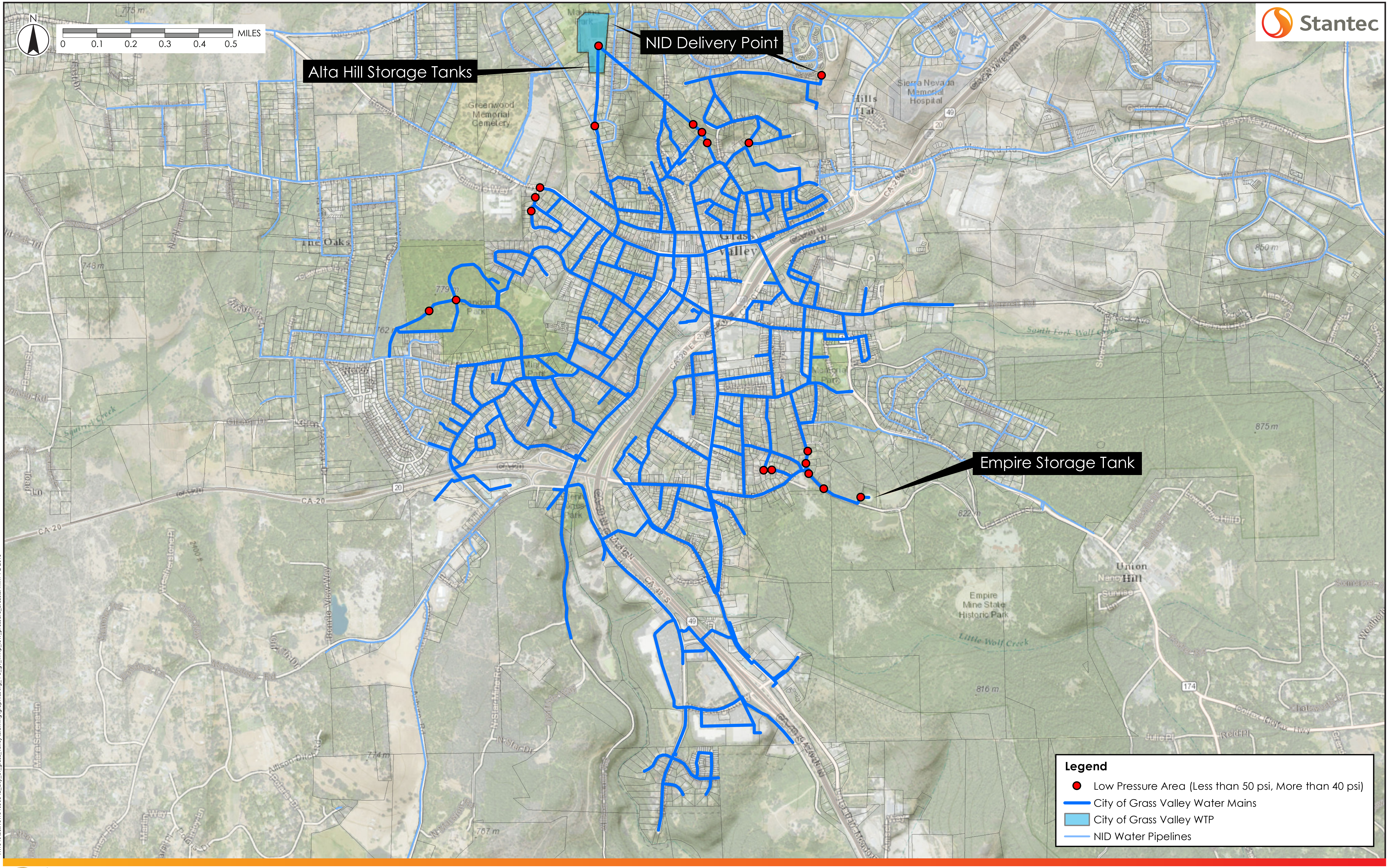
1. The first stage of development includes in-fill development of the current service area, the addition of service to the Broadview area by the City (currently served by NID), and service for a small area of the Berriman Ranch area.

2. The second stage of future development includes expanded service to the remainder of Berriman Ranch, and service for 50% of the Northstar special development area.

3. The third stage of development is the expansion of service to the remainder of the Northstar special development area. To be conservative in determining possible future improvements, the entire 760-acre area of the Northstar special development area was used in generating future demands in the third stage of the future growth scenario.

4.4.2 Model Results – Existing Development

The existing system model results revealed certain areas of low pressure (less than 50psi but greater than 40psi) (**Figure 4-5**). These areas included the Empire Court area down gradient of the Empire Tank, Condon Park, the Forest Glade area north of Condon Park, and the intersection of Broadview Ave and Bawden Ave. These low pressures are more a result of higher elevations than deficiencies in the system grid layout. All of these locations meet minimum pressure and fireflow requirements and there are no projects are planned to address the low pressures at this time. Areas with even lower pressures (less than 40psi) existed along the Empire tank and Alta Hill transmission lines, but there are no homes receiving service off of these lines. During peak hour demands, the low pressure in the Forest Glade area increased to include locations in the system between Forest Glade and Condon Park. The remainder of the system met the pressure and velocity requirements of the City.



City of Grass Valley
Water System Master Plan

Figure 4-5
Location of Low Pressure Areas

Distribution system fire flow requirements were tested using an analysis of system pressures and velocities in the model during max day demand (MDD). The analysis set a minimum required flow of 1,000 gallons per minute (gpm) for the junctions at fire hydrants, with a required minimum pressure of 20 psi in the system during the fire flow withdrawal. This analysis did not include the Empire tank and Alta Hill transmission lines because there are no hydrants receiving service on these lines. The fire hydrants in the model that flowed at less than 1,000 gpm during the MDD are located on:

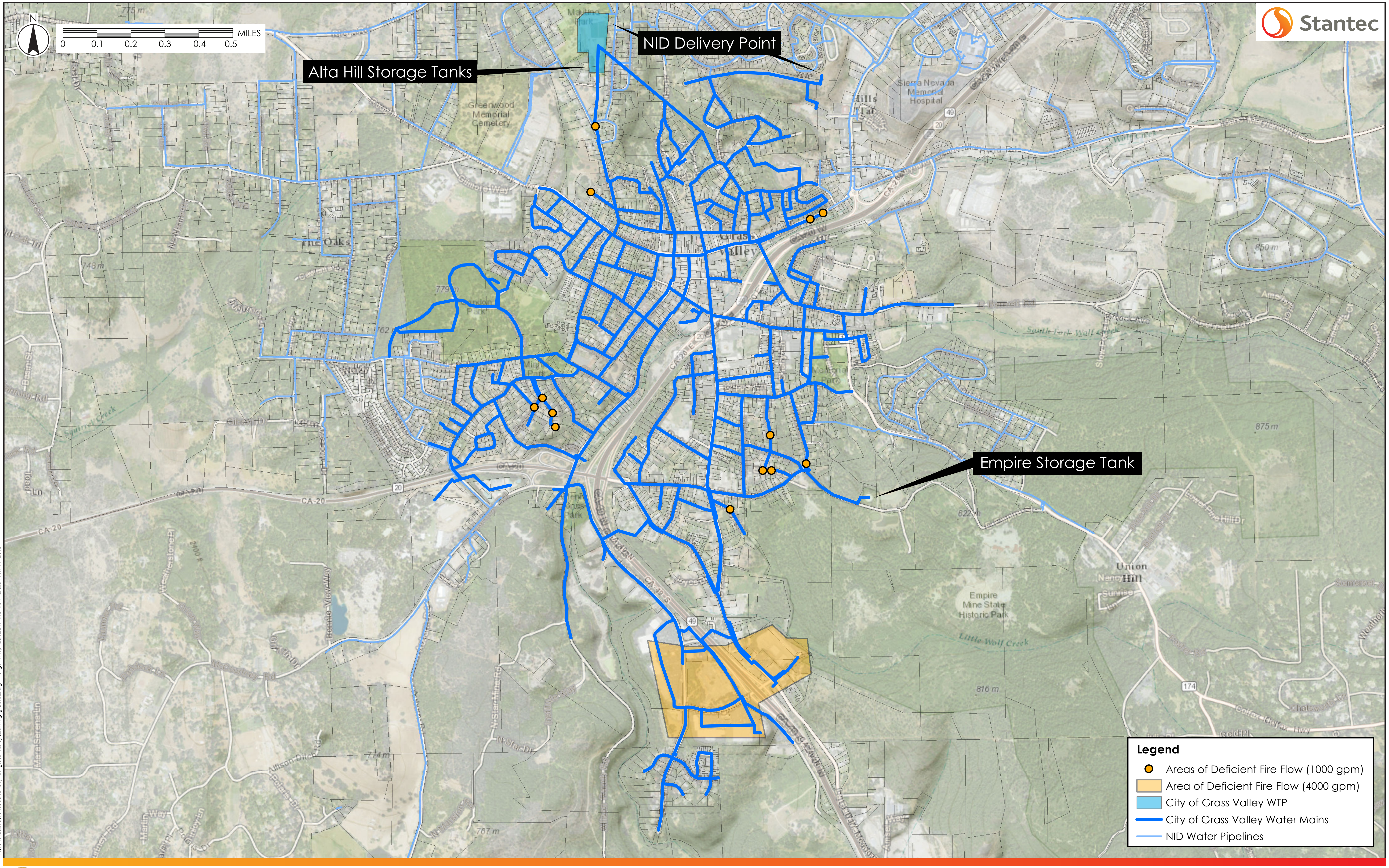
1. the Cornwall Avenue cul-de-sac,
2. the dead end line at East Main Street near Eureka Street,
3. the dead end line at the west end of Linden Avenue off Alta Street, and
4. the dead end line at Stacey Lane off of South Auburn Street south of Empire Street.

All of these hydrants are identified in **Figure 4-6**. Several improvements presented in Section 4.5.6 have been identified to remedy the deficient fire flow in these areas.

Although the minimum fire flow was 1,000 gpm for the majority of the city service area a few select areas were analyzed with a higher fire flow requirement. The highest fire flow requirement for the City service area, as defined by the City of Grass Valley Fire Department, is a discharge of 4,000 gpm for 4 hours. This is the fire flow demand required on McKnight Way at the shopping center and eastward near the Diamond Pacific construction supply store as shown in **Figure 4-6**. The existing layout of the system cannot deliver that flow and maintain a residual pressure of 20 psi. Improvements will be needed to accommodate the required fire flow. These improvements are covered in more detail in Sections 4.5 and 4.6.

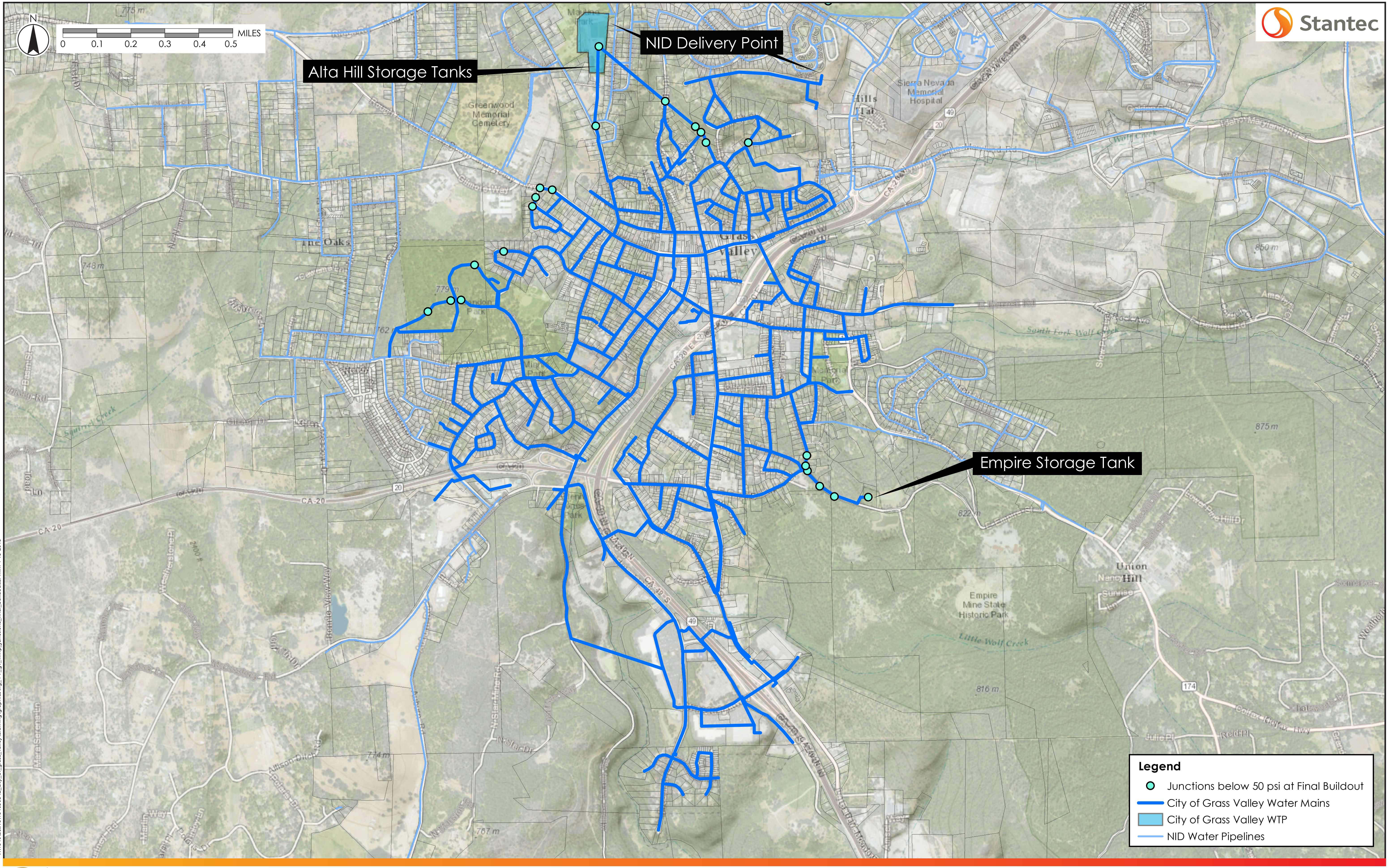
4.4.3 Model results – Future Conditions

In all three stages of future development, pressure and velocity requirements were met except in those areas of low pressure mentioned previously in Section 4.4.2. The model predicted that the existing layout of the system can accommodate the future growth as defined in this report. **Figure 4-7** identifies junctions with pressures less than 50 psi in the final stage of buildout during MDD. Future fire flow requirements for the future development areas are unknown at this time, and were not considered in the analysis. Prior to development in these areas, it is recommended that the system's ability to meet future fire flow requirements be reassessed. All future condition scenarios were modeled with the recommended improvements as described in Sections 4.5 and 4.6.



City of Grass Valley
Water System Master Plan

Figure 4-6
Areas of Deficient Fire Flow



V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-7_gv_wmp_junctions_final_buildout.ai mlm 4-15-2015

Figure 4-7
Junctions Less than 50 psi at Final Buildout

4.5 DISTRIBUTION SYSTEM IMPROVEMENTS

4.5.1 Purpose

This section presents improvements to the current distribution system to address deficiencies identified in the water system performance analysis, and the system evaluation described in the previous sections. The system deficiencies addressed by improvements described in this section include:

1. Limited function of the Empire tank,
2. low pressure in zones identified during MDD flow, and
3. areas with insufficient fire flow during MDD.

The criteria for evaluation of the alternatives are presented, and in situations where multiple alternatives are described the recommended alternative is identified.

The deficiencies outlined above are proposed to be addressed with improvements to the system that would allow for better pressure control in the system, better management of water age and chlorine residual, fire flow needs, and most effectively meet potential future growth needs.

4.5.2 Improvement Evaluation Criteria

The following criteria were used to judge the efficacy of the various alternatives for the system:

- Upfront construction costs plus operational and maintenance costs
- Ability to maintain or improve fire flows in the system
- Ability to turn over the water and maintain chlorine residuals in the Empire Tank
- Ability to utilize the storage available in the Tanks.
- Operational complexity in introducing the alternative into the existing maintenance schedule

In addressing the low pressure condition in the Empire Court subdivision, the main criteria used to evaluate the alternatives were the ability to meet minimum pressure requirements, and the cost of the proposed measures. The same criteria were used in reviewing supply of potable water to the Broadview area.

4.5.3 Empire Tank Improvements

Four alternatives for the operation of the Empire tank were modeled in order to more fully utilize the storage within the tank. The tank was constructed at an elevation below the hydraulic grade of the Alta Hills treatment plant and will only drain during fire flow conditions, and then, only in the vicinity of the tank. This causes long residence times in the tank, and the water tends to lose its chlorine residual. The Empire tank alternatives only altered the pipe layout immediately adjacent to the tank, the general system pipe layout remained unchanged in all four alternatives. The four alternatives that were discussed previously with City staff and subsequently modeled are as follows:

4.5.3.1 Reverse the Existing Booster Pump Station

Operation of the Empire tank can be improved by reversing the direction of flow at the existing booster pump station on the transmission line to the tank, pumping water from the tank into the system. The existing booster pump stations original intention was to pump water into the tank and has never been used. In this alternative, the pump direction is reversed such that the station pumps into the system. A pump curve was developed for this scenario due to the lack of information on the existing pumps. A 10 to15 horsepower (hp) pump would be required for this improvement. Improvements to the existing controls and tying the pumps into the system SCADA (namely the Alta Hill Tanks) are also advised.

In modeling this scenario, during MDD and ADD, the pump flow remained approximately the same. However, the pump flow supplied approximately 100% of the demand during ADD and approximately 50% of the demand during MDD. The system met all velocity and pressure parameters set by the City except for those areas previously identified as deficient in the existing system (see Section 4.4.2). Junctions with less than 50psi during MDD in this alternative are identical to those of the existing system as identified in **Figure 4-5**. Although pressure deficiencies are not remedied by simply reversing the pumps, the use of the pumps would provide multiple benefits including: improving the tanks ability to drain and refill, more completely utilizing the tank storage, as well as mitigating water quality, chlorine residual, and corrosion issues. In this scenario undersized water lines immediately downstream of the pump were upsized from 6 inches to 12 inches to increase flow from the pump. Additionally, a flow control valve is required to prevent high velocities (greater than 7 feet per second) when the Empire tank refills. Fire flow response remains unchanged from the existing system in this alternative.

To address the lingering low pressure areas in the vicinity of Empire Court, the City would need to install a booster pump. This would be included as part of any project to reverse the Empire Tank pumps. The evaluation of system requirements, including the approximate sizing of an Empire Court booster pump is discussed in Section 4.5.4.

Based on the criteria outlined above for the Empire tank alternatives, this alternative has been identified as the preferred alternative for the Empire tank. There is an upfront cost of modifying the pump station and there are operational and maintenance costs associated with this alternative. Included in the maintenance costs is the cost of maintaining the tank structure itself. In addition certain control improvements would need to be made to allow automated operation of the pump. Because this alternative is the preferred scenario for the empire tank it was used when modeling the future growth scenarios (see section 4.5.4).

4.5.3.2 Abandon the Empire Tank

Abandoning the Empire Tank is a viable alternative for the City. The model response to this alternative is basically the same as the existing system since there is currently no flow out of the Empire tank, except under certain fire flow conditions. Pressures and velocities are all within set parameters. Conditions at the junctions below 50 psi at MDD are very similar to the existing condition junctions and are shown in **Figure 4-8**. Fire flow response also remained unchanged from the existing system, but fire storage requirements will have to be reviewed to ensure the abandonment of the tank would not create a fire storage shortage, either for the current system or with planned improvements. This alternative would not add additional operational considerations or additional costs to the system except costs related to abandoning the tank. This alternative would eliminate the cost of maintaining/rehabilitating the tank.

4.5.3.3 Create Second Pressure Zone

Another alternative for improving the operation of the Empire Tank is to create a separate pressure zone that is fed solely from the Empire tank. This zone would encompass approximately the southern one-third of the City service area. The remainder of the system would continue to be fed from the Alta Hills tanks. The new zone would operate at the hydraulic grade of the Empire tank.

Due to the lower elevation of the Empire tank, pressures in the new zone would decrease from current conditions by 10 psi or more. It is shown in **Figure 4-9** that in this scenario, during MDD the number of areas with less than 50 psi slightly increase in the Empire tank zone as compared to the existing MDD conditions shown in **Figure 4-5**. In addition to separating the two pressure zones with valves, a control valve would have to be installed at the zone boundary to allow the tank to refill. Fire flow response (greater than 1,000 gpm) was not met in the Empire tank zone. The Alta Hill zone operated under fire flow as it does in the existing system. As with the other alternatives, some type of flow control valve is recommended to prevent high velocities (greater than 7 feet per second) when the Empire tank refills.

This alternative is not recommended for several reasons. It would introduce complexities into the operation of the system including ensuring certain valves are always closed, installation of a flow control valve, and control strategies needed to ensure its correct operation. In addition, pressures and fire flow would decrease in the Empire tank zone.

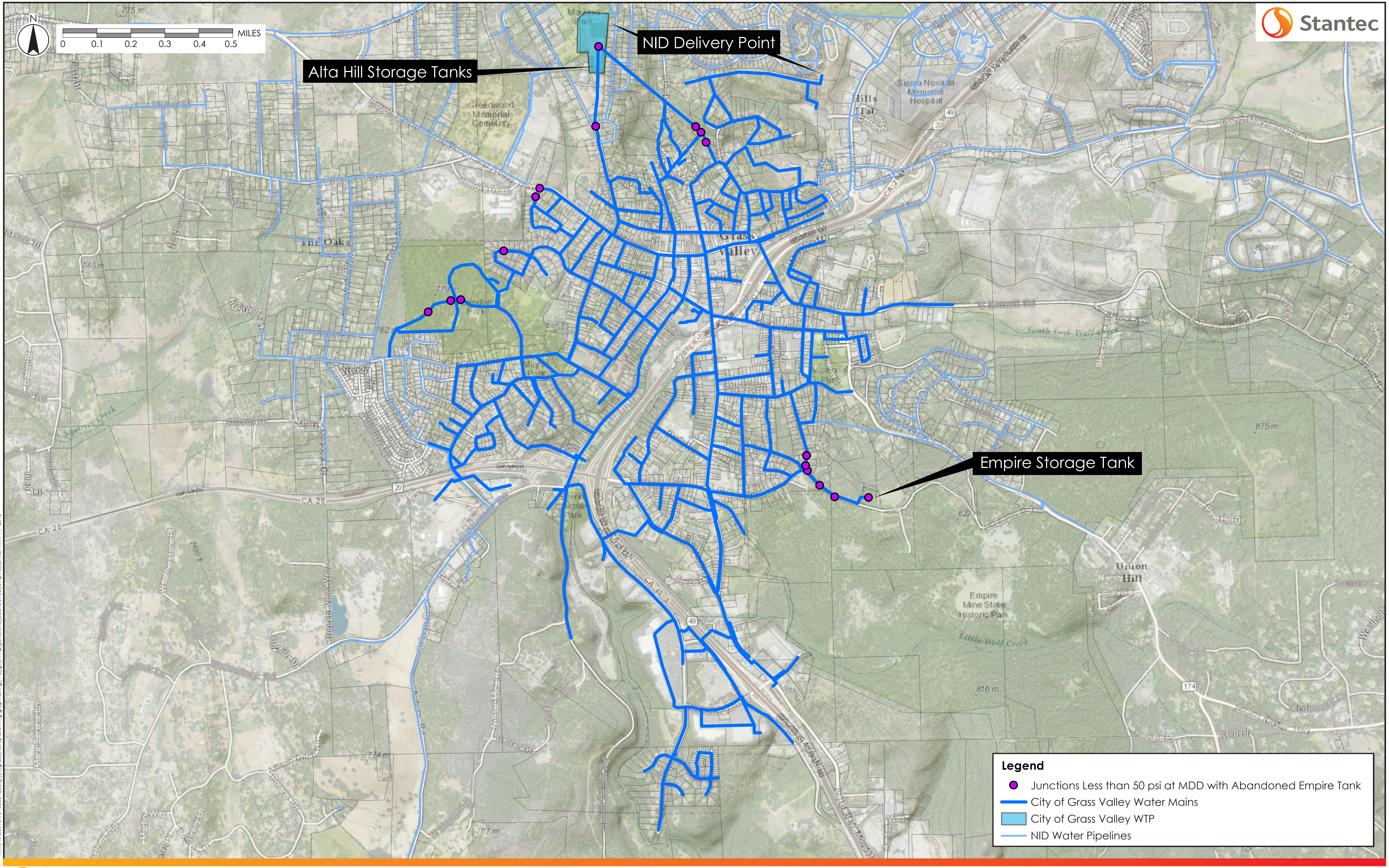


Figure 4-8
Junctions Less than 50 psi with Abandoned Empire Tank

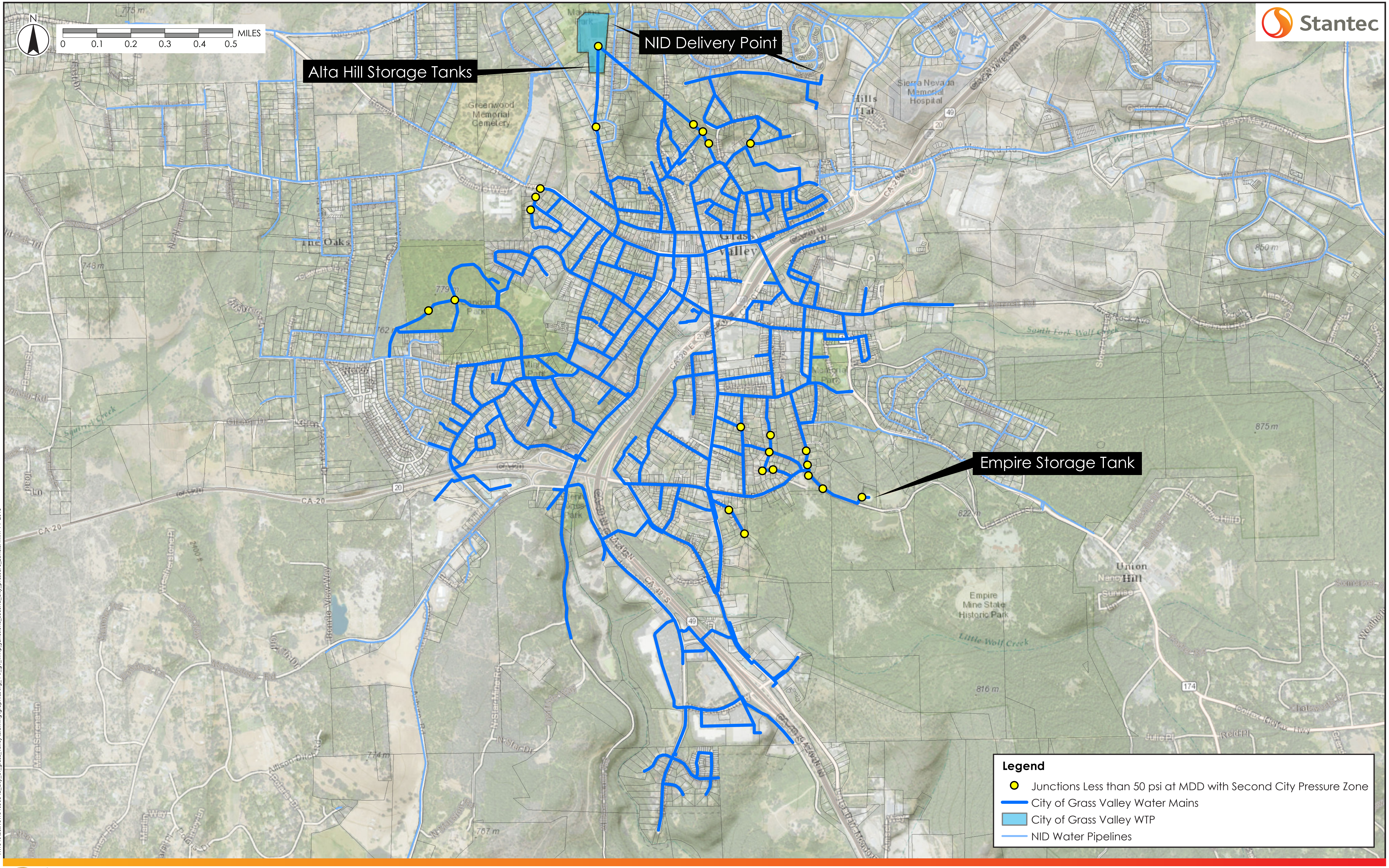


Figure 4-9
Junctions Less than 50 psi with Second City Pressure Zone

4.5.3.4 Construct a New Tank

Another Empire Tank alternative that was investigated is the construction of a new tank at an elevation that would place it at the same hydraulic grade as the Alta Hill Tanks. This requires the tank base to be set at an elevation of 2,643 feet. Based on simulations, during ADD and MDD approximately one-third of the flow to the system was from the new Empire tank. Velocity and pressure results were within desired parameters, in both demand scenarios. Pressure and fire flow response remained basically unchanged from the existing system. Due to the topography of the area, the new tank may require additional mainline pipe to connect to the existing system.

