NEPHI CITY

CULINARY WATER SYSTEM

USDA – RD

PRELIMINARY ENGINEERING REPORT

2016

Revised 8/10/16

SUNRISE ENGINEERING

NEPHI CITY

CULINARY WATER IMPROVEMENTS PROJECT - 2017

USDA—RD PRELIMINARY ENGINEERING REPORT

July 2016

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TABLE OF CONTENTS

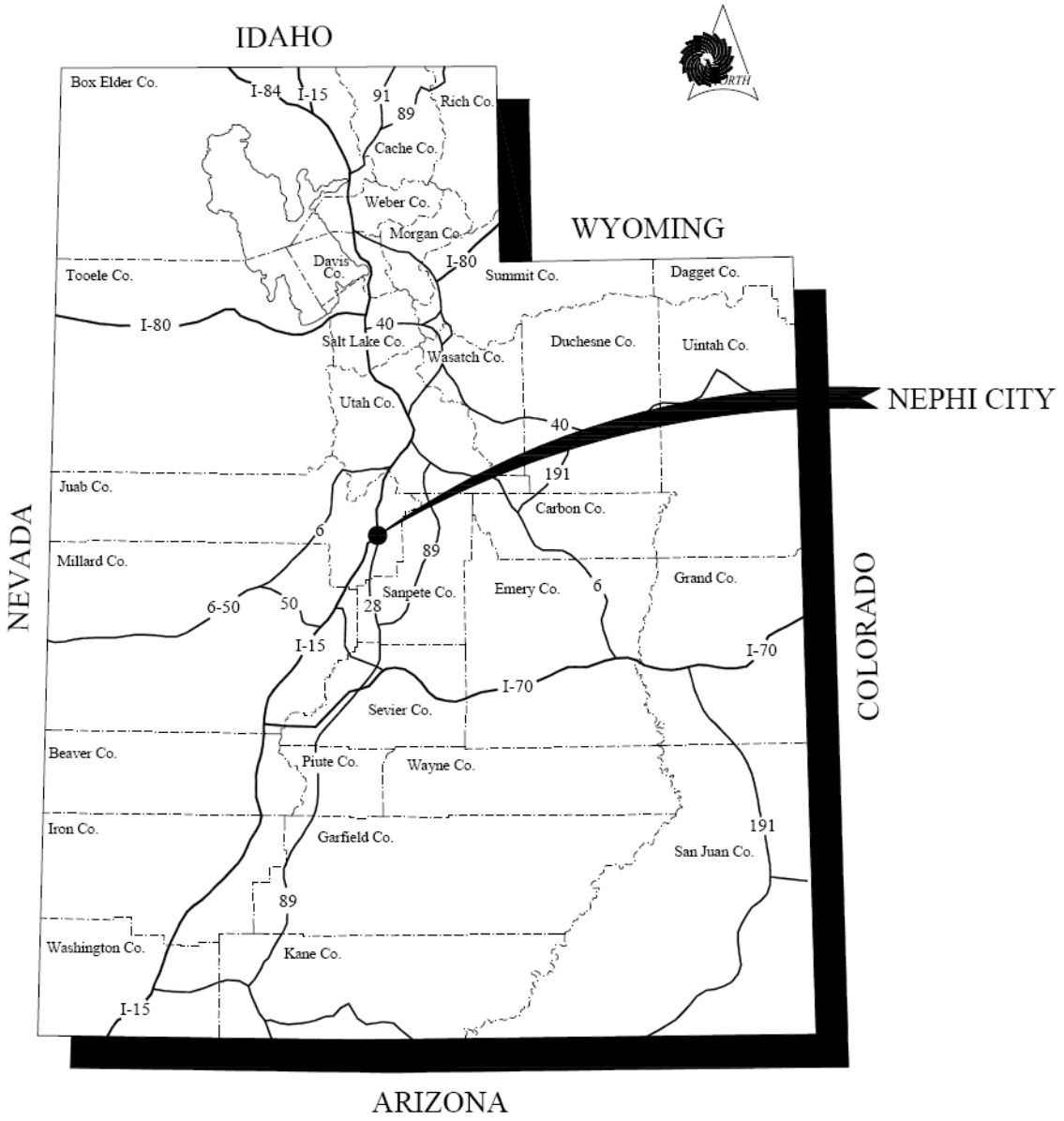
SECTION

SECTION 1.0
INTRODUCTION

1.1 GENERAL

This Preliminary Engineering Report has been prepared for Nephi City, which is located in east Juab County near the geographical center of the State of Utah. The Nephi City Administrator is Randy McKnight. He can be contacted at (435) 623-0822. The Nephi City offices are located at 21 East 100 North, Nephi UT 84648. An area map, showing the location of Nephi City, is provided below.

AREA MAP



1.2 HISTORY OF NEPHI

The history of Nephi, Utah as provided herein is taken from the "Utah History Encyclopedia". There were over 250 contributors to the "Utah History Encyclopedia." The authors, who donated their time to the project as a gift to the people of Utah for the state's centennial celebration, comprise nearly all scholars of Utah history working both within and outside the state. The following, through the date of its publication is used with thanks, by permission of University Press, University of Utah.

Nephi

Pearl D. Wilson
Utah History Encyclopedia

Nephi is located at the mouth of Salt Creek Canyon; the north peak of Mount Nebo is to the northeast and the Red Cliffs are to the southeast. The city covers an area of approximately four square miles.

As with most settlements in Utah, Nephi's founders were Mormons, and the name of the town came from the Book of Mormon. In the summer of 1851 Joseph L. Haywood and Jesse W. Fox, the territorial surveyor, were instructed by church leaders to lay out the town of Salt Creek, so named for the local salty stream. Haywood served as civic and spiritual leader in the area for three years. The settlers immediately began to clear ground and build homes. They also started schools for their children. Nephi boasted the third high school (and the first rural one) in the state in 1894. In 1879 a Presbyterian school was opened and later a Methodist school.

Nephi was known for some years as Salt Creek. However, early church records refer to it as the Nephi Branch and some government records also called it Nephi. Until 22 May 1882 mail to the town was addressed to the Salt Creek post office. Nephi was incorporated in 1889, and on 16 January 1892 an act by the governor and the legislature of the territory was approved, making Nephi the county seat of Juab County.

Agriculture was the first industry. Farming and livestock have always been important in the Nephi area. The settlers traced the source of the salt in the creek to a cave in the canyon east of town and they then began to mine it. This soon became a flourishing local industry, with salt traded to people as far away as St. George in exchange for food and clothing. In 1893 the Nebo Salt Manufacturing Company was organized. However, it eventually became unprofitable to compete with the larger companies on the shores of the Great Salt Lake, and 1925 marked the end of the local industry.

Milling was another local industry with Zimra H. Baxter, George W. Bradley, and Abraham Boswell building a grist mill. Later more mills were built and modernized, and Nephi's Gem and Snowflake flour became known throughout most of Utah. In 1917 R.C. and Robert Winn built a mill which was later purchased by the Hermanson family. In June 1991 it was destroyed by fire with a loss of more than $20,000 worth of inventory; however, the California partners who now own it are planning to rebuild.

When gypsum was found at the mouth of Salt Creek Canyon, plaster was made by grinding it between two rocks and cooking the powder. Later a grinding machine was obtained and a waterwheel installed which was powered by water diverted from Salt Creek. In 1889 the Nephi Plaster and Manufacturing Company was incorporated and the first mill was constructed. It survived two fires in the early 1900s and flourished to become the major employer in Nephi.

On 3 May 1879 the railroad came to Nephi, and in 1880 the Sanpete Valley Railroad was built from Wales to Nephi for the purpose of hauling coal from the mines. This helped make Nephi a business center and greatly improved the local economy.

The business district on Main Street grew rapidly, and during the late nineteenth century there were restaurants, meduantile stores, hotels, clothing stores, a tailor, a furniture store, two millinery stores, two barber shops, and several other establishments. At this time, because of the number of businesses, Nephi was frequently referred to as "Little Chicago."

Early in 1900 the main railroad line was moved west to Lynndyl and Delta. This resulted in some changes, but the people generally adjusted and other industries appeared to supplement the economy. In 1930 Nephi Poultry, Inc., which was affiliated with the Utah Poultry Association, was formed and employed a number of locals. The Nephi Processing Plant was organized in July 1945 to process turkey meat. In 1947 the Juab Valley Feed Company was organized; in 1958 it was purchased by Utah Poultry.

In June 1948 Termoid Western was dedicated and opened for inspection. The company manufactured rubber conveyor and transmission belting; molded types of industrial hose for oil fields, automotive fan belts, mechanical rubber products, and tank lining. By 1956-57 gross sales reached over six million dollars and it employed about 300 people. During the past thirty years the company has had multiple changes. It has closed and reopened, has changed owners several times, and is now operating as N.R.P.-Jones. It currently employs about 145 people.

Unfortunately, with the general ease and availability of transportation to larger urban areas, Nephi's Main Street business district has somewhat declined, as is the case with many rural areas in Utah. Nevertheless, Nephi's population reached its largest numbers in 1980, 3,285 residents, and continued to grow throughout the decade to 3,515 in 1990. Students attend the Nephi Elementary School and the Juab Middle and High School which share a building completed in 1980. The city hosts the annual Ute Stampede Rodeo, first held in 1936. The population is predominantly LDS with members attending seven wards in two stakes.

See: Keith N. Worthington, Sadi Greenhalgh, and Fred J. Chapman, *They Left a Record: A Comprehensive History of Nephi, Utah* (1979); and Alice P. McCune, *History of Juab County* (1947).Used by permission, University Press, Sharon Day, Permission Manager, University of Utah, Salt Lake City Utah.

1.3 METHOD OF SYSTEM ANALYSIS

A Five Point Analysis of the culinary water system, which includes water right, source capacity, storage capacity, treatment, and distribution in accordance with the *State of Utah Rules for*

Public Drinking Water Systems (Rules), is used as the basis of this report. The Five Point Analysis calculations and projections are included in Appendix A.

1.4 CURRENT CONDITION

Nephi City is growing with new homes and subdivisions being added to accommodate the growth. The 2010 census established the population of Nephi City at 5,389. As of January 2016, the population is estimated at 5,697, which will be used as the base population for projections in this Preliminary Engineering Report. Nephi City's culinary water system must be upgraded to meet requirements of the Rules; to keep pace with growth that has occurred; and to maintain required service levels to support projected growth through a planning period covering the next twenty years. Observations of current culinary water system conditions are itemized below:

- Much of Nephi City's culinary water distribution system consists of lead joint cast iron pipelines that have been in service for over 70 years. Many of these old pipelines are undersized ranging from 1" to 4" in diameter, and no longer meet the requirements of the Rules.

- An inventory taken of fire hydrants in the system revealed that some hydrants were over 100 years old. A few of these hydrants have been replaced, but many old hydrants still remain. A few hydrants are difficult or impossible to operate, and many hydrants are currently connected to 4" pipelines. Fire hydrant spacing does not meet current requirements.

- No new storage tanks have been constructed since 1972, leaving the City short of needed storage in accordance with the Rules.

- At this time the City's water source capacity is very close to that required by the Rules. However, current source capacity is inadequate to meet projected requirements.

Nephi City has its own power company and is a member of the Utah Municipal Power Agency. Hydro-electric power is produced by diverting culinary spring water from the Upper Bradley Springs transmission pipeline through a small hydro-electric generating station east of Nephi City in Salt Creek Canyon. The City uses the power produced to offset culinary well pumping costs and other City power needs. Excess power produced by the power plant is sold through UMPA.

1.5 ENVIRONMENTAL RESOURCES

The Nephi City culinary water system is located on City owned property, county and state road rights of way, or within easements on private property. Because the project will be funded using USDA-RD funds, cultural and biological surveys are being prepared for areas that may be impacted by proposed system improvements. The results of these surveys will be included in the environmental report being prepared for this project. No improvements will be located on any state or federal lands.

SECTION 2.0
SYSTEM USERS ANALYSIS

2.1 POPULATION TRENDS

It is essential in the development of this Preliminary Engineering Report to evaluate population and water system trends and growth rates. Growth rate projections give the planner an idea of future demands that must be accommodated by the culinary water system. The table below shows Nephi City's historic growth rate from 1970 through 2010 and an estimate through 2016.

TABLE OF NEPHI CITY POPULATION GROWTH

Year	Census Population	Growth Rate	
1970	2,699		
1980	3,285	1970 - 1980	1.98% per year
1990	3,515	1980 - 1990	0.68% per year
2000	4,733	1990 - 2000	3.02% per year
2010	5,389	2000 - 2010	1.31% per year
2016	5,697(est.)	2010 - 2016	1.40% per year

Calculations to determine historic or projected growth rates use past and present census population data plugged into the compound interest formula.

$$F = P (1 + i)^N$$

where:

F = 2016 Population = 5,697
P = 1970 Population = 2,699
i = Historic Growth Rate = ? %
N = Period in Years = 46

$$5,697 = 2,699 (1 + i)^{46}$$

[Solving for "i" results in a historic growth rate of 1.64%, from 1970 to 2016]

Growth rates fluctuate over the years. However, it seems reasonable to assume that Nephi City will continue to grow at its recent historic growth rate. The City has a general plan that has more detailed information on growth rate projections. This PER uses the growth rate projections from the general plan as the basis for projections; therefore, annual growth rates are assumed at: 2.73% residential, 2.00% commercial, and 5% industrial. These rates are used for projecting growth rates for population, residential connection, commercial connection, and industrial connections in the Five Point Analysis calculations included in Appendix A.

It is important to understand that the rate of growth is not necessarily as important as total growth. If the rate of growth varies, and if the projected maximum number of connections is reached earlier than projected, or later than projected, then future improvements to support growth may come earlier or later. If growth is faster, system revenue is collected at a more rapid rate, and debt service can be retired earlier, making additional improvements possible. System fees are set at an amount to allow payment of system debt service under low-growth conditions. Therefore, user fees, connection fees, and, when applicable, impact fees will not be significantly affected if the actual growth rate varies from the 2.73% residential growth rate used in this PER.

2.2 LENGTH OF PLANNING PERIOD

This Preliminary Engineering Report uses a 20-year planning period, beginning in the fiscal year ending June 2016 and running through the fiscal year ending June 2036, to evaluate system improvements. Population growth projections and the expected service life of infrastructure improvements make this a reasonable length for the planning period in a small city.