This alternative would have a very high initial cost due to the cost of a new tank, grading, etc., in addition to the amount of any new mainline that may be required. In addition, there would continue to be recurring costs associated with maintaining the tank. Pressure and fire flow response is not increased over the existing system or the other alternatives. Due to the high cost of this alternative it is not recommended for the City.

4.5.4 Empire Court Booster Pump

An alternative was modeled that mitigates the low pressure in the Empire Court area. This alternative involves the use of a 3 to 5 hp booster pump near the intersection of East Empire Street and Pine Street/Miners Trail. Five check valves were used to create a pressure zone in the East Empire Street, Kate Hayes Street and Miners Trail area depicted in **Figure 4-10**. The booster pump and check valves provided additional pressure to the Empire Court area, eliminating the low pressure zone. An alternative option would involve individual booster pumps installed at each service affected by the low pressure.

A booster pump in the Empire Court area would have an upfront cost and continuing operational costs. Individual booster pumps on each service could potentially raise the question of who is responsible to install, maintain and replace damaged pumps or parts. A booster pump for the area would have a more predictable future total cost. Fire flow to the area can still reliably be supplied in this alternative; a fire pump would not be necessary.

4.5.5 Providing Service to Broadview Heights

An alternative was modeled for providing service to the Broadview Heights subdivision which is within the City Service Area No. 2, but currently served by NID. Installing a 5 to 7.5 hp booster pump near the intersection of Broadview Avenue and Bawden Avenue would allow the City to serve this area. Similarly to the Empire Court alternative, installation of booster pumps at individual homes could be an alternative solution.

The Broadview area has the identical criteria and issues as the Empire Court area, with the exception of Fire flow, which could be supplied by NID through the existing intertie; an emergency supply agreement may be necessary with NID if this alternative were pursued. Fire flow could also be supplied by a fire pump; a fire pump could potentially require a standby generator, though, to ensure uninterruptable flow.

4.5.6 Improved Fire Flow

Improvements have been identified to allow the system to deliver the 4,000 gpm, 4 hour fire flow at 20 psi to the southern portion of the system, i.e., McKnight Way/Freeman Lane. Recommended improvements are shown in **Figure 4-11** and include 550 feet of 12-inch pipeline along the McKnight Way overpass from South Auburn Street to Taylorville Road, a 700 foot extension of 12-inch pipeline on Freeman Lane to McKnight Way, and a 1,600 foot extension of 12-inch pipeline along Allison Ranch Road connecting to Freeman Lane. An emergency intertie connection with NID in the area could be investigated as an alternative way of increasing the fire flow in this area.

Low fire flow (less than 1,000 gpm at a residual pressure of 20 psi) in various areas of the City as identified in **Figure 4-6** can be mitigated by looping dead end lines in the proximity of the delinquent hydrants, and upsizing pipe sizes at dead end lines. These improvements are shown on **Figure 4-11**. They include an additional 400 feet of 6-inch pipe to complete a loop at East Main Street and Eureka Street, 420 feet of 6-inch pipe to complete loop on the end of the Cornwall cul-de-sac line, upsizing the existing 4-inch pipe on the dead end line on Linden Avenue with 380 feet of 8-inch pipe, and upsizing the existing 4-inch pipe on the dead end line on Stacey Lane with 330 feet of 8-inch pipe.

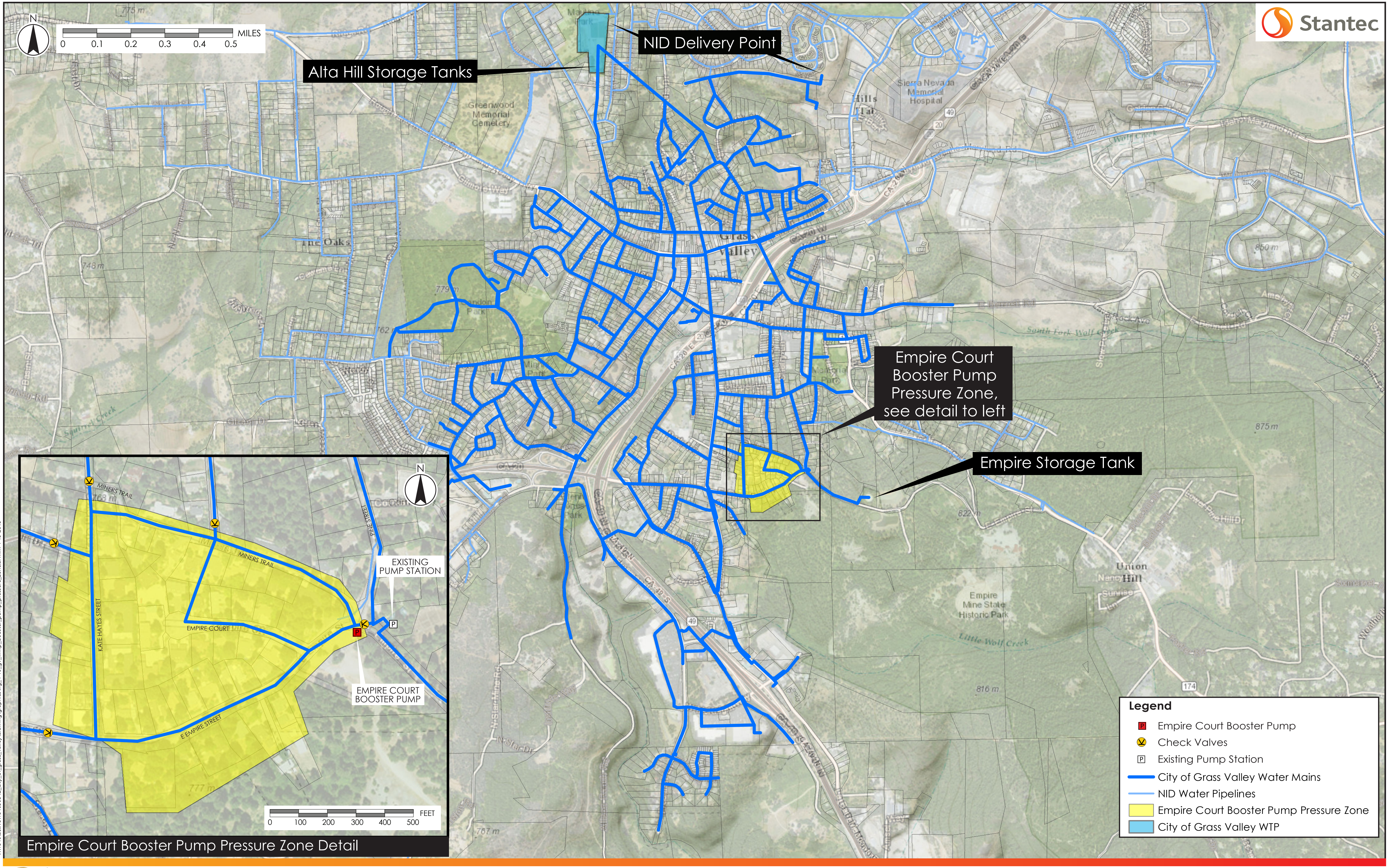
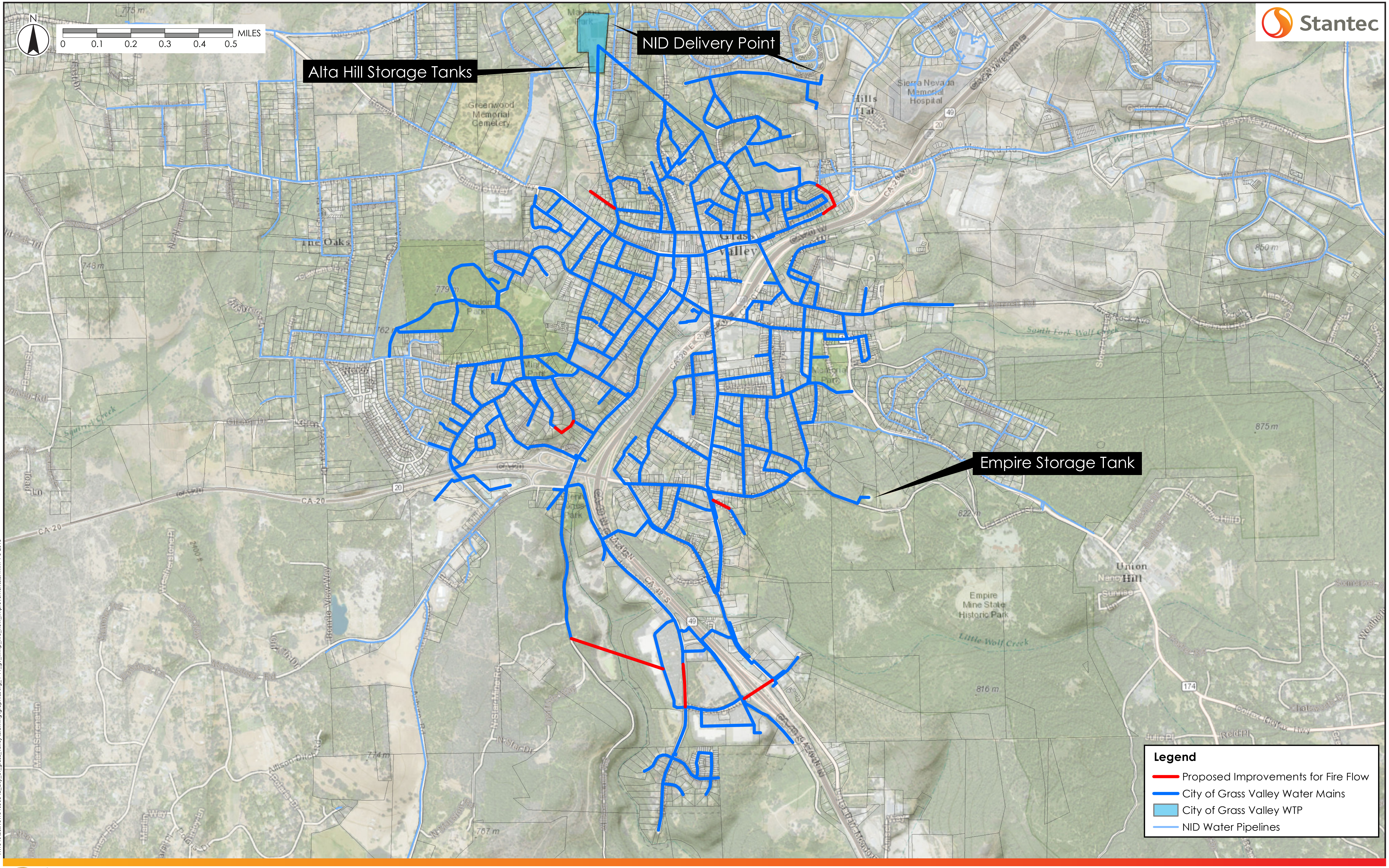


Figure 4-10
Empire Court Booster Pump Pressure Zone



V:\1840\active\184030342_city_of_grass_valley\drawing\graphics\fig_4-11_gv_wmp_fire_flow_improvements.ai mlm 4-8-2015

City of Grass Valley
Water System Master Plan

Figure 4-11
City of Grass Valley - Fire Flow Improvements

4.6 COST ESTIMATES & POTENTIAL IMPROVEMENTS

The recommended alternative to more fully utilize the Empire Tank would involve sizing and installing a new pump(s). Determination would then be made to upgrade any piping in the vicinity of the pump station. Control upgrades would also be needed. In addition, the City should invest in improvements recommended by recent inspections of the Empire Tank, which assessed corrosion inside the tank and coating systems generally. Cost estimates for these Empire Tank improvements as well as the suggested distribution network improvements to enhance fire flow and system pressure are included in **Table 4-3**. Additional cost details are included in **Appendix A**.

Table 4-3 Proposed Improvements [(a)]

Suggested Improvements	Cost
Empire Tank and Empire Court Improvements	
Rehabilitate Empire Tank coating systems	$1,060,000
Remove existing booster pumps	$10,000
Piping upgrades to allow new pumps to be installed with reverse discharge	$40,000
Install flow control valve on new pump discharge	$20,000
Install new tank booster pumps and associated electrical upgrades	$260,000
Upsize downstream main (940 lf 12-inch; 130 lf 6-inch)	$270,000
Install new booster pump for Empire Court area	$260,000
Booster pump check valves (2, 12-inch; 3, 6-inch)	$110,000
Sub-Total Storage Facilities	**$2,030,000**
Distribution System Improvements	
Install new pipelines to increase Fire flow at McKnight Way (~550 lf, 12-inch pipe, crossing Highway 49 at McKnight Way; ~700 lf, 12-inch pipe, connecting Freeman Lane main to McKnight Way; ~1,650 lf, 12-inch pipe, connecting main along Allison Ranch Road to Freeman Lane)	$1,100,000
Install ~520 lf of new 6-inch pipeline to complete loop at East Main and Eureka	$260,000
Install ~420 lf of new 6-inch pipeline to complete loop at Cornwall cul de sac	$100,000
Pipe upgrades at the dead end section of Linden from 4-inch to 8-inch (~400 lf of 8-inch pipe, including replacement of ~400 feet of 4-inch pipe)	$230,000
Pipe upgrades at the dead end section of Stacy Ln from 4-inch to 8-inch (~700 lf of 8-inch pipe, including replacement of ~700 lf of 4-inch pipe)	$300,000
Install new booster pump and check valves to serve Broadview Heights	$260,000
Sub-Total Distribution System Improvements	**$2,250,000**

(a) ENR CCI = 10037, July 2015

5.0 WATER TREATMENT FACILITIES

Water treatment facilities are discussed in this section, including a description of existing facilities currently in operation and improvements to correct existing deficiencies to serve future growth.

5.1 EXISTING SYSTEM

Existing raw water conveyance, treatment, and storage facilities are discussed in this section. **Figure 5-1** includes a schematic of the overall raw water storage/supply, treatment processes and treated water storage facilities. **Figure 5-2** includes a site layout with major facilities shown. Descriptions of the facilities are included below.

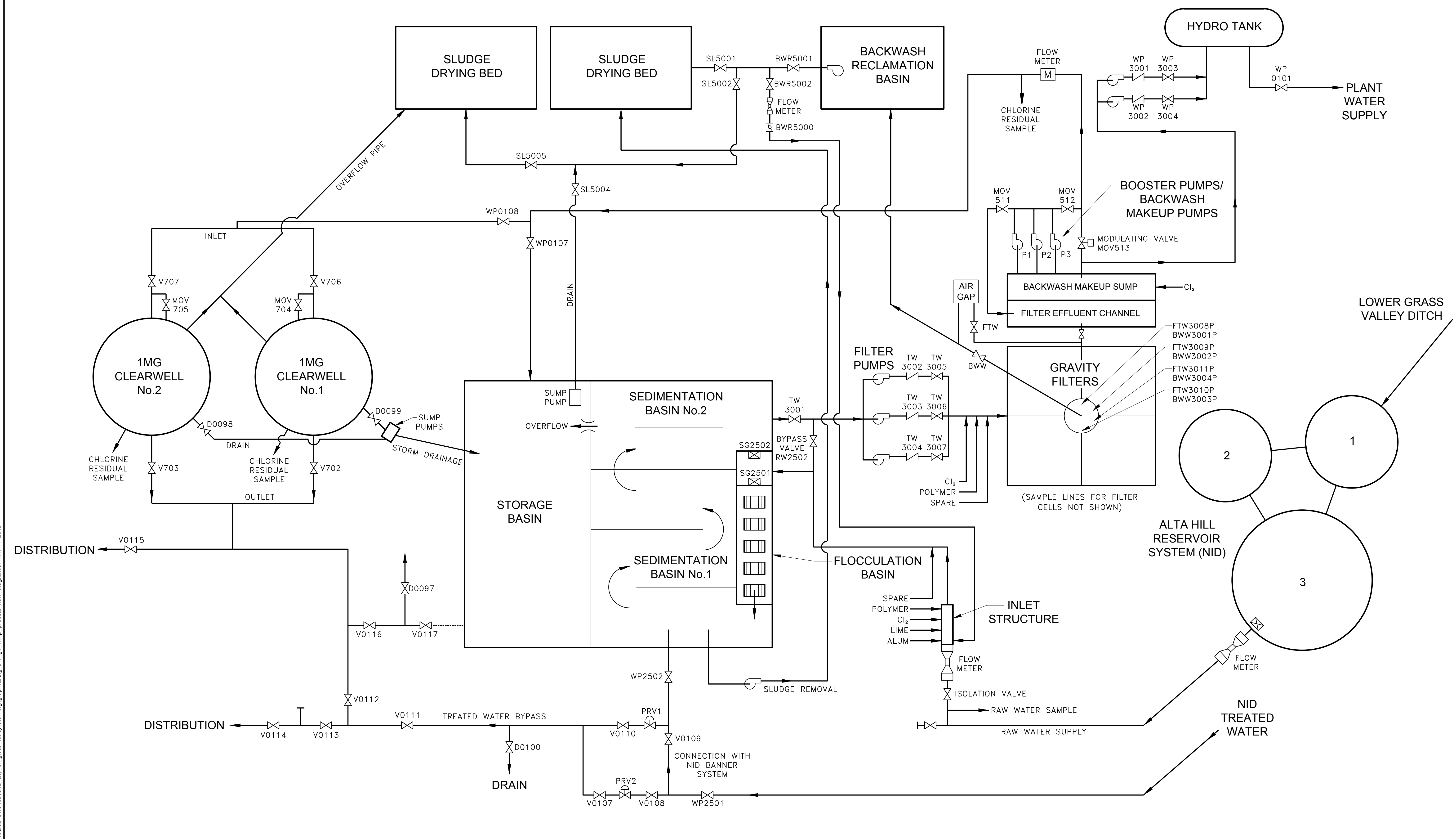
5.1.1 Raw Water Supply

The City's primary water supply is from the Lower Grass Valley Ditch, operated by the Nevada Irrigation District (NID). Water is conveyed from the NID ditch to the Alta Hill Reservoir located northeast of the water treatment plant (WTP).Flow is then conveyed from the Alta Hill Reservoir via a 30-inch influent pipe by gravity to the WTP. NID controls flow to the WTP at the Alta Hill Reservoir with the use of stop logs.

Based on discussions with WTP operations staff, an agreement between the City of Grass Valley and NID allows the raw water flow to be manipulated once per day. Any change in flow to the WTP will affect NID's raw water distribution system, and therefore can only be controlled by NID. WTP operations staff indicated that this arrangement has been working well.

5.1.2 Treatment System

The treatment plant is considered a conventional treatment plant, utilizing flocculation and sedimentation pretreatment processes followed by filtration and disinfection to provide treatment. The existing treatment facility produces excellent quality water, and the facilities are maintained very well. **Figure 5-1** shows the existing process flow diagram identifying the major components that make up the treatment system. A site plan for the WTP is presented in **Figure 5-2**. For reference purposes the water demands which the City system must meet are identified in **Table 5-1**. In addition, there is 1.2 MG of additional maximum daily demand (refer to Chapter 3 for discussion concerning this) from potential service areas in the southern portion of the City's service area, not all of which is currently included in the City's service area boundary.



HYDRO TANK
PLANT WATER SUPPLY
WP 0101
WP 3001
WP 3003
WP 3002
WP 3004
FLOW METER
CHLORINE RESIDUAL SAMPLE
SLUDGE DRYING BED
SLUDGE DRYING BED
BACKWASH RECLAMATION BASIN
SL5001
SL5002
BWR5001
BWR5002
FLOW METER
BWR5000
SL5005
SL5004
OVERFLOW PIPE
WP0108
WP0107
INLET
V707
V706
MOV 705
MOV 704
1MG CLEARWELL No.2
1MG CLEARWELL No.1
D0098
D0099
SUMP PUMPS
STORM DRAINAGE
DRAIN
CHLORINE RESIDUAL SAMPLE
CHLORINE RESIDUAL SAMPLE
V703
V702
OUTLET
DISTRIBUTION
V0115
SUMP PUMP
OVERFLOW
SEDIMENTATION BASIN No.2
STORAGE BASIN
SEDIMENTATION BASIN No.1
SG2502
SG2501
TW 3001
BYPASS VALVE RW2502
MOV 511
MOV 512
BOOSTER PUMPS/ BACKWASH MAKEUP PUMPS
P1
P2
P3
MODULATING VALVE MOV513
BACKWASH MAKEUP SUMP
Cl_2
AIR GAP
FILTER EFFLUENT CHANNEL
FTW
BWW
FILTER PUMPS
TW 3002
TW 3005
TW 3003
TW 3006
TW 3004
TW 3007
Cl_2
POLYMER
SPARE
GRAVITY FILTERS
FTW3008P BWW3001P
FTW3009P BWW3002P
FTW3011P BWW3004P
FTW3010P BWW3003P
(SAMPLE LINES FOR FILTER CELLS NOT SHOWN)
LOWER GRASS VALLEY DITCH
1
2
3
ALTA HILL RESERVOIR SYSTEM (NID)
FLOCCULATION BASIN
INLET STRUCTURE
SPARE
POLYMER
Cl_2
LIME
ALUM
FLOW METER
ISOLATION VALVE
RAW WATER SAMPLE
RAW WATER SUPPLY
FLOW METER
NID TREATED WATER
D0097
V0116
V0117
WP2502
SLUDGE REMOVAL
V0112
PRV1
DISTRIBUTION
V0114
V0113
V0111
TREATED WATER BYPASS
V0110
V0109
D0100
DRAIN
CONNECTION WITH NID BANNER SYSTEM
PRV2
V0107
V0108
WP2501

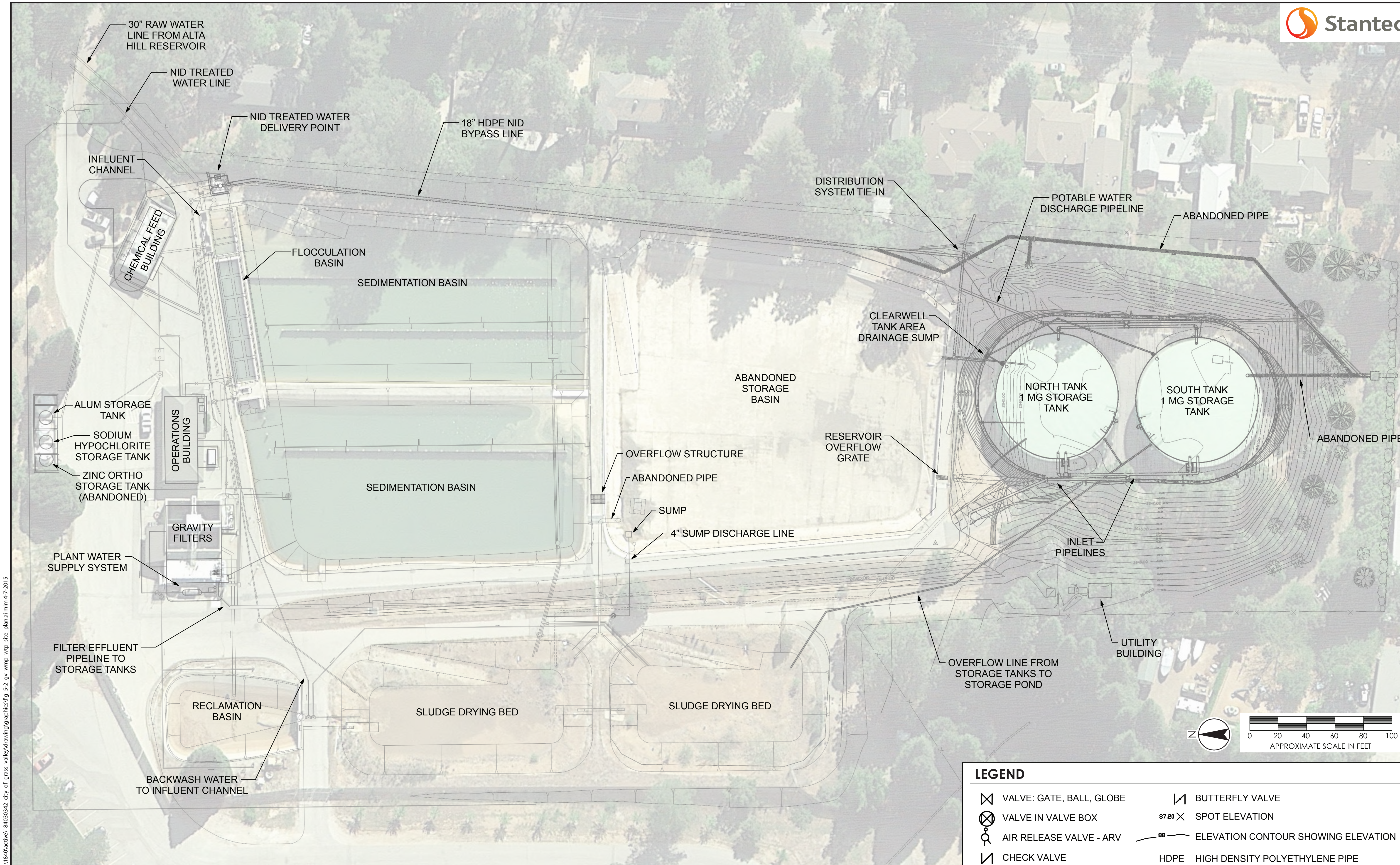


Figure 5-2
WTP Site Plan

5.1.2.1 Raw Water Inlet Structure

Raw water is conveyed from the Alta Hill Reservoir to the treatment plant through an inlet structure at the WTP site. This structure contains a Parshall Flume, shown in **Figure 5-3**, used to monitor open channel flow via an ultrasonic flowmeter and transmitter. The flume has a flow capacity up to 5 million gallons per day (MGD). The WTP's annual daily average flows are approximately 1 MGD, with summer flows averaging approximately 1.6 MGD.

Water samples are collected manually in the influent channel and tested in the WTP laboratory. Raw water turbidity is typically measured at 2 to 5 nephelometric turbidity units (NTU), with spikes of approximately 30 NTU measured during storm events. These turbidities are considered relatively low for a raw surface water supply.

Downstream of the Parshall Flume are four (4) chemical injection points where chemicals for water treatment are injected. The chemicals currently used at this stage of the treatment process include: alum, lime, and sodium hypochlorite, with one spare line and injection point available for another chemical, if needed. **Figure 5-4** shows the chemical injection points. There is currently no mechanical mixing at these points of injection. Individual chemical systems are described further later in this chapter.

In addition to the chemical injection points described in the preceding paragraph, there is also a 4-inch line downstream of the Parshall flume that conveys supernatant from the backwash water storage basin to the head of the plant where it is combined with raw influent water for treatment. **Table 5-1** provides a summary of the existing treated water demands at the treatment plant. The demands and peaking factors presented in this table are discussed in detail in Chapter 3 of this Master Plan.

Table 5-1 Water Demands

Demand Type	Existing Demand	Projected Future Demand [(a)]
Average Day Demand, MGD	0.92	1.06
Maximum Day Demand, MGD	2.4	2.8
Peak Hour Demand, MGD	4.1 (2,825 gpm)	4.6 (3,225 gpm)
Fire Flow	4,000 gpm for 4 hours	4,000 gpm for 4 hours

(a) Does not include additional possible demand from build-out of Berriman Ranch or the proposed Northstar project.

Figure 5-3 Parshall Flume in Raw Water Inlet Structure

Figure 5-4 Chemical Injection

5.1.2.2 Flocculation Basin

The flocculation basin is a 104,000 gallon basin equipped with two (2) horizontal paddle mixers, used to bring suspended and colloidal particles into contact with each other following coagulation to form flocs which are larger and heavier than the individual particles and can be more easily settled out of the water. The paddle mixers are equipped with variable frequency drives (VFDs), and operated by a one (1) horsepower (HP) motor on a three (3) phase, 230/460V, 60 Hz electrical service. The paddle mixers require frequent maintenance, as these are original mixers; however they appear to be working well.

Figure 5-5 Flocculation Basin

Under normal operating conditions, flow enters the flocculation basin and passes through the paddle mixers, continuing downstream into the sedimentation basin. Two slide gates are located in the upstream compartment of the basin. This allows the raw water to be filtered directly, bypassing the flocculation and sedimentation basin; however, raw water is typically not treated in this manner.

A summary outlining the design criteria of the WTP's flocculation basin is presented in **Table 5-2** below:

Table 5-2 Flocculation Basin Design Criteria

Flocculation Basin	
Nominal Volume (gallons)	104,000
Dimensions (l x w x h)	96' x 16' x 9'
Flocculator Paddle Type	Horizontal Paddle

Flocculation Basin	
Number of Flocculator Paddles	Two
Motor	1 HP, 230V, 60 Hz, 3 Ph.
Detention Time	30 min. @ 5MGD
Basin Capacity	7.5 MGD

5.1.2.3 Sedimentation Basin

The sedimentation basin consists of two (2) one (1) million gallon concrete basins, separated by a series of redwood baffles. The baffles in the eastern sedimentation basin direct flow in a serpentine pattern to increase the detention time, promote settling in the basin, and prevent short-circuiting. The detention time in the sedimentation basins is 576 minutes (9.6 hours) at the design flow rate of the plant, which is 5.0 MGD. The purpose of the sedimentation basins is to remove the floc particles by gravity settling prior to filtration and thus extend filter run times.

Figure 5-6 Sedimentation Basin

The basin is equipped with one (1) sludge collection sump where solids are collected for removal. Removal of the sludge is accomplished through the use of portable sludge pumps located in the basin sludge collection sump. The collection sump is located immediately downstream of the flocculation basin and is equipped with a 25 GPM portable submersible pump. The pump is sized to pump against a total dynamic head (TDH) of 25 feet at this flow rate. Sludge is pumped to sludge drying beds located on the WTP site. The sludge is dewatered on the drying beds prior to being hauled off for disposal.

The sedimentation basin shares a common wall with the WTP's 2.1 million gallon storage basin (formerly the plant treated water storage basin; although use for this purpose was discontinued in 2010). The sedimentation basin is equipped with an overflow which discharges into the storage basin. Under normal operating conditions, the water from Sedimentation Basin 2 discharges into the filter pump wet well.

A summary outlining the design criteria of the sedimentation basin is presented in **Table 5-3** below:

Table 5-3 Sedimentation Basin Design Criteria

Sedimentation Basin	
Nominal Volume (gallons)	2 Million
Area (sf)	40,000
Detention Time	9.5 hrs @ 5 MGD
Total Capacity	12 MGD for 4 hours of detention time

5.1.2.4 Gravity Filters

Following the sedimentation basin, water flows via a 24 inch pipe to a 7,000 gallon filter supply wet well, where three (3) filter supply pumps convey water to the four declining-rate dual media gravity filter cells. Each pump is rated at 1,700 GPM with a TDH of 25 feet. The pumps are equipped with VFD's and are operated by a 15 HP motor on a 3 phase, 460V, 60 Hz electrical service. These pumps are controlled by the backwash makeup sump level that is located downstream of the gravity filters. Two of the pumps are operated as a lead/lag pair, while the third pump is on standby. The pumps deliver water to the top of the filter supply wet well, where it can be directed to any of the four gravity filter cells.

Figure 5-7 Vertical Turbine Filter Supply Pumps

During high turbidity events (generally occurring a few times each year) polymer is added prior to the gravity filters in the splitter box. Sodium hypochlorite is added after filtration prior to the booster/backwash makeup pumps used to convey filtered water to the finished water storage tanks at the WTP site.

Filtration for the WTP is provided using a four (4) cell declining rate dual media gravity filter. The purpose of the gravity filter is to remove any suspended solids formed during coagulation and flocculation that have carried over from the sedimentation basin. Each cell is 16 feet by 14 feet, and has a total filtering area of 896 ft^2. The allowable loading rates for the dual media gravity filters is 3.9 gpm/ft^2 (less than the State allowable standard of 6 gpm/ft^2), resulting in a maximum allowable loading rate for the four cell filter basin of 3,495 gpm which corresponds to the WTP maximum design flow of 5 MGD.

Figure 5-8 Filter Basins

The filter is comprised of a 24 inch thick anthracite layer and a 12 inch thick fine sand layer over an underdrain system. As water passes through the media, the filtered water is collected in the filter effluent channel, and overflows into the backwash makeup sump. Since the original installation, the filter media has not been replaced; however within the past ten years, anthracite has been occasionally added to make up for media lost during backwash.

A series of three (3) booster/backwash makeup water pumps are used to convey the filtered water to the WTP's storage tanks and supply backwash water to the filters when elevation in the finished water storage tanks is too low. The pumps are multi-purpose: capable of providing filtered water for backwash purposes, as well as pumping the filtered water to the storage tanks. This change in discharge location is made possible through the operation of a series of valves located downstream of the pumps. In addition to regular backwashing, the filter basin cells are required to be sprayed or washed down to break up any solids or algae that build up on the walls, troughs, and brackets. This is currently performed with a hose.

Figure 5-9 Filter Backwash Pumps

The filters are equipped with a control program for filtering and backwash operation.

A summary outlining the design criteria of the WTP's filtration facilities is presented in **Table 5-4**.

Table 5-4 Filter and Filter Backwash Design Criteria

Filter Supply Pumps	
Number	Three (3)
Pump Type	Vertical Turbine
Capacity	1,700 gpm
Motor	15 HP
Wet Well Nominal Volume	7,000 gallons

Filter Basins	
Type	Gravity Dual Media
Number of Cells	Four (4)
Media	24" Anthracite / 12" Sand
Total Surface Area	896 sf
Maximum design loading rate	3.9 gpm/sf or 5 MGD
Maximum allowable loading rate	6 gpm/sf
Manufacturer	General Filter Co.
Filter Effluent / Backwash Pumps	
Number	Three (3)
Pump Type	Vertical Turbine
Capacity	1,700 gpm
Motor	15 HP

5.1.2.5 Backwashing Facilities

Backwashing of the filters incorporates both air scour and water backwash. The initial phase of the backwash cycle involves a simultaneous air scour and water backwash. Air scouring utilizes one 15 HP, 448 cubic foot per minute (cfm) blower, with a pressure rating of 15 pounds per square inch gage (psig). After the initial simultaneous cycle is complete, the air valve for the backwashed cell closes and the blower is stopped. The water backwash continues in order to purge air remaining in the filter media. At the end of the air purge cycle, the filter-to-waste and cell inlet valves open and the accumulated backwash water is drained to the backwash reclamation pond.

The filters are backwashed one cell at a time, as required. The filtered water from the three remaining cells serves as the backwash water supply to the cell being backwashed in reverse direction to remove trapped solids. In addition to the filtered effluent, potable water from the storage tanks has the capability of being brought back to the backwash makeup tank, if required. The multi-cell configuration and ability to generate backwash supply water eliminates the need for additional backwash supply storage. The filter beds are agitated by the air scour system which breaks up any surface cakes. Backwash cycles may be initiated manually based on effluent quality and/or pressure loss through the filters. Once initiated, automatic control valves actuate to accomplish the backwash. During a backwash cycle, treated water is not being produced and the system is supplied from storage.

The backwash/makeup pumps are controlled by the storage tank level during normal operation and by the filter effluent channel during backwash mode.

Spent backwash water (dirty water collected during the backwash cycle) is discharged to a backwash reclamation pond which is used to store and treat the water to remove solids through gravity settling. Solids collected in this basin can be conveyed to the northern sludge drying bed, located adjacent to the basin. The supernatant is pumped to the WTP's inlet structure and mixed with raw water to be treated. All backwash water is contained on site, either recycled or evaporated in the sludge drying beds.

A summary outlining the characteristics of the WTP's backwashing facilities is identified in **Table 5-5**.

Table 5-5 Backwash Facility Design Criteria/Settings

Backwashing Facilities	
Method	Air scour with backwash water
Backwash Rate	15 gpm/sf (3,400 gpm)
Air Compressor	Single 448 cfm
Blower	15 HP
Blower Rate	2 cfm/sf (448 cfm)
Backwash Reclamation Basin Volume	200,000 gallons
Sludge Drying Beds	2
Sludge Drying Bed Area, sf	12,100
Drying Bed Solids Loading Capacity, lb/yr-sf	7
Simultaneous Air Scour Cycle	10 minutes
Air Purge Cycle	3 minutes
Filter-to-waste Cycle	5 minutes
Filter-to-waste Volume	~44,000 gallons

5.1.2.6 Chemical Systems

Alum (Aluminum Sulfate) is used as the primary coagulant to destabilize negatively charged colloidal solids found in the raw water, so that they can be flocculated and settled out of solution. The alum system consists of a 5,600 gallon storage tank and one (1) alum feed pump. Dosage is adjusted manually at the pump, based on incoming raw water flow rate and quality.

Polymer may be added in the influent channel and/or upstream of the filters; however polymer is not normally fed in the influent channel. No mixing devices are employed at the addition point of the polymer, which is located in the filter splitter box, except hydraulic turbulent mixing. Flocs form as the water mixes in the pipeline which increases the solids removal efficiency in the filter basins. The polymer feed system consists of a 1/6 HP diaphragm-type metering pump with a capacity up to 2.0 gallons per hour (gph). The City currently uses ClariFloc polymer solution which is generally only added when settled water turbidity is over 3 NTU to the filters.

Sodium hypochlorite is used for disinfection of raw water, filter influent and filter effluent water. Pre-chlorination is applied in the influent channel and is used to prevent the growth of bacteria and algae in the flocculation, sedimentation and filter basins. Post-chlorination is applied downstream of the booster pumps/backwash makeup pumps and disinfects water conveyed to the storage tanks, as well as the in-plant water supply. The sodium hypochlorite system consists of a 3,000 gallon storage tank and three (3) chemical feed pumps with a capacity of 4.5 gph (2 duty – one dedicated for pre-chlorination and one for post-chlorination, and 1 standby pump that can be used for either system).

Figure 5-10 Polymer Storage and Sodium Hypochlorite Feed Pumps – Chemical Feed Building

Hydrated lime is used to adjust pH and has historically been used at the WTP when the raw water temperature decreases below 50˚F (10˚C). Hydrated lime is fed from a dry hopper into a small mixing tank where a concentrated lime slurry solution is rapidly mixed and discharged into the influent channel upstream of the flocculation basin. The lime feed system consists of a volumetric feeder with storage hopper and dust collector, solution tank and a 0.5 HP lime slurry pump with a capacity up to 3.2 gph.

Figure 5-11 Lime Feed Pumps

For some time a corrosion inhibitor feed system was used on site, adding zinc orthophosphate to the filtered water to inhibit corrosion in distribution system piping and plumbing in homes and businesses served. This system includes a 4,200 gallon storage tank and chemical feed pump; however, this system is no longer used because it caused the WWTP to exceed the maximum contaminant level (MCL) for zinc. The City has been discussing the introduction of orthophosphate for corrosion control.

It should be noted that all chemical feed systems are controlled manually and based on the WTP's raw water influent and effluent flow.

Table 5-6 Chemical Feed System Characteristics

Alum Feed System	
Storage Tank Volume (gallons)	5,600
Number of Feed Pumps	1
Feed Pump Type	diaphragm
Feed Pump Capacity, gph	1.5-6.0
Feed Pump Motor	¼ hp, single phase, 115 V
Polymer Feed System	
Storage Volume	Up to four (4) 5-gallon drums (for a maximum of 20 gallons)
Number of Feed Pumps	2
Feed Pump Type	diaphragm
Feed Pump Capacity (ea.), gph	0-2.0
Feed Pump Motor	1/6 hp, 1,725 rpm, single phase, 120 V
Pump Manufacturer & Model	Stranco, PB 200-2
Maximum Dose	5.0 mg/L (raw water); 2.0 mg/L (filter influent)
Sodium Hypochlorite Feed System	
Storage Tank Volume, gallons	3,000
Number of Feed Pumps	3
Feed Pump Type	positive displacement, liquifram
Feed Pump Capacity (ea.), gph	0.022-4.5 (@50 psig)
Feed Pump Motor	Single phase, 115 V
Maximum Dose, mg/L	2.0 (raw water, pre- and post-filter)
Lime Feed System	
Storage Hopper Volume, cu. ft.	30
Volumetric Feeder, cu. ft./hr	1.6
Number of Feed Pumps	1
Feed Pump Type	Diaphragm
Feed Pump Capacity (ea.), gph	3.2 (@ 10 psig)
Feed Pump Motor	½ hp, 1,750 rpm, single phase, 115 V
Maximum Dose, mg/L	5

5.1.2.7 Storage Basin / Old Treated Water Reservoir (Storage)

A 2 million gallon concrete reservoir is located adjacent to the sedimentation basin. This was originally designed to be the finished (treated) water storage basin, but since the construction of the new treated water storage tanks this basin is being used as an overflow storage basin for the sedimentation basin as well as a holding basin for stormwater collected from the storage tank area. A sump is located in the northwest corner of the basin, allowing a submersible pump to convey water to the sludge drying beds.

Figure 5-12 Old Treated Water Reservoir (Old Storage Basin)

5.1.2.8 Plant Water System

The WTP's water system is used to provide process and wash water for the treatment plant. In addition, it is also used to provide irrigation water for a sports field located adjacent to the WTP. The plant water system tees off the filter effluent line, downstream of the chlorine feed. This water does not reliably receive the necessary amount of chlorine contact time for potable use and is limited to process and wash water uses at the plant (and local irrigation).

The water system consists of two 7.5 HP vertical turbine pumps that are rated at 100 gpm at 155 feet of total dynamic head (TDH). The pumps, operating in a lead/lag configuration, discharge to a 1,000 gallon hydropneumatic tank that maintains a working pressure range of 40 to 60 psig. The system consists of all original equipment installed in 1975. The plant water system hydropneumatic tank and pumps are shown in **Figure 5-13**. **Table 5-7** summarizes the design criteria for plant water system components.

Figure 5-13 Plant Water System

Table 5-7 Plant Water System Design Criteria

Plant Water System	
Number of Plant Water Pumps	2
Pump Type	Vertical turbine
Pump Capacity (ea.), gph	100 gpm @155 ft. TDH
Pump Motor	7.5 hp, 3,500 rpm, three phase, 460 V
Hydropneumatic Tank Volume, gallons	1,000
Hydropneumatic Tank Working Pressure range	40 to 60 psig

5.1.2.9 Solids/Residuals Handling

There are two sludge drying beds located at the treatment plant that are used to store overflow from the two 1 MG storage tanks on the plant site, and overflow from the backwash basin. Sludge removed from the sedimentation basins when a basin is taken off line for cleaning is also stored in the drying beds. The combined volume of the two sludge drying beds is approximately 1.25 million gallons.

Backwash water is settled in the backwash reclamation basin. Sludge from the reclamation basin can be pumped to the nearby sludge drying beds. However, the clarified backwash water is typically pumped back to the head of the plant where it is combined with raw water (at a rate not intended to exceed 10% of the raw water feed) for treatment. Water that is not recovered is lost to evaporation or percolation. Plant staff can control which drying bed will receive solids pumped from the sedimentation basin by manually opening and closing valves. Periodically, one sludge drying bed will be taken off line so the sludge may be dried and removed. There appears to be plenty of capacity in the drying beds and no further work beyond regular sludge removal is recommended.

5.1.2.10 Electrical/Instrumentation

The power supply and electrical distribution system at the plant are in good, but aging condition. As electrical gear has failed through the years, the City has replaced it with more modern equipment. A 208V delta transformer supplies power to the WTP. A more detailed study of the plant electrical supply and distribution system may be required to fully identify potential problem areas.

The WTP's emergency power system consists of one 344 kVA / 275 kW diesel powered generator unit. WTP operations staff have indicated that there have not been any issues with the generator and it appears to be working well.

There is currently not what would be considered a full SCADA system at the plant. The existing system is made up of several process controllers and chart recorders mounted in control panels which are hard-wired to an alarm auto-dialer. The plant has an operator interface that allows operations staff to remotely access these control panels. The process controllers have been failing and have been replaced/upgraded as needed.

It is recommended that this equipment be abandoned and a plant-wide SCADA computer and software system be installed. This new system would become part of the redundant system recommended for the wastewater treatment plant and will provide many operational advantages at the water treatment plant.

5.1.3 Treated Water Storage and Chlorine Contact Time (CT)

Downstream of the filter basins treated water is pumped to two, 1 MG storage tanks. Each tank is constructed of steel and is 86 feet in diameter and 24 feet in height. The tanks are installed at an elevation such that potable water from the tanks can be gravity fed back to the backwash makeup sump, in the event that additional water is required for filter backwashing. These two tanks are installed in parallel and discharge to the City's water distribution system.

Treated water storage provides a number of functions including:

- Flow equalization
- Emergency storage
- Fire flow storage
- Residence time for disinfection and inactivation of viruses

Chlorine residual is measured at each tank, and as indicated in Section 2.2.3, is greater than the minimum required residual as outlined by the CDPH (now State Water Board Division of Drinking Water) regulations.

The storage tanks are located within a depressed area, such that berms surround the tanks. An asphalt concrete surface surrounds the tanks and is sloped towards a drainage sump. The sump houses two submersible pumps, each rated a 62 GPM, which pump to the storage basin located adjacent to the tanks. The pumps are supplied with 120V, one phase, 60Hz power, from the WTP. It has been found over time that the tank area can experience flooding during storm events, such that the control valves become submerged and fail to operate.

5.2 WATER TREATMENT PLANT IMPROVEMENTS

Improvements to the existing treatment facility are discussed in this section. The improvements will be constructed in phases, beginning with high priority upgrades. Improvement phasing is discussed in Section 5.4.

The improvements identified herein are based on a planning level analysis used to determine the nature of improvements and planning level costs. Prior to implementing improvements, a preliminary engineering report must be completed to confirm the assumptions used to develop the proposed improvements. As previously outlined in the regulatory section (Section 2) of this Master Plan, the City is currently in compliance with existing federal, state and municipal regulations, and the improvements outlined in this section are intended to enhance the function of the WTP from an operations perspective, and to improve worker safety.

Prior to implementing any of the suggested improvements included herein the City will comply with the California Environmental Quality Act (CEQA) and prepare the necessary documentation depending on the nature of the improvements. The City may also be subject to the National Environmental Protection Act (NEPA) and other Federal regulations depending on the nature of the project and funding sources. The determination of necessary documentation to comply with CEQA, and possibly NEPA, should occur during the predesign phase of the project when the specific nature of the improvements is known.

5.2.1 Raw Water Supply

The existing raw water supply facilities are adequate and functioning well; however, during discussions with the WTP operations staff it was determined that two improvements to the influent channel and raw water supply can be implemented to improve the operation of the WTP.

Currently operations staff monitor influent turbidity and pH by collecting jar samples of raw water and analyze them in the lab. This is not only an inefficient use of Operator's time, but it also does not provide real-time monitoring to manipulate chemical feed dosages when required. A streaming current monitor can provide monitoring capabilities for key water quality parameters such as turbidity, pH, temperature and electrical conductivity. This instrument can provide real-time monitoring and can pace chemical injections with the influent flow meter for the WTP's chemical feed systems, such as polymer, alum, pre-chlorination, and lime dosage. This will reduce operator time spent on jar sampling and manually adjusting chemical dosages, as well as increasing the efficiency of the treatment system.

Currently, raw water flows from the NID Lower Grass Valley Ditch and Alta Hill Reservoir to the WTP. The plant receives the water without any way of controlling the rate of raw water flow, which has caused the sedimentation basin to overflow into the storage basin in the past. By having control of raw water flow, operation of the WTP can be optimized to a desired flow and prevent any overflow conditions. Discussions with NID are required to determine if this is feasible for operation of their system.

5.2.2 Treatment Facilities

Improvements associated with each treatment process are discussed in this section. Planning level costs are provided for the improvements.

Flocculation Basin. WTP operations staff have indicated that the flocculation basin has been producing adequate floc particles required for settling in the sedimentation basin. The horizontal flocculator paddle mixers have experienced some maintenance issues in the past with shafts breaking. It is recommended that the horizontal flocculator paddles be replaced with vertical flocculators, as they offer a number of benefits over horizontal mixers. The vertical mixers are suspended, typically by a catwalk structure, above the flocculator basin. The mixer motor sits on the catwalk, which provides support for the mixer as well as providing maintenance access to the motor. The existing flocculator motors are located underground, providing for a much more cumbersome effort to maintain the equipment. Secondly, the vertical mixers require a much smaller footprint (i.e. smaller mixer blades) than the horizontal flocculators, while providing the same, if not better mixing capability while producing adequate floc for settling in the sedimentation basin.

The existing catwalks located between the sedimentation and flocculation basins are constructed of redwood beams and planks, with aluminum handrailing. Sections of the redwood walkway have deteriorated. It is proposed that the catwalks be replaced with aluminum grating, or at least new redwood planks. Aluminum grating is more robust and will offer a longer life expectancy; however, it will come with higher capital costs.

Figure 5-14 Existing Catwalks between the Sedimentation and Flocculation Basins

Sedimentation Basin. Based on existing water quality data, the sedimentation basin has been operating sufficiently to produce effluent with low turbidity. Over time, cracks have developed in the southeast corner of the east sedimentation basin. The cracks run parallel to an existing sludge collection sump that runs east/west on the south end of the basin. The cracks may be attributed to differential settling, or poor original construction of the concrete basin. An inspection by a structural engineer is required to determine if the cracks have potential for further damage and if so, what repairs are required. Based on the potential severity of the cracks, a cosmetic repair such as patching may not be sufficient as the structural integrity of the concrete may be compromised.

Annually the sedimentation basin is drained and the sludge that has settled is removed using portable submersible sludge pumps, which operations staff can lower into the sludge removal sump. This can be a labor intensive process, costly, and requires the water treatment plant to be taken off line and, therefore, relying primarily on stored water and the NID inter-tie to supply treated water the distribution system. An automated basin cleaning system can:

- provide effective removal of solids from the sedimentation basin without draining the basin;
- allow for more frequent removal (not just annually);
- reduce impacts to plant production capacity;
- provide improved sedimentation basin effluent water quality; and
- avoid floc carry over to the filter basins.

Filters. As discussed in Chapter 3 of this master plan, the existing maximum daily demand (MDD) of the City of Grass Valley service area is approximately 2.4 MGD. Future build-out projections indicate that a MDD of 2.8 MGD will be required. If the areas of the proposed Northstar and Berriman Ranch development projects, which are discussed separately in Chapter 3, are also to be served, the build-out MDD could be as high as 4.0 MGD. The filtration system consists of four (4) dual media gravity sand filters operated in parallel fashion with each other from a common splitter box. Each filter provides a nominal capacity of 1.25 MGD at the approved loading rate of 6.0 gallons per minute per square foot of surface area, and therefore with all four filters online, the filtration system has a nominal capacity of 5.0 MGD. Three filters can operate to achieve a reliable capacity of 3.75 MGD. If the Northstar and Berriman Ranch areas are included in the service area, there could be a shortage of treatment (filtration) capacity at the plant (estimated build-out demand including the Northstar and Berriman Ranch developments is 4 MG MDD) that would have to be addressed.

The dual media filters have operated very reliably since the WTP was commissioned. The existing media in the filter basins consists of the original media that was installed. As a regular maintenance procedure and to improve the efficiency of the filters, it is recommended the filtration media (sand and anthracite) be replaced.

Once the filtration media has been removed, and prior to replacement, an inspection of the filters' underdrain system, overflow backwash troughs and concrete walls should be performed. Based on a visual observation of the filters, exposed aggregate is present on the concrete walls above the filter media. It is recommended that grouting and resurfacing of the walls also be completed.