2.3 CULINARY WATER CONNECTIONS

2.3.1 Existing Culinary Water Connections and EDUs

According to Nephi City staff, the number of culinary connections as of January 2016 was 2,100. It is assumed in this PER that this is the number of connections that are served at the start of the planning year and the start of the planning period. The 2,100 connections include 1,910 residential connections, 189 commercial connections, and 1 industrial connection.

In this plan, reference is made to Equivalent Domestic Units (EDU(s)). One EDU is defined as the amount of culinary water required by an average residential connection. Because an EDU relates to the amount of water required for the average residential connection, use of this term allows commercial and industrial users to be equated to residential connections. A residential connection is assumed to always equal 1 EDU in calculations.

Based on past usage records, Nephi City staff provided average culinary water usage for various types of connections in the City. The 1,210 residential connections without pressurized irrigation use on average 26,976 gallons per month. The 700 residential connections with pressurized irrigation water available use an average of 6,434 gallons per month. The calculated weighted average usage by all residential connections is 19,458 gallons per month.

Therefore, one EDU represents 19,458 gallons per month in Nephi City. Based on the data that was supplied the 189 commercial connections use an average of 72,647 gallons per month. Dividing 72,647 by 19,458 yields approximately 3.73 EDUs per commercial connection. The industrial connection uses an average of 3,160,166 gallons per month. This figure divided by 19,458 gallons per month per EDU yields 162 EDUs for the one industrial connection. The calculations, included in Appendix B—Average Water Usage and EDU Determinations, provide the method of determining the weighted average for residential usage and the number of EDUs.

Table 2-A provides the comparison between the current culinary water connections and EDUs. The number of connections listed in the table is the number of connections as of the start of the planning period. The number of commercial and industrial EDUs is found by multiplying the number of connections by the number of EDUs per connection, as shown in Appendix B.

TABLE 2-A		
CLASSIFICATION	**CONNECTIONS**	**EDUs**
Residential	1910	1910
Commercial	189	705
Industrial	1	162
TOTAL	**2,100**	**2,777**

It is important to understand that although the one industrial connection represents 162 EDUs, the revenue collected from the industrial user is greatly reduced from that which would be expected from 162 EDUs. As in many other communities, the industrial overage rates are kept very low to encourage this industry to remain in Nephi for the employment opportunities it provides to the residents.

The actual revenue collected for the past year from the industrial user was $13,377.70. This more closely represents the revenue expected from 12 EDUs, and the difference in revenue must be made up by the other residential and commercial users on the system as needed to cover the loan payments required to construct the project.

2.3.2 Projected Culinary Water Connections and EDUs

It is assumed that the number of connections and EDUs grow at the same projected rates from the general plan as discussed above. Based on this assumption, the number of either culinary water connections or EDUs expected at the end of the planning period can be calculated using the compound interest formula, and inserting the projected growth rate; the existing number of culinary water connections or EDUs; and the 20 year planning period for culinary water improvements.

The projected number of connections and EDUs for any year within the 20 year planning period is provided in Part 1, Population Data, of the Five Point Analysis spreadsheet in Appendix A. The Five Point Analysis spreadsheet incorporates the compound interest formula to provide the projections. Table 2-B shows projected connections and EDUs at the end of the planning period in 2036 as taken from the Five Point Analysis spreadsheet.

It should be noted that the 2016 numbers in the Five Point Analysis spreadsheet are whole numbers. After 2016, the numbers in the columns in the Five Point Analysis are rounded to the nearest whole number at the projected annual rate of growth. This rounding causes the number of projected EDUs for industrial connections (430) in Table 2-B to be lower than direct multiplication of the rounded whole number industrial connections (3) by 162 EDU per industrial connection, which would yield 486 EDU. The number of industrial EDUs, 430, provided in Table 2-B is correct.

TABLE 2-B		
CLASSIFICATION	**CONNECTIONS**	**EDUs**
Residential	3,273	3,273
Commercial	281	1,048
Industrial	3	430
TOTAL	**3557**	**4,751**

The total number of culinary water connections projected at the end of the planning period is 3,557. The total number of culinary water EDUs projected at the end of the planning period is 4,751. It is recommended that Nephi City size all future culinary water related infrastructure improvements for at least 4,751 EDUs.

It is important to note that Nephi City currently uses culinary water for the sprinkler systems of almost all of its parks, schools, the cemetery, and the golf course. An approximation of the existing acreage of these Large Green Areas (LGA) is 124 acres. The projected acreage of the LGA at the end of the planning period is 174 acres. This projection is based on the approximate area of two parcels that the City has identified as the location of planned parks. The area of the LGA is a major factor in the calculations to determine the amount of required water right, source capacity, and storage capacity.

One objective of the project covered by this PER is to shift the culinary supply to the LGA away from the blended spring and well water in the storage tanks and distribution system. Water for the LGA will be supplied directly from the culinary well transmission pipelines that feed the blue tank. Connections from the transmission lines to the irrigation system at each LGA will be through the use of reduced pressure zone check valves, which will to protect the sources from cross connection. This change offers two potential advantages for residents:

1. It will supply the LGA with water before the water is stored in the tanks, which will allow a significant reduction in the projected required storage capacity. For comparison purposes, the projected required storage capacity in the 5 Point Analysis in Appendix A is calculated both with the LGA supplied from the tanks and without the LGA supplied from the tanks.

2. Residents believe that their spring water tastes better than the well water. This change allows a higher percentage of the water in the tank to be spring water, improving the taste of the water in the system. Whether or not the spring water actually tastes better than the well water is subjective. But general public perception across the State of Utah is that spring water is almost always better tasting.

SECTION 3.0
WATER RIGHT ANALYSIS

3.1 EXISTING WATER RIGHT

Existing Nephi City water rights used for culinary water are identified in Table 3-A below.

TABLE 3-A

Water Right Number	Source	Ac-Ft (Calculated from cfs value)	CFS Flow (Taken From Water Rights Website)	GPM Flow (Calculated from cfs value)
53-00	Marsh Spring	562.42 ac-ft.	0.78 cfs	348.68 gpm
53-2	Rowley's Spring	83.00 ac-ft.	0.11 cfs	51.46 gpm
53-35	Monument Springs 1,2,3	488.68 ac-ft.	0.68 cfs	302.97 gpm
53-53	Underground, Airport well	57.92 ac-ft.	0.08 cfs	35.91 gpm
53-63	Underground, Salt Creek Well, Rocky Ridge Well, Blake Garrett Well, Airport Well	2,628.04 ac-ft.	3.63 cfs	1,629.28 gpm
53-64	Industrial Waste	200.00 ac-ft.	0.28 cfs	123.99 gpm
53-65	Underground, Jones Well & Bradley Spring	4,343.87 ac-ft.	6.00 cfs	2,693.02 gpm
53-80	Bradley Spring Winter	1092.48 ac-ft. (Nov.1 to April 1)	3.63 cfs	1,629.29 gpm
53-87	Underground, Fire Station Well	3,062.42 ac-ft.	4.23 cfs	1,898.58 gpm
53-88	Underground, Shop Well	3,663.33 ac-ft.	5.06 cfs	2,271.12 gpm
53-1516	Underground, Shop Well	839.82 ac-ft.	1.16 cfs	520.65 gpm
TOTAL:		**17,021.98 ac-ft.**	**25.64 cfs.**	**11,504.94 gpm**

The City is currently leasing excess summer Bradley Spring water from the irrigation company through a water use agreement. The agreement allows the City to use the irrigation company's spring water for culinary purposes during the summer months. In turn, Nephi City provides water to the Irrigation Company from its culinary well sources. The amount of Bradley Spring water exchanged with the irrigation company should remain constant, because no additional irrigation shares are being created. In addition, the culinary water master plan stated that Nephi City leases approximately 1,057 ac-ft of its surplus water right to the Irrigation Company each year, which serves to protect the city's water right because it is put to beneficial use.

3.2 EXISTING REQUIRED WATER RIGHT

Required water right is divided into two categories, indoor and outdoor. The Rules require that a community should have adequate water right to supply each culinary connection with 400 gallons per day for indoor water use.

Nephi City staff reported that only 700 out of 1,910 residential connections have secondary irrigation water available. This means that currently 1,210 residential customers depend on culinary water to meet the irrigation needs for their landscapes and other outdoor usages.

Assumptions must be made to account for the use of the culinary water for irrigation in water right calculations. Therefore, it is assumed that the 700 connections that have secondary irrigation water do not use culinary water for irrigation purposes and they are not included in the 5 Point Analysis calculations for required outdoor water. Data from the master plan completed in 2013 showed that the average irrigated area per EDU in Nephi is 1/5 acre, which will be assumed in all 5 Point Analysis calculations. Finally, it is assumed that all culinary water used for irrigation is applied by sprinklers. (It should be noted that sprinkler irrigation is considered to be 70% efficient as opposed to 40% for flood irrigation. With this in mind, an efficiency factor of 70% is used for outdoor water usage calculations for Water Right, Required Source Capacity, Required Storage Capacity, and Distribution, Source Capacity, Storage Capacity, and Distribution System in the 5 Point Analysis.)

According to the State of Utah Rules for Public Drinking Water Systems, Utah has 6 climate zones (excluding non-arable lands), which correspond with consumptive use and annual precipitation. In the northern mountains, outside watering requirements are quite low (Zone 1), compared with the southern part of the state where the climate is usually very warm (Zone 6). As a result, these zones have different outside watering requirements. Rule R309-510 provides minimum recommended requirements for outside consumptive use for each zone.

Nephi City is located in Zone 4, which is listed as moderately high for consumptive use. According to the rule, Nephi requires 1.87 acre-feet per irrigated acre as the demand to be used in the calculations, which determine required water right for residential irrigation.

There is a spike in outdoor use by commercial connections during the summer. Although some of this spike can be attributed to landscape irrigation, it is more likely that most of this water is a result of increased tourist travel and recreation during the summer months. The spike is over and above the year round average commercial use. This spike in use during the summer, spread over 705 commercial EDUs, amounts to 35,780 gallons per month per EDU based on annual meter data from commercial connections. It is included separately in the 5 Point Analysis Calculations to ensure that the water right, source capacity, and storage capacity calculations reflect the summer increase over annual average requirements. If excluded, the required water right, source capacity, and storage capacity calculations would not reflect actual required values during the summer, which would result in under sizing of the infrastructure improvements required for the City's water source and storage.

The 2.47 ac-ft per irrigated acre used to calculate the water necessary for the existing large green areas was taken from actual usage as noted for the golf course in the culinary master plan, and it is assumed that all of the large green areas will require a similar amount of irrigation water.

Based on the information above and the total number of existing EDUs, the existing required water right is calculated as follows:

Residential Use:

Indoor: 1,910 EDU x $\frac{400 \text{ gpd}}{\text{EDU}} \times \frac{365 \text{ day}}{1 \text{ year}} \times \frac{1 \text{ ac-ft.}}{325851 \text{ gal.}}$ = 856 ac-ft.

Outdoor: 1,210 EDU x $\frac{1 \text{ ir.-acre}}{5 \text{ EDU}} \times \frac{1.87 \text{ acre-ft}}{\text{ir.-acre}} \times \frac{1 \text{ (efficiency)}}{0.7}$ = 646 ac-ft.

Commercial Use:

Indoor: 705 EDU x $\frac{400 \text{ gpd}}{\text{EDU}} \times \frac{365 \text{ day}}{1 \text{ year}} \times \frac{1 \text{ ac-ft.}}{325{,}851 \text{ gal.}}$ = 316 ac-ft.

Additional Commercial Summer Use

Outdoor: 705 EDU x $\frac{35780 \text{ gal}}{\text{EDU month}} \times \frac{6 \text{ month/yr}}{} \times \frac{1 \text{ ac ft.}}{325{,}851 \text{ gal.}}$ = 464 ac-ft.

Industrial Use:

162 EDU x $\frac{400 \text{ gpd}}{\text{EDU}} \times \frac{365 \text{ day}}{1 \text{ year}} \times \frac{1 \text{ ac-ft.}}{325{,}851 \text{ gal.}}$ = 73 ac-ft.

Large Green Areas (Schools, Golf Course, Parks, & Cemetery):

124 ir.-acre x $\frac{2.47 \text{ acre-ft.}}{\text{ir-acre}} \times \frac{1 \text{ (efficiency)}}{0.7}$ = 438 ac-ft.

Leased Water to the Irrigation Co: = 1,057 ac-ft.

TOTAL EXISTING REQUIRED WATER RIGHT = **3,880 ac-ft.**
ESTIMATED EXISTING WATER RIGHT SURPLUS **=13,172 ac-ft.**

Calculations of required water right in the above section show an existing water right surplus of 13,172 acre feet.

3.3 PROJECTED REQUIRED WATER RIGHT

The number of projected EDU's at the end of the planning period is 4,772. As noted above, it is assumed that all new residential connections will use culinary water for irrigation purposes. Despite having the total EDU value, each category of EDU's is listed below in order to better distinguish where the greatest needs are. It is estimated that by the end of the planning period the acreage of the large green areas will increase to 174 acres.

Based on the information above and the total number of EDU's, the projected required water right is calculated as follows:

Residential Use:

Indoor: $3{,}273 \text{ EDU} \times \frac{400 \text{ gpd} \times 365 \text{ day}}{\text{EDU}} \times \frac{1 \text{ ac-ft.}}{1 \text{ year} \quad 325851 \text{ gal.}} = 1{,}389 \text{ ac-ft.}$

Outdoor: $2{,}573 \text{ EDU} \times \frac{1 \text{ ir.-acre} \times 1.87 \text{ acre-ft}}{5 \text{ EDU}} \times \frac{1 \text{ (efficiency)}}{\text{ir.-acre} \quad 0.7} = 1{,}375 \text{ ac-ft.}$

Commercial Use:

Indoor: $1{,}048 \text{ EDU} \times \frac{400 \text{ gpd} \times 365 \text{ day}}{\text{EDU}} \times \frac{1 \text{ ac-ft.}}{1 \text{ year} \quad 325{,}851 \text{ gal.}} = 470 \text{ ac-ft.}$

Additional Commercial Summer Use

Outdoor: $1{,}048 \text{ EDU} \times \frac{35780 \text{ gal} \times 6 \text{ month/yr}}{\text{EDU month}} \times \frac{1 \text{ ac ft.}}{325{,}851 \text{ gal.}} = 691 \text{ ac-ft.}$

Industrial Use:

$430 \text{ EDU} \times \frac{400 \text{ gpd} \times 365 \text{ day}}{\text{EDU}} \times \frac{1 \text{ ac-ft.}}{1 \text{ year} \quad 325{,}851 \text{ gal.}} = 193 \text{ ac-ft.}$

Large Green Areas (Schools, Golf Course, Parks, & Cemetery):

$174 \text{ ir.-acre} \times \frac{2.47 \text{ acre-ft.}}{\text{ir-acre}} \times \frac{1 \text{ (efficiency)}}{0.7} = 614 \text{ ac-ft.}$

Leased Water to the Irrigation Co: = 1,057 ac-ft.

TOTAL PROJECTED REQUIRED WATER RIGHT = 5,865 ac-ft.
ESTIMATED PROJECTED WATER RIGHT SURPLUS =11,157 ac-ft.

Calculations of required water right in the above section show a projected water right surplus of 11,157 acre feet at the end of the planning period. These water right projections are commonly shown as measured by acre-feet, which is how all of the comparisons have been made in this

report. However, all of Nephi City's water rights have been appropriated with cfs. (flow) limitations. Thus with the current limitations on the water right, as recorded with the State Engineer, Nephi can only draw up to 25.64 cfs at any given time throughout the year. This is a problem because the water demand in the summer is much higher than in the winter.

3.4 RECOMMENDED WATER RIGHT IMPROVEMENTS

Rejected, unapproved, rights 53-683, 53-912, 53-913, and 53-914:

- Research water right 53-683 historical documents to determine if the lapsed status can be amended to an approved status.
- Research is also required to determine if any portion of 53-912 A57867, 53-913 A57868, or 53-914 A57869 can be approved.

Consumptive Water Rights 53-00, 2, 35, 53, 63, 64, 65, 80, 87, 88, and 1516:

- Prepare a Point of Diversion (POD) Matrix to determine which water right PODs are approved for use for each right.
- Prepare required Change Applications to determine that all of the above rights can be approved for each, any, or all POD use.
- Update the 40-year Water Right Plan.
- Prepare a water use evaluation for each POD currently, to determine which rights could be Proofed once the water right is determined to be fully beneficially used.

Irrigation Water Rights 53-2 (Rowley's Spring), and 64 (industrial waste water):

- Change the Ag use water right to Municipal use.

Municipal Water Rights:

- Prepare the paper work (Diligence) to create a water right for "Marsh Spring" water right 53-??? because this water right does not, at present, exist at Utah Division of Water Rights.
- Prepare a Proof Matrix to determine the current level of beneficial use to determine when Proof of Beneficial Use is to be prepared and filed.
- Prepare required change applications needed to quantify the rights based on acre foot quantities not flow rates.
- Meet with the local irrigation companies to determine the present written or non-written cooperative agreements. Prepare recommendations to update those agreements.
- Identify using needs assessments/pros and cons for any future additional local water use agreements.
- Meet with legal counsel to consult, prepare protocols to update local water use agreements.

SECTION 4.0
SOURCE CAPACITY ANALYSIS

4.1 EXISTING SOURCE CAPACITY

Nephi City staff has estimated that the City's springs (Upper and Lower Bradley Springs and Marsh Springs) provide a reliable minimum flow rate (during low flow conditions) of 1,900 gpm, and the Equipment Shed Well is estimated to pump at a rate of up to 2,400 gpm. The Jones Well is available as a culinary source at a rate of up to 2,400 gpm, but it is currently being used to supplement the irrigation system in exchange for the better quality water from Bradley Springs that is allocated to the irrigation company during the irrigation season, and is not included in the source capacity totals in this report.

The State of Utah Rules for Public Drinking Water Systems require that the minimum flow from spring sources be used as the source capacity from that source in determining system source capacity. Therefore, 4,300 gpm will be used as the available source capacity to calculate existing and projected required source needs.

4.2 EXISTING REQUIRED SOURCE CAPACITY

Existing source capacity requirements are separated into indoor and outdoor use. The Rules state that a community should have an adequate water source capacity to supply a peak demand of 800 gallons per day per connection for indoor use. The regulations also require the source to be capable of meeting peak irrigation demands where no secondary source of irrigation water is available.

Nephi City staff estimated that 700 out of 1,910 residential culinary water connections have secondary water available for irrigation needs. Because the irrigation system is not expanding, it is understood that all future connections will use culinary water for their irrigation needs.

Outdoor usage records were determined by taking annual usage totals and reducing the total by the calculated indoor usage amount. The indoor usage amount was determined by taking the amount of water used during the winter months, when no irrigation was occurring, and calculating the same usage for the entire year. It is assumed that all supplemental irrigation is applied by sprinklers, and an efficiency factor of 70% is used in the calculations. Water right, storage, and distribution calculations also include these assumptions.

There is a spike in outdoor use during the summer by commercial connections. This spike in use during the summer spread over 705 EDUs amounts to 1,193 gallons per day per EDU based on annual meter data from commercial connections. It is included separately in the 5 Point Analysis Calculations to ensure that the water right, source capacity, and storage capacity calculations reflect the summer increase over annual average requirements. If excluded, the required source capacity calculation would not reflect actual required source capacity. Also, the results of the

required water right and storage calculations would be lower than the actual requirements, and that would result in under sizing the recommended infrastructure improvements needed for the City's water source and storage.

According to the State of Utah Rules for Public Drinking Water Systems, Utah has 6 climate zones (excluding non-arable lands), which correspond with consumptive use and annual precipitation. Nephi City is located in Zone 4, which is listed as moderately high for consumptive use. According to the rule, Nephi requires 3.96 gallons per minute for each irrigated acre as the peak day demand to be used in calculations to determine required source capacity for residential irrigation. A value of 5.23 gpm per irrigated acre was used in the calculations below for areas involving the parks, cemetery, and golf course. This number was derived from actual usage records for these outdoor connections.

Based on the information above, the existing required source capacity is calculated as follows:

Residential Use:

Indoor: $1{,}910 \text{ EDU} \times \frac{800 \text{ gal}}{\text{day-EDU}} \times \frac{1 \text{ day}}{1440 \text{ min.}} = 1{,}061 \text{ gpm}$

Outdoor: $1{,}210 \text{ EDU} \times \frac{1 \text{ acre}}{5 \text{ EDU}} \times \frac{3.96 \text{ gpm}}{\text{ir. acre}} \times \frac{1 \text{ (efficiency)}}{0.7} = 1{,}369 \text{ gpm}$

Commercial Use:

$705 \text{ EDU} \times \frac{800 \text{ gal}}{\text{EDU-day-}} \times \frac{1 \text{ day}}{1440 \text{ min.}} = 392 \text{ gpm}$

Additional Commercial Summer Use:

$705 \text{ EDU} \times \frac{1{,}193 \text{ gal}}{\text{EDU-day}} \times \frac{1 \text{ day}}{1440 \text{ min.}} = 584 \text{ gpm}$

Industrial Use:

$162 \text{ EDU} \times \frac{800 \text{ gal}}{\text{EDU-day-}} \times \frac{1 \text{ day}}{1440 \text{ min.}} = 90 \text{ gpm}$

Large Green Areas (Schools, Golf Course, Parks, & Cemetery):

$124 \text{ acre} \times \frac{5.23 \text{ gpm}}{\text{acre}} \times \frac{1 \text{ (efficiency)}}{0.7} = 926 \text{ gpm}$

TOTAL EXISTING REQUIRED SOURCE CAPACITY = 4,422 gpm
ESTIMATED EXISTING SOURCE CAPACITY DEFICIT = (122) gpm

As shown in the calculations above, Nephi City currently has 122 gpm less than the required culinary water source capacity in accordance with the State of Utah Rules for Public Drinking Water Systems.

4.3 PROJECTED REQUIRED SOURCE CAPACITY

The number of EDU's projected at the end of the planning period is 4,751. No additional secondary irrigation water is currently available to the City, so culinary water use for irrigation will increase throughout the planning period. The calculation of projected required source capacity is provided below.

Residential Use:

Indoor: $3{,}273 \text{ EDU} \times \frac{800 \text{ gal} \times 1 \text{ day}}{\text{day-EDU} \quad 1440 \text{ min.}} = 1{,}818 \text{ gpm}$

Outdoor: $2{,}573 \text{ EDU} \times \frac{1 \text{ acre} \times 3.96 \text{ gpm} \times 1 \text{ (efficiency)}}{5 \text{ EDU} \quad \text{ir. acre} \quad 0.7} = 2{,}911 \text{ gpm}$

Commercial Use:

$1{,}048 \text{ EDU} \times \frac{800 \text{ gal} \times 1 \text{ day}}{\text{EDU-day-} \quad 1440 \text{ min.}} = 582 \text{ gpm}$

Additional Commercial Summer Use:

$1{,}048 \text{ EDU} \times \frac{1{,}540 \text{ gal} \times 1 \text{ day}}{\text{EDU-day} \quad 1440 \text{ min.}} = 868 \text{ gpm}$

Industrial Use:

$430 \text{ EDU} \times \frac{800 \text{ gal} \times 1 \text{ day}}{\text{EDU-day-} \quad 1440 \text{ min.}} = 239 \text{ gpm}$

Large Green Areas (Schools, Golf Course, Parks, & Cemetery):

$174 \text{ acre} \times \frac{5.23 \text{ gpm} \times 1 \text{ (efficiency)}}{\text{acre} \quad 0.7} = 1{,}300 \text{ gpm}$

TOTAL PROJECTED REQUIRED SOURCE CAPACITY = 7,719 gpm
ESTIMATED PROJECTED SOURCE CAPACITY DEFICIT = (3,419) gpm

4.4 RECOMMENDED SOURCE CAPACITY IMPROVEMENTS

Calculations in this section show that Nephi City currently has a 122 gpm source capacity deficit, and that there is a projected source capacity deficit of 3,419 gpm at the end of the planning

period. Additional source capacity to meet demands throughout the planning period must be developed as soon as possible.

One option to increase culinary water source capacity might be to investigate and, if necessary, redevelop one or more springs. However, the condition of the existing spring collection systems is reported to be good. Therefore, it is unlikely that spring redevelopment would significantly increase source capacity at this time.

Work is required at Lower Bradley Spring to abandon the current outlet transmission pipeline from Lower Bradley Spring to the Marsh Spring outlet. The Lower Bradley Spring transmission pipeline is in poor condition and too expensive to replace at this time. The Lower Bradley Spring output will be combined with the Upper Bradley Spring output at a new power plant head house immediately below Lower Bradley Spring. The combined output of the Upper and Lower Bradley Springs will use the existing Upper Bradley Spring Transmission Pipeline. If the project budget allows, the existing corrugated galvanized steel collection box at Lower Bradley Spring should be upgraded. At the time this work is going on, the corrugated galvanized steel collection pipes at the spring should also be inspected and replaced if necessary.

To meet the current and projected source capacity shortfall, it is recommended that the City develop an additional well source(s) using one or a combination of the options below. There are essentially 4 well options for the City to explore. Option 1 is to construct a new culinary well with a dedicated transmission pipeline to the tank. Option 2 is to purchase an existing culinary well and install required pipelines to get the water to the tanks and distribution system. Option 3 is to refurbish the Fire House Well and install a dedicated transmission pipeline to the tank. Option 4 is to return the Jones Well, which was constructed as a culinary well, to dedicated culinary service. The output of the Jones Well is not adequate to meet the projected required source capacity deficit on its own. The Fire House Well will still need to be refurbished and an additional culinary source may still be needed. Each of these options is discussed in greater detail below.

Option 1—Construct New Culinary Well

Construction of a new culinary well would provide the City with the advantage and flexibility of having a third well that can supply the culinary water system. Given the output of the existing wells in the City, it is reasonable to expect that an additional well could be constructed in the area to produce 2,000 to 2,400 gpm. But, if the well cannot produce 3,400 gpm, then an additional source would be required before the end of the planning period.

The new well will require a dedicated pipeline from the well to the storage tank to ensure that water from the new well meets minimum chlorine contact time for disinfection in accordance with the Rules. The pipeline is also required to prevent local over-pressurization of the distribution piping while the well is running.

The major problem with locating and constructing a new culinary well is that the new well must meet the latest DDW source protection requirements for new drinking water sources. It may be

difficult to find a location available to the City, for a new well that can meet the source protection requirements at a reasonable cost.

The source protection rule requires that if the well is not in a protected aquifer, which is defined as an aquifer with a minimum 30' clay layer between the surface and the water producing zone, then it must have an approved source protection plan. Source protection Zone 1 is a 100' radius around the well head that is defined as an exclusion zone and no uncontrolled pollution source can be in that zone.

Zone 2 is defined as the distance from the well head that equals a time of travel for the groundwater to reach the well equal to 250 days. Generally, the higher the pumping rate from the well, the larger the area required for Zone 2.

If the City does not own or control all property within source protection Zone 2, and the aquifer is not classified as a protected aquifer, then every landowner within that zone must sign a land use agreement. The land use agreement states that the property owner will not develop his property in a way that may include any one of the many potential sources of pollution identified in the source protection rule that may impact the well. For example, a single septic tank within Zone 2 that cannot be satisfactorily mitigated, i.e. connected to a sewer, will block construction of the municipal culinary well. The land use agreement remains in effect to successor owners if the property is sold, and it may significantly impact the future value of the property.

This requirement for land use agreements makes it difficult to find a site for a new municipal culinary well. Where subdivision development of the land is likely, as is the case in and around Nephi, the City would most likely need to purchase the properties in Zone 2 to meet the land use agreement requirements. Purchase of all of the property that might fall within Zone 2 for a 3,400 gpm well may be prohibitive, effectively eliminating this option from consideration at this time.

Option 2—Purchase an Existing Private Well

There is a private well capable of producing 1,200 to 1,500 gpm that is currently for sale to the City. This well, located south of Nephi City limits, has been drilled in a protected aquifer, which means that it can meet source protection requirements. It also has the required DDW certified sanitary seal so it meets culinary water source standards. The owner of the well is willing to sell the well because the county has rejected the family's request to construct a residential sub-division at that location.

The location of this well makes it convenient to supply a culinary water tank located south of the I-15 south interchange, which provides an advantage to the distribution system. This would eliminate the need for a booster station and special operating requirements to fill the tank from the distribution system.

Before a decision can be made to purchase the well, it will be necessary to collect a full new source sample from the well and perform a 24-hour pump test to verify the aquifer capacity. If the sample results are satisfactory, the output of the well is adequate, and a reasonable price can

be negotiated, it is recommended that Nephi City purchase this well along with additional property to allow for construction of another future well at that site.