Plant Water System. The existing plant water system currently provides filtered effluent to supply the WTP with washdown water process water, as well as supplying the adjacent sports field with irrigation water; however, the original intent of the system was only to provide water to the WTP. Due to the addition of supplying irrigation water to the sports field, it is unclear whether the existing booster pumps can supply all systems without reducing its flow to the WTP. An analysis of the plant water system should be conducted to determine the total capacity required to supply these systems. Based on this analysis, if the existing system cannot meet this capacity, upgrades such as pump, hydropneumatic tank and piping replacement will be required. Such upgrades may be well timed given the age and condition of the existing facilities.

The system's infrastructure consists of original tanks, pumps, and piping. It appears that this equipment is showing signs of deterioration and aging. Specifically the hydropneumatic tank and booster pumps appear to be corroding and it is unclear as to when the last time these pieces of equipment were inspected. It is recommended that all equipment, specifically the tank and pumps, be inspected to determine if the equipment can be repaired, or requires replacement. The opinion of probable cost identified in Section 5.4 provides the costs associated with the inspection of the equipment, and a replacement value if required following the inspection.

Chemical Feed Systems. As noted herein, relatively minor improvements are anticipated to be required to the chemical feed systems in order to improve the efficiency and safety of the WTP. The chemical feed systems include:

- Alum for coagulation
- Polymer for flocculation (enhanced filtration/clarification)
- Sodium hypochlorite (NaOCl) for disinfection
- Lime ($CaCO_3$) for pH adjustment
- Zinc Orthophosphate for corrosion inhibition (decommissioned)

The sodium hypochlorite storage tank is located north of the Operations Building and sits adjacent to the Alum storage tank and the inactive Zinc Orthophosphate storage tank. Each tank sits on a concrete pad and is separated by an approximately two foot high block containment wall. A block wall is located on the north side of the containment areas which extends to the height of each tank.

Based on visual observations, the sodium hypochlorite tank is showing signs of degradation most likely due to tank leakage. In addition, the sodium hypochlorite tank as well as the other chemical storage tanks and piping appear to be experiencing degradation due to UV exposure. The following recommendations are provided for storage of chemicals on site:

- Address sodium hypochlorite tank leakage by replacing the existing tank with a new chemical resistant tank and relocating it closer to the Filter building. Secondary containment is to be provided surrounding the tank.

- Install a sun shade structure over each tank to protect it from UV exposure.

Treated Water Storage. The existing steel treated water storage tanks that were installed in 2009 serve two purposes. The first is to provide two (2) million gallons of treated water storage to meet the variable demands within the City's service area. The second purpose of the tanks is to provide sufficient chlorine contact time for the treated water, prior to entering the distribution system. Based on discussions with WTP operations staff, the chlorine contact time meets existing Division of Drinking Water and EPA guidelines, and provides the required capacity to meet the City's desired flows.

The tanks are installed on the southern end of the WTP site within a depression with berms surrounding them. This installation offers benefits from an aesthetic point of view and hydraulically allows treated water to flow back to the backwash makeup tank; however the site has been experiencing drainage issues. The storage tank site is graded such that the asphalt surface is sloped away from the tanks to a perimeter drainage swale. The concrete swale is graded, conveying water to the north-east corner of the tank site where a sump is located. Two submersible pumps are located within the sump, to convey storm water into the adjacent storage basin. Since the tanks were installed, the tank site has been flooded during storm events, recently causing damage to one of the motorized operating valves located within an underground vault. Based on as-built drawings of the tank site, it appears that grading of the site is sufficient, sloping the asphalt surface away from the tanks; however the sump located in the north-east corner of the site does not appear to be pumping water fast enough to meet stormwater runoff rates. This can be attributed to two things: 1) the volume of the drainage sump is not large enough (approximately 200 gallons); and/or 2) the submersible pumps are sized too small for this application.

Based on as-built drawings of the storage tanks that were installed in 2009, the valve vaults are equipped with a drain line that connects to the sump located north of the tanks. The invert elevation of the valve vault drain line is approximately 2,634.4 feet, while the drain line discharges into the drainage sump at an elevation of 2,633.17 feet. The sump vault has a depth of 54" (4.5 feet), with a top of rim elevation of 2,635.78 feet. If the sump pumps cannot keep up with incoming flows and the sump fills to half or three-quarters full, then, due to the hydraulic grade-line, water will back up and enter the valve vault.

With regards to the drainage issues, a series of solutions are presented to prevent flooding of the tank area:

- Increase the size of the sump vault, or construct a second sump adjacent to the existing sump and intertie the sumps together.
- Install submersible pumps with a larger capacity (this solution would require significant electrical supply improvements to this portion of the WTP site);
- Or construct a second sump located at the south end of the site, with a pumping system (this solution would also require significant electrical supply improvements to this portion of the WTP site);
- Install check valves/flap gates on vault drains.

Effective drainage of the tank area is critical in preventing any additional equipment from becoming submerged and eventually damaged. In addition to addressing the drainage concerns, the existing control valve should be repaired or replaced.

Water Recycling. The storage tanks overflow line currently discharges to the Sludge Drying Beds, located northwest of the tanks. The operation of this system has been working well; however from a water conservation perspective, the treated water is wasted and cannot be retrieved or recycled once it enters the drying beds. As water becomes scarcer in the State of California, conservation of water plays an even more important role in the operation of the WTP. In order to retain this water on site, the City should consider reconfiguring the tank overflow piping to discharge into the adjacent storage basin, where currently the sedimentation basin overflow and storage tank stormwater is pumped to.

It is recommended that the water collected in the storage basin from these three sources be pumped to the headworks of the WTP, into the influent channel. The storage tank drainage pump discharges into the southeast corner of the storage basin. As indicated above, it is proposed that the tank overflow piping discharge into the southeast corner as well. The sedimentation basin overflow is located in the northwest corner of the storage basin. Based on visual observations and discussions with plant staff, it appears that the storage basin is sloped to the southeast corner, where a sump is located.

Due to the WTP currently not having control over the influent flow of raw water into the WTP (controlled by NID) there are instances where the sedimentation basin will overflow and this water is wasted (or may be recycled at additional pumping expense in the future). Due to the fact that the amount of overflow cannot be controlled, recycling the water in the storage basin is important in conserving water conveyed from the NID system, and purchased from NID, in addition to reclaiming other drain or overflow volumes.

In order to convey water from the storage basin to the WTP headworks, a submersible pumping system is recommended to be constructed. It is unknown how much water will be collected in the basin; however at this time a portable submersible pump with flexible discharge piping is recommended. The piping is expected to be on the surface, alongside the storage basin, and discharge into the influent channel.

Electrical/SCADA. An evaluation of the existing WTP electrical and plant SCADA system was completed and a series of deficiencies were identified. To address these deficiencies identified below, recommendations are presented to improve the overall operation of the WTP.

1. The existing emergency generator has been operating well; however regular maintenance by WTP plant staff requires use of their time, which can be used elsewhere at the WTP. A regular generator maintenance program would be developed to include all City of Grass Valley generators. It is recommended that this maintenance be accomplished by a specialty contractor.

2. Many of the water quality parameters recorded at the WTP are done so with chart recorders, which can be inaccurate and inefficient. As well, the data is difficult to trend and requires more time to do so. It is recommended that paperless recorders be installed to replace the existing paper chart recorders. These new recorders would be tied in to the PLC and have the capability of being trended.

3. The filtration system is equipped with a program that controls the operation of the filters, with relation to backwashing, air scouring and controlling the operation of the influent and effluent valves. Although this program has worked as intended it requires a significant use of time by operations to monitor and control the filters. The filter control program should be upgraded.

4. The operator interface currently allows WTP operations staff to view the WTP's operation remotely; however does not provide full control remotely. This includes alarms which can be viewed, but not turned off. This can require a significant use of operator time, especially during on-call hours during the night. The operator interface should be upgraded to provide remote access and control of the WTP's systems. A Remote Desktop Connection (RDP) would be installed in the plant's operator system.

5. The existing 208 volt delta transformer may be at, or approaching its capacity. An evaluation of the plant loads versus the future loads shall be performed to determine if the existing transformer is capable of providing the necessary power to all WTP equipment. Based on this evaluation, an additional transformer may be required, or a full replacement of the transformer may be advised.

6. It was previously identified that the existing storage tank drainage submersible pumps do not have sufficient capacity to keep up with incoming flows during storm events. The existing pumps are supplied by a 120V cable from the WTP electrical room, which may restrict the size of the pumps capable of being installed. It is recommended that a 240V cable be run from the WTP electrical room to the storage tank area. The City may also wish to tie the new pumps into the SCADA system. Upgrading the electrical supply to accommodate changes to the storm water pumping system in the storage tank area would be a significant undertaking itself, which must be reflected in the assessment of project cost and prioritization.

5.3 PRIORITY PHASING OF IMPROVEMENTS

The improvements identified in Section 5.2 provide a number of upgrades that have been determined by the City and Stantec as necessary to improve the efficiency of the WTP; however not all of the improvements are considered priority items. Priority improvements are upgrades that are required if they meet any of the following criteria:

- Any upgrades to meet new and existing Division of Drinking Water and EPA standards
- Any upgrades required to meet City's projected water demands
- Replacement of existing equipment that is deteriorating or which continuously requires maintenance
- Upgrades that will improve the efficiency of the system, such as replacing the existing paper recorders with digital recorders
- Upgrades required to improve the safety of the operations staff at the WTP

Current plant water quality does meet existing treatment standards, and plant capacity is sufficient to meet the City's projected water demands. No projects were selected based on those two criteria. The list below presents recommended improvements, along with the urgency to complete the improvement. Improvements that are not listed as priority are items that may still be required to improve the efficiency of the plant and reduce or eliminate certain labor intensive tasks currently performed by WTP operations staff, such as jar sampling of raw water.

Higher Priority Improvements

- Streaming current monitor
- Repair existing catwalk between flocculation and sedimentation basins
- Drain sedimentation basin and inspect concrete floor
- Inspect filter basin underdrains, overflow wash troughs, concrete walls
- Repair filter basin concrete walls
- Replace filter media
- Inspect plant water supply system and replace/upgrade if required
- Determine plant water supply capacity for irrigation and plant use to determine if system is sufficient to serve all current needs
- Relocate sodium hypochlorite storage tank closer to filters and replace, if necessary
- Repair storage tank control valve damaged by flooding
- Address drainage issues around storage tanks
- Eliminate paper chart recorders with paperless recorders
- Continue ongoing generator maintenance program
- Evaluate the existing and future loading on the WTP to determine the necessary transformer sizing, and if upsizing is warranted, confirm emergency generator remains sufficient

Lower Priority or Maintenance Improvements

- Install a flow control valve on raw water line from Alta Hill Reservoir (This is not an improvement solely within the discretion or control of the City as NID supplies raw water via their facilities)
- Replace horizontal flocculators with vertical flocculators
- Install a sunshade structure above chemical storage tanks
- Redirect storage tank overflow to the old storage basin

- Pump the water accumulated in the old storage basin to the influent channel of the WTP
- Provide SCADA/Operator interface improvements to allow remote access and control of the WTP systems
- Upgrade power supply to the storage tank area with 240V cable

5.4 OPINION OF CAPITAL COSTS

Planning level costs for the improvements discussed in this section are included below in **Table 5-8**. All costs included are based on the Engineering News Record Construction Cost Index of 10,037. The estimates include a 30-percent contingency and a 25-percent allowance for engineering, administration and legal fees. Additional cost details are included in **Appendix A**.

Table 5-8 Proposed Improvements [a]

Project No.	Project Description	Cost (rounded)
1	Install streaming current monitor in influent channel [b]	$60,000
2	Install flow control valve on raw water influent line	$140,000
3	Replace Flocculator Paddles	$550,000
4	Replace catwalks between flocculation and sedimentation basins	$480,000
5	Repair cracks in sedimentation basin	$200,000
6	Replace filter media (sand, anthracite, and gravel drain), and repair filter basin walls	$230,000
7	Replace filter underdrain and overflow troughs (potential future project – requires inspection of existing facilities)	$350,000
8	Upgrade plant water system – pumps, hydropneumatic tank, etc. (potential future project – requires inspection of existing facilities)	$590,000
9	Replace sodium hypochlorite tank	$100,000
10	Install sunshade structure over chemical storage tanks	$200,000
11	Stormwater sump improvements at treated water storage tanks	$200,000
12	Water recycle pumps in storage basin	$280,000
13	Ongoing generator maintenance program [c]	$40,000
14	Install paperless recorders to replace chart recorders	$130,000
15	Upgrade plant SCADA system	$240,000
	Total	**$3,790,000**

(a) ENR CCI = 10037, July 2015.

(b) Installation of a flow control valve on the raw water line is not an improvement solely within the discretion of the City; NID supplies the raw water via their facilities.

(c) This is an ongoing maintenance program performed by a third party. Project cost reflects annual cost.

5.5 ASSET MANAGEMENT

In addition to the accounting of existing WTP facilities, equipment and instrumentation presented here, Stantec has gathered information on these assets and input them into a Microsoft Excel spreadsheet. System components were tagged in coordination with City operations staff. This information has since been uploaded into the NexGen Utility Management Asset Management software.

6.0 RECOMMENDATIONS

6.1 PURPOSE

The purpose of this chapter is to summarize the recommendations for system improvements to mitigate hydraulic capacity and condition deficiencies identified in Chapters 4 and 5 of this Master Plan report. This chapter also includes planning level cost estimates for projects needed to serve new development and address system deficiencies.

6.2 DISTRIBUTION SYSTEM DEFICIENCIES

As described in Chapter 4, there are a number of improvements that should be made to address deficiencies identified based on the results of computer model simulations of the City's water distribution system. These are summarized **Table 6-1** along with the estimated cost of implementation. **Table 6-1** also includes projects identified previously by the City, but not yet completed. **Table 6-1** also identifies projects which involve a component of additional system capacity. Additional cost details are included in **Appendix A**.

Table 6-1 Opinions of Capital Cost to Address Distribution System Deficiencies

Label	Location	Description	Additional Capacity	Total Base Project Costs (a)
CIP-001	East Main St	Replace 350 LF of 4" CIP with 6" C900 on East Main Street between Murphy Street and Eureka Street. Install 520 lf of new 6-inch pipeline to complete loop at East Main and Eureka. Replace existing hydrant with new hydrant.	X	$260,000
CIP-002	Cherry Ln	Replace approximately 200 Lf of dead end 2" steel line on Cherry Lane.		$80,000
CIP-003	Depot St	Replace 113 LF of 2" and 4" water main with an 8" water main on Depot Street east of Kidder (Biggs?) Street to the intersection of Kidder (Biggs?) Street and Depot Street. Extend 140 LF of 2" water line to west end of Depot Street, and install 8 services. Connect two parcels on Lincoln to water line on Colfax Ave.	X	$140,000
CIP-004	Florence Ave	Replace 1-1/2" steel with 2" pvc approximately 240 feet on Florence Avenue. No hydrant, replace 3 services.	X	$80,000

Label	Location	Description	Additional Capacity	Total Base Project Costs [(a)]
CIP-006	Grey Ave	Abandon 2" steel line on Grey Avenue, and construct 4 new services with meters off of Le Duc.		$30,000
CIP-007	Kendall St	Eliminate dead end system on Kendall Street, east of Memorial Park. Project requires trenching through park.		$210,000
CIP-008	Kidder Ave	Replace 353 LF of 4" CIP along Kidder Avenue from Bennett Street to Maryland Drive. Tie in to 6" CIP at Kidder and Bennett and tie in to 6" at intersection of Kidder and Maryland Drive		$130,000
CIP-009	Linden Ave	Replace 2" steel line with 8" line in Linden Street west of Alta	X	$230,000
CIP-010	Valley View	Replace 350 LF of 2" steel on Valley View. Tie in to 12" DIP at intersection of Valley View and Maryland Drive.		$230,000
CIP-011	Maryland Dr.	Replace 590 LF of 1-1/2" steel pipe replace with 6" pipe along Maryland Drive, north of Valley View.	X	$250,000
CIP-012	N. Church	Replace 4" CIP with 6" C900 on North Church Street between Richardson Street and Doris Drive. On the south end of North Church Street, tie into new 6" line installed by Habitat for Humanity. On the north end, tie into existing 6" line at the intersection of North Church Street and Doris Drive.	X	$250,000
CIP-013	Temby St	Replace 2" steel with 6" on Temby Street. Connect to 8" CIP at Intersection of Temby and Pleasant. At the other end, connect to 6" at Temby and Columbia.	X	$160,000
CIP-014	Wood St	Reroute existing line so that new alignment goes from Wood Street, through private property, to N. Auburn. Service 2 residences with new services from Chester Street.		$90,000

Label	Location	Description	Additional Capacity	Total Base Project Costs (a)
CIP-015	McKnight Wy	Install new pipelines to increase Fire flow at McKnight Way (~550 lf, 12-inch pipe, crossing Highway 49 at McKnight Way; ~700 lf, 12-inch pipe, connecting Freeman Lane main to McKnight Way; ~1,650 lf, 12-inch pipe, connecting main along Allison Ranch Road to Freeman Lane)	X	$1,100,000
CIP-017	Stacy Ln	Pipe upgrades at the dead end section of Stacy Ln from 4-inch to 8-inch (~700 lf of 8-inch pipe, including replacement of ~700 lf of 4-inch pipe)	X	$300,000
CIP-018	Broadview Heights	Install new booster pump and check valves		$260,000
			Distribution System Total	**$3,900,000**
EMP-001	Empire Tank	Rehabilitate Empire Tank coating systems		$1,060,000
EMP-002	Empire Tank	Remove and waste existing booster pumps		$10,000
EMP-003	Empire Tank	Piping upgrades to allow new pumps to be installed with reverse discharge		$40,000
EMP-004	Empire Tank	Install flow control valve on new pump discharge		$20,000
EMP-005	Empire Tank	Install new booster pumps		$260,000
EMP-006	Empire Tank	Upsize downstream main (940 lf 12-inch; 130 lf 6-inch)	X	$270,000
EMP-007	Empire Court	Install new booster pump for Empire Court area		$260,000
EMP-008	Empire Court	Booster pump check valves (2, 12-inch; 3, 6-inch)		$110,000
			Empire tank Total	**$2,030,000**

(a) ENR CCI = 10037, July 2015; All Costs have been rounded to the nearest $10,000

6.3 WATER TREATMENT PLANT DEFICIENCIES

The improvements identified in Chapter 5 to address deficiencies at the City's WTP are summarized in **Table 6-2**. As with distribution system improvements, the water treatment plant improvements summarized in **Table 6-2** present planning level estimates for the cost of each project. Additional cost details are included in **Appendix A**.

Table 6-2 Opinions of Capital Cost to Address WTP Deficiencies

Label	Description	Total Base Project Costs [(a)]
WTP-001	Install streaming current monitor in influent channel [(b)]	$60,000
WTP-002	Install flow control valve on raw water influent line	$140,000
WTP-003	Replace Flocculator Paddles	$550,000
WTP-004	Replace catwalks between flocculation and sedimentation basins	$480,000
WTP-005	Repair cracks in sedimentation basin	$200,000
WTP-006	Replace filter media (sand, anthracite, and gravel drain), and repair filter basin walls	$230,000
WTP-007	Replace filter underdrain and overflow troughs (potential future project – requires inspection of existing facilities)	$350,000
WTP-008	Upgrade plant water system – pumps, hydropneumatic tank, etc. (potential future project – requires inspection of existing facilities)	$590,000
WTP-009	Replace sodium hypochlorite tank	$100,000
WTP-010	Install sunshade structure over chemical storage tanks	$200,000
WTP-011	Stormwater sump improvements at treated water storage tanks	$200,000
WTP-012	Water recycle pumps in storage basin	$280,000
WTP-013	Ongoing Generator maintenance program [(c)]	$40,000
WTP-014	Install paperless recorders to replace chart recorders	$130,000
WTP-015	Upgrade plant SCADA system	$240,000
	Water Treatment Plant Total	**$3,790,000**

(a) ENR CCI = 10037, July 2015; All Costs have been rounded to the nearest $10,000

(b) Installation of a flow control valve on the raw water line is not an improvement solely within the discretion of the City; NID supplies the raw water via their facilities.

(c) This is an ongoing maintenance program performed by a third party. The total base project cost reflects the annual costs for this program.

6.4 IMPROVEMENT PROGRAM

The improvements summarized in **Tables 6-1** and **6-2** form the foundation of an Improvement Program intended to address system deficiencies as well as place the City in a position to be able to serve future development which may occur within their water system service area.

The improvement projects identified in **Tables 6-1** and **6-2** do not include repair and replacement (R&R) of City facilities. A robust R&R program is a key element of any properly managed public infrastructure system. The City's R&R program for the water utility includes an annual expenditure for the replacement of older, aging infrastructure. To replace all of the facilities in the City's water enterprise would require a significant sum of money. The annual R&R allocation is intended to reduce the impact of repairing and replacing critical portions of the City's potable water system by stretching them out over time.

As a result, to ensure the elements of these systems that are in place today remain in service, the City has elected to fund their R&R program sufficiently to allow replacement of all distribution system mechanical components (valves, pumps and appurtenances) on a schedule which is consistent with industry standard expectations for service life. Similarly, water treatment plant components are identified for replacement at regular intervals based on industry standards applicable to each component. In addition, the City is budgeting for replacement of all pipelines and storage tanks with a goal of a 75 year service life. At a minimum the City does not wish to rely on any water distribution or storage infrastructure older than 100 years of age.

There are just over 500 hundred control, diversion and isolation valves within the City's distribution and storage system. Unlike pipelines and storage tanks, valves do include a mechanical and in some cases electrical component. This added complexity contributes to potentially lower anticipated service lives than for pipelines and/or storage assets. The City currently expects to replace the valves in their system on an ongoing basis with the goal of maintaining an average service life of 25 years. A further goal for the City is to achieve a reasonable, allowable level of standardization around preferred manufacturers of valves and system components to streamline maintenance and service. This has the benefit of allowing operations staff to maintain fewer, more interchangeable spare parts and reduce the number of vendors whom the City must coordinate with when repair is deemed preferable to replacement.

As such, the City R&R program for the treated water distribution system is based on a goal of 75 year service life and a requirement that no infrastructure be in place which is 100 years old, or older. This should allow the City sufficient flexibility within its Water enterprise fund to affect replacement of critical and aging infrastructure without adopting system replacement requirements which would adversely affect revenues, fund reserves or user charges in any given fiscal year. The City's long-term financial planning for this fund should allow any potential concerns with revenue and expenditure balances to be identified at least five (5) years in advance and corrective actions taken in their R&R planning.

Many of the City's existing water system assets date from the 1920's through the 1940's. Those older assets also include some materials of construction which are no longer industry standard, such as asbestos cement and cast iron pipe (referred to as ACP and CIP respectively). At this time, the City is planning to budget approximately $300,000 annually for repair and replacement of system assets.

Prioritization of R&R projects for any given fiscal year will take into consideration the age of assets and emphasize the replacement of ACP and CIP assets in particular. However no mandate is included in the City's financial planning to replace ACP and CIP assets by a date certain.

APPENDICES

Appendix A OPINIONS OF CAPITAL COSTS FOR IMPROVEMENT PROJECTS

Opinions of Capital Cost to Address Distribution System Deficiencies

LABEL	LOCATION	DESCRIPTION	Additional Capacity	TOTAL BASE PROJECT COSTS [a]
Distribution System Projects				
CIP-001	East Main St	Replace 350 LF of 4" CIP with 6" C900 on East Main Street between Murphy Street and Eureka Street. Install 520 lf of new 6-inch pipeline to complete loop at East Main and Eureka. Replace existing hydrant with new hydrant.	x	$260,000
CIP-002	Cherry Ln	Replace approximately 200 Lf of dead end 2" steel line on Cherry Lane.		$80,000
CIP-003	Depot St	Replace 113 LF of 2" and 4" water main with an 8" water main on Depot Street east of Kidder Street to the intersection of Kidder Street and Depot Street. Extend 140 LF of 2" water line to west end of Depot Street, and install 8 services. Connect two parcels on Lincoln to water line in Colfax.	x	$140,000
CIP-004	Florence Ave	Replace 1-1/2" steel with 2" pvc approximately 240 feet on Florence Avenue. No hydrant, replace 3 services.	x	$80,000
CIP-006	Grey Ave	Abandon 2" steel line on Grey Avenue, and construct 4 new services with meters off of Le Duc.		$30,000
CIP-007	Kendall St	Eliminate dead end system on Kendall Street, east of Memorial Park. Project requires trenching through park.		$210,000
CIP-008	Kidder Ave	Replace 353 LF of 4" CIP along Kidder Avenue from Bennett Street to Maryland Drive. Tie in to 6" CIP at Kidder and Bennett and tie in to 6" at intersection of Kidder and Maryland Drive		$130,000
CIP-009	Linden Ave	Replace 2" steel line with 8" line in Linden Street west of Alta	x	$230,000
CIP-010	Valley View	Replace 350 LF of 2" steel on Valley View. Tie in to 12" DIP at intersection of Valley View and Maryland Drive.		$230,000
CIP-011	Maryland Dr	Replace 590 LF of 1-1/2" steel pipe replace with 6" pipe along Maryland Drive, north of Valley View.	x	$250,000
CIP-012	N. Church	Replace 4" CIP with 6" C900 on North Church Street between Richardson Street and Dorris Drive. On the south end of North Church Street, tie into new 6" line installed by Habitat for Humanity. On the north end , tie into existing 6" line at the intersection of North Church Street and Doris Drive.	x	$250,000
CIP-013	Temby St	Replace 2" steel with 6" on Temby Street. Connect to 8" CIP at Intersection of Temby and Pleasant. At the other end, connect to 6" at Temby and Columbia.	x	$160,000
CIP-014	Wood St	Reroute existing line so that new alignment goes from Wood Street, through private property, to N. Auburn. Service 2 residences with new services from Chester Street.		$90,000
CIP-015	McKnight Wy	Install new pipelines to increase Fire flow at McKnight Way (~550 lf, 12-inch pipe, crossing Highway 49 at McKnight Way; ~700 lf, 12-inch pipe, connecting Freeman Lane main to McKnight Way; ~1,650 lf, 12-inch pipe, connecting main along Allison Ranch Road to Freeman Lane)	x	$1,100,000
CIP-016	Cornwall	Install ~420 lf of new 6-inch pipeline to complete loop at Cornwall cul de sac		$100,000

Opinions of Capital Cost to Address Distribution System Deficiencies

LABEL	LOCATION	DESCRIPTION	Additional Capacity	TOTAL BASE PROJECT COSTS [(a)]
CIP-017	Stacy Ln	Pipe upgrades at the dead end section of Stacy Ln from 4-inch to 8-inch (~700 lf of 8-inch pipe, including replacement of ~700 lf of 4-inch pipe)	x	$300,000
CIP-018	Broadview Heights	Instsall new booster pump and check valves		$260,000
		Subtotal:		**$3,900,000**
		Empire Tank & Empire Court		
EMP-001	Empire Tank	Rehabilitate Empire Tank coating systems		$1,060,000
EMP-002	Empire Tank	Remove and waste existing booster pumps		$10,000
EMP-003	Empire Tank	Piping upgrades to allow new pumps to be installed with reverse discharge		$40,000
EMP-004	Empire Tank	Install flow control valve on new pump discharge		$20,000
EMP-005	Empire Tank	Install new booster pumps		$260,000
EMP-006	Empire Court	Upsize downstream main (940 lf 12-inch; 130 lf 6-inch)		$270,000
EMP-007	Empire Court	Install new booster pump for Empire Court area		$260,000
EMP-008	Empire Court	Booster pump check valves (2, 12-inch; 3, 6-inch)		$110,000
		Subtotal:		**$2,030,000**