A second private well has also been offered for sale to the City as a culinary grade well. It is located north of the City at approximately 200 East and 1700 North. Water quality, quantity, and whether it can meet source protection requirements are not known for this well at this time. This second well would not be a candidate to directly supply the new tank that is recommended to be south of I-15, but with approximately 5,000 feet of pipeline and a crossing under I-15, it could be pumped to the Silver Tank.

The City should investigate this well thoroughly. It should be pump tested to determine aquifer capacity, and a new source sample should be collected and analyzed prior to an offer to purchase the well. Sanitary seal documentation must also be verified; however, it should be noted that it is possible to install the required seal on an existing well if necessary. If it meets all DDW requirements, purchase of this well could be considered in the future when additional sources are needed on the north side of the City.

Option 3—Refurbish and Rehabilitate the Fire House Well

Generally, the Division of Water Rights will allow a well to be refurbished without changes to the water right. Refurbishment includes complete reconstruction of the well if necessary, as long as the reconstruction is at the same site as the original well (within a few feet). As such, it may be possible that the Fire House Well could be enlarged and deepened as it is refurbished.

City Staff reported that the Fire House Well is included in the City's source protection plan, which also includes the Equipment Shed Well and the Jones Well. Therefore, a new source protection plan should not be required for the Fire House Well. However, if the output of the well is increased significantly above the output included in the source protection plan, it may be necessary to update the plan. Due to the potential difficulty and expense for land use agreements to meet the latest DDW source protection requirements for new culinary wells as discussed above in Option 1, refurbishment of the Fire House Well is an excellent option to enable Nephi City to obtain additional culinary source capacity.

According to City Staff, the well originally produced 1,800 gpm, or more. It is expected that this well could provide at least 1,800 – 2,400 gpm and maybe the full 3,400 gpm once it is refurbished. This option may require an additional source of water to meet the projected required source capacity if the Fire House Well cannot produce the full 3,400 gpm required.

This option will require construction of a dedicated pipeline from the Fire House Well to the storage tank. No such pipeline currently exists. The pipeline is needed to prevent local over pressurization of the distribution piping while the well is running, and to allow water from the refurbished well to meet minimum chlorine contact time for disinfection in accordance with the Rules.

The Fire House Well is known to produce sand. Sand production is most likely a result of the way the well was constructed. If the well casing was perforated without a filter pack as the City Staff believes, there is nothing to stop sand in the aquifer formation from entering the well. Because of the sand production, this well has not been used for many years and the electrical control equipment and pump are no longer functional.

Rehabilitation of the Fire House Well will be aimed at eliminating the sand production and increasing its output. It is recommended that the well be camera inspected, test pumped for 24 hours, and sampled before rehabilitation is started. This will to allow professional analysis by an Engineer to determine the best method to refurbish the well. Since the goal of rehabilitation of the well is to increase its output, it is assumed that the cost of rehabilitation will be the same as the cost to construct a new culinary well at the same site, without the expense of obtaining land use permits for a new source protection plan.

Based on the capacity of the Jones Well and the Equipment Shed Well, it is reasonable to assume that the Fire House Well, located in the same general area, could produce 1,800 gpm to 2,400 gpm when rehabilitation is complete. Assuming the output was improved to 2,200 gpm, that would still leave the source capacity 1,200 gpm short of the projected required source capacity from the calculations in this section. This shortfall might potentially be resolved by purchase of the private well discussed above under Option 2.

If the full output of 3,400 gpm cannot be achieved through reconstruction of the Fire House Well and purchase of the private well discussed in Option 2, then an additional well will be needed to enable Nephi City to meet its projected culinary source capacity requirements within a few years. In this case a combination of this Option 3 and Option 4 below might be employed to achieve the projected required source capacity and still meet the requirements of the irrigation exchange agreement. A decision regarding an additional well or wells should wait at least until the Fire House Well has been refurbished.

Option 4—Return the Jones Well to Dedicated Culinary Service

City Staff reported that the Jones well is capable of pumping at 2,000 to 2,400 gpm. Therefore, returning the Jones Well to dedicated culinary service could increase the available culinary water source capacity by that amount. Currently the Jones Well is pumped to the irrigation system at a rate of 2,000 gpm for up to 24 hours per day.

If the Jones Well is rededicated to the culinary system, an additional large capacity irrigation well must be purchased or constructed to make up the irrigation shortfall in order for Nephi City to continue using the summer water from the Bradley Springs under the irrigation exchange agreement with the irrigation company. The water rights for the summer water from Bradley Springs are decreed to the irrigation company. In addition, a new pipeline will be required to run from the location of the new irrigation well to the irrigation pond.

Construction of a new 2,000 - 2,400 gpm irrigation well with a dedicated pipeline to the pond and shifting the Jones Well to the culinary system may cost less than construction of a 3,400 gpm

culinary well with a dedicated pipeline to the tank. However, with only 2,000 gpm to 2,400 gpm of culinary water available from the Jones Well, the culinary source capacity will still have a deficit of 1,000 to 1,400 gpm. Therefore, it will still be necessary to either construct or purchase an additional culinary well and/or refurbish the Fire House Well to meet the projected culinary water shortfall. With this in mind, this option is as at least as expensive and perhaps more expensive than Option 3.

It should be noted that there is a risk that the cone of depression for the Fire House Well, the Jones Well, and the Equipment Shed Well overlap, which may result in a reduction of the water level in the aquifer. A reduction in the water level in the aquifer, if it occurred, may negatively impact the output of individual wells when they are operated simultaneously. However, City Staff reported that there are other wells in the area, and there has been no noticeable impact to either the Jones Well or the Equipment Shed Well when all of the wells have been running simultaneously.

SECTION 5.0
STORAGE CAPACITY ANALYSIS

5.1 EXISTING STORAGE CAPACITY

Nephi City currently has 2 steel storage tanks with a total storage capacity of 2,600,000 gallons. Tank #1, the Blue Tank, located east of the golf course, has a capacity of 2,000,000 gallons. Tank #2, the Silver Tank, located on the east side of Interstate 15 at approximately 1300 North, has a capacity of 600,000 gallons. The Blue Tank was constructed in 1972, and the Silver Tank was constructed in 1966.

An inspection of the Blue Tank approximately 5 years ago revealed some corrosion on the floor and ceiling. Once a new tank is in place, the Blue Tank will need to be taken out of service so that the tank can be drained, allowing the interior of the tank to be abrasive blasted and repainted. Inspections of the Silver Tank in recent years showed minor thinning of the tank walls. Maintenance was performed on the tank and City Staff reports that it is in good condition. Once the Blue Tank interior is repainted, both tanks should last beyond the 20-year planning period, and therefore no replacement of either tank is recommended at this time.

The Blue Tank feeds the Silver Tank through a dedicated 14" pipeline with an altitude-control valve on the system. The Silver Tank is not as tall as the Blue Tank, and it is reported to be approximately 6 feet lower in elevation than the Blue Tank. The culinary system operator reported that during high use periods, the Silver Tank will not stay full.

5.2 EXISTING REQUIRED STORAGE CAPACITY

Water storage capacity requirements are separated into three categories, indoor, outdoor, and fire protection. Regarding storage capacity, the Rules require a minimum of 400 gallons per day per connection for indoor culinary water use.

Because Nephi Irrigation Company is not likely to increase the number of secondary irrigation connections in the City, it is assumed that all new EDUs will use culinary water as their only source of yard and garden irrigation. Therefore, the total number of EDUs at the end of the planning period using culinary water for irrigation would be 3,273. Based on actual usage totals and State irrigation values, it is assumed that the average irrigated area per EDU is 1/5 of an acre. Finally, it is assumed that all supplemental irrigation is applied by sprinklers, and an efficiency factor of 70% is used in the calculations. Water right, source capacity, and distribution calculations also include these assumptions.

There is a spike in outdoor use during the summer by commercial connections. The source of the additional use is most likely from the summer tourist surge. Spreading this summer usage spike over 705 EDUs represented by commercial connections amounts to 1,193 gallons per day per EDU based on annual meter data from commercial connections. It is included separately in the 5

Point Analysis Calculations to ensure that the water right, source capacity, and storage capacity calculations reflect the summer increase over annual average requirements. If excluded, the storage capacity calculation would not reflect actual required storage capacity. Likewise, results of required water right, and source calculations would be lower than the actual requirements, which would result in under sizing the recommended infrastructure improvements needed for the City's water source and storage.

According to the Rules, Utah has 6 climate zones (excluding non-arable lands), which correspond with consumptive use and annual precipitation. In the northern mountains, outside watering requirements are quite low (Zone 1), compared with the southern part of the state where the climate is usually very warm (Zone 6). As a result, these zones have different outside watering requirements. Rule R309-203 provides minimum recommended requirements for outside consumptive use for each zone.

Nephi City is located in Zone 4, which is listed as moderately high for consumptive use. According to the rule, Nephi requires 2,848 gallons per irrigated acre as the storage capacity to be used in calculations of storage for residential irrigation.

A large portion of the storage volume required is attributed to outdoor irrigation. Approximately 3.3 million gallons of projected required storage volume is a result of outdoor irrigation needs.

One objective of the project covered by this PER is to shift the culinary supply to the LGA away from the blended spring and well water in the storage tanks and distribution system. Water for the LGA will be supplied directly from the culinary well transmission pipelines that feed the blue tank. This change offers two advantages for residents.

1. It will supply the LGA with water before the water is stored in the tanks, which will allow a significant reduction in the projected required storage capacity. For comparison purposes, the projected required storage capacity in the calculations below and in the 5 Point Analysis in Appendix A is calculated both with the LGA supplied from the tanks and without the LGA supplied from the tanks. The reduction in required storage capacity is significant.

2. Residents believe that their spring water tastes better than the well water. Therefore, this change allows a higher percentage of the water in the tank to be spring water, improving the taste of the water in the system.

Storage requirements for fire protection vary from system to system. In general, fire flow requirements are based on building size and type of construction. The Rules require 1,000 gpm for one-family and two-family dwellings with an area less than 3,600 square feet and 1,500 gpm or greater for all other structures. The statewide minimum fire flow according to the Rules is set at 1,000 gpm at a fire hydrant. However, higher fire flow requirements can be set by local fire authorities in their communities. Nephi City's Fire Marshall has suggested a minimum flow of 1,500 gpm for the majority of the City, and 3,000 gpm in industrial zones. A value of 1,500 gpm

is used in the existing calculations, and 3,000 gpm is used for projected figures for storage calculations. Fire protection storage assumes a continuous fire flow for two hours.

Based on the information above, and the total number of existing EDUs, the existing required storage capacity is calculated below. Rounded EDU values shown below provide a slightly different number than the calculated gallon figure below. These EDU values are shown as rounded, but are actual decimal values in the calculations.

Residential Use:

Indoor: 1,910 EDU x $\frac{400 \text{ gal.}}{\text{EDU}}$ = 764,000 gal.

Outdoor Use: 1,110 EDU x $\frac{1/5 \text{ ir ac} \times 2{,}848 \text{ gal.} \times 1 \text{ (efficiency)}}{\text{EDU} \qquad \text{ir. ac} \quad 0.7}$ = 984,594 gal.

Commercial Use:

Indoor: 705 EDU x $\frac{400 \text{ gal.}}{\text{EDU}}$ = 281,988 gal.

Additional Commercial Summer Use:

705 EDU x $\frac{1{,}193 \text{ gal.}}{\text{EDU}}$ = 841,029 gal.

Industrial Use:

162 EDU x $\frac{400 \text{ gal.}}{\text{EDU}}$ = 64,800 gal.

Large Green Areas (Schools, Golf Course, Parks, and Cemetery):

Outdoor Use: $\frac{124 \text{ ir ac} \times 2{,}848 \text{ gal.} \times 1 \text{ (efficiency)}}{\text{ir. ac} \quad 0.7}$ = 504,503 gal.

Fire Protection:

1,500 gpm x 120 minutes = 180,000 gal.

TOTAL EXISTING REQUIRED STORAGE CAPACITY = 3,620,914 gal.
ESTIMATED EXISTING STORAGE CAPACITY DEFICIT = (1,020,914) gal.

The calculations show that the existing Nephi City storage capacity is 1,020,914 gallons below the minimum that is required by the Rules.

5.3 PROJECTED REQUIRED STORAGE CAPACITY WITH LGA FROM TANKS

The number of EDU's projected at the end of the planning period is 4,751. No additional secondary irrigation water is currently available to the City, so culinary water use for irrigation will increase throughout the planning period. A target fire flow rate of 3,000 gpm for a 2-hour period has been set by the City in order to provide fire protection for large industrial users now and in the future. The calculation of projected required storage capacity with the LGA supplied from the culinary system through the tanks is provided below.

Residential Use:

Indoor: $3{,}273 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 1{,}309{,}200 \text{ gal.}$

Outdoor Use: $2{,}523 \text{ EDU} \times \frac{1/5 \text{ ir ac} \times 2{,}848 \text{ gal.}}{\text{EDU}} \times \frac{1 \text{ (efficiency)}}{\text{ir. ac} \quad 0.7} = 2{,}093{,}687 \text{ gal.}$

Commercial Use:

Indoor: $1{,}048 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 419{,}252 \text{ gal.}$

Additional Commercial Summer Use:

$1{,}048 \text{ EDU} \times \frac{1{,}193 \text{ gal.}}{\text{EDU}} = 1{,}250{,}419 \text{ gal.}$

Industrial Use:

$430 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 171{,}934 \text{ gal.}$

Large Green Areas (Schools, Golf Course, Parks, and Cemetery):

Outdoor Use: $\frac{174 \text{ ir ac} \times 2{,}848 \text{ gal.}}{\text{ir. ac} \quad 0.7} \times \frac{1 \text{ (efficiency)}}{} = 707{,}931 \text{ gal.}$

Fire Protection:

$3{,}000 \text{ gpm} \times 120 \text{ minutes} = 360{,}000 \text{ gal.}$

TOTAL PROJECTED REQUIRED STORAGE CAPACITY = 6,312,423 gal.
ESTIMATED PROJECTED STORAGE CAPACITY DEFICIT = (3,712,423) gal.

If the LGA remain supplied by the culinary distribution system with the required water stored in the tanks, the calculations show that the projected Nephi City storage capacity is 3,712,423 gallons below the minimum that is required by the Rules.

5.4 PROJECTED REQUIRED STORAGE CAPACITY W/O LGA FROM TANKS

With all other parameters remaining unchanged, the calculation of projected required storage capacity with the LGA supplied directly from the well transmission lines and not passing through the tanks is provided below.

Residential Use:

Indoor: $3{,}273 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 1{,}309{,}200 \text{ gal.}$

Outdoor Use: $2{,}523 \text{ EDU} \times \frac{1/5 \text{ ir ac} \times 2{,}848 \text{ gal.}}{\text{EDU}} \times \frac{1 \text{ (efficiency)}}{\text{ir. ac } 0.7} = 2{,}093{,}687 \text{ gal.}$

Commercial Use:

Indoor: $1{,}048 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 419{,}252 \text{ gal.}$

Additional Commercial Summer Use:

$1{,}048 \text{ EDU} \times \frac{1{,}193 \text{ gal.}}{\text{EDU}} = 1{,}250{,}419 \text{ gal.}$

Industrial Use:

$430 \text{ EDU} \times \frac{400 \text{ gal.}}{\text{EDU}} = 171{,}934 \text{ gal.}$

Fire Protection:

$3{,}000 \text{ gpm} \times 120 \text{ minutes} = 360{,}000 \text{ gal.}$

TOTAL PROJECTED REQUIRED STORAGE CAPACITY = 5,604,492 gal.
ESTIMATED PROJECTED STORAGE CAPACITY DEFICIT = (3,004,492) gal.

If the LGA are supplied by the culinary well transmission lines to the tanks rather than through the tanks and distribution system, the calculations show that the projected Nephi City storage capacity is only 3,004,492 gallons below the minimum that is required by the Rules, which reduces the amount of storage that must be constructed by the project to ensure that storage meets the requirements of the Rules by a little over 700,000 gallons.

Based on economy of scale for construction of two 1.5 million gallon tanks versus two 1.85 million gallon tanks, the extra 700,000 gallons of storage can be expected to cost approximately $400,000. Adding 5,000 feet of 8" AWWA C900 purple pipe, valves, and fittings to supply the LGA from the well transmission lines can be expected to cost approximately $200,000 including street repairs. Therefore, from a cost standpoint, it is recommended that the LGA be supplied from the well transmission lines rather than from the tanks and distribution system.

5.5 RECOMMENDED STORAGE CAPACITY IMPROVEMENTS

In accordance with the Rules, Nephi City currently has a storage deficit of 1,020,914 gallons. The projected storage capacity calculations show that the deficit would expand to 3,004,492 gallons at the end of the planning period if the LGA are supplied directly from the culinary well transmission pipelines. If the LGA are supplied through the culinary distribution system with the required capacity for the LGA stored in the tanks, then the calculations show that the storage capacity deficit will be 3,712,423 gallons.

The existing steel tanks are reported to be in relatively good condition, but the Blue Tank interior must be blasted to remove all rust, repaired if necessary, and then repainted with a coating system that meets NSF standard 61 for contact with potable water. It is likely that, with proper maintenance, these tanks will operate throughout the planning period.

Based on the projected storage deficit, it is recommended that Nephi City construct two additional storage tanks storing a minimum total of 3,000,000 gallons. It is recommended that two identical concrete storage tanks be constructed. One tank should be constructed at the location of the Blue Tank, and the other tank should be located at the south end of the system.

It is recommended that the south tank should be constructed at the same elevation as the Blue Tank. It should be located along Old Pinery Road, south of the south I-15 interchange. There are three potential sites along that road, all on private property. The recommended site is on the west side of Old Pinery Road at the correct elevation, which occurs approximately 4,800 feet south of the intersection of Old Pinery Road and Highway 28. The City will need to acquire the land and easements necessary to construct the tank. The proposed locations for the new tanks are shown on the map in Appendix D.

SECTION 6.0
DISTRIBUTION SYSTEM ANALYSIS

6.1 EXISTING DISTRIBUTION SYSTEM ANALYSIS

The Rules require that distribution systems equipped with fire hydrants "shall be designed to insure that a minimum of 20 psi exists at all points within the system when fire flow demands are imposed during peak day demand flows." Peak day demands are equal to the required source capacity. The existing and projected required source capacities are calculated in Section 4. Because Nephi City has fire hydrants in its distribution system the peak day demands are used in its computer models. The existing peak day demand is 4,422 gpm, and the projected required source capacity at the end of the planning period was calculated to be 7,719 gpm.

In January of 2007 the Rules were revised to require the minimum dynamic pressure under peak day demands to be 40 psi, and 30 psi under peak-instantaneous demands in new systems. The State encourages existing systems to meet these new rule requirements when possible.

It is recommended that distribution system pressures be maintained between 50 and 80 psi during normal system operations. Based on elevations within the City, most system pressures are within the recommended range. The highest static pressures in the system are about 95 psi.

There is currently only 1 pressure zone within the Nephi City culinary water system. A booster pump station supplies one subdivision at the highest elevation in the City west of I-15, but the rest of the system is in the existing pressure zone. This simplifies analysis and recommendations for improvements in the system.

The State of Utah Rules for Public Drinking Water Systems require all fire hydrants to be supplied from 8-inch diameter or larger lines, unless it can be proven through the use of computer modeling that a smaller line will meet minimum fire flow requirements. The transmission pipelines from the tanks to the distribution system consist of 14-inch, 12-inch and 10-inch pipelines. These larger lines provide a good back bone to a large portion of the system. The existing distribution system is made up of 12-inch, 10-inch, 8-inch, 6-inch, 4-inch, and some pipelines smaller than 4 inch. Most of the older pipelines currently in the system are cast-iron lead joint pipelines. A map of the existing culinary water distribution system is included in Appendix C.

6.2 COMPUTER MODEL OF THE EXISTING DISTRIBUTION SYSTEM

Nephi City's existing culinary water distribution system was modeled using "H2O Net," a water system modeling program. In this process the peak day demand is spread throughout the entire system. The model then analyzes the system with a fire flow assigned in turn to each junction

node. The model is adjusted so that no connection in the system can fall below 20 psi during a fire flow event during peak day demand, which is mandated by the Rules.

Results of modeling the existing system show that the existing system does not meet the required minimum fire flows of 1,000 gpm at a large number of locations. These problem areas were identified using existing demands on the system. The major problems in the system are related to undersized pipelines. Due to high flow velocities in the undersized lines feeding the distribution system from the tanks, friction induced head loss reduces pressure before the water reaches the main distribution system. Pressure and flow problems are compounded where 4" and smaller pipelines are found in the distribution system. The existing system map in Appendix C, includes color coded dots at fire flow junction nodes included in the computer model for reference. Those junctions colored in red on the map are nodes where available fire flow is less than 1,000 gpm. Other junctions are colored as defined in the legend on the map.

6.3 RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS

The Rules state that "For water mains not connected to fire hydrants, the minimum line size shall be 4 inches in diameter, unless they serve picnic sites, parks, semi-developed camps, primitive camps, or roadway rest-stops." There are numerous distribution pipelines in the Nephi culinary distribution system that are smaller than 4 inches in diameter. It is recommended that these lines be upgraded where possible.

As noted in the Section 5, fire flow requirements are based on building size and type of construction. The statewide minimum fire flow set by the Rules is 1,000 gpm at a fire hydrant. The Rules require 1,000 gpm for one and two family dwellings with an area less than 3,600 square feet and 1,500 gpm or greater for all other structures. The Rules state that "when a public water system is required to provide water for fire flow by the local fire code official, or if the system has installed fire hydrants on existing distribution mains for that purpose, the design of the distribution system shall be consistent with the fire flow requirements as determined by the local fire code official." The Nephi City Fire Chief suggested that a minimum value of 1,500 gpm be obtained in local areas, and 3,000 gpm be available at fire hydrants located in more important industrial and commercial areas. This target will require upgrades for many of the distribution lines throughout the system.

The Rules state that the "minimum water main size, serving a fire hydrant lateral, shall be 8 inches in diameter unless a hydraulic analysis (computer model) indicates that required flow and pressures can be maintained by 6-inch lines." In addition, the Rules state that "fire hydrant laterals shall be a minimum of 6 inches in diameter." There are numerous places in the Nephi City culinary water distribution system where 4-inch pipelines are currently supplying fire hydrants. In fact, it was observed that there are 4-inch fire hydrants in Nephi City that are over 100 years old!

Much of Nephi's residential distribution system consists of 4-inch cast iron pipelines with lead joints. There are also larger cast iron lead joint pipelines in the system. Most pipelines in the

culinary system are over 70 years old. There are multiple problems with cast iron lead joint pipelines, although in general larger pipelines have fewer problems than smaller pipelines:

1. The lead joints in the pipelines represent a potential source of lead contamination in the culinary water system.

2. Lead joint cast iron pipelines are prone to developing leaks at the lead joints due to traffic induced ground vibration. Small pipelines seem to be more prone to joint leakage than the larger, more rigid pipelines, but in Nephi City the cast iron pipelines in the State Highways are notorious for requiring repairs. This is likely due to large truck traffic on the highways, which in Nephi City are Main Street and 100 North.

   The option between replacing more small diameter residential pipelines or replacing the pipelines in the highways warrants consideration. Replacement of the piping in the State highways is the most expensive pipeline work in a project, because there are permits with very strict requirements for work completed in the highways. The traffic control is more stringent, requiring more signs, flaggers, and steel plating over trenches, etc. Asphalt patching is more complicated in the State highways, requiring thicker and more expensive asphalt for patches and flowable fill, consisting of lean concrete, will be required for backfill on trenches running perpendicular to the traffic lanes, or they must be bored, which may cost more. However, since the pipelines in the highways are a significant problem due to ongoing leaks, and because contractors are generally better equipped to replace highway piping than the City maintenance crews, it is recommended that the highway piping be replaced before more of the small diameter lead joint pipelines in the residential areas are replaced.

3. Smaller diameter cast iron pipelines frequently fail by breaking clean across the pipeline for no apparent reason. Older pipelines may be more susceptible to breaking than newer pipelines. The smaller diameter pipelines are more susceptible to problems caused by ground vibration than larger cast iron lines.

Although Nephi City has not experienced high levels of lead in their culinary system, there is potential to introduce lead contamination into the system every time a lead joint cast iron pipe develops a leak or breaks. Nephi City regularly experiences both joint leakage and pipe breaks with the small cast iron pipelines. This significantly increases maintenance costs. Therefore, it is recommended that the small diameter lead joint cast iron piping be replaced where possible with larger PVC pipelines, within the limitations of the project budget.

6.4 COMPUTER MODEL OF THE DISTRIBUTION SYSTEM WITH PROPOSED IMPROVEMENTS

The projected demands on the system were incorporated into the model in order to determine the improvements required to meet the projected system needs at the end of the planning period. To increase fire flows in the system, a 16” pipeline was added from the Blue Tank under I-15 along 700 North. This line significantly reduces the load on the 10” pipeline from the Silver Tank to

the distribution system, which was the only entry point to the distribution system other than under I-15 at 100 North. This pipeline also greatly reduces the velocity of the water in the lines from the tank that cross under I-15 at 100 North. A new large diameter supply pipeline will also enter the distribution system from the new tank at the south end of the City.

The proposed system map in Appendix D, shows all of the recommended pipeline changes to meet the needs of the distribution system through the planning period. After the distribution improvements shown on the map are completed, there will be approximately 20,000 feet of 4 inch cast iron lead joint pipelines remaining. These remaining small diameter pipelines will be prioritized and replaced during the project if the budget allows.

The map in Appendix D also includes results of fire flow modeling with all of the proposed pipeline changes. After modeling the system with all of the system improvements in place it was found that nearly all fire flow nodes included in the system model meet or exceed the 1,500 gpm minimum fire flow requested by the fire marshal. Nodes exceeding 1,500 gpm are colored green. It should also be noted that the fire flow in the industrial areas meets or exceeds 3,000 gpm as requested by the fire marshal. Nodes exceeding 3,000 gpm are colored blue. Other junctions are colored as defined in the legend on the map.

It should be noted that fire flow in the small subdivision in the northeast corner of town and served by the booster station is limited by the total output from all of the pumps in the station. Although the nameplate total for all pumps added together is approximately 1,100 gpm, to account for system losses, it is assumed that the total fire flow will not exceed 1,000 gpm, unless larger fire pumps are installed. Therefore, the color of these nodes remains red.

The map in Appendix E is a wide area view of the entire system This map includes the system features such as the City's springs than cannot be shown on the smaller scale maps.

6.5 OTHER SYSTEM IMPROVEMENT RECOMMENDATIONS

Lower Bradley Spring Transmission Pipeline

The 10" Lower Bradley Spring transmission line is in poor condition and should be replaced. However, an analysis of the 16" pipeline from Upper Bradley Spring to the power house showed that the Lower Bradley Spring flow could be combined with the Upper Bradley Spring flow in the same line. Even though approximately 50 feet of head will be lost to the power house, the increased volume in the pipeline will offset the reduced head without serious impact to power production. The Lower Bradley Spring outlet will be tied into the Upper Bradley Spring transmission pipeline as part of this project.

Fire Hydrants

The Rules require fire hydrants to be spaced at 500' intervals, but guidance is offered that allows fire hydrant spacing to exceed 500 feet by placing the hydrants at block intersections. Current fire hydrant spacing exceeds the recommended distance of 500 feet in many areas of the system.

It is recommended that the City add additional fire hydrants as needed to bring fire hydrant spacing to 500 feet or at each block intersection. It is expected 47 existing hydrants will be reconnected and that 139 new hydrants will be added to replace the obsolete hydrants and achieve the minimum spacing requirements of the Rules. Additional new hydrants will be installed if additional existing 4" pipelines are replaced within the project budget. If all existing 4" cast iron lead joint pipelines can be replaced within the budget, up to 25 additional hydrants could be required to meet the fire hydrant spacing in accordance with the rules.

Distribution System Valves

Valves will be added to the system on all new pipelines. In addition, additional valves will be added as required and where possible to allow the operators to isolate individual city streets in the distribution system for repair or maintenance as needed.

SCADA System

A SCADA system will be installed to allow remote monitoring and control for all system wells, tanks, booster stations, and disinfection systems. Installation of the SCADA system will simplify and improve system operability, safety, and reliability. It will also simplify metering and required records maintenance associated with managing the City's water system.

6.6 COMPUTER MODEL MAINTENANCE

Once all recommended improvements have been completed, the hydraulic model will be recalibrated to specific flow readings in the system in order to reflect actual flows as required by the Rules. The model will then be ready for use by the City's engineer or consultant to determine the impact to the system of any new subdivisions.