Notes: (a) All costs have been rounded to the nearest 10,000. Cost basis, ENR CCI, July 2015 = 10,037

City of Grass Valley
Capital Improvement Plan

EAST MAIN

Limits: East Main Street between Murphy Street and Eureka Street

Proposed Improvement (Scope): Replace 350 LF of 4" CIP with 6" C900. Replace existing hydrant with new hydrant.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$149,047
ROCK EXCAVATION	**25%**	$37,262
TOTAL PROJECT CONSTRUCTION COSTS		$186,309
ENVIRONMENTAL MITIGATION!	**2%**	$3,726
ENGINEERING DESIGN COSTS	**20%**	$37,262
CONSTRUCTION MANAGEMENT	**15%**	$27,946
PROJECT CONSTRUCTION COSTS		$186,309
TOTAL *BASE* PROJECT COSTS		**$255,243**

Notes:

EAST MAIN

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	870	LF	$72	$62,275
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$62,275

Section 2 Valves				
2" Gate Valve		EA	$100	$0
4" Gate Valve		EA	$1,016	$0
6" Gate Valve	1	EA	$1,792	$1,792
8" Gate Valve		EA	$2,664	$0
10" Gate Valve		EA	$3,159	$0
12" Gate Valve		EA	$3,656	$0
12" Butterfly Valve		EA	$2,742	$0
1" Air Release Valve		EA	$2,845	$0
2" Blow Off Assembly		EA	$2,391	$0
			Subtotal Valves	$1,792

Section 3 Fire Hydrants				
Fire Hydrant	1	EA	$5,341	$5,341
			Subtotal Fire Hydrants	$5,341

Section 4 Water Services				
3/4" Residential Service	5	EA	$2,508	$12,540
1" Residential Service		EA	$2,508	$0
1 1/2" Residential Service		EA	$2,508	$0
Commercial Service		EA	$2,508	$0
Reconnect Service		EA	$1,200	$0
Directional Drill Service Line		LF	$200	$0
			Subtotal Water Services	$12,540

EAST MAIN

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	1	EA	$3,686	$3,686
8" Line		EA	$3,963	$0
10" Line		EA	$4,965	$0
		Subtotal Tie-In/Connect to Ex		$3,686

Section 6 Pavement/Curb & Gutter	Quantity	Unit	Unit Price	Item Cost
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$12	$0
Curb & Gutter Removal		LF	$50	$0
Asphalt Pavement w/ Base	1,330	SF	$9	$12,413
Concrete Pavement w/ Base		SF	$11	$0
Concrete Curb & Gutter		LF	$75	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & G		$12,413
		TOTAL SECTION 1 thru		$98,047.30

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 98,047	x	(7.6%)	=	$8,000
			TOTAL MINOR ITEMS		$8,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 106,047	x	(3.0%)	=	$4,000
			TOTAL TRAFFIC CONTROL		$4,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 106,047	x	(10.0%)	=	$11,000
			TOTAL MOBILIZATION		$11,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 106,047	x	(5.45%)	=	$6,000
Contingencies (Subtotal Sections 1 thru 7)	$ 106,047	x	20%	=	$22,000
			TOTAL ADDITIONS		$28,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$149,047

CHERRY LANE

PROJECT DESCRIPTION:

Limits: Approximately 200 Lf of Cherry Lane

Proposed Improvement (Scope): Replace approximately 200 Lf of dead end 2" steel line.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$46,822
ROCK EXCAVATION	**25%**	$11,706
TOTAL PROJECT CONSTRUCTION COSTS		$58,528
ENVIRONMENTAL MITIGATION!	**2%**	$1,171
ENGINEERING DESIGN COSTS	**20%**	$11,706
CONSTRUCTION MANAGEMENT	**15%**	$8,779
PROJECT CONSTRUCTION COSTS		$58,528
TOTAL *BASE* PROJECT COSTS		**$80,183**

Notes:

CHERRY LANE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit		Unit Price	Item Cost
2" PVC Pipe	200	LF		$50	$10,000
4" C900 Pipe		LF		$65	
6" C900 Pipe		LF		$72	
8" C900 Pipe		LF		$75	
10" C900 Pipe		LF		$112	
12" C900 Pipe		LF		$135	
Directional Drill 4" Line		LF		$190	
Directional Drill 6" Line		LF		$200	
Pressure Test Line/Disinfect		LF		$2	
				Subtotal Piping	$10,000
Section 2 Valves					
2" Gate Valve	2	EA		$100	$200
4" Gate Valve		EA		$1,016	$0
6" Gate Valve		EA		$1,792	$0
8" Gate Valve		EA		$2,664	$0
10" Gate Valve		EA		$3,159	$0
12" Gate Valve		EA		$3,656	$0
12" Butterfly Valve		EA		$2,742	$0
1" Air Release Valve		EA		$2,845	$0
2" Blow Off Assembly	1	EA		$2,391	$2,391
				Subtotal Valves	$2,591
Section 3 Fire Hydrants					
Fire Hydrant		EA		$5,341	$0
				Subtotal Fire Hydrants	$0
Section 4 Water Services					
3/4" Residential Service		EA		$2,508	$0
1" Residential Service		EA		$2,508	$0
1 1/2" Residential Service		EA		$2,508	$0
Commercial Service		EA		$2,508	$0
Reconnect Service	2	EA	550	$1,200	$2,400
Directional Drill Service Line		LF	550	$200	$0
				Subtotal Water Services	$2,400

CHERRY LANE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	
8" Line	2	EA	$3,963	$7,925
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,925

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	740	SF	$9	$6,907
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$6,907
		TOTAL SECTION 1 thru 6		$29,822

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 29,822	x	(7.6%)	=	$3,000
				TOTAL MINOR ITEMS	$3,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 32,822	x	(3.0%)	=	$1,000
				TOTAL TRAFFIC CONTROL	$1,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 32,822	x	(10.0%)	=	$4,000
				TOTAL MOBILIZATION	$4,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 32,822	x	(5.45%)	=	$2,000
Contingencies (Subtotal Sections 1 thru 7)	$ 32,822	x	20%	=	$7,000
				TOTAL ADDITIONS	$9,000
				TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)	$46,822

DEPOT STREET

PROJECT DESCRIPTION:

Limits: Depot Street from east of Biggs Street to west end

Proposed Improvement (Scope): Replace 113 LF of 2" and 4" water main with an 8" water main. Extend 140 LF of 2" water line to west end of Depot Street, and install 8 services. Connect two parcels on Lincoln to water line in Colfax.

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$79,961
ROCK EXCAVATION	**25%**	$19,990
TOTAL PROJECT CONSTRUCTION COSTS		$99,952
ENVIRONMENTAL MITIGATION!	**2%**	$1,999
ENGINEERING DESIGN COSTS	**20%**	$19,990
CONSTRUCTION MANAGEMENT	**15%**	$14,993
PROJECT CONSTRUCTION COSTS		$99,952
TOTAL *BASE* PROJECT COSTS		**$136,934**

Notes:

DEPOT STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe	140	LF	$50	$7,000
4" C900 Pipe		LF	$65	
6" C900 Pipe		LF	$72	
8" C900 Pipe	113	LF	$75	$8,494
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$15,494

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve		EA	$1,792	
8" Gate Valve	2	EA	$2,664	$5,328
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly	1	EA	$2,391	$2,391
			Subtotal Valves	$7,719

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service		EA	$2,508	
1" Residential Service	8	EA	$2,508	$20,063
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$20,063

DEPOT STREET

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	
8" Line	1	EA	$3,963	$3,963
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Exis		$3,963

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	506	SF	$9	$4,723
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gut		$4,723
		TOTAL SECTION 1 thru 6		$51,961

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 51,961	x	(7.6%)	=	$4,000
			TOTAL MINOR ITEMS		$4,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 55,961	x	(3.0%)	=	$2,000
			TOTAL TRAFFIC CONTROL		$2,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 55,961	x	(10.0%)	=	$6,000
			TOTAL MOBILIZATION		$6,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 55,961	x	(5.45%)	=	$4,000
Contingencies (Subtotal Sections 1 thru 7)	$ 55,961	x	20%	=	$12,000
			TOTAL ADDITIONS		$16,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$79,961

FLORENCE AVENUE

PROJECT DESCRIPTION:

Limits:

Florence Avenue

Proposed Improvement (Scope):

Replace 1-1/2" steel with 2" pvc approximately 240 feet. No hydrant, replace 3 services.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$49,053
ROCK EXCAVATION	**25%**	$12,263
TOTAL PROJECT CONSTRUCTION COSTS		$61,316
ENVIRONMENTAL MITIGATION!	**2%**	$1,226
ENGINEERING DESIGN COSTS	**20%**	$12,263
CONSTRUCTION MANAGEMENT	**15.0%**	$9,197
PROJECT CONSTRUCTION COSTS		$61,316
TOTAL *BASE* PROJECT COSTS		**$84,003**

Notes:

FLORENCE AVENUE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe	240	LF	$50	$12,000
4" C900 Pipe		LF	$65	$0
6" C900 Pipe		LF	$72	$0
8" C900 Pipe		LF	$75	$0
10" C900 Pipe		LF	$112	$0
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$12,000

Section 2 Valves				
2" Gate Valve	1	EA	$100	$100
4" Gate Valve		EA	$1,016	$0
6" Gate Valve		EA	$1,792	$0
8" Gate Valve		EA	$2,664	$0
10" Gate Valve		EA	$3,159	$0
12" Gate Valve		EA	$3,656	$0
12" Butterfly Valve		EA	$2,742	$0
1" Air Release Valve		EA	$2,845	$0
2" Blow Off Assembly		EA	$2,391	$0
			Subtotal Valves	$100

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	$0
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	3	EA	$2,508	$7,524
1" Residential Service		EA	$2,508	$0
1 1/2" Residential Service		EA	$2,508	$0
Commercial Service		EA	$2,508	$0
Reconnect Service		EA	$1,200	$0
Directional Drill Service Line		LF	$200	$0
			Subtotal Water Services	$7,524

FLORENCE AVENUE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	$0
8" Line	1	EA	$3,963	$3,963
10" Line		EA	$4,965	$0
		Subtotal Tie-In/Connect to Existing		$3,963

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$12	$0
Curb & Gutter Removal		LF	$50	$0
Asphalt Pavement w/ Base	800	SF	$9	$7,467
Concrete Pavement w/ Base		SF	$11	$0
Concrete Curb & Gutter		LF	$75	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & Gutter		$7,467
		TOTAL SECTION 1 thru 6		$31,052.89

Section 7 Minor Items						
	(Subtotal Sections 1 thru 6)	$ 31,053	x	(7.6%)	=	$3,000
				TOTAL MINOR ITEMS		$3,000
Section 8 Traffic Control						
	(Subtotal Sections 1 thru 7)	$ 34,053	x	(3.0%)	=	$2,000
				TOTAL TRAFFIC CONTROL		$2,000
Section 9 Mobilization						
	(Subtotal Sections 1 thru 7)	$ 34,053	x	(10.0%)	=	$4,000
				TOTAL MOBILIZATION		$4,000
Section 10 Additions						
	Supplemental Work (Subtotal Sections 1 thru 7)	$ 34,053	x	(5.45%)	=	$2,000
	Contingencies (Subtotal Sections 1 thru 7)	$ 34,053	x	20%	=	$7,000
				TOTAL ADDITIONS		$9,000
				TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$49,053

GREY AVENUE

PROJECT DESCRIPTION:

Limits: GREY AVENUE

Proposed Improvement (Scope): Abandon 2" steel line, and construct 4 new services with meters off of Le Duc.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$18,032
ROCK EXCAVATION	**25%**	$4,508
TOTAL PROJECT CONSTRUCTION COSTS		$22,540
ENVIRONMENTAL MITIGATION!	**2%**	$451
ENGINEERING DESIGN COSTS	**20%**	$4,508
CONSTRUCTION MANAGEMENT	**15.0%**	$3,381
PROJECT CONSTRUCTION COSTS		$22,540
TOTAL *BASE* PROJECT COSTS		**$30,879**

Notes:

GREY AVENUE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe		LF	$72	
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$0

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve		EA	$1,792	
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$0

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	4	EA	$2,508	$10,032
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$10,032

GREY AVENUE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	$0
8" Line		EA	$3,963	$0
10" Line		EA	$4,965	$0
		Subtotal Tie-In/Connect to Existing		$0

Section 6 Pavement/Curb & Gutter	Quantity	Unit	Unit Price	Item Cost
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$12	$0
Curb & Gutter Removal		LF	$50	$0
Asphalt Pavement w/ Base		SF	$9	$0
Concrete Pavement w/ Base		SF	$11	$0
Concrete Curb & Gutter		LF	$75	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & Gutter		$0
		TOTAL SECTION 1 thru 6		$10,031.64

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 10,032	x	(7.6%)	=	$1,000
			TOTAL MINOR ITEMS		$1,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 11,032	x	(3.0%)	=	$1,000
			TOTAL TRAFFIC CONTROL		$1,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 11,032	x	(10.0%)	=	$2,000
			TOTAL MOBILIZATION		$2,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 11,032	x	(5.45%)	=	$1,000
Contingencies (Subtotal Sections 1 thru 7)	$ 11,032	x	20%	=	$3,000
			TOTAL ADDITIONS		$4,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$18,032

KENDALL STREET

PROJECT DESCRIPTION:

Limits: Kendall Loop

Proposed Improvement (Scope): Eliminate dead end system, east of Memorial Park. Project requires trenching through park.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$121,009
ROCK EXCAVATION	**25%**	$30,252
TOTAL PROJECT CONSTRUCTION COSTS		$151,261
ENVIRONMENTAL MITIGATIONS	**2%**	$3,025
ENGINEERING DESIGN COSTS	**20%**	$30,252
CONSTRUCTION MANAGEMENT	**15%**	$22,689
PROJECT CONSTRUCTION COSTS		$151,261
TOTAL *BASE* PROJECT COSTS		**$207,228**

Notes:

KENDALL STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	$0
4" C900 Pipe		LF	$65	$0
6" C900 Pipe	625	LF	$72	$44,738
8" C900 Pipe		LF	$75	$0
10" C900 Pipe		LF	$112	$0
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$44,738

Section 2 Valves				
2" Gate Valve		EA	$100	$0
4" Gate Valve		EA	$1,016	$0
6" Gate Valve	1	EA	$1,792	$1,792
8" Gate Valve	1	EA	$2,664	$2,664
10" Gate Valve		EA	$3,159	$0
12" Gate Valve		EA	$3,656	$0
12" Butterfly Valve		EA	$2,742	$0
1" Air Release Valve		EA	$2,845	$0
2" Blow Off Assembly		EA	$2,391	$0
			Subtotal Valves	$4,456

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	$0
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service		EA	$2,508	$0
1" Residential Service		EA	$2,508	$0
1 1/2" Residential Service		EA	$2,508	$0
Commercial Service		EA	$2,508	$0
Reconnect Service		EA	$1,200	$0
Directional Drill Service Line		LF	$200	$0
			Subtotal Water Services	$0

KENDALL STREET

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	1	EA	$3,686	$3,686
8" Line	1	EA	$3,963	$3,963
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,648

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$12	$0
Curb & Gutter Removal		LF	$50	$0
Asphalt Pavement w/ Base	2,375	SF	$9	$22,167
Concrete Pavement w/ Base		SF	$11	$0
Concrete Curb & Gutter		LF	$75	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & Gutter		$22,167
		TOTAL SECTION 1 thru 6		$79,009.06

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 79,009	x	(7.6%)	=	$7,000
			TOTAL MINOR ITEMS		$7,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 86,009	x	(3.0%)	=	$3,000
			TOTAL TRAFFIC CONTROL		$3,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 86,009	x	(10.0%)	=	$9,000
			TOTAL MOBILIZATION		$9,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 86,009	x	(5.45%)	=	$5,000
Contingencies (Subtotal Sections 1 thru 7)	$ 86,009	x	20%	=	$18,000
			TOTAL ADDITIONS		$23,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$121,009

KIDDER AVENUE

PROJECT DESCRIPTION:

Limits: Kidder from Bennett to Maryland Drive

Proposed Improvement (Scope): Replace 353 LF of 4" CIP along Kidder. Tie in to 6" CIP at Kidder and Bennett and tie in to 6" at intersection of Kidder and Maryland Drive

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$76,776
ROCK EXCAVATION	**25%**	$19,194
TOTAL PROJECT CONSTRUCTION COSTS		$95,970
ENVIRONMENTAL MITIGATION!	**2%**	$1,919
ENGINEERING DESIGN COSTS	**20%**	$19,194
CONSTRUCTION MANAGEMENT	**15%**	$14,396
PROJECT CONSTRUCTION COSTS		$95,970
TOTAL *BASE* PROJECT COSTS		**$131,479**

Notes:

KIDDER AVENUE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	353	LF	$72	$25,268
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$25,268

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	1	EA	$1,792	$1,792
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$1,792

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	3	EA	$2,508	$7,524
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$7,524

KIDDER AVENUE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	1	EA	$3,686	$3,686
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$3,686

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	1,340	SF	$9	$12,507
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$12,507
		TOTAL SECTION 1 thru 6		$50,776.16

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 50,776	x	(7.6%)	=	$4,000
			TOTAL MINOR ITEMS		$4,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 54,776	x	(3.0%)	=	$2,000
			TOTAL TRAFFIC CONTROL		$2,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 54,776	x	(10.0%)	=	$6,000
			TOTAL MOBILIZATION		$6,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 54,776	x	(5.45%)	=	$3,000
Contingencies (Subtotal Sections 1 thru 7)	$ 54,776	x	20%	=	$11,000
			TOTAL ADDITIONS		$14,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$76,776

LINDEN AVENUE

PROJECT DESCRIPTION:

Limits: Linden Street west of Alta

Proposed Improvement (Scope): Replace 2" steel line with 6' line in Linden Street west of Alta

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$134,675
ROCK EXCAVATION	**25%**	$33,669
TOTAL PROJECT CONSTRUCTION COSTS		$168,344
ENVIRONMENTAL MITIGATION!	**2%**	$3,367
ENGINEERING DESIGN COSTS	**20%**	$33,669
CONSTRUCTION MANAGEMENT	**15.0%**	$25,252
PROJECT CONSTRUCTION COSTS		$168,344
TOTAL *BASE* PROJECT COSTS		**$230,631**

Notes:

LINDEN AVENUE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe		LF	$72	
8" C900 Pipe	440	LF	$75	$33,073
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$33,073

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	1	EA	$1,792	$1,792
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$1,792

Section 3 Fire Hydrants				
Fire Hydrant	1	EA	$5,341	$5,341
			Subtotal Fire Hydrants	$5,341

Section 4 Water Services				
3/4" Residential Service	11	EA	$2,508	$27,587
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$27,587

LINDEN AVENUE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
4" Line	1	EA	$2,456	$2,456
6" Line		EA	$3,686	
8" Line		EA	$3,963	
10" Line		EA	$4,965	
			Subtotal Tie-In/Connect to Exist	$2,456

Section 6 Pavement/Curb & Gutter	Quantity	Unit	Unit Price	Item Cost
AC Removal		SF	$12	
Sidewalk Removal		SF	$50	
Curb & Gutter Removal		LF	$0	
Asphalt Pavement w/ Base	1,675	SF	$11	$18,425
Concrete Pavement w/ Base		SF	$12	
Concrete Curb & Gutter		LF	$9	
Striping		LF	$2	
			Subtotal Pavement/Curb & Gutt	$18,425
			TOTAL SECTION 1 thru 6	$88,674.98

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 88,675	x	(7.6%)	=	$7,000
			TOTAL MINOR ITEMS		$7,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 95,675	x	(3.0%)	=	$3,000
			TOTAL TRAFFIC CONTROL		$3,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 95,675	x	(10.0%)	=	$10,000
			TOTAL MOBILIZATION		$10,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 95,675	x	(5.45%)	=	$6,000
Contingencies (Subtotal Sections 1 thru 7)	$ 95,675	x	20%	=	$20,000
			TOTAL ADDITIONS		$26,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$134,675

VALLEY VIEW

PROJECT DESCRIPTION:

Limits:

Valley View

Proposed Improvement (Scope):	Replace 350 LF of 2" steel along Valley View. Tie in to 12" DIP at intersection of Valley View and Maryland Drive.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$134,521
ROCK EXCAVATION	**25%**	$33,630
TOTAL PROJECT CONSTRUCTION COSTS		$168,151
ENVIRONMENTAL MITIGATIONS	**2%**	$3,363
ENGINEERING DESIGN COSTS	**20%**	$33,630
CONSTRUCTION MANAGEMENT	**15.0%**	$25,223
PROJECT CONSTRUCTION COSTS		$168,151
TOTAL *BASE* PROJECT COSTS		**$230,367**

Notes:

VALLEY VIEW

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe		LF	$72	
8" C900 Pipe		LF	$75	
10" C900 Pipe	350	LF	$112	$39,288
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$39,288

Section 2 Valves	Quantity	Unit	Unit Price	Item Cost
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve		EA	$1,792	
8" Gate Valve		EA	$2,664	
10" Gate Valve	1	EA	$3,159	$3,159
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$3,159

Section 3 Fire Hydrants	Quantity	Unit	Unit Price	Item Cost
Fire Hydrant		EA	$5,341	$0
			Subtotal Fire Hydrants	$0

Section 4 Water Services	Quantity	Unit	Unit Price	Item Cost
3/4" Residential Service	8	EA	$2,508	$20,063
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$20,063

VALLEY VIEW

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	
8" Line		EA	$3,963	
10" Line	1	EA	$4,965	$4,965
		Subtotal Tie-In/Connect to Exi		$4,965

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	2,255	SF	$9	$21,047
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gu		$21,047
		TOTAL SECTION 1 thru (		$88,521.15

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 88,521	x	(7.6%)	=	$7,000
	TOTAL MINOR ITEMS				$7,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 95,521	x	(3.0%)	=	$3,000
	TOTAL TRAFFIC CONTROL				$3,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 95,521	x	(10.0%)	=	$10,000
	TOTAL MOBILIZATION				$10,000
Section 10 Additions					
Supplemental Work	$ 95,521	x	(5.45%)	=	$6,000
(Subtotal Sections 1 thru 7)					
Contingencies	$ 95,521	x	20%	=	$20,000
(Subtotal Sections 1 thru 7)					
	TOTAL ADDITIONS				$26,000
	TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)				$134,521

MARYLAND DRIVE

PROJECT DESCRIPTION:

Limits:	Maryland Drive north of Valley View
Proposed Improvement (Scope):	Replace 590 LF of 1-1/2" steel pipe replace with 6" pipe along Maryland Drive, north of Valley View.

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$143,875
ROCK EXCAVATION	**25%**	$35,969
TOTAL PROJECT CONSTRUCTION COSTS		$179,844
ENVIRONMENTAL MITIGATIONS	**2%**	$3,597
ENGINEERING DESIGN COSTS	**20%**	$35,969
CONSTRUCTION MANAGEMENT	**15.0%**	$26,977
PROJECT CONSTRUCTION COSTS		$179,844
TOTAL *BASE* PROJECT COSTS		**$246,386**

Notes:

MARYLAND DRIVE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	590	LF	$72	$42,233
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$42,233

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	2	EA	$1,792	$3,585
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$3,585

Section 3 Fire Hydrants				
Fire Hydrant	1	EA	$5,341	$5,341
			Subtotal Fire Hydrants	$5,341

Section 4 Water Services				
3/4" Residential Service	10	EA	$2,508	$25,079
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$25,079

MARYLAND DRIVE

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	2	EA	$3,686	$7,371
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,371

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	1,100	SF	$9	$10,267
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$10,267
		TOTAL SECTION 1 thru 6		$93,875.31

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 93,875	x	(7.6%)	=	$8,000
				TOTAL MINOR ITEMS	$8,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 101,875	x	(3.0%)	=	$4,000
				TOTAL TRAFFIC CONTROL	$4,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 101,875	x	(10.0%)	=	$11,000
				TOTAL MOBILIZATION	$11,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 101,875	x	(5.45%)	=	$6,000
Contingencies (Subtotal Sections 1 thru 7)	$ 101,875	x	20%	=	$21,000
				TOTAL ADDITIONS	$27,000
				TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)	$143,875

N. CHURCH STREET

PROJECT DESCRIPTION:

Limits: North Church Street from Richardson to Doris Drive

Proposed Improvement (Scope): Replace 4" CIP with 6" C900. On the south end, tie into new 6" line installed by Habitat for Humanity on North Church Street. On the north end , tie into existing 6" line at the intersection of Church and Doris Drive.

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$145,047
ROCK EXCAVATION	**25%**	$36,262
TOTAL PROJECT CONSTRUCTION COSTS		$181,309
ENVIRONMENTAL MITIGATIONS	**2%**	$3,626
ENGINEERING DESIGN COSTS	**20%**	$36,262
CONSTRUCTION MANAGEMENT	**15.0%**	$27,196
PROJECT CONSTRUCTION COSTS		$181,309
TOTAL *BASE* PROJECT COSTS		**$248,393**

Notes:

N. CHURCH STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	615	LF	$72	$44,022
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$44,022

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	2	EA	$1,792	$3,585
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$3,585

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	13	EA	$2,508	$32,603
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$32,603

N. CHURCH STREET

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	2	EA	$3,686	$7,371
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,371

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	800	SF	$9	$7,467
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$7,467
		TOTAL SECTION 1 thru 6		$95,047.16

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 95,047	x	(7.6%)	=	$8,000
			TOTAL MINOR ITEMS		$8,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 103,047	x	(3.0%)	=	$4,000
			TOTAL TRAFFIC CONTROL		$4,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 103,047	x	(10.0%)	=	$11,000
			TOTAL MOBILIZATION		$11,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 103,047	x	(5.45%)	=	$6,000
Contingencies (Subtotal Sections 1 thru 7)	$ 103,047	x	20%	=	$21,000
			TOTAL ADDITIONS		$27,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$145,047

TEMBY STREET

PROJECT DESCRIPTION:

Limits: Temby street from Pleasant to Columbia

Proposed Improvement (Scope): Replace 2" steel with 6". Connect to 8" CIP at Intersection of Temby and Pleasant. At the other end, connect to 6" at Temby and Columbia.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$95,051
ROCK EXCAVATION	**25%**	$23,763
TOTAL PROJECT CONSTRUCTION COSTS		$118,813
ENVIRONMENTAL MITIGATION!	**2%**	$2,376
ENGINEERING DESIGN COSTS	**20%**	$23,763
CONSTRUCTION MANAGEMENT	**15.0%**	$17,822
PROJECT CONSTRUCTION COSTS		$118,813
TOTAL *BASE* PROJECT COSTS		**$162,774**

Notes:

TEMBY STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	360	LF	$72	$25,769
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$25,769

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	2	EA	$1,792	$3,585
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$3,585

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	5	EA	$2,508	$12,540
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$12,540

TEMBY STREET

Section 5 Tie-In/Connect to Existin	Quantity	Unit	Unit Price	Item Cost
6" Line	2	EA	$3,686	$7,371
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,371

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	1,370	SF	$9	$12,787
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$12,787
		TOTAL SECTION 1 thru 6		$62,050.79

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 62,051	x	(7.6%)	=	$5,000
			TOTAL MINOR ITEMS		$5,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 67,051	x	(3.0%)	=	$3,000
			TOTAL TRAFFIC CONTROL		$3,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 67,051	x	(10.0%)	=	$7,000
			TOTAL MOBILIZATION		$7,000
Section 10 Additions					
Supplemental Work	$ 67,051	x	(5.45%)	=	$4,000
(Subtotal Sections 1 thru 7)					
Contingencies	$ 67,051	x	20%	=	$14,000
(Subtotal Sections 1 thru 7)					
			TOTAL ADDITIONS		$18,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$95,051

WOOD STREET

PROJECT DESCRIPTION:

Limits: Wood Street from North Auburn to Richardson Street.

Proposed Improvement (Scope): Reroute existing line so that new alignment goes from Wood Street, through private property, to N. Auburn. Service 2 residences with new services from Chester Street.

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$41,721
ROCK EXCAVATION	**25%**	$10,430
TOTAL PROJECT CONSTRUCTION COSTS		$52,152
ENVIRONMENTAL MITIGATIONS	**2%**	$1,043
ENGINEERING DESIGN COSTS	**20%**	$10,430
CONSTRUCTION MANAGEMENT	**15%**	$7,823
PROJECT CONSTRUCTION COSTS		$52,152
UTILITY EASEMENT		$18,000
TOTAL *BASE* PROJECT COSTS		**$89,448**

Notes:

WOOD STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	150	LF	$72	$10,737
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$10,737

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	1	EA	$1,792	$2,664
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$2,664

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service	2	EA	$2,508	$5,016
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$5,016

WOOD STREET

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	2	EA	$3,686	$7,371
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$7,371

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	
Sidewalk Removal		SF	$12	
Curb & Gutter Removal		LF	$50	
Asphalt Pavement w/ Base	100	SF	$9	$933
Concrete Pavement w/ Base		SF	$11	
Concrete Curb & Gutter		LF	$75	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$933
		TOTAL SECTION 1 thru 6		$26,721.43

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 26,721	x	(7.6%)	=	$3,000
				TOTAL MINOR ITEMS	$3,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 29,721	x	(3.0%)	=	$1,000
				TOTAL TRAFFIC CONTROL	$1,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 29,721	x	(10.0%)	=	$3,000
				TOTAL MOBILIZATION	$3,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 29,721	x	(5.45%)	=	$2,000
Contingencies (Subtotal Sections 1 thru 7)	$ 29,721	x	20%	=	$6,000
				TOTAL ADDITIONS	$8,000
				TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)	$41,721

MCKNIGHT WAY

PROJECT DESCRIPTION:

Limits: Mcknight Way

Proposed Improvement (Scope): Install new pipelines to increase Fire flow at McKnight Way (~550 lf, 12-inch pipe, crossing Highway 49 at McKnight Way; ~700 lf, 12-inch pipe, connecting Freeman Lane main to McKnight Way; ~1,650 lf, 12-inch pipe, connecting main along Allison Ranch Road to Freeman Lane)

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$642,062
ROCK EXCAVATION	**25%**	$160,515
TOTAL PROJECT CONSTRUCTION COSTS		$802,577
ENVIRONMENTAL MITIGATION!	**2%**	$16,052
ENGINEERING DESIGN COSTS	**20%**	$160,515
CONSTRUCTION MANAGEMENT	**15.0%**	$120,387
PROJECT CONSTRUCTION COSTS		$802,577
TOTAL *BASE* PROJECT COSTS		**$1,099,531**

Notes:

MCKNIGHT WAY

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe		LF	$72	
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe	2,900	LF	$135	$390,630
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$390,630

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve		EA	$1,792	
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve	4	EA	$3,656	$14,624
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$14,624

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service		EA	$2,508	
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$0

MCKNIGHT WAY

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line		EA	$3,686	$0
8" Line		EA	$3,963	$0
10" Line		EA	$4,965	$0
12" Line	4	EA	$5,952	$23,808
		Subtotal Tie-In/Connect to Existing		$23,808

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$50	$0
Curb & Gutter Removal		LF	$0	$0
Asphalt Pavement w/ Base		SF	$11	$0
Concrete Pavement w/ Base		SF	$12	$0
Concrete Curb & Gutter		LF	$9	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & Gutter		$0
		TOTAL SECTION 1 thru 6		$429,061.73

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 429,062	x	(7.6%)	=	$33,000
			TOTAL MINOR ITEMS		$33,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 462,062	x	(3.0%)	=	$14,000
			TOTAL TRAFFIC CONTROL		$14,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 462,062	x	(10.0%)	=	$47,000
			TOTAL MOBILIZATION		$47,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 462,062	x	(5.45%)	=	$26,000
Contingencies (Subtotal Sections 1 thru 7)	$ 462,062	x	20%	=	$93,000
			TOTAL ADDITIONS		$119,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$642,062

CORNWALL STREET

PROJECT DESCRIPTION:

Limits: Cornwall St

Proposed Improvement (Scope): Install ~420 lf of new 6-inch pipeline to complete loop at Cornwall cul de sac

SUMMARY OF *BASE* PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$61,000
ROCK EXCAVATION	**25%**	$15,250
TOTAL PROJECT CONSTRUCTION COSTS		$76,250
ENVIRONMENTAL MITIGATIONS	**2%**	$1,525
ENGINEERING DESIGN COSTS	**20%**	$15,250
CONSTRUCTION MANAGEMENT	**15.0%**	$11,438
PROJECT CONSTRUCTION COSTS		$76,250
TOTAL *BASE* PROJECT COSTS		**$104,463**

Notes:

CORNWALL STREET

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe		LF	$65	
6" C900 Pipe	420	LF	$72	$30,064
8" C900 Pipe		LF	$75	
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$30,064

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve	1	EA	$1,792	$1,792
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$1,792

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service		EA	$2,508	
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$0

CORNWALL STREET

Section 5 Tie-In/Connect to Existing	Quantity	Unit	Unit Price	Item Cost
6" Line	2	EA	$3,686	$7,371
8" Line		EA	$3,963	$0
10" Line		EA	$4,965	$0
		Subtotal Tie-In/Connect to Existing		$7,371

Section 6 Pavement/Curb & Gutter				
AC Removal		SF	$12	$0
Sidewalk Removal		SF	$12	$0
Curb & Gutter Removal		LF	$50	$0
Asphalt Pavement w/ Base		SF	$9	$0
Concrete Pavement w/ Base		SF	$11	$0
Concrete Curb & Gutter		LF	$75	$0
Striping		LF	$2	$0
		Subtotal Pavement/Curb & Gutter		$0
		TOTAL SECTION 1 thru 6		$39,227.17

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 39,227	x	(7.6%)	=	$3,000
			TOTAL MINOR ITEMS		$3,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 42,227	x	(3.0%)	=	$2,000
			TOTAL TRAFFIC CONTROL		$2,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 42,227	x	(10.0%)	=	$5,000
			TOTAL MOBILIZATION		$5,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 42,227	x	(5.45%)	=	$3,000
Contingencies (Subtotal Sections 1 thru 7)	$ 42,227	x	20%	=	$9,000
			TOTAL ADDITIONS		$12,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$61,000

STACY LANE

PROJECT DESCRIPTION:

Limits: Stacy Lane

Proposed Improvement (Scope): Pipe upgrades at the dead end section of Stacy Ln from 4-inch to 8-inch (~700 lf of 8-inch pipe, including replacement of ~700 lf of 4-inch pipe)

SUMMARY OF ***BASE*** PROJECT COST ESTIMATE

TOTAL WATER IMPROVEMENT ITEMS		$174,000
ROCK EXCAVATION	**25%**	$43,500
TOTAL PROJECT CONSTRUCTION COSTS		$217,500
ENVIRONMENTAL MITIGATIONS	**2%**	$4,350
ENGINEERING DESIGN COSTS	**20%**	$43,500
CONSTRUCTION MANAGEMENT	**15.0%**	$32,625
PROJECT CONSTRUCTION COSTS		$217,500
TOTAL *BASE* PROJECT COSTS		**$297,975**

Notes:

STACY LANE

I. WATER ITEMS

Section 1 Piping	Quantity	Unit	Unit Price	Item Cost
2" PVC Pipe		LF	$50	
4" C900 Pipe	700	LF	$65	$45,500
6" C900 Pipe		LF	$72	
8" C900 Pipe	700	LF	$75	$52,617
10" C900 Pipe		LF	$112	
12" C900 Pipe		LF	$135	
Directional Drill 4" Line		LF	$190	
Directional Drill 6" Line		LF	$200	
Pressure Test Line/Disinfect		LF	$2	
			Subtotal Piping	$98,117

Section 2 Valves				
2" Gate Valve		EA	$100	
4" Gate Valve		EA	$1,016	
6" Gate Valve		EA	$1,792	
8" Gate Valve		EA	$2,664	
10" Gate Valve		EA	$3,159	
12" Gate Valve		EA	$3,656	
12" Butterfly Valve		EA	$2,742	
1" Air Release Valve		EA	$2,845	
2" Blow Off Assembly		EA	$2,391	
			Subtotal Valves	$0

Section 3 Fire Hydrants				
Fire Hydrant		EA	$5,341	
			Subtotal Fire Hydrants	$0

Section 4 Water Services				
3/4" Residential Service		EA	$2,508	
1" Residential Service		EA	$2,508	
1 1/2" Residential Service		EA	$2,508	
Commercial Service		EA	$2,508	
Reconnect Service		EA	$1,200	
Directional Drill Service Line		LF	$200	
			Subtotal Water Services	$0

STACY LANE

Section 5 Tie-In/Connect to Existin	Quantity	Unit	Unit Price	Item Cost
4" Line	1	EA	$2,456	$2,456
6" Line		EA	$3,686	
8" Line		EA	$3,963	
10" Line		EA	$4,965	
		Subtotal Tie-In/Connect to Existing		$2,456

Section 6 Pavement/Curb & Gutter	Quantity	Unit	Unit Price	Item Cost
AC Removal		SF	$12	
Sidewalk Removal		SF	$50	
Curb & Gutter Removal		LF	$0	
Asphalt Pavement w/ Base	1,400	SF	$11	$15,400
Concrete Pavement w/ Base		SF	$12	
Concrete Curb & Gutter		LF	$9	
Striping		LF	$2	
		Subtotal Pavement/Curb & Gutter		$15,400
		TOTAL SECTION 1 thru 6		$115,972.67

Section 7 Minor Items					
(Subtotal Sections 1 thru 6)	$ 115,973	x	(7.6%)	=	$9,000
			TOTAL MINOR ITEMS		$9,000
Section 8 Traffic Control					
(Subtotal Sections 1 thru 7)	$ 124,973	x	(3.0%)	=	$4,000
			TOTAL TRAFFIC CONTROL		$4,000
Section 9 Mobilization					
(Subtotal Sections 1 thru 7)	$ 124,973	x	(10.0%)	=	$13,000
			TOTAL MOBILIZATION		$13,000
Section 10 Additions					
Supplemental Work (Subtotal Sections 1 thru 7)	$ 124,973	x	(5.45%)	=	$7,000
Contingencies (Subtotal Sections 1 thru 7)	$ 124,973	x	20%	=	$25,000
			TOTAL ADDITIONS		$32,000
			TOTAL WATER IMPROVEMENTS (Subtotal Sections 1 thru 10)		$174,000

LABEL	DESCRIPTION	PRIORITY	TOTAL BASE PROJECT COSTS[(a)]
Water Treatment Plant			
WTP-001	Install streaming current monitor in influent channel [(b)]		$ 60,000
WTP-002	Install flow control valve on raw water influent line		$ 140,000
WTP-003	Replace Flocculator Paddles		$ 550,000
WTP-004	Replace catwalks between flocculation and sedimentation basins		$ 480,000
WTP-005	Repair cracks in sedimentation basin		$ 200,000
WTP-006	Replace filter media (sand, anthracite, and gravel drain), and repair filter basin walls		$ 230,000
WTP-007	Replace filter underdrain and overflow troughs (potential future project – requires inspection of existing facilities)		$ 350,000
WTP-008	Upgrade plant water system – pumps, hydropneumatic tank, etc. (potential future project – requires inspection of existing facilities)		$ 590,000
WTP-009	Replace sodium hypochlorite tank		$ 100,000
WTP-010	Install sunshade structure over chemical storage tanks		$ 200,000
WTP-011	Stormwater sump improvements at treated water storage tanks		$ 200,000
WTP-012	Water recycle pumps in storage basin		$ 280,000
WTP-013	Ongoing Generator maintenance program [(c)]		$ 40,000
WTP-014	Install paperless recorders to replace chart recorders		$ 130,000
WTP-015	Upgrade plant SCADA system		$ 240,000
		Subtotal:	**$ 3,790,000**

Notes: (a) All costs have been rounded to the nearest $10,000. Cost basis, ENR CCI, July 2015 = 10,037

(b) Installation of a flow control valve on the raw water line is not an improvement solely within the discretion of the City as NID supplies the raw water via their facilities

(c) This is an ongoing maintenance program performed by a third party. Project cost reflects annual cost.

Opinion of Probable Costs

PROJECT NUMBER:	**WTP-001**	**TYPE**
PROJECT NAME:	**Install streaming current monitor in influent channel**	**ENRCCI 10037**
City of Grass Valley		**DATE Jul-15**
Water Treatment Plant		

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		**$ 1,000**
DIVISION 3 - CONCRETE		**$ 2,500**
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		**$ 5,000**
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		**$ 2,500**
DIVISION 16 - ELECTRICAL		**$ 17,500**
IMPROVEMENT SUB-TOTAL		**$ 28,500**
CONTRACTOR MOBILIZATION/DEMOBILIZATION	**5%**	**$ 1,425**
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	**20%**	**$ 5,700**
IMPROVEMENT CONSTRUCTION COSTS		**$ 35,625**
CONSTRUCTION CONTINGENCY	**30%**	**$ 10,688**
TOTAL CONSTRUCTON BUDGET		**$ 46,313**
ENVIRONMENTAL MITIGATIONS	**2%**	**$ 926**
ENGINEERING DESIGN	**20%**	**$ 9,263**
CONSTRUCTION MANAGEMENT	**15%**	**$ 6,947**
TOTAL *BASE* PROJECT COSTS		**$ 63,448**

Opinion of Probable Costs

PROJECT NUMBER:	WTP-002	TYPE	
PROJECT NAME:	Install flow control valve on raw water influent line	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 1,000
DIVISION 3 - CONCRETE		$ 2,500
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 25,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 20,000
DIVISION 16 - ELECTRICAL		$ 15,000
IMPROVEMENT SUB-TOTAL		$ 63,500
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 3,175
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 12,700
IMPROVEMENT CONSTRUCTION COSTS		$ 79,375
CONSTRUCTION CONTINGENCY	30%	$ 23,813
TOTAL CONSTRUCTON BUDGET		$ 103,188
ENVIRONMENTAL MITIGATIONS	2%	$ 2,064
ENGINEERING DESIGN	20%	$ 20,638
CONSTRUCTION MANAGEMENT	15%	$ 15,478
TOTAL *BASE* PROJECT COSTS		$ 141,367

Opinion of Probable Costs

PROJECT NUMBER:	WTP-003	TYPE	
PROJECT NAME:	Replace Flocculator Paddles	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 15,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 180,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 20,000
DIVISION 16 - ELECTRICAL		$ 25,000
IMPROVEMENT SUB-TOTAL		$ 245,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 12,250
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 49,000
IMPROVEMENT CONSTRUCTION COSTS		$ 306,250
CONSTRUCTION CONTINGENCY	30%	$ 91,875
TOTAL CONSTRUCTON BUDGET		$ 398,125
ENVIRONMENTAL MITIGATIONS	2%	$ 7,963
ENGINEERING DESIGN	20%	$ 79,625
CONSTRUCTION MANAGEMENT	15%	$ 59,719
TOTAL *BASE* PROJECT COSTS		$ 545,431

Opinion of Probable Costs

PROJECT NUMBER:	WTP-004	TYPE	
PROJECT NAME:	Replace catwalks between flocculation and sedimentation basins	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 15,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		$ 150,000
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 30,000
DIVISION 16 - ELECTRICAL		$ 15,000
IMPROVEMENT SUB-TOTAL		$ 215,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 10,750
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 43,000
IMPROVEMENT CONSTRUCTION COSTS		$ 268,750
CONSTRUCTION CONTINGENCY	30%	$ 80,625
TOTAL CONSTRUCTON BUDGET		$ 349,375
ENVIRONMENTAL MITIGATIONS	2%	$ 6,988
ENGINEERING DESIGN	20%	$ 69,875
CONSTRUCTION MANAGEMENT	15%	$ 52,406
TOTAL *BASE* PROJECT COSTS		$ 478,644

Opinion of Probable Costs

PROJECT NUMBER:	WTP-005	TYPE	
PROJECT NAME:	Repair cracks in sedimentation basin	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 10,000
DIVISION 3 - CONCRETE		$ 75,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		
DIVISION 16 - ELECTRICAL		$ 5,000
IMPROVEMENT SUB-TOTAL		$ 90,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 4,500
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 18,000
IMPROVEMENT CONSTRUCTION COSTS		$ 112,500
CONSTRUCTION CONTINGENCY	30%	$ 33,750
TOTAL CONSTRUCTON BUDGET		$ 146,250
ENVIRONMENTAL MITIGATIONS	2%	$ 2,925
ENGINEERING DESIGN	20%	$ 29,250
CONSTRUCTION MANAGEMENT	15%	$ 21,938
TOTAL *BASE* PROJECT COSTS		$ 200,363

Opinion of Probable Costs

PROJECT NUMBER:	WTP-006	TYPE	
PROJECT NAME:	Replace filter media (sand, anthracite, and gravel drain) and repair filter basin walls	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 1,000
DIVISION 3 - CONCRETE		$ 17,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		$ 12,000
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		$ 60,000
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 10,000
DIVISION 16 - ELECTRICAL		$ 5,000
IMPROVEMENT SUB-TOTAL		$ 105,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 5,250
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 21,000
IMPROVEMENT CONSTRUCTION COSTS		$ 131,250
CONSTRUCTION CONTINGENCY	30%	$ 39,375
TOTAL CONSTRUCTON BUDGET		$ 170,625
ENVIRONMENTAL MITIGATIONS	2%	$ 3,413
ENGINEERING DESIGN	20%	$ 34,125
CONSTRUCTION MANAGEMENT	15%	$ 25,594
TOTAL ***BASE*** PROJECT COSTS		$ 233,756

Opinion of Probable Costs

PROJECT NUMBER:	WTP-007	TYPE	
PROJECT NAME:	Replace filter underdrain and overflow troughs (potential future project – requires inspection of existing facilities)	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 20,000
DIVISION 3 - CONCRETE		$ 20,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 60,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		$ 30,000
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 20,000
DIVISION 16 - ELECTRICAL		$ 5,000
IMPROVEMENT SUB-TOTAL		$ 155,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 7,750
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 31,000
IMPROVEMENT CONSTRUCTION COSTS		$ 193,750
CONSTRUCTION CONTINGENCY	30%	$ 58,125
TOTAL CONSTRUCTON BUDGET		$ 251,875
ENVIRONMENTAL MITIGATIONS	2%	$ 5,038
ENGINEERING DESIGN	20%	$ 50,375
CONSTRUCTION MANAGEMENT	15%	$ 37,781
TOTAL *BASE* PROJECT COSTS		$ 345,069

Opinion of Probable Costs

PROJECT NUMBER:	WTP-008	TYPE	
PROJECT NAME:	Upgrade plant water system – pumps, hydropneumatic tank, etc. (potential future project – requires inspection of existing facilities)	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 10,000
DIVISION 3 - CONCRETE		$ 10,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 170,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		$ 10,000
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 30,000
DIVISION 16 - ELECTRICAL		$ 35,000
IMPROVEMENT SUB-TOTAL		$ 265,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 13,250
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 53,000
IMPROVEMENT CONSTRUCTION COSTS		$ 331,250
CONSTRUCTION CONTINGENCY	30%	$ 99,375
TOTAL CONSTRUCTON BUDGET		$ 430,625
ENVIRONMENTAL MITIGATIONS	2%	$ 8,613
ENGINEERING DESIGN	20%	$ 86,125
CONSTRUCTION MANAGEMENT	15%	$ 64,594
TOTAL *BASE* PROJECT COSTS		$ 589,956

Opinion of Probable Costs

PROJECT NUMBER: WTP-009	TYPE	
PROJECT NAME: Replace sodium hypochlorite tank	ENRCCI	10037
City of Grass Valley	DATE	Jul-15
Water Treatment Plant		

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 5,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		$ 20,000
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 5,000
DIVISION 16 - ELECTRICAL		$ 10,000
IMPROVEMENT SUB-TOTAL		$ 45,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 2,250
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 9,000
IMPROVEMENT CONSTRUCTION COSTS		$ 56,250
CONSTRUCTION CONTINGENCY	30%	$ 16,875
TOTAL CONSTRUCTON BUDGET		$ 73,125
ENVIRONMENTAL MITIGATIONS	2%	$ 1,463
ENGINEERING DESIGN	20%	$ 14,625
CONSTRUCTION MANAGEMENT	15%	$ 10,969
TOTAL *BASE* PROJECT COSTS		$ 100,181

Opinion of Probable Costs

PROJECT NUMBER:	WTP-010	TYPE	
PROJECT NAME:	Install sunshade structure over chemical storage tanks	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 5,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		$ 60,000
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		
DIVISION 16 - ELECTRICAL		$ 20,000
IMPROVEMENT SUB-TOTAL		$ 90,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 4,500
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 18,000
IMPROVEMENT CONSTRUCTION COSTS		$ 112,500
CONSTRUCTION CONTINGENCY	30%	$ 33,750
TOTAL CONSTRUCTON BUDGET		$ 146,250
ENVIRONMENTAL MITIGATIONS	2%	$ 2,925
ENGINEERING DESIGN	20%	$ 29,250
CONSTRUCTION MANAGEMENT	15%	$ 21,938
TOTAL *BASE* PROJECT COSTS		$ 200,363

Opinion of Probable Costs

PROJECT NUMBER:	WTP-011	TYPE	
PROJECT NAME:	Stormwater sump improvements at treated water storage tanks	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 5,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		$ 5,000
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 15,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 40,000
DIVISION 16 - ELECTRICAL		$ 20,000
IMPROVEMENT SUB-TOTAL		$ 90,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 4,500
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 18,000
IMPROVEMENT CONSTRUCTION COSTS		$ 112,500
CONSTRUCTION CONTINGENCY	30%	$ 33,750
TOTAL CONSTRUCTON BUDGET		$ 146,250
ENVIRONMENTAL MITIGATIONS	2%	$ 2,925
ENGINEERING DESIGN	20%	$ 29,250
CONSTRUCTION MANAGEMENT	15%	$ 21,938
TOTAL *BASE* PROJECT COSTS		$ 200,363

Opinion of Probable Costs

PROJECT NUMBER:	WTP-012	TYPE	
PROJECT NAME:	Water recycle pumps in storage basin	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		$ 5,000
DIVISION 3 - CONCRETE		$ 5,000
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 75,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		$ 10,000
DIVISION 16 - ELECTRICAL		$ 30,000
IMPROVEMENT SUB-TOTAL		$ 125,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 6,250
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 25,000
IMPROVEMENT CONSTRUCTION COSTS		$ 156,250
CONSTRUCTION CONTINGENCY	30%	$ 46,875
TOTAL CONSTRUCTON BUDGET		$ 203,125
ENVIRONMENTAL MITIGATIONS	2%	$ 4,063
ENGINEERING DESIGN	20%	$ 40,625
CONSTRUCTION MANAGEMENT	15%	$ 30,469
TOTAL *BASE* PROJECT COSTS		$ 278,281

Opinion of Probable Costs

PROJECT NUMBER:	WTP-013	TYPE	
PROJECT NAME:	Ongoing Generator maintenance program	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		
DIVISION 3 - CONCRETE		
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		
DIVISION 16 - ELECTRICAL		$ 20,000
IMPROVEMENT SUB-TOTAL		$ 20,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 1,000
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 4,000
IMPROVEMENT CONSTRUCTION COSTS		$ 25,000
CONSTRUCTION CONTINGENCY	30%	$ 7,500
TOTAL CONSTRUCTON BUDGET		$ 32,500
ENVIRONMENTAL MITIGATIONS	2%	$ 650
ENGINEERING DESIGN	20%	$ 6,500
CONSTRUCTION MANAGEMENT	15%	$ 4,875
TOTAL *BASE* PROJECT COSTS		$ 44,525

Opinion of Probable Costs

PROJECT NUMBER:	WTP-014	TYPE
PROJECT NAME:	Install paperless recorders to replace chart recorders	ENRCCI 10037
City of Grass Valley		DATE Jul-15
Water Treatment Plant		

ITEM		OPC TOTAL COST
DIVISION 2 - SITEWORK		
DIVISION 3 - CONCRETE		
DIVISION 4 - MASONARY		
DIVISION 5 - METALS		
DIVISION 6 - WOODS & PLASTICS		
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
DIVISION 8 - DOORS & WINDOWS		
DIVISION 9 - FINISHES		
DIVISION 10 - SPECIALTIES		
DIVISION 11 - EQUIPMENT		$ 10,000
DIVISION 12 - FURNISHINGS		
DIVISION 13 - SPECIAL CONSTRUCTION		
DIVISION 14 - CONVEYING SYSTEM		
DIVISION 15 - MECHANICAL		
DIVISION 16 - ELECTRICAL		$ 50,000
IMPROVEMENT SUB-TOTAL		$ 60,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$ 3,000
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$ 12,000
IMPROVEMENT CONSTRUCTION COSTS		$ 75,000
CONSTRUCTION CONTINGENCY	30%	$ 22,500
TOTAL CONSTRUCTON BUDGET		$ 97,500
ENVIRONMENTAL MITIGATIONS	2%	$ 1,950
ENGINEERING DESIGN	20%	$ 19,500
CONSTRUCTION MANAGEMENT	15%	$ 14,625
TOTAL *BASE* PROJECT COSTS		$ 133,575

Opinion of Probable Costs

PROJECT NUMBER:	WTP-015	TYPE	
PROJECT NAME:	Upgrade plant SCADA system	ENRCCI	10037
City of Grass Valley		DATE	Jul-15
Water Treatment Plant			

ITEM			OPC TOTAL COST
DIVISION 2 - SITEWORK			
DIVISION 3 - CONCRETE			
DIVISION 4 - MASONARY			
DIVISION 5 - METALS			
DIVISION 6 - WOODS & PLASTICS			
DIVISION 7 - THERMAL & MOISTURE PROTECTION			
DIVISION 8 - DOORS & WINDOWS			
DIVISION 9 - FINISHES			
DIVISION 10 - SPECIALTIES			
DIVISION 11 - EQUIPMENT		$	10,000
DIVISION 12 - FURNISHINGS			
DIVISION 13 - SPECIAL CONSTRUCTION			
DIVISION 14 - CONVEYING SYSTEM			
DIVISION 15 - MECHANICAL			
DIVISION 16 - ELECTRICAL		$	100,000
IMPROVEMENT SUB-TOTAL		$	110,000
CONTRACTOR MOBILIZATION/DEMOBILIZATION	5%	$	5,500
CONTRACTOR GENERAL CONDITIONS, OVERHEAD & PROFIT	20%	$	22,000
IMPROVEMENT CONSTRUCTION COSTS		$	137,500
CONSTRUCTION CONTINGENCY	30%	$	41,250
TOTAL CONSTRUCTON BUDGET		$	178,750
ENVIRONMENTAL MITIGATIONS	2%	$	3,575
ENGINEERING DESIGN	20%	$	35,750
CONSTRUCTION MANAGEMENT	15%	$	26,813
TOTAL *BASE* PROJECT COSTS		$	244,888

Appendix B CALIFORNIA DEPARTMENT OF HEALTH SERVICES LETTER, DATED FEBRUARY 18, 2004

State of California—Health and Human Services Agency
DEPARTMENT OF HEALTH SERVICES
Division of Drinking Water and Environmental Management
415 Knollcrest Drive, Suite 110
Redding, CA 96002
(530) 224-4800 FAX (530) 224-3270
Internet Address: www.dhs.ca.gov

ARNOLD SCHWARZENEGGER
Governor

February 18, 2004

City of Grass Valley
125 East Main Street
Grass Valley, CA 95945

Attention: Richard Beckley, Deputy Director of Public Works

SUBJECT: PUBLIC WATER SYSTEM NO. 2910001 – REDUCED PRESSURE PRINCIPLE BACKFLOW DEVICE AT WASTEWATER TREATMENT PLANT

On February 6, 2004, we received your request to approve the reduced pressure principle (RP) backflow prevention device installed at the domestic water service connection to the City of Grass Valley's Wastewater Treatment Plant. Title 17 of the California Code of Regulations, Section 7404, requires this approval.