It is expected that Nephi City will continue to grow and develop during the foreseeable future as the "Wasatch Front" population and industry spreads southward. Prior to any new subdivision connecting to the system, it must be modeled in accordance with the Rules to ensure that the distribution system can support the new subdivision without causing problems elsewhere in the system. As a matter of policy, the City should require any new main-line piping installed in future subdivisions to be 8-inch diameter or larger where necessary to support future distribution system expansion as required.

SECTION 7.0
WATER TREATMENT REQUIREMENTS

7.1 GENERAL SYSTEM OVERVIEW

The Rules, in accordance with the National Safe Drinking Water Act, have adopted "primary" regulations for the protection of public health, and "secondary" regulations related to taste and aesthetics. The Nephi City culinary water system currently meets all requirements.

The regulations also recommend that all culinary water sources have provisions for continuous disinfection. Nephi City currently has equipment that will allow disinfection of all of its spring sources using a chlorination system. However, there is currently no chlorination system for any of the wells.

7.2 CHLORINATION SYSTEM OPERATION

The existing chlorination system is currently used for the springs. Disinfection of the water from the wells can only be accomplished by manually increasing the chlorine injected into the spring water to blend with the unchlorinated water from the wells in the Blue Tank. The chlorinated water from the springs is mixed with well water where the spring line and the well lines come together just before the water enters the tank. Disinfection contact time must be achieved once the water enters the Blue Tank

The existing chlorination equipment is currently located in a small CMU building constructed adjacent to the pipeline from the springs. The injector is buried in the ground outside of the building, and must be dug up to maintain the solution feed system. This is a major maintenance headache. For the chlorine room ventilation system, the Rules require one complete air exchange per minute. The ventilation system in the chlorine building is inadequate.

The chlorination building is not fenced inside the tank enclosure, which would be recommended. Rather it is currently located adjacent to the tank access road where it is more accessible to curious teenagers or vandals and traffic damage. The chlorine gas inside the building represents a severe health hazard to anyone unfamiliar with the systems.

7.3 RECOMMENDED DISINFECTION SYSTEM IMPROVEMENTS

The existing chlorination building incurred some structural damage when it was hit by a vehicle, and given the other inadequacies identified, it should be replaced and relocated away from the road and inside of the tank site fence as part of this project. In addition, to ensure the correct chlorination dosages and proper disinfection of the well water, each well should have its own chlorination system, or a method of precisely controlling the amount of chlorine being injected based on the amount of water flowing into the tank.

SECTION 8.0
SUMMARY OF RECOMMENDED IMPROVEMENTS

8.1 RECOMMENDED IMPROVEMENTS

Based on recommendations from Sections 3 through 7, it is recommended that Nephi City proceed with a construction project to implement recommended improvements as summarized in the table below as soon as possible.

TABLE 8-1

RECOMMENDED CULINARY WATER SYSTEM IMPROVEMENTS

Description	Recommended Upgrade
Water Rights	Perform required research, prepare required change applications, update 40 year Water Right Plan, prepare use evaluations, prepare protest hearing information, etc. to accomplish water right improvements recommended in Paragraph 3.4.
Source Capacity	Additional Source Capacity is needed immediately. It is recommended that the City rehabilitate the Fire House Well and purchase an additional culinary well to provide 3,400 gpm as part of this Project. Combine the Upper and Lower Bradley Spring output into the Upper Bradley Spring pipeline, eliminating the need to replace the Lower Bradley Spring transmission pipeline. If additional source capacity is still required, the next recommended step is to add an additional irrigation quality well to exchange with the irrigation company near the end of the planning period so that the Jones well can be dedicated to the culinary system. Add VFD controls to the Jones Well and Equipment Shed Well to save electrical power.
Storage	Construct two new concrete storage tanks totaling a minimum of 3,000,000 gal. (See Distribution #4 below.) One tank should be located adjacent to the existing Blue Tank where the main transmission lines currently supply the distribution system and the second tank should be located at the south end of the distribution system. All tanks should be at the same elevation. Paint the interior of the Blue Tank
Distribution	1. Install 16" transmission piping from the new tanks to the Distribution system to reduce head loss. Upgrade distribution main lines where required to improve system fire flow performance. Where possible, replace 4" and smaller lead joint cast iron pipe in the system with new AWWA C900 PVC pipe. Old pipelines should be abandoned in place. Dead end pipelines should be looped where practical to improve system peak day performance and fire flow. 2. Add valves at all intersections where new pipe is being installed for improved system operability. If permitted by the budget, add additional valves to existing system pipelines where needed so that the lines can be isolated at every block throughout the system. 3. Replace cast iron lead joint pipelines in Main Street and 100 North due to increasingly frequent leak development. 4. If practical, transfer irrigation of all large green areas from the culinary system supplied from the storage tanks to the well supply pipelines, reducing the amount of storage required. (If not practical, storage tank capacity must increase by a minimum of 712,000 gallons and the recommendation would be for two standard sized 2,000,000 gallon tanks.)

TABLE 8-1 (Continued)	
RECOMMENDED CULINARY WATER SYSTEM IMPROVEMENTS	
Description	**Recommended Upgrade**
Distribution (Continued)	5. Replace obsolete fire hydrants with new hydrants. Add additional new hydrants to ensure hydrant spacing meets the recommendations of the Rules.
Water Treatment	The existing chlorination building incurred some structural damage when it was hit by a vehicle, it should be replaced and relocated inside of the tank site fence. To ensure proper disinfection, each well should have its own chlorination system, or a method of precisely controlling the amount of chlorine being injected based on the amount of water flowing into the tank.

8.2 NEED FOR PROJECT

Table 8-1 above summarizes the recommended improvements from Sections 3-7.

Nephi City's existing culinary water system does not meet the current requirements of the Utah Division of Drinking Water Rules. Culinary water source capacity and storage capacity are currently inadequate. In addition, many distribution pipelines are undersized. Valve spacing requires large areas of the system to be isolated to repair leaks or conduct maintenance. Many existing fire hydrants are antiquated. With exception of components installed in recent sub-divisions and the blue tank, which is 44 years old, the entire system is over 50 years old.

Nephi City has an immediate need for additional source capacity, storage capacity, distribution system piping upgrades, additional distribution system valves, fire hydrant upgrades, and upgrades to the disinfection system to bring the system into compliance with the Rules. Project alternatives will be discussed in the next section.

SECTION 9.0
ALTERNATIVES CONSIDERED

9.1 GENERAL

To meet then needs of projected growth and to bring the culinary water system into compliance with the State Rules for Drinking Water Systems, Nephi City must develop approximately 3,400 gpm of new source capacity, add 3,000,000 gallons of new storage capacity, upgrade the distribution system, and modify its disinfection systems.

9.2 ALTERNATIVE 1 – NO ACTION

Alternative 1 would be the no action alternative. If no action is taken, Nephi City remains in violation of the Rules with inadequate source capacity, inadequate storage capacity, inadequate distribution system piping, valve deficiencies, fire hydrant spacing deficiencies, and disinfection facility deficiencies. This alternative is the least costly of any alternative considered, because no money would be expended to correct the out of compliance source, storage, distribution system, fire hydrant spacing, and disinfection deficiencies. However, the no action alternative is unacceptable to Nephi City and to the Division of Drinking Water, because there is a serious potential risk to the public health and safety, as long as the system remains out of compliance with the Rules.

9.3 ALTERNATIVE 2 – CORRECT EXISTING SYSTEM DEFICIENCIES ONLY

Alternative 2 would be the minimum action alternative. Under this alternative:

1. Nephi City would immediately add a 1,100,000-gallon storage tank at the south end of the distribution system, and paint the Blue Tank interior.

2. Source capacity might be improved by increasing the output frequency of one or both of its culinary wells which might provide enough over-speed of the pump motors to increase the total output by 122 gpm.

3. Upgrade only pipelines required to provide 1,000 gpm of fire flow in the system, which would not meet fire flows requested by the local fire marshal. Pipelines in Main Street and 100 North would not be upgraded.

4. Leave fire hydrants and valves as they are. Large areas of the system must be isolated for maintenance. Obsolete fire hydrants would remain in place and not be upgraded.

5. Disinfection systems would remain unchanged.

This alternative provides a potential to bring the system into compliance with the Rules only to the minimum level of compliance possible, but it allows no potential growth of the system. Nephi would not be able to add any new culinary water connections.

Alternative 2 is not feasible, nor is it practical. Alternative 2 is not acceptable to Nephi City, because it does not allow any growth to occur within Nephi City.

9.4 ALTERNATIVE 3 – CONSTRUCT RECOMMENDED IMPROVEMENTS. REHABILATE FIRE HOUSE WELL TO PRODUCE 3,400 GPM. INSTALL A BOOSTER STATION TO FILL THE NEW SOUTH TANK. SUPPLY LGA FROM WELL TRANSMISSION PIPELINES.

Alternative 3 would construct all major recommended improvements. The improvements address source capacity, storage capacity, distribution capacity, fire protection, disinfection, and maintenance. This alternative will correct most of the deficiencies in the Nephi culinary water system regarding the DDW rules. Under this Alternative:

1. The Fire House Well will be rehabilitated up to and including reconstruction of a new well at the site. The object of rehabilitation of the well will be to attempt to increase its capacity to 3,400 gpm while eliminating sand production. This option includes a 16" dedicated pipeline from the Fire House Well to the site of the Blue tank.

   There are potential risks associated with attempting to increase the output of the Fire House Well to the full 3,400 gpm needed to meet the projected required source capacity. First, the City staff reported that the well was originally test pumped at 1,800 gpm and that it produces sand. To increase the production of this well without production of sand will require construction of a much larger well with a filter pack that will stop the sand from entering the well. As the well is pumped the sand may gradually reduce permeability of the filter pack, which in turn will reduce the output until an equilibrium is reached where no more sand is moving into the filter pack.

   Second, even though this aquifer is known to produce high volumes of water, the Fire House Well has not been pumped at the same time as the Jones Well and Equipment Shed Well for many years. With that in mind, the Jones and Equipment Shed wells are currently started directly across the line rather than using VFDs. Staff reported that as the summer progresses, the output from these two wells gradually decreases. This is an indication that they are in the same aquifer and that the aquifer level may be dropping during the summer months. In addition to the City's culinary wells, there are some irrigation wells that tap this aquifer. Adding another well pumping at a rate of 3,400 gpm from the aquifer may lower the aquifer level to the point that other wells in the aquifer may need to be deepened or re-equipped.

   Although the Fire House Well could be used to supply the new south tank directly rather than pumping to the Blue Tank, the additional piping and valves required would cost over $600,000. Therefore, under this option, it will be necessary to fill the new south tank

using a booster pump station, drawing water from the distribution system. The booster station would cost roughly one third of the additional cost to feed this south tank from the Fire House Well.

The booster station would be located on Nephi City property located east of the railroad tracks adjacent to Highway 28 and south of I-15. The booster station, designed for 1,500 gpm, would pull water from the distribution system and pump it to the tank through a dedicated pipeline (a pipeline that is separate from the tank outlet) approximately 4,500 feet in length to the new south tank.

To keep the water in the new tank fresh, the tank level would be allowed to drop several feet before the booster station would come on line to refill the tank. The alternative of filling the new south tank using a booster station is less favorable than using a separate supply to the tank. However, if no separate supply is available, the method described with a separate dedicated line from the booster station is better than having the tank float on line with little or no circulation of new water through the tank.

2. Large Green Areas such as parks and schools will be supplied with water directly from the well transmission lines rather than from the culinary distribution system through the tanks. This reduces the required storage improvements to 3,000,000 gallons rather than 3,700,000 gallons. It also increases the percentage of spring water available in the tanks to improve the taste of the water.

3. Two new 1,500,000-gallon tanks will be constructed and the Blue Tank interior will be recoated to extend its life through the planning period. One new tank will be located at the site of the Blue Tank, and the second new tank will be located south of the City. The new tank south of the City will be fed from the distribution system through a booster station rather than from a well source.

4. The chlorination building and equipment would be relocated inside of the tank site fence to protect the system from vandalism. It is also a protection for the public against potential exposure to the chlorine gas that could be caused by accident, vandalism, or terrorism.

5. Pipelines will be replaced as depicted on the Proposed System Map in Appendix D. Associated valves and hydrants will be replaced or reconnected as applicable on the new pipelines. Additional hydrants will be added where possible to meet hydrant spacing requirements, without installing hydrants on 4 inch pipelines. Additional valves may be added where required to replace faulty valves and enhance system operability. In addition, this alternative includes replacement of as much of the remaining 4” cast iron lead joint piping as possible within the project budget after all other work is completed.

Alternative 3 is considered feasible.

9.5 ALTERNATIVE 4 – CONSTRUCT RECOMMENDED IMPROVEMENTS. REHABILITATE FIRE HOUSE WELL TO PRODUCE 2,200 GPM. PURCHASE WORWOOD WELL AND EQUIP IT TO PROVIDE 1,200 GPM TO THE NEW SOUTH TANK. SUPPLY LGA FROM WELL TRANSMISSION PIPELINES.

Alternative 4 would construct all major recommended improvements. The improvements address source capacity, storage capacity, distribution capacity, fire protection, disinfection, and maintenance. This alternative will correct most of the deficiencies in the Nephi culinary water system regarding the DDW rules. Under this alternative:

1. The Fire House Well would be rehabilitated up to and including reconstruction of a new well at the site. The goal of rehabilitation of the well under this alternative will be to eliminate sand production from the well and to slightly increase its capacity to 2,200 gpm without adverse effects on the output of other wells in the area including the existing Jones Well and Equipment Shed Well, which Nephi City must rely on. This option includes a 16" dedicated pipeline from the Fire House Well to the site of the Blue Tank.

   To further increase source capacity, the City will either drill an additional well or purchase a privately held existing culinary grade well. A private well must meet all of the requirements for construction, source protection, water quality, and output capacity.

   A suitable private well is located south of the City. It is in a location that would not impact the existing output from other City wells. The well log for this well shows that it has the necessary clay layers for the aquifer to be classified as a protected aquifer, which makes source protection for this well relatively simple. The well is believed to have a capacity of 1,200 gpm, but no pump test data meeting the requirements of DDW is available at this time. The City will also need to obtain a full new source sample analysis and verify sanitary seal documentation before an offer to purchase could be made. This well could conveniently supply a new tank south of I-15.

   The addition of this well along with the rehabilitated Fire House Well could provide the projected required source capacity with a reduced risk that the output of the Jones Well or Equipment Shed Well would be seriously impacted.

2. Large Green Areas such as parks and schools will be supplied with water directly from the well transmission lines rather than from the culinary distribution system through the tanks. This reduces the required storage improvements to 3,000,000 gallons rather than 3,700,000 gallons. It also increases the percentage of spring water available in the tanks to improve the taste of the water.

3. Two new 1,500,000-gallon tanks will be constructed and the Blue Tank interior will be recoated to extend its life through the planning period. One new tank will be located at the site of the Blue Tank, and the second new tank will be located south of the City. The new tank south of the City will be fed from the distribution system through a booster station rather than from a well source.

4. The chlorination building and equipment would be relocated inside of the tank site fence to protect the system from vandalism. It is also a protection for the public against potential exposure to the chlorine gas that could be caused by accident, vandalism, or terrorism.

5. Pipelines will be replaced as depicted on the Proposed System Map in Appendix D. Associated valves and hydrants will be replaced or reconnected as applicable on the new pipelines. Additional hydrants will be added where possible to meet hydrant spacing requirements, without installing hydrants on 4 inch pipelines. Additional valves may be added where required to replace faulty valves and enhance system operability. In addition, this alternative includes replacement of as much of the remaining 4" cast iron lead joint piping as possible within the project budget after all other work is completed.

Alternative 4 is considered feasible.

9.6 ALTERNATIVE 5 – CONSTRUCT RECOMMENDED IMPROVEMENTS FROM ALTERNATIVE 4. REPLACE ALL 4 INCH AND SMALLER DIAMETER LEAD JOINT CAST IRON PIPING. DO NOT REPLACE MAIN LINES IN STATE HIGHWAYS (MAIN STREET AND 100 NORTH STREET).

This alternative is identical in scope to Alternative 4, except that approximately 14,000 feet of proposed piping running along Main Street and 100 North Street would be eliminated. Except in the case of some road crossing pipelines, which will still need to be replaced by boring or open cutting the highway, these pipelines in Main Street are all larger than 4". In exchange for the piping in Main Street, all of the 4" and smaller and some additional 6" lead joint cast iron pipelines in residential areas would be replaced. The cost of this alternative is considered to be the same as the cost of Alternative 4, because the lead joint cast iron pipelines would be replaced until the budget is exhausted.

Although Alternative 5 may initially be considered feasible, it is not recommended. If work in the UDOT highway is eliminated from the project, then the City crews would soon need to replace the pipelines. The City crews are not equipped to safely and effectively complete major pipeline replacement work in UDOT rights-of-way within a reasonable amount of time. Work within the UDOT rights-of-way requires strict traffic control, material specifications, and construction practices. A general contractor would be much better equipped to complete such work. Therefore, Nephi City would prefer not to take on major pipeline replacements within the main UDOT rights-of-way.

For the reasons in the discussion above, Alternative 5 is not a good choice; therefore, Alternative 5 is not considered feasible.

SECTION 10.0
SELECTED ALTERNATIVE

10.1 GENERAL

Nephi City needs major improvements to its culinary water system to bring the system into compliance with the Rules. Five alternatives have been discussed in Section 9 of this report including the do nothing alternative.

Of the five alternatives, Alternative 3 and Alternative 4 are considered feasible as discussed in Section 9. The differences between Alternative 3 and Alternative 4 is the difference in the source of water and the method of introduction of water into the proposed tank south of I-15. The itemized Opinions of Probable Cost for Alternatives 3 and 4 are found in Appendix F. Also included in Appendix F for each of these two alternatives is a Proposed Funding Plan and a Cash Flow Spreadsheet.

Under Alternative 3, water would be pulled from the distribution system via a 1,500 gpm booster station located south of I-15 and pumped to the new south tank through a dedicated pipeline. The tank control would be set to allow the tank to be drawn down several feet before the booster station would start and refill the tank. Deep cycling the level of the water in the tank before refilling the tank with the booster pumps through a dedicated refill transmission pipeline will keep the water in the tank fresh, even though it is essentially "floating" on line.

Under Alternative 4, water would be provided by a well located approximately 5,000 feet directly west of the proposed tank location. The well is currently held by private parties, and is must be purchased for a reasonable price. Since the City has plenty of water right that could be transferred to this well through a point of diversion change application, the well owner can keep the water right or sell it separately on the open market. Initial investigation of the well suggests that the well appears to meet all current culinary requirements, but a full new source sample must be collected for analysis and a pump test for 24 hours must be conducted to verify the capacity of the aquifer.

These two feasible alternatives are compared in a non-monetary comparison in Appendix G and a net present value analysis in Appendix H. The capital cost of Alternative 3 is lower than the capital cost Alternative 4 by $92,000, and the difference will vary only based on the cost to acquire and equip the private well for Alternative 4. The net present value evaluation also shows that Alternative 3 is the lower cost alternative, but the difference in capital cost and net present value between the two Alternatives is less than 1% and, which is negligible.

The non-monetary comparison, favors Alternative 4 on Water Quality, System Management, and Support for Future Development as follows:

- Water Quality scores better on Alternative 4 for two reasons. First, with a lower pumping rate from the fire house well, the percentage of spring water in the tanks at the Blue Tank

site and the silver tank will remain higher. Second, with a booster pump supplying water to the new south tank from the distribution system as in Alternative 3, the water quality in the tank may not be as high as it would be if it was supplied from a well, assuming that the quality of the well water meets all DDW standards.

- System Reliability scores better on Alternative 4 because the south tank will not have to cycle several feet before the booster pump refills the tank. With a well to fill the tank, the tank level will remain nearly full at all times, which increases system reliability.

- Support for Future Development scores higher on Alternative 4 because the well filling the south tank is drawing water from a different aquifer than the aquifer supplying all other Nephi City wells. Continuously adding wells drawing from the same aquifer, will eventually overtax the aquifer, such that no additional water can be pumped from that aquifer.

Either Alternative 3 or Alternative 4 could be constructed for this project. However, if the private well can be acquired within the project budget, Alternative 4 is the better Alternative.

10.2 SELECTED ALTERNATIVE

Alternative 4, which will construct all of the improvements recommended in this Preliminary Engineering Report and provide a separate well source to the proposed south tank, is the selected alternative. Construction will begin as soon as funding is available and final design can be completed. Contract Documents for the proposed project will be in accordance with the EJCDC Funding Agency Edition Documents for water projects.

10.3 PROPOSED PROJECT

Nephi City will construct a water improvements project that will include all improvements recommended in Section 8 of this preliminary engineering report. The entire scope of the project is itemized in the Opinion of Probable Cost for Alternative 4 included in Appendix F.

A Nephi City culinary water system map showing existing and proposed system features, piping, and major components is provided in Appendix D.

10.4 ENVIRONMENTAL RESOURCES PRESENT

All of the recommended project improvements are to be constructed on City owned property, county and state road rights of way, or within easements on private property. The site of the proposed south tank and the Worwood Well are located on private property. Purchase of these sites, which each will require approximately 3 acres, will be negotiated by Nephi City. The pipeline from the Worwood Well to the south tank will cross private property and easements will be negotiated by Nephi City for this line. The maintenance work at Bradley Springs is on private property on previously granted easements.

Because the project will be funded using USDA-RD RUS funds, an environmental report is required. To prepare the environmental report the surveys discussed below have been contracted, and the results of these surveys will be included in the report.

- A cultural resource survey is being conducted to verify that there are no significant artifacts that will be disturbed. If artifacts are found in the construction corridor, mitigation will be required in accordance with State and Federal law.

- A biological resource survey is being conducted to ensure that there are no impacts to sensitive species.

SECTION 11.0
MISCELLANEOUS INFORMATION

11.1 WATER RATES

Nephi City's culinary water rates are currently under review and will soon be increased to cover new loan payments required to construct the recommended improvements. Customers currently receive no water with their base water rates. The base rate for residential customers is $7.50 per month. The base rate for commercial and industrial customers is $10.50 per month. The current usage rate for all residential and commercial customers is $0.60 per 1,000 gallons. The current usage rate for industrial customers is $0.35 per 1,000 gallons.

The cash flow spread sheets included in Appendix F for each of the two feasible options includes the tentative proposed water rates required for each Alternative based on the Proposed Funding Plan loan/grant mix. The final rates adopted by the City may differ from those shown in the spreadsheets, but they will provide the required income to meet all budget obligations including debt service coverage and loan payment reserves. It is anticipated that a stepped overage rate structure will also be adopted, to encourage water conservation in accordance with requirements of the Rules.

Irrigation usage is not metered. The current assessment for city shares of irrigation water in the city is $125.00 per share per year. There are 794 city shares of Nephi Irrigation Company irrigation water currently in use in Nephi City. The average cost per connection of irrigation water in Nephi City is determined by multiplying $125.00 by 794 shares, which equals $99,250.00, and then dividing that total by 2,100 connections in the culinary system and then again by 12 months, which yields $3.94 per month per culinary connection. This value is used in the Proposed Funding Plans for the feasible project alternatives, included in Appendix F.

11.2 WATER METERS

Water meters are currently required on all connections to the Nephi City culinary water system. The City has a radio read meter system and meters are read monthly.

11.3 DRINKING WATER SOURCE PROTECTION

All of Nephi City's culinary water sources have source protection plans maintained in accordance with the Rules.

11.4 ACCESSIBILITY

Nephi City's business is conducted in the City's offices, which are located at 21 East 100 North, Nephi, Utah. The office complex meets ADA handicap access requirements.

11.5 COORDINATE LOCATIONS OF MAJOR SYSTEM COMPONENTS

Google Earth uses the WGS 84 coordinate system. Locations for major components of the Nephi City culinary water system obtained using Google Earth are listed in the Table below.

COORDINATE LOCATIONS FOR MAJOR SYSTEM COMPONENTS

Component	WGS – 84 North Coordinate	WGS – 84 West Coordinate
Equipment Shed Well	39° 42’ 40.73”	111° 50’ 28.06”
Jones Well	39° 42’ 26.63”	111° 49’ 52.55”
Fire House Well	39° 42’ 28.72”	111° 50’ 06.72”
Proposed Worwood Well	39° 39’ 31.07”	111° 51’ 54.48”
Silver Tank	39° 43’ 37.62”	111° 49’ 13.07”
Blue Tank	39° 42’ 58.01”	111° 48’ 27.03”
Proposed Tank at Blue Tank	39° 42’ 57.51”	111° 48’ 24.28”
Proposed South Tank	39° 39’ 30.14”	111° 50’ 49.03”
Upper Bradley Spring	39° 42’ 46.58”	111° 44’ 03.42”
Lower Bradley Spring	39° 42’ 50.28”	111° 44’ 00.22”
Marsh Spring	39° 43’ 06.94”	111° 46’ 33.43”

11.6 RUS – WEP HOMELAND SECURITY INITIATIVE

Nephi City has a city-wide emergency preparedness and response plan that is updated annually. The City is in the process of revising its existing emergency preparedness and response plan to address requirements of the Bioterrorism Preparedness and Response Act of 2002.

11.7 PROPOSED PROJECT SCHEDULE TIMELINE

The table below shows the tentative schedule for this project.

Project Funding Authorized	September 2016
Engineering Contract Agreement Approved & Executed	October 2016
Begin Detailed Design	October 2016
Detailed Design Complete	May 2017
Advertise for Bids	June 2017
Bid Opening	July 2017
Construction Contract Award	July 2017
Construction Start	August 2017
All Construction & Startup Activities Complete	October 2020
Final Acceptance	October 2020

11.8 SHORT LIVED ASSET RESERVES

A list of short lived assets for the Nephi Culinary water system totaling $1,925,000.00 can be found in Appendix I. The list does not include consumables.

11.9 NEPHI CITY CONSUMER CONFIDENCE

Nephi City culinary water system Consumer Confidence Report from the Division of Drinking Water is included in Appendix J.

11.10 NEPHI CITY PUBLIC WATER SYSTEM INVENTORY

Nephi City culinary water system Public Water System Inventory Report from the Division of Drinking Water is included in Appendix K.

11.11 NEPHI CITY CULINARY WATER SYSTEM WATER QUALITY DATA

Nephi City culinary water system meets all requirements for water quality required by the Rules. A copy of the June 2016 distribution system routine bacteria sample analysis results is included in Appendix L.

11.12 NEPHI CITY PUBLIC WATER SYSTEM IPS REPORT

Nephi City Public Water System IPS Report from the Division of Drinking Water is included in Appendix M.

SECTION 12.0
SUMMARY

Nephi City is in critical need of major improvements to its culinary water system. The following needs have been identified:

- Additional Source Capacity is needed immediately. With the springs and the Equipment Shed Well running at peak capacity the City cannot keep both tanks full at all times. At times, the Jones Well, which is normally dedicated to irrigation exchange for spring water is used to supplement other culinary sources. Calculations in this PER show that the system will require an additional 3,400 gpm of source capacity to meet the projected needs of the system during the 20 year planning period.

  Some or all of the projected required source capacity can be obtained by refurbishing (reconstructing) the Fire House Well, which has not been used for over 20 years due to excess sand production. The balance may be achieved through purchase of a privately owned culinary well, which is recommended due to its location, if the well meets all quality standards and pump tests are satisfactory.

- The system is out of compliance with the Rules for fire hydrant spacing, and many existing hydrants are 4 inch hydrants and are over 70 years old. One hydrant that was over 100 years old and inoperable was found in the system. It was replaced within one week of discovery. Approximately 140 - 160 additional fire hydrants are needed to replace old hydrants and achieve the required spacing.

- The system is out of compliance with the Rules regarding water storage, and needs over 1,000,000 gallons of storage immediately. The projected required storage calculation showed that 3,700,000 gallons of additional storage are required to meet projected system needs throughout the twenty year planning period. However, if irrigation for the City's parks, cemeteries, schools, and golf course are shifted from the tanks and culinary distribution system to dedicated pipelines directly from the well transmission pipelines during the summer, the projected required storage is reduced by 700,000 gallons. This change still leaves an additional 3,000,000 gallons of storage that must be constructed. Two new tanks that will each store at least 1,500,000 gallons, one near the existing Blue Tank and the other south of the south I-15 interchange, will be constructed.

- The existing pipelines from the existing tanks are undersized. During periods of high demand, and especially during fire flow demands, these undersized pipelines starve the distribution system. This starvation is caused by head loss in the pipelines due to high velocity. In addition, the tanks currently supply the distribution system at only two locations. This will be improved by the addition of two new transmission lines to the distribution system. One line will enter the system at 700 North, the second line will enter the system at the south I-15 interchange. These changes will make a major

difference in pressure and volume available in the distribution system during high demand periods.

- A large number of cast iron lead joint pipelines are in the older parts of the existing system. Pipelines in newer subdivision are PVC and most are 8 inch, which is recommended. A large number of the cast iron pipelines are 4 inch and smaller.

  The cast iron pipelines, especially small diameter lines and those in roads with heavy truck traffic frequently develop leaks at the joints. In addition, the smaller lines break on a regular basis. The lead joint pipelines in the highways and as many of the 4 inch and smaller pipelines in the system will be replaced to the point that budget allows.

Five potential alternatives were reviewed. Three of the alternatives were not feasible. The two feasible alternatives would construct all of the recommended improvements to correct the needs discussed above. The only difference between the two feasible alternatives is the source of water to the new tank south of the south I-15 interchange. With a capital cost difference of $92,000 between the alternatives, based on the cost of the project, the difference in capital cost and net present value between the alternatives is negligible. The non-monetary, comparison favors the higher cost alternative, which became the selected alternative. The opinion of probable cost for this alternative is $18,123,000.00, including a 10% construction cost contingency.

The City will apply to USDA – RD for the total project funding for this project, requesting the best loan grant ratio that RD can provide. Work on design and construction of the selected alternative will begin as soon as funding is available.

APPENDIX A

FIVE POINT ANALYSIS

APPENDIX A
FIVE POINT ANALYSIS

1 POPULATION DATA:

1970 Census Data	**2,699**
1980 Census Data	**3,285**
1990 Census Data	**3,515**
2000 Census Data	**4,733**
2010 Census Data	**5,389**

Growth rate from 1970 to 1980	**1.98%**
Growth rate from 1980 to 1990	**0.68%**
Growth rate from 1990 to 2000	**3.02%**
Growth rate from 2000 to 2010	**1.31%**
Growth rate from 1970 to 2010	**1.74%**
Growth rate from 1990 to 2010	**2.16%**

Growth rate used for planning	
Residential	**2.73%**
Commercial	**2.00%**
Industrail	**5.00%**
2016 Census Population	**5,389**
2036 Projected Population	**9,763**
2016 Connections	**2,100**
2036 Projected Connections	**3,557**

		Connection Projections				EDU Projections			
Year	***Population**	***Est. Res. Conn.**	***Est. Com. Conn.**	***Est. Ind. Conn.**	***Est. Total Conn.**	***Est. Res. EDU's**	***Est. Com. EDU's (1)**	***Est. Ind. EDU's (3)**	***Est. Total EDU's**
2016	5,697	1,910	189	1	2,100	1,910	705	162	2,777
2017	5,853	1,962	193	1	2,156	1,962	720	170	2,852
2018	6,012	2,016	197	1	2,214	2,016	735	179	2,929
2019	6,176	2,071	201	1	2,273	2,071	750	188	3,008
2020	6,345	2,128	205	1	2,334	2,128	765	197	3,090
2021	6,518	2,186	209	1	2,396	2,186	780	207	3,172
2022	6,696	2,246	213	1	2,460	2,246	794	217	3,258
2023	6,879	2,307	217	1	2,525	2,307	809	228	3,344
2024	7,067	2,370	221	1	2,592	2,370	824	239	3,434
2025	7,260	2,435	225	2	2,662	2,435	839	251	3,526
2026	7,458	2,501	230	2	2,733	2,501	858	264	3,623
2027	7,662	2,569	235	2	2,806	2,569	877	277	3,723
2028	7,871	2,639	240	2	2,881	2,639	895	291	3,825
2029	8,086	2,711	245	2	2,958	2,711	914	305	3,930
2030	8,306	2,785	250	2	3,037	2,785	933	321	4,038
2031	8,533	2,861	255	2	3,118	2,861	951	337	4,149
2032	8,766	2,939	260	2	3,201	2,939	970	354	4,262
2033	9,005	3,019	265	2	3,286	3,019	988	371	4,379
2034	9,251	3,101	270	2	3,373	3,101	1,007	390	4,498
2035	9,504	3,186	275	3	3,464	3,186	1,026	409	4,621
2036	9,763	3,273	281	3	3,557	3,273	1,048	430	4,751

* Figures are rounded to the nearest whole number at projected annual rate of growth except for the first row in 2016. The initial year's numbers are whole numbers from which the rest of the figures are calculated.

EDU Calculations

(1) 1 Residential Connection Weighted Average Use =	19,458	Gal/Month	=	1 EDU
(2) 1 Commercial Connection Average Use =	72,647	Gal/Month	=	3.73 EDU
(3) 1 Industrial Connection Average Use =	3,160,166	Gal/Month	=	162.00 EDU

APPENDIX A
FIVE POINT ANALYSIS

2. Water Rights

A. Existing Water Right

W.R. #	Source		ac-ft	cfs	gpm
			Amount of Right		
53	Marsh Spring	=	562.42	0.78	348.68
53-2	Rowley's Spring	=	83.00	0.11	51.46
53-35	Monument Springs 1,2,3	=	488.68	0.68	302.97
53-53	Underground, Airport well	=	57.92	0.08	35.91
53-63	Underground	=	2628.04	3.63	1629.28
53-64	Industrial Waste	=	200.00	0.28	123.99
53-65	Underground & Bradley Spring	=	4343.87	6.00	2693.02
53-80	Bradley Spring Winter	=	1092.48	3.63	1629.29
53-87	Underground	=	3062.42	4.23	1898.58
53-88	Underground	=	3663.33	5.06	2271.12
53-1516	Underground	=	839.82	1.16	520.65
		Total =	17,021.97	25.63	11,504.94
		Water Right Available	**17,021.97**	**25.63**	**11,504.94**

B. Existing Required Water Right:

Residential Use:

Indoor

1,910 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 856 ac-ft

Outdoor

1,210 EDUs x (1 ir. acre / 5 EDU) x (1.87 ac-ft/yr / ir.-acre/yr) x (1 eff / 0.7) = 646 ac-ft

Commercial Use:

Indoor

705 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 316 ac-ft

Additional Commercial Summer Use

705 EDUs x (35780 gal / EDU month) x (6 month / year) x (1 ac-ft / 325,851 gal) = 464 ac-ft

Industrial Use:

162 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 73 ac-ft

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

(124 ir. acre / ir.-acre/yr) x (2.47 ac-ft/yr / 1) x (1 eff / 0.7) = 438 ac-ft

Leased to Irrigation Company (Data Supplied by City from the Culinary Water Master Plan) 1,057.0 ac-ft

Total Existing Required Water Right	**3,850**	**ac-ft**
Estimated Existing Water Right Surplus	**13,172**	**ac-ft**

C. Projected Required Water Right: (20 year growth)

Residential Use:

Indoor

3,273 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 1,466 ac-ft

Outdoor

2,573 EDUs x (1 ir. acre / 5 EDU) x (1.87 ac-ft/yr / ir.-acre/yr) x (1 eff / 0.7) = 1,375 ac-ft

Commercial Use:

1,048 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 470 ac-ft

Additional Commercial Summer Use

1,048 EDUs x (35780 gal / EDU month) x (6 month/yr x (1 ac-ft / 325,851 gal) = 691 ac-ft

Industrial Use:

430 EDUs x (400 gal / EDU day) x (365 day / 1 year) x (1 ac-ft / 325,851 gal) = 193 ac-ft

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

(174 ir. acre / ir.-acre/yr) x (2.47 ac-ft/yr / 1) x (1 eff / 0.7) = 614 ac-ft

Leased to Irrigation Company (Data Supplied by City from the Culinary Water Master Plan) 1,057.0 ac-ft

Total Projected Required Water Right	**5,865**	**ac-ft**
Estimated Projected Water Right Surplus	**11,157**	**ac-ft**

Note 1: 1/5Acre = Assumed average irrigated acre per lot with a 70% sprinkler efficiency.
Note 2: The number of outdoor residential EDUs is indoor EDUs minus 700 irrigation customers

APPENDIX A
FIVE POINT ANALYSIS

3. Water Source Capacity:

Source		
Upper & Lower Marsh Springs	=	600 gpm
Upper & Lower Bradley Springs	=	1300 gpm
Equipment Shed Well	=	2400 gpm
**Jones Well	=	0 gpm
Total	**=**	**4300 gpm**

A. Existing Required Source Capacity:

Residential Use:

Indoor

1,910 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 1,061 gpm

Outdoor

1,210 EDUs x (1 acre / 5 EDU) x (3.96 gpm / irr. acre) x (1 / 0.7 eff) = 1,369 gpm

Commercial Use:

Indoor

705 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 392 gpm

Additional Commercial Summer Use

705 EDUs x (1193 gal / EDU day) x (1 day / 1440 minute) = 584 gpm

Industrial Use:

162 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 90 gpm

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

124 acre x (5.23 gpm / irr. acre) x (1 / 0.7 eff) = 926 gpm

Total Existing Required Source Capacity	**4,422 gpm**
Estimated Existing Source Capacity Surplus	**(122) gpm**

B. Projected Required Source Capacity:

Residential Use:

Indoor

3,273 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 1,818 gpm

Outdoor

2,573 EDUs x (1 acre / 5 EDU) x (3.96 gpm / irr. acre) x (1 / 0.7 eff) = 2,911 gpm

Commercial Use:

Indoor

1,048 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 582 gpm

Additional Commercial Summer Use

1,048 EDUs x (1193 gal / EDU day) x (1 day / 1440 minute) = 868 gpm

Industrial Use:

430 EDUs x (800 gpd / EDU) x (1 day / 24 hr) x (1 hr / 60 min.) = 239 gpm

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

174 acre x (5.23 gpm / irr. acre) x (1 / 0.7 eff) = 1,300 gpm

Total Projected Required Source Capacity	**7,719 gpm**
Estimated Projected Source Capacity Deficit	**(3,419) gpm**

Note 1: 1/5Acre = Assumed average irrigated acre per lot with a 70% sprinkler efficiency.

Note 2: The number of outdoor residential EDUs is indoor EDUs minus 700 irrigation customers

** Jones Well is listed as zero because it is being diverted for irrigation use

APPENDIX A
FIVE POINT ANALYSIS

4. Water Storage Capacity:*

(*Projected value without the Large Green Area irrigation water stored in the tanks)

Existing Storage Capacity:	Tank #1 (Blue Tank)	2,000,000 gal.
	Tank #2 (Silver Tank)	600,000 gal.
	Total Existing Storage Capacity	**2,600,000 gal.**

A. Existing Required Storage Capacity:

Residential Use:

Indoor

1,910 EDUs x 400 gal. / EDU = 764,000 gal.

Outdoor

1,210 EDUs x 1 acre / 5 EDU x 2848 gal / irr. acre x 1 eff / 0.7 = 984,594 gal.

Commercial Use:

Indoor

705 EDUs x 400 gal. / EDU = 281,988 gal.

Additional Commercial Summer Use

705 EDUs x 1193 gal / EDU day = 841,029 gal.

Industrial Use:

162 EDUs x 400 gal. / EDU = 64,800 gal.

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

124 acre x 2848 gal / irr. acre x 1 eff / 0.7 = 504,503 gal.

Fire Protection:

1500 gal. / min x 2 hr. x 60 min. / hr = 180,000 gal.

Total Existing Required Storage Capacity	**3,620,914 gal.**
Estimated Existing Storage Capacity <u>Deficit</u>	**(1,020,914) gal.**

B. Projected Required Storage Capacity:

Residential Use:

Indoor

3,273 EDUs x 400 gal. / EDU = 1,309,200 gal.

Outdoor

2,573 EDUs x 1 acre / 5 EDU x 2848 gal / irr. acre x 1 eff / 0.7 = 2,093,687 gal.

Commercial Use:

1,048 EDUs x 400 gal. / EDU = 419,252 gal.

Additional Commercial Summer Use

1,048 EDUs x 1193 gal / EDU day = 1,250,419 gal.

Industrial Use:

430 EDUs x 400 gal. / EDU = 171,934 gal.

Fire Protection:

3000 gal. / min x 2 hr. x 60 min. / hr = 360,000 gal.

Total Projected Required Storage Capacity	**5,604,492 gal.**
Estimated Projected Storage Capacity <u>Deficit</u>	**(3,004,492) gal.**

Note 1: 1/5Acre = Assumed average irrigated acre per lot with a 70% sprinkler efficiency.

Note 2: The number of outdoor residential EDUs is indoor EDUs minus 700 irrigation customers

APPENDIX A
FIVE POINT ANALYSIS

4. Water Storage Capacity:*

(*Projected value with the Large Green Area irrigation water stored in the tanks)

Existing Storage Capacity:	Tank #1 (Blue Tank)	2,000,000	gal.
	Tank #2 (Silver Tank)	600,000	gal.
	Total Existing Storage Capacity	**2,600,000**	**gal.**

B. Projected Required Storage Capacity with Large Green Areas:

Residential Use:

Indoor

3,273 EDUs x 400 gal. / EDU = 1,309,200 gal.

Outdoor

2,573 EDUs x 1 acre / 5 EDU x 2848 gal / irr. acre x 1 eff / 0.7 = 2,093,687 gal.

Commercial Use:

1,048 EDUs x 400 gal. / EDU = 419,252 gal.

Additional Commercial Summer Use

1,048 EDUs x 1193 gal / EDU day = 1,250,419 gal.

Industrial Use:

430 EDUs x 400 gal. / EDU = 171,934 gal.

Large Green Areas (Schools, Golf Course, Parks, & Cemetery)

174 acre x 2848 gal / irr. acre x 1 eff / 0.7 = 707,931 gal.

Fire Protection:

3000 gal. / min x 2 hr. x 60 min. / hr = 360,000 gal.

Total Projected Required Storage Capacity	**6,312,423**	**gal.**
Estimated Projected Storage Capacity Deficit	**(3,712,423)**	**gal.**

Note 1: 1/5Acre = Assumed average irrigated acre per lot with a 70% sprinkler efficiency.

Note 2: The number of outdoor residential EDUs is indoor EDUs minus 700 irrigation customers

APPENDIX A
FIVE POINT ANALYSIS

5. Distribution:

A. Existing Distribution Requirement:

Systems with fire protection use peak day demands + fire flow. Peak day demands are calculated to determine required source capacity. However, in the case of Nephi City, the Peak Day Demand on the distribution system will not include the water used by the large green areas, because these areas are going to be supplied from the well transmission lines directly and not from the distribution system. The current and projected peak day demand listed below on this sheet excludes the large green area demands that appear on the Minimum Required Source Capacity on Page 3 of this 5 Point Analysis