In the request, you detailed your inspection findings that identified the uses of the domestic water at the wastewater treatment plant. You indicated that there are two water systems at the wastewater plant, potable and secondary effluent, and these systems are not physically connected. You also indicated that two additional RP devices inside the wastewater plant further protect the potable water for consumers at the plant. It was indicated that certified testers test all three RP devices annually.

At this time, it appears that satisfactory measures have been implemented to ensure that sewage backflow will not occur to either the domestic water system that serves the wastewater plant, or to the domestic water system that serves the City of Grass Valley. However, this situation may change in the future if there are modifications to the piping at the wastewater treatment plant.

Based on a review of your current findings, we hereby tentatively approve the use of the RP device at the City of Grass Valley Wastewater Treatment Plant. You need to ensure that regular inspections of the wastewater facility validate your findings. Make sure you document your inspection findings, and make these inspections available for review upon request.

This approval is based conditionally on regular (at least annual) inspections of the backflow potentials at the wastewater plant.

Gunther L. Sturm
Gunther L. Sturm, P.E.
Valley District Engineer
Drinking Water Field Operations
Branch

cc: Nevada County Department of Environmental Health

GS
RC

City of Grass Valley
A CENTENNIAL CITY

RECEIVED
DHS - REDDING
FEB 10 2004
DRINKING WATER
FIELD OPS BRANCH

PUBLIC WORKS DEPARTMENT

Richard Beckley
DEPUTY DIRECTOR OF PUBLIC WORKS
WATER & WASTEWATER

February 5, 2004

Mr. Reese Crenshaw
Department of Health Services
415 Knoll Crest Drive, Suite 110
Redding, CA 96002

RE: Backflow Prevention at Grass Valley Wastewater Treatment Facility

Grass Valley's Wastewater Treatment Facility, WTF, is served potable water from the Grass Valley's Surface Water System, System number 2900001. Immediately upon entering the WTF property the potable water line has a reduced pressure (RP) backflow prevention device. State certified Backflow Prevention Device testers test the RP annually. In addition to the main RP device there are RP's on the existing laboratory/administration building and Belt Thickener building. These are also tested by Certified Testers annually.

There are two water systems at the WTF – potable and secondary effluent. The potable water service is used exclusively for potable purposes; there are no cross connections at process equipment or the secondary effluent piping system. The two systems are physically isolated, no valves or RP are used to prevent contamination. All process equipment requiring a water connection utilize secondary effluent.

Title 17 Section 7404 states that a RP device can be used "in lieu of an air gap if approved by the health agency and water supplier." As the water supplier, The City of Grass Valley will allow the utilization of a RP and, as such, is requesting DHS approval to utilize a RP device.

If you have any questions, or need further information, please contact me at (530) 477-4626.

Sincerely,

Richard W. Beckley

Richard W. Beckley
Deputy Director of Public Works
City of Grass Valley

125 East Main Street • Grass Valley, California 95945 • Phone (530) 477-4626 • Fax (530) 272-1807

Appendix C FIRE HYDRANT FLOW INFORMATION

City of Grass Valley Fire Hydrant Flows and Pressures

Fire Hydrant Tag ID	Address Number	Street Name	Test Date	Pitot PSI	Static Pressure PSI	Residual Pressure PSI	Hydrant Flow GPM	Projected Flow GPM*	AWWA Hydrant Color
	223	North Auburn Street	1/6/2011	80	99	95	1501	7515	7515
	120	North Auburn Street	1/6/2011	82	105	98	1519	5851	5851
	131	South Auburn Street	1/6/2011	80	110	104	1501	6478	6478
	203	West Main Street	1/6/2011	89	100	94	1583	6411	6411
	305	West Main Street	1/6/2011	84	91	86	1538	6444	6444
	115	West Main Street	1/6/2011	91	104	95	1601	5347	5347
	126	Mill Street	1/6/2011	65	102	92	1353	4214	4214
	144	Mill Street	1/6/2011	78	102	92	1482	4616	4616
	214	Mill Street	1/6/2011	70	104	98	1404	5838	5838
	671	Brighton Street	1/18/2011	13	84	64	605	1134	1134
	472	Brighton Street	2/3/2011	60	90	80	1300	3717	3717
1	10382	Alta Street	2/14/2011	20	24	24	750	Infinity	Infinity
75	337	Alta Street	2/14/2011	40	59	58	1061	7674	7674
155	536	Ivy Street	2/14/2011	60	80	76	1300	5610	5610
47	336	North School Street	2/14/2011	60	82	79	1300	6670	6670
134	220	North School Street	2/14/2011	55	80	77	1244	6274	6274
73	536	Linden Avenue	2/14/2011	50	70	65	1187	4114	4114
15	412	Linden Avenue	2/14/2011	25	68	62	839	2579	2579
131	536	Richardson Street	2/15/2011	55	68	64	1244	4761	4761
217	508	Richardson Street	2/15/2011	30	66	63	919	4014	4014
45	402	Richardson Street	2/15/2011	45	80	76	1126	4858	4858
10	609	West Main Street	2/15/2011	50	68	66	1187	6601	6601
71	801	West Main Street	2/15/2011	50	70	68	1187	6748	6748
150	823	West Main Street	2/15/2011	45	64	62	1126	5975	5975
76	909	West Main Street	2/15/2011	30	46	45	919	5339	5339
249	900	Forest Glade Circle	2/15/2011	25	50	37	839	1318	1318
11	869	Forest Glade Circle	2/15/2011	27	50	36	872	1316	1316
20	855	Forest Glade Circle	2/15/2011	38	68	52	1034	1872	1872
253	827	Forest Glade Circle	2/15/2011	40	70	52	1061	1843	1843
233	815	Forest Glade Circle	2/15/2011	32	62	47	949	1655	1655

* Projected available flows calculated at 20 psi residual, or ½ the static pressure for low pressure hydrants having static pressures of less than 40 psi.

City of Grass Valley Fire Hydrant Flows and Pressures

128	137	Townsend Street	2/16/2011	55	72	70	1244	7229	7229
213	618	Walsh Street	2/16/2011	60	78	74	1300	5508	5508
144	142	Carpenter Street	2/16/2011	50	72	66	1187	3808	3808
56	125	Scotia Pines Circle	2/16/2011	53	72	66	1222	3921	3921
60	154	Scotia Pines Circle	2/16/2011	50	68	60	1187	3122	3122
72	259	Scotia Pines Circle	2/16/2011	35	56	44	993	1797	1797
94	221	Scotia Pines Circle	2/16/2011	38	58	48	1034	2127	2127
212	188	Scotia Pines Circle	2/16/2011	50	68	59	1187	2930	2930
68	131	Peabody Court	2/16/2011	55	75	54	1244	2093	2093
133	203	Pleasant Street	2/16/2011	49	70	66	1175	4594	4594
51	303	Pleasant Street	2/16/2011	45	68	64	1126	4307	4307
31	321	Pleasant Street	2/16/2011	45	62	58	1126	4007	4007
	370	Pleasant Street	2/17/2011	53			1222		
93	499	Doris Drive	8/31/2011	45	62	58	1126	4007	4007
187	411	Doris Drive	8/31/2011	50	66	60	1187	3564	3564
153	303	Doris Drive	8/31/2011	60	70	65	1300	4507	4507
159	141	Doris Drive	8/31/2011	70	86	79	1404	4716	4716
110	116	Doris Drive	8/31/2011	70	86	78	1404	4388	4388
147	110	Doris Drive	8/31/2011	70	86	77	1404	4117	4117
16	271	Hazel Lane	8/31/2011	70	86	78	1404	4388	4388
	123	Berryman	1/10/2012	65	83	75	1353	4123	4123
	100	Joyce		80	111	101	1501	4946	4946
	204	Joyce		80	112	98	1501	4148	4148
							0		
							0		
							0		
							0		
							0		
							0		
							0		
							0		
							0		
							0		

* Projected available flows calculated at 20 psi residual, or ½ the static pressure for low pressure hydrants having static pressures of less than 40 psi.

Appendix D CALIFORNIA DEPARTMENT OF PUBLIC HEALTH 2012-2013 WTP INSPECTION REPORT, DATED JULY 31, 2013

State of California—Health and Human Services Agency
California Department of Public Health

RON CHAPMAN, MD, MPH
Director & State Health Officer

EDMUND G. BROWN JR.
Governor

July 31, 2013

City of Grass Valley
Public Works Department
125 East Main Street
Grass Valley, CA 95945

Attention: Tim Kiser, Director of Public Works

SUBJECT: CITY OF GRASS VALLEY – PUBLIC WATER SYSTEM NO. 2910001 – FISCAL YEAR 2012 - 2013 ANNUAL INSPECTION

On March 27, 2013, Dan Cikuth of my staff met with Mike Busse to conduct an annual inspection of the City of Grass Valley Public Water System. Two new deficiencies were noted, and one is ongoing from the previous inspection. Please see the attached inspection report.

The 2012 Lead and Copper Violation must be listed in the 2013 CCR if it wasn't identified in the 2012 CCR. Failure to correct the remaining deficiencies may result in future enforcement action.

If you have any questions, please call Dan Cikuth at (530) 224-3252 or me at (530) 224-4861. Jim Reade remains your principle contact.

R. Crenshaw
Reese B. Crenshaw, P.E.
Valley District Engineer
Drinking Water Field
Operations Branch

Enclosure: Annual Inspection Report

cc: Nevada County Department of Environmental Health
Mike Busse, City of Grass Valley

State of California Department of Public Health
Division of Drinking Water and Environmental Management
Drinking Water Field Operations Branch
Annual Inspection Report

Purveyor *City of Grass Valley* System Number *2910001*
Person(s) Contacted/Position *Mike Busse, Chief Plant Superintendent*
Date of Inspection *March 27, 2013* Reviewing Engineer *Daniel L. Cikuth, P.E.*
Last Annual Inspection *June 14, 2012 by Ray Bruun, P.E.* District Engineer *Reese B. Crenshaw, P.E.*

A. INTRODUCTION

1. Permit Status (Date Issued/Amendment Purpose)

Full *A full permit was issued to the City on February 4, 1974 for the following: Pre-chlorination, alum coagulation-flocculation-sedimentation, and post chlorination of raw ditch water from Nevada Irrigation District (NID), and a 2.1 MG storage basin.*

Amendment(s) *A permit amendment was reportedly done in 1986 for the 2.5 MG Empire storage tank, the 2.0 MG clearwell, the chlorination facilities, but the amendment cannot be found. State of California Department Public Health (Department) staff and City of Grass Valley (City)staff have searched their files. A permit amendment was issued in May 2010, to the City for the two new one-million gallon welded steel storage tanks that were installed to replace the two-million gallon Hypalon covered clearwell.*

Are the permit provisions complied with? *There are no relevant permit conditions from the 1974 permit. The 1986 permit amendment cannot be located in the permit file.*

Is the permit up to date? *No – the permit does not include the gravity filters installed in 1994, which is important as the design filter loading rate (3.9 gpm/sf) is less than that allowed by regulation (6 gpm/sf). Also, a full permit is needed for Broadview Heights (62 service connections), which is its own water system.*

List data sheets on file (permit, files, etc.) *No current data sheets could be located in the permit file other than the data sheets that are available for the two new one-million gallon welded steel tanks.*

2. Changes in System

Since last annual inspection *Two filter effluent turbidity meters were replaced. NSF 61 certified lime is now used to supplement coagulation.*

Planned future changes *No major changes are planned.*

3. Consumer & Production Data – from 2012 Annual Report

Number of service connections *2,452 total = 2,390 main system + 62 Broadview Heights (which is a separate distribution system owned by the city with water provided by Nevada Irrigation District).*

Number with meters *2,433 main system; all connections in Broadview Heights are metered*

Approximate population served *4,453*

Water produced + bought during recent 12-month period *(Jan 2012 through December 2012)*

Amount *Annual production for 2012 was 382 million gallons (MG). 14 MG purchased from Nevada Irrigation District (NID) for use in the Broadview Heights system.*

Maximum month *52.3 MG (August 2012)** Maximum day *No daily production data provided.*

**2.14 MG was provided to the Broadview Heights system during the maximum month.*

4. Past Water Production Data

Table 1 – Water Use Data

Year	Report Max Month MG	Max Day 1.5 x gpm	Report Max Day MG	Max Day gpm	GPM Per Conn	Total Conn	Meter Conn	Flat Conn	Source Capacity gpm	Max Pop
2003	70.2	2,359	2.46	1,708	0.74	2,314	2,314	0	3,500	5,600
2004	64.8	2,177	2.34	1,625	0.70	2,314	2,314	0	3,500	5,600
2005	61.3	2,060	2.28	1,583	0.68	2,328	2,328	0	3,500	5,600
2006	65.5	2,201	2.4	1,667	0.71	2,337	2,337	0	3,500	5,600
2007	57.6	1,935	2.2	1,528	0.65	2,352	2,352	0	3,500	5,600
2008	55.4	1,862	2.2	1,528	0.63	2,428	2,428	0	3,500	5,600
2009	52.5	1,764	2.1	1,458	0.63	2,311	2,293	18	3,500	5,600
2010	57.4	1,929	2.3	1,597	0.69	2,311	2,293	18	3,500	4,930
2011	54.4	1,828	2.49	1,729	0.73	2,384	2,365	19	3,500	4,452
2012	52.3	1,757	N/A	1,757	0.72	2,452	2,433	19	3,500	4,453
			5 yr.-average =							

Discussion: *The maximum day demand (MDD, the highest daily demand in past 10 years) is 2,359 gpm (2003), based on calculation from maximum month. The peak hourly demand (PHD = 1.5 x MDD) is 3,539 gpm. MDD and PHD are defined in the California Drinking Water Regulations, specifically T22 CCR §64554. This section of the regulations requires that MDD be met by sources alone and that four hours of PHD be met by a combination of sources, storage, or interties. The Grass Valley water system has sufficient source capacity to meet MDD but requires storage (a minimal amount) or another source water, in addition to source capacity, to meet PHD. Required storage or additional capacity = PHD – source capacity x 4 hours: (3,539 gpm – 3,500 gpm) x 240 minutes = 9,360 gallons. Grass Valley's 2.5 MG of storage is more than adequate to meet PHD.*

B. SOURCE DATA

Table 2 – Source Data

Sources	Status	Capacity	Comments
NID raw water as supplied to City	*Active*	***3,500 gpm***	*3,500 gpm (5 MGD) is the rated hydraulic capacity of raw water connection with NID and is the nominal filtration capacity of City's Alta Hill Water Treatment Plant.*
NID treated water intertie (at Alta Hill WT Plant)	*Active, but only when WTP is down for maintenance (8 days in 2011)*	***2,000 gpm***	*Hydraulic capacity of intertie with NID—**not used in computing total source capacity**.*
	Total	***3,500 gpm***	

Discussion & appraisal (i.e., does source capacity comply with Waterworks Standards?)

Yes, see discussion at the end of Section A.4.

The intertie between NID and the main Grass Valley distribution system is utilized when the City's Alta Hill Water Treatment Plant or the canal ditch for the raw water delivered to the plant are down for maintenance. This maintenance is usually planned and occurs during low demand times of year.

The Broadview Heights area of Grass Valley is served solely by NID and has no interties to the City's main distribution system. However, the distribution system is owned and maintained by the city and the service connections are city customers.

C. TREATMENT

1. Surface Water Sources

Are there significant sewage hazards? *Yes. Some sewer lines are near, adjacent to, or across canals providing raw water to the treatment plant (reference NID's 2012 watershed sanitary survey). According to NID, sewer lines crossing canals are required to have an encroachment permit and be appropriately sleeved. Sewer lines crossing conveyances are inspected annually by NID personnel.*

Under the federal Long Term 2 Surface Water Treatment Rule (LT2), the City, as a Schedule 4 water system with less than 10,000 population, was required to test for E. coli in its source water, beginning in October 2008. Testing was done biweekly for 12 months. This E. coli testing has provided useful information on the bacteriological quality of the City's raw water supply. Because the E. coli results were less than trigger values, the City is not required to conduct LT2 monitoring for cryptosporidium and the E. coli results require only Bin 1 treatment level which the City currently has.

Is there significant recreation? *Yes. Boating and body contact recreation are allowed on Upper Scott's Flat Reservoir. Also, a portion of the canal entering Grass Valley runs along a bike/walking path.*

Has a sanitary survey been conducted? *Yes. Nevada Irrigation District completed an updated watershed sanitary survey in April 2012. The survey includes all areas of Grass Valley's watershed, including Scott's Flat Reservoir, Lower Scott's Flat Reservoir, D-S canal, Lower Grass Valley Canal, and Grass Valley Ditch, the final conveyance prior to the treatment plant.*

Treatment classification *The City's Alta Hill Water Treatment Plant provides conventional treatment (i.e., coagulation, flocculation, sedimentation, and filtration) as defined in T22 CCR, §64651.2. Title 22, §64660(b)(1) specifies a maximum allowable filtration rate of 6 gpm/sf for conventional treatment. However, the filter's design capacity is 3.9 gpm/sf (rated at 5 mgd). Section 64652(a), of Title 22, stipulates that treatment plants required to filter must provide multi-barrier treatment, consisting of filtration and disinfection, to achieve at least 99.9 percent (3-log) reduction in Giardia cysts and 99.99 percent (4-log) reduction in viruses. The plant qualifies, under Title 22, §64653(b), for removal credits of 2.5-log for Giardia and of 2-log for virus. Therefore, the disinfection component of the plant's multi-barrier approach must achieve, through sufficient CT (i.e., disinfectant concentration and contact time), a 0.5-log inactivation of Giardia cysts and a 2.0-log inactivation of viruses. The filtration system is also given credit for 99% (2 log removal) of cryptosporidium which, because the source water qualifies for Bin 1 under the LT2, satisfies the USEPA cryptosporidium removal requirement.*

Describe treatment process (i.e., chemicals, dosages, flocculation & sedimentation contact time, filter media, media depth, alarms) *Raw water flows to the Plant via a pipeline from the Alta Hill Pond, which is about a quarter of a mile from the Plant. The flow from the pond is controlled by a valve manually operated by NID. The City operates the Plant on a uniform rate. Any change in flow rate must be requested by the city, and NID staff adjust the valve accordingly. Flow adjustments can be requested up to once daily, but requests are typically made over longer intervals, e.g., twice a week. The flow of raw water entering the plant is measured in a Parshall flume. Operators seek to establish the uniform flow rate through plant that will maintain a suitable water level in the effluent pump sump (formerly the backwash makeup sump), while at the same time keeping water levels in the sedimentation basin at appropriate levels. Since the hydraulic gradeline of the new clearwells is approximately 12 feet higher than the old clearwell (which was gravity fed from the filters) and 8.5 feet above the filter effluent channel, the function of the backwash makeup pumps have changed so that they now boost water from the backwash makeup sump (i.e., effluent pump sump) to the clearwell tanks. Because of the need to boost water to the clearwells, plant staff state that it would be too complicated to operate the plant manually. Should manual operation ever become necessary, the plant can be operated manually at the hydraulic gradeline of the former clearwell, which would mean temporarily decreasing clearwell capacity by 50%. Depending on system demand, this could require that chlorine residual be increased to maintain adequate CT.*

Chemical dosing in the plant is flow paced, but operators can manually adjust chemical feed systems as needed. The pre-filter chlorination rate is adjusted based on floc basin residual chlorine readings and the rate of raw water flow. Post-filter chlorination rate is adjusted based on the chlorine residual of the combined filter effluent and the target chlorine residual leaving the plant. The following chemicals are injected immediately prior to rapid mixing: alum, sodium hypochlorite solution, and lime slurry. Polymer is added as a filter aid only when raw water quality is poor and, when used, injection is flow paced based on the plant inflow rate. Pumps lift settled water to four elevated gravity filters. After filtration, sodium hypochlorite solution is injected. Filtered and chlorinated water is pumped by booster pumps to the new 2.0 MG steel tank clearwell system. Plant operators visit the treatment plant every day. When no operator is present, the plant is set to steady state operation for inlet flow and chemical feed. Filter media are checked twice yearly. The City reports that treatment operators verify up front on chemical deliveries and verify NSF approved chemicals are used.

Alum: *A 48% solution of NSF-approved alum is added to raw water at a concentration of 7 to 15 mg/L, depending on raw water turbidity.*

Pre - Lime: *Hydrated lime is added in order to maintain a pH of approximately 7.4. Lime can also be added as a pH buffer in winter conditions when water temperature is low. Dry hydrated lime and water are mixed in a W&T lime slurry feeder. Slurry is delivered with a 100 gph metering pump.*

Polymer / Filter Aid : *EcoChem EC-981 non-ionic polymer or the equivalent CP301 polymer are added to pre-filtered water when raw water turbidities are excessive (e.g., above 7 to 8 NTU). The polymer is mixed with a 40-gph diverted water stream prior to injection into the flash mixer at a dose of approximately 0.3 ppm. The rate of injection is flow-paced based on the rate of water leaving the filters.*

Pre & Post Chlorination: *A sodium hypochlorite chlorine concentration of 0.3 to 0.5 mg/L is injected prior to sedimentation to maintain a trace of free chlorine on the filters for algal control. The dosage is manually set according to the current inflow rate. A pre-filter chlorine injection system is available but is not currently being used. Post-filter chlorine injection boosts the free chlorine residual entering the clearwell to approximately 0.7 mg/L. An on-line analyzer monitors the combined post-filter chlorine residual. Free chlorine levels leaving the clearwells are monitored by grab sample, twice each day. The new welded steel clearwell tank system also has an on-line chlorine residual analyzer on the discharge side of each tank. Operators try to maintain a chlorine residual of approximately 0.5 mg/L entering the distribution system. Strip charts are used for record for chlorine analyzers.*

The following is a listing of the elements of the surface water treatment plant:

Intake Screens: *A fixed grate, situated downstream of the Parshall flume, removes debris from raw water.*

Coagulation/Rapid Mix: *Water leaving the Parshall flume enters a vertical drop pipe inlet leading to a rapid vortex mixing chamber (coagulant, etc., added) followed by an underground concrete basin. Coagulated water flows by gravity to the flocculation basin.*

Flocculation: *The flocculation chamber holds 104,000 gallons and contains two 6-foot diameter paddle wheels, which gently mix the water, aiding in the formation of the floc. The paddles are turned by manually-adjusted variable frequency drives.*

Sedimentation: *A baffled, 2.0 MG sedimentation basin allows floc to settle. Clarified water is pumped to the filters. The sedimentation basin does not have a sludge removal system. The treatment plant is shut down once a year so the basin can be cleaned.*

Filtration: *Water is pumped from the sedimentation basin through a manifold that distributes flow to four multi-media rapid sand filters. Each of the filters is just under 15 feet square (total filter area = 4 x 224 sf = 896 sf) and contains 24 inches of anthracite over 12 inches of sand. The plant is rated at 5 mgd (3,500 gpm), equivalent to a filtration rate of 3.9 gpm/sf. Filtration rates are controlled by opening or closing valves and by adjusting the rate of water pumped from the sedimentation basin. All four filters are typically used. They are backwashed manually (or by timer) approximately once per month during the winter, and approximately once every two weeks during the summer. Head loss across the filters is usually around 4 ft prior to routine backwash events. Backwash will begin automatically at a head loss of 8 ft, although this is rarely necessary. The post-backwash filter loading flow rate is increased at a rate controlled automatically by the inlet valve, allowing the filter to season before returning to a full loading rate of 3.9 gpm/ft2. The Department does not have a minimum requirement for backwash frequency, and though a 13 - 30-day interval may seem overly long, City staff say the filters perform well and are meeting operating criteria at this backwash frequency interval. City staff believe this to be an optimal frequency for filter performance.*

Disinfection of final effluent for surface water sources *Pre- and post-chlorination are practiced.*

Type *12.5% sodium hypochlorite solution cut to approximately 8% to bring it within the range of the metering pump. Chlorine analyzers are calibrated weekly.*

Capacity *Maximum dosing capacity is approximately 5 mg/L.*

Standby feeders *Emergency standby chlorination equipment is available.*

"CT" values *As discussed previously, the treatment plant must provide sufficient disinfection to achieve a minimum 0.5-log inactivation of Giardia cysts and a 2.0-log inactivation of viruses.*

Alarm *The water treatment plant has a callout system to notify operators in the event of an alarm condition. Alarm conditions include excessive sedimentation basin water turbidity, finished water turbidity, and low or high effluent chlorine residual. The clearwell system has a low and high level alarm.*

Standby replacement *The City keeps replacement pumps, parts, and chemical feed systems at the plant in case of emergencies. The plant also has three filter feed pumps for redundancy. Each 15 hp pump is rated at 1,740 gpm. Filter feed pumps can run independently of each other and are powered by variable frequency drives.*

Standby power *The plant is equipped with a 250 KW standby, diesel-powered, auto-starting generator that can power the entire plant. The generator is tested monthly.*

Describe records maintained of treatment *The following parameters are monitored and recorded: 1) influent – flow rate and pH; 2) sedimentation basin – level, pH, free chlorine, temperature, and turbidity at inlet and exit; 3) clearwell: level, pH, and free chlorine at inlet and exit; 4) combined filter effluent turbidities; and 5) chemical injection pump settings (stroke/speed).*

Describe operations and maintenance of treatment plant *At least annually, the City shuts down the Plant for cleaning.*

Is filter to waste provided? *Yes. Effluent from each filter is wasted for approximately 1.5 hours after a backwash event, but in summer may only last for around 50 minutes based on operator decision.*

Is reclaimed backwash water returned to headworks? (Treatment & settling time provided) *Yes. Backwash water is allowed to settle for approximately nine hours in a 200,000-gallon settling pond. A 70 gpm pump sends decant to the head works. The backwash-return flow rate is adjusted manually to keep return flow at or less than 10% of WTP flow. The recycle stream also includes treated water that is filtered to waste.*

Are design criteria met? If not what facilities are needed? *The treatment plant conforms to the design loading rate of 3.9 gpm/sf and not the higher, 6.0 gpm/sf, maximum loading rate specified the Drinking Water Regulations (T22 CCR §64660(b)(1)). The City's reports show that the treatment process effectively removes turbidity and provides adequate chlorine residual throughout the distribution system.*

Are performance standards met? *The City's monthly monitoring reports for 2007, 2008, 2009, 2010, 2011, and 2012 verify that the plant's combined filter effluent met the "95% less than 0.3 NTU" turbidity requirement and the 80% raw water turbidity reduction requirement for surface water treatment plants as specified in Sections 64657.3 and 64660 of Title 22, California Code of Regulations (CCR).*

Sampling *Raw and treated water (individual filter and combined filter) streams are monitored by online turbidimeters. Periodic grab samples are collected to verify the calibration of the on-line turbidimeters. The City was previously provided a copy of Department guidance on verification and calibration of turbidimeters. The City reports that on a quarterly basis the City follows HACH procedures to calibrate turbidimeters and calibration information reported on monthly SWTR reports.*

Where are turbidity samples collected? (must be before clearwell) *The following turbidities are measured via online instruments: individual filter effluents, and combined filter effluent. Combined filter effluent turbidity is monitored prior to the clearwell. Raw water samples are grab samples.*

Are operations criteria met? (i.e., filtration rate, operation plan, etc.) *The City Reports that the treatment plant is operated in accordance with the City's Plant Operations Plan, which is kept at the water treatment plant as well as being available in electronic form. The Operations Plan was updated to address the new welded steel clearwell system. As noted above in the Performance Standards section, the City reports verify compliance with operations criteria.*

Disinfection of surface water sources *Pre- and post-chlorination are practiced.*

Residuals *Free chlorine residual leaving the filters ranges from 0.4 to 0.7 ppm.*

Time *The plant's CT evaluation is based on the chlorine concentration leaving the clearwell and contact time in the clearwell. Typical contact times are 150 to 220 minutes in summer (at a flow of 1,600 gpm) and 400 to 700 minutes in winter (at a flow of 600 gpm). The two 1.0-MG clearwell tanks have no baffles; therefore, the short circuit factor is assumed to be 0.15.*

CT *Typical summer CT(req) = 10 mg/L-min and CT(prov) = 100 to 170 mg/L-min; typical winter CT(req) = 20 to 30 mg/L-min and CT(prov) = 300 to 400 mg/L-min.*

pH range *The pH leaving the filters is maintained near 7.0.*

Temperature range *The temperature of the finished water ranges from about 20 °C in the summer to 4 to 9 °C in the winter.*

Is a minimum disinfectant concentration of 0.2 mg/L being maintained at the distribution entry point? *Yes. Operators collect grab samples twice daily to ensure the target disinfectant (chlorine) residual of 0.5 to 0.7 mg/L is maintained out of the clearwell tanks.*

Are distribution residuals detectible at least 95% of the time? *Yes. Based on distribution chlorine residuals are checked whenever routine or repeat bacteriological samples are taken, detectible levels of chlorine are maintained throughout the distribution system.*

Watershed control *The Nevada Irrigation District (NID) has primary authority and responsibility for the watershed, including canals and ditches that convey water to the City's treatment plant. The NID watershed is generally uncontrolled, but NID has personnel assigned to patrol the various ditches and canals within the watershed.*

Discussion & appraisal *The surface water treatment plant is classified as a conventional water treatment plant. The plant appears to comply with the design and operational requirements of the Surface Water Treatment Rule. CT compliance is being measured and reported based on contact time and chlorine concentrations in the clearwell tanks. City also appears to maintain adequate distribution residuals.*

2. **Groundwater Sources** *None*

3. **Other Treatment or Blending Facilities**
Describe facilities & parameters treated/blended (i.e. iron, & manganese, fluoridation, nitrate, corrosion control, organics, etc.) *There is no other treatment than that described above.*

4. **Describe Records Maintained of Treatment**
The City maintains records of treatment processes and regulated parameters. Monitoring reports are submitted monthly to the Department.

D. STORAGE DATA

Table 3 – Reservoir Data*

Name	Type	Capacity	Zone	Comments
Empire Tank (Built in 1983)	*Welded Steel*	*2.5 MG*	*Empire Tank*	*Filled by gravity through pressure reducer from the treatment plant pressure zone. Very little turnover. Hand chlorinated, if chlorine residual drops below 0.3 ppm. Main purpose of the tank is fire protection. The water level in the tank is below the normal hydraulic grade line. The tank will supply water only if system pressures drop dramatically. Has altitude valve.*
	Total Active	***2.5 MG***		

** Alta Hill Clearwells (Tanks 1 and 2) were formerly listed as storage. However, as clearwells are not considered storage, they have been removed from this table.*

Does storage capacity comply with Waterworks Standards? *Yes. Source capacity, by itself, meets the Waterworks Standards for quantity of water supply. Storage capacity is not required to meet the peak hourly demand requirement.*

Are all data sheets completed & on file? *No. Not all data sheets are available. Reportedly, the permit amendment in 1986 included the Empire Tank. The 1986 permit amendment could not be located in the Department's or the City's files. Data sheets are available for Tanks 1 and 2.*

Are DDWEM coating procedures adhered to? *The City is aware of the Department's tank coating procedures. NSF Standard 61 certification is required.*

Discussion & appraisal (i.e., were reservoirs coated, cleaned &/or inspected last year? Plans for recoatings, cleanings &/or inspections? *Satisfactory.*

E. TRANSMISSION FACILITIES

Describe transmission facilities *There are no transmission mains, per se. There two short reaches of pipe, a 10" and a 20" (neither over 1,200 feet), connecting treatment facilities to the distribution system.*

Are there low-head lines? *The City reports that there are no low-head lines in the distribution system.*

Discussion & appraisal *Service connections are gravity fed directly through the distribution system under pressure from the Plant clearwell system.*

F. DISTRIBUTION SYSTEM

1. Pressure Zones

Describe or tabulate *See tabulation below*

Table 4 – Pressure Zone Data

Pressure Zone Name	Pressure Range	Water Sources	Storage Capacity	No. of Conn.
Treatment Plant	*34 psi to 115 psi*	*Treatment plant clearwell, or the Empire Tank in case of low pressure or fire.*	*2.0 MG (normal pressure from clearwell), 2.5 MG (lower pressure from Empire Tank)*	*2,384 (all but Broadview Heights)*
Broadview Heights System (NID treated water)	*50 to 78 PSI*	*Served only by NID's E. George distribution system. Not connected to other portions of the City's distribution system. Grass Valley unable to provide adequate pressure to this area.*	*NID*	*62*

Discussion & appraisal *There is one pressure zone floating on (pressurized by) the clearwells. There is a pressure reducing station for the Carriage House Development to address otherwise excessive water pressure in that low elevation part of the City's distribution system.*

2. Booster or Reducing Stations

Describe or tabulate *See tabulation below. There are no pump stations in the distribution system besides one that can be (but isn't) used to fill the Empire Tank.*

Table 5 – Booster Stations

Station	Capacity (gpm)	Power (HP)	From Zone	To Zone	Comments
Treatment Plant - Sedimentation basin to filter inlet	*3 @ 1,740 gpm each*	*15 HP each*	*Sedimentation basin*	*Filter inlet*	*One pump is spare; two pumps rated at 3,500 gpm (5 MGD)*
Plant Booster – Former Backwash Pump Station	*3 @ 1,700 gpm each*	*15 HP each*	*Filter* *Clearwell*	*Clearwell* *Filter*	*Formerly pumped backwash makeup water, but now conveys water to the new clearwell tanks.*

Table 6 – Pressure Reducing Stations

Station	From Zone	To Zone	Comments
Carriage House Subdivision	*Main*	*Carriage House*	*Reduced from 110 to 50 psi*

Discussion & appraisal *The entire distribution system is gravity fed and has one pressure reducing station and one (unused) booster station.*

3. **Water Mains**

Describe or tabulate *See tabulation below.*

Table 7 – Distribution System Data

Material	Amount	Size	Condition	Comments
Steel	*6%*			*Replaced when leaks discovered*
Cast Iron	*42%*			*Replaced when leaks discovered*
AC	*10%*			
C900 PVC	*20%*	*4" to 24"*	*Good*	*Most used for new & replacement*
Ductile iron	*21%*		*Good*	*Used high traffic areas &/or near surface*
HDPE	*1%*			

4. Discuss leak history during past 12 months (mains & connections)

During the 2012 calendar year, it was reported that there were 2 main leaks and 4 service connection leaks requiring repairs. Two water outages were also reported during 2012 according to the City's Annual Report to the Department. These were handled by the City without notifying the Department.

5. Are distribution facilities constructed in accordance with Waterworks Standards?

The City reports that distribution facilities are maintained and constructed per compliance with the Waterworks Standards and that City has full access to AWWA standards.

6. Describe water main & sewer line separation practices

A copy of the Department's water and sewer separation requirements was given to the City staff during the 2010 inspection. City staff report that Department's requirements are followed. City Engineering Department does review and plan checking for proposals for new water lines and new sewer lines to ensure water line and sewer line separation. Ray Clark of the City is involved in plan checking process. The entire City of Grass Valley has public sanitary sewer collection system. The City treats the wastewater before discharging to Wolf Creek under a NPDES permit. Treated wastewater is not recycled.

7. Extent of lead pipes, joints, &/or lead solder used in distribution system & present policy

There are no known instances of lead or lead solder in the distribution system.

8. Air release valve (ARV) operation in distribution system

The City has a trailer mounted equipment routinely used to clean and check ARVs. City requires all new ARVs to have risers.

9. Discussion & appraisal *Distribution system piping and facilities are said to be in good condition. The City has prepared a TMF report and a capital improvement program (CIP) to address needed distribution system issues. The City has a budget process for annual assessments.*

G. WATER QUALITY & MONITORING

1. **Bacteriological Monitoring**

Description of **distribution system** bacti monitoring program *The City has been collecting eight routine bacteriological samples each month (two per week, except none during the fifth week, when there was a fifth week). When figuring minimum number of bacteriological samples, the main distribution system and the Broadview Heights distribution system should be considered separately. The City's Broadview Heights area (62 connections) consists of distribution piping owned by the City and treated water provided by Nevada Irrigation District. One routine sample is collected each month from Broadview Heights, and seven routine samples are collected each month from the main distribution system. The* samples are analyzed at the City's ELAP-certified laboratory (Certificate No. 1762). The ELAP Certification was recently renewed and is good through May 31, 2014.

Sampling plan approved & current (do we have a copy?) The City submitted Sample Siting Plans to the Department in 1997 and in 2004. The most recent update is dated June 2, 2011.

Controlling factor is population or service connections? The number of service connections (2,390 and 62 for main and Broadview Heights, respectively) are the controlling factors.

Number of samples per month or week required? Seven samples per month (main) and one sample per month (Broadview Heights).

MCL violations in past year? None.

Discussion & appraisal The bacteriological monitoring program under the TCR appears adequate. The Broadview Heights bacteriological sample result needs to be reported separately from the City's main system results.

Description of **raw water** bacti monitoring program The City completed the raw water bacti monitoring requirements of the USEPA's Long Term 2 Surface Water Treatment Rule (LT2) in November 2009. The coliform monitoring results showed that monitoring for cryptosporidium was not required and that the City qualified for a Bin 1 classification which means that the City's treatment plant was adequate for the raw water bacti quality as seen in bacti monitoring results. The City is subject to the State of California Interim Enhanced Surface Water Treatment Rule requirements of 2008 which specify that raw water total coliform and fecal/E. coli must be sampled and reported monthly. The City is generally reporting the bacti results for raw water monitoring on a monthly basis.

Compliance and Appraisal: Satisfactory.

2. **Chemical Monitoring**

Description of program The City relies on monitoring schedules issued by the Department.

Who collects samples? Distribution operators collect chemical water quality samples.

Discussion & appraisal The City is up-to-date on sampling with its chemical monitoring schedule.

3. **Other Organics**

Description of program The City has completed initial monitoring for MTBE and UCMR-1.

Discussion & appraisal Organic testing appears to be on schedule.

4. **Disinfection Byproducts**

Description of program Chlorine (sodium hypochlorite) is used as a disinfectant. Therefore, the City must monitor for disinfection byproducts (DBPs). For the 4 quarters of 2012, the City's TTHMs averaged 24.5 μg/L and the HAA5s averaged 8.4 μg/L. Table 8 summarizes DBP result for the 1st Quarter of 2005 through the 4th Quarter of 2012.

Table 8 – Disinfection Byproduct Data

Quarter Sampled	TTHMs, μg/L (MCL = 80 μg/L)	HAA5s, μg/L (MCL = 60 μg/L)
1st 2005	24	7.2
2nd 2005	36	5.5
3rd 2005	28	5.4
4th 2005	23	9.5
1st 2006	22.4	5.9
2nd 2006	24	2.3
3rd 2006	9.8	4.4
4th 2006	17.7	6.3
1st 2007	22.8	8.0
2nd 2007	26.6	6.7
3rd 2007	28.2	ND
4th 2007	18.1	4.3
4 quarters of 2008	16.4, 24.4, 27.8, 24.4	4.7, 2.5, 1.7, 4.5
4 quarters of 2009	17.9, 25.2, 25, 21.6	6.2, 4, 6.2, 8.6
4 quarters of 2010	20, 34, 23, 22	9.1, 4.4, 6.7, 5.2

4 quarters of 2011	15.0, 20.0, 40.3, 20.2	5.9, 4.9, 4.2, 9.5
4 quarters of 2012	14.4, 28.1, 29.1, 26.3	16.3, 5.6, 6.2, 5.5
2012 - 4 Quarter Avg.	**24.5**	**8.4**

Discussion & appraisal *The City is a Schedule 4 system under the federal Stage 2 Disinfection Byproducts Rule. By no later than April 1, 2008, Schedule 4 systems were required to submit an Individual Distribution System Evaluation plan (either a Standard Monitoring Plan or a System Specific Study Plan) or a 40/30 Certification. Based on there being no DBP values above ½ the MCL for TTHMs or HAA5s in the monitoring results shown in Table 8, above, the Department approved the City for a 40/30 Certification under 40 CFR 141.603 in April 2008. The City complies with DPB requirements. Compliance with the Stage 2 rule must begin no later than October 1, 2013.*

5. **Disinfection By-products Precursors**
Description of program: *In March 2006, the Department approved the City's request to conduct quarterly DBP precursor (i.e., TOC) monitoring in lieu of monthly monitoring.*
Discussion & appraisal: *Satisfactory.*

6. **Lead and Copper Monitoring**
Description of program (Physical quality of distribution system, corrosion, lead monitoring, etc.) *The City has completed six rounds of lead and copper testing. The Department has approved the City's request to reduce sampling from 40 samples to 20 samples (which is the reduced sample size for 3,301 to 10,000 population). All 90th percentile results have been less than ½ the action level (except the 1993 lead 90th% = 10 µg/L). The City failed to collect the sample set due by September 30, 2009, so make-up samples were collected in 2010. The 2010 results showed the following 90th percentile results meet the action level standards : lead – 10.9 µg/L (< 15 µg/L) and copper – 955 (< 1,300 µg/L) µg/L. It appears that the City did not conduct lead and copper sampling in 2012.* ***The City must collect and report a round of lead and copper samples by no later than September 30, 2013.***

7. **Additional Monitoring**
Is an approved water quality-monitoring plan on file? (i.e., briefly summarize plan & needed additions) *The City has less than 10,000 service connections and, therefore, is not subject to the monitoring plan requirements of Section 64416 of Title 22, CCR.*

8. Was the **Consumer Confidence Report (2012 CCR)** sent to customers? *Yes, report dated April 15, 2013.*
Date sent? *June 2013* Is a copy of the report on file with DDW? *No. A copy of the report was posted to the City of Grass Valley website in April 2013.*
Are there needed additions or changes? *No.*

9. Was the **Annual Report to the Drinking Water Program (ARDWP)** sent to DDW? *Yes, the 2012 Electronic Annual Report has been received.*

H. OPERATIONS & MAINTENANCE

1. **Planning & Personnel**
Are system improvements made in accordance with the Waterworks Standards?
The City reportedly makes all system improvements in accordance with the Waterworks Standards.
Does the utility have up-to-date distribution system maps? *The City has up-to-date maps.*
Is up-to-date copy of system schematic on file? *Yes.*
What are the minimum grade requirements (treatment and distribution)? *The City is required to have a Grade T3 Certified Water Treatment Operator in responsible charge as a Chief Operator of the surface water treatment plant and a Grade T2 Shift Operator. The City is also required to have a Grade D2 Certified Distribution Operator as Chief Operator to oversee the distribution system and a Grade D1 Shift Operator.*

Plant operations and staffing *The City does not have a SCADA system nor remote access via computer to the plant and system operation. A water treatment operator is present at the plant site every day of the year. A shift typically lasts from two to eight hours. The standard procedure is for the plant to be checked by operators twice a day during weekdays and once a day during the weekend. When there is no operator at the plant, a duty operator is accessible around the clock 365 days a year through the alarm-pager system. City staff respond to alarm calls by making a site visit.*

Distribution system operations and staffing *A distribution system operator is available every day of the year. A distribution operator is accessible around the clock 365 days a year through a pager system.*

List or tabulate certified personnel *See below table.*

Table 9 – City Personnel

Name	Title	Operator Grade*
Michael S. Busse	***Chief Treatment Operator***	*T3*
Gregory D. Swanton	*Shift Operator*	*T2*
Trever L. Van Noort	*Shift Operator*	*T3*
David J. Winterholler	*Shift Operator*	*T3*
Tyler D. Pellow	*Shift Operator*	*T2*
Raymond K. Clark	***Chief Distribution Operator***	*D3*
Gregory J. Smith	*Shift Operator*	*D3*
Jonathan M. Davis	*Shift Operator*	*D3*

*Operator grades obtained from the City's 2012 Annual Report to the Department.

2. Cross-Connection Control Program

Name of cross-connection control inspector(s) *Mike Busse is responsible for the City's cross-connection control program and reviews projects and does plan checks for backflow protection needs. Testing, installation, and service for the City-owned backflow devices are provided by a private contractor (Bill's Backflow) – by Jim Green (certification #7608). Jim Green also assists as the cross-connection control program coordinator. The City reports that a cross-connection control survey was completed in October 2012.*

Is there a copy of the cross-connection control ordinance on file? *Yes – Grass Valley Code of Ordinances, Title 13, Chapter 13.08, "Backflow Prevention Devices," has been printed and placed in the case file. An electronic copy has been placed on the server.*

Discussion & appraisal *The City sends letters to all owners of backflow devices and tracks completion of testing and verification of passing or failure and repair. Device testing and test reports are tracked using a backflow protection maintenance system (BPMS). The City reported that in 2012 there were 116 backflow prevention devices in the system. No devices were installed in 2012. Thirty devices were tested in 2012. No devices failed and/or were replaced in 2012.* ***The City needs to ensure that all backflow prevention devices are tested annually.***

The city's wastewater treatment plant has two service connections (6" and 2-1/2") to the municipal water supply. Each service connection is protected by a reduced pressure valve. However, air gaps are required when connecting to sewerage works unless RPs are specifically approved (Title 17 §7604). City staff said that replacing the RPs with air gaps is not presently feasible due to lack of funding.

3. Complaints

Describe complaint program *Complaints are received via phone calls to City Hall, the sewer plant, or the water treatment plant and directed to the water treatment operator on call. Complaints are entered on forms and on a tally sheet. Operators normally respond to a complaint the same day. The following table summarizes complaints received in 2012.*

Table 10 – Complaints Summary for 2012

Type	Number	Comments
Taste and Odor	*0*	
Color	*7*	*Cause unknown, flushed main line.*
Turbidity (or sand)	*6*	*Cause unknown, flushed main line.*

Type	Number	Comments
Worms and Other Visible Organisms	*0*	
Pressure (High or Low)	*0*	
Water Outages	*0*	
Illnesses (Waterborne)	*0*	
Other (specify)	*1*	*A customer said the water was acidic. Tests came back normal.*
Total	***14***	

Discussion & appraisal *The City appears to have a satisfactory customer complaint program. No complaints received in 2012 required referral to the Department.*

4. Emergency Response

Is an up-to-date emergency notification plan on file? *An Emergency Notification Plan (dated November 21, 2012) is on file.*

Emergency response plan *Section 1433(b) of the US Safe Drinking Water Act, as amended by the Public Health Bioterrorism Preparedness Act of 2002, requires that water systems with more than 3,300 population prepare an emergency response plan (ERP). The City of Grass Valley has prepared an overall Community Emergency Response Plan.*

Notification of DDWEM of significant system problems *Since the Valley District of the Department assumed oversight of this water system, the City has not reported any significant problems.*

Discussion & appraisal *Satisfactory.*

5. Main Disinfection Program

Describe main disinfection program (i.e., method, contact time, chlorine residual, bacteriological tests, records) for new & repaired mains *Most main repairs are accomplished while the system is under pressure. Main repairs performed when lines are depressurized are reportedly disinfected per the AWWA Specifications. Calcium hypochlorite tablets used for larger lines and projects and HTH liquids and spray used for smaller lines and projects.*

Does the main disinfection program comply with AWWA specifications? *Yes.*

Discussion & appraisal *The City has an adequate main disinfection program. In 2011, there were a total of 6 service connection and 3 water main breaks or leaks reported.*

6. Valve Maintenance Program

Describe program *The City does not have a formal valve maintenance program. There are approximately 300 valves in the system which have been located by GPS and included on the water system map. They range in size from 2 to 20 inches in diameter. According to the City's 2012 Annual Report to the Department 100 valves were exercised in 2012. The frequency of valve exercising is biennially.*

Are number & location of valves satisfactory? (i.e., mainline, ARVR, blowoff valves, etc.) *The number and placement of valves appears adequate to isolate water mains for repairs without having to shut off large portions of the distribution system.*

Discussion & appraisal (i.e., are valves recorded on maps available to field crews? Are all valves located with valve covers raised to grade?) *About 98% of the system valves are recorded in a valve book and a CAD system, but they not all are marked and readily identifiable in the field.*

7. Flushing

Describe flushing program (i.e. deadends, records, etc.) *The City has begun to institute a formal flushing program, but only two field staff are available for the flushing program. Localized flushing is done on an as needed basis, often in response to customer complaints. Flushing is sometimes done to achieve circulation during a valve test. The City has a program goal of developing a uni-directional flushing regimen. The water department has also made requests for summer manpower increases to achieve system wide flushing every year.*

Approximate number of dead ends 36 Percent with flushing valves 100%
Discussion & appraisal *The City reports that all dead ends have blow off valves or hydrants. Section 64642 of Title 22 requires blow off valves (or hydrants) on all dead ends.*

8. Emergency Backup Power

Discussion & appraisal *The City has a backup generator sufficiently sized to run the entire water treatment plant.*

9. Supervisory Control and Data Acquistion System (SCADA)

Discussion & appraisal *The City does not have, nor is required to have a SCADA system or on-line remote terminal access system. In August 2011, the City completed the installation of DCI Position Collection Global Water Fantom water meter system which has replaced all system meters. Now hourly readings are reported from the meters in the system to the City.*

I. OVERALL SYSTEM APPRAISAL

The City of Grass Valley's Public Water System appears overall to be in compliance with the regulations relating to drinking water and water systems in Division 4 of Title 22 of the California Code of Regulations. The City has certified operators and staff who operate and maintain the domestic surface water treatment plant and distribution system in a satisfactory manner. The City strives to comply with the Department's requirements and maintains good communication with the Department.

J. APPENDIX

Deficiency Report

Report prepared by:

R. Crenshaw for 7/31/13

Signature Date

Daniel L. Cikuth, P.E.
Associate Sanitary Engineer

SYSTEM DEFICIENCY RECORD

Name of System City of Grass Valley System Number 2910001

Date Noted	Description of Defect or Hazard	Priority Code*	Reported Corrected	Confirmed Corrected
6-8-11	No deficiencies noted.	--	--	--
6-14-12	Two of the four filter effluent turbidity meters are not in working order. The water system is looking into replacements but expects it will take several months. Failure to continuously monitor effluent turbidity on each individual filter violates federal regulations, specifically 40 CFR 141.560. The State of California has drafted, but not yet implemented, regulations that would make this a California requirement as well. Deficiency must be corrected before state version of this rule comes into effect.	4		3-27-2013
6-14-12	Bags of lime (Chemstar Type S) stockpiled at the plant and occasionally used for pH adjustment are not certified under NSF 60. In accordance with Title 22 CCR, §64590, only direct additives meeting NSF 60 may be used. Existing stock of Chemstar Type S lime must not be used, and the new supply of lime must conform to NSF 61. Correct as soon as possible but before the rainy season when lime is typically used.	ASAP		3-27-2013
6-14-12	Triennial nitrite sampling was missed in 2010. Collect sample as soon as possible.	ASAP		3-27-2013
6-14-12	Wastewater Treatment Plant has two service connections (6" and 2-1/2"), each protected by a double-check valve. However, air gaps are required unless RPs are specifically approved (Title 17 §7604).	2		Ongoing
3-27-2013	Collect and report a round of lead and copper samples by September 30, 2013.	2		
3-27-2013	The City needs to ensure that all backflow prevention devices are tested annually.	3		

***Priority Code:**

1. Serious health hazard; corrective action must be taken immediately.
2. Critical system or operational defect and/or potential health hazard; must be corrected as soon as possible.
3. System or operational defect and/or potential contamination hazards of lesser public health significance. Must be corrected as workload permits.
4. System or operational defect and/or potential health hazard - costly to correct - to be included in any long-range water improvement project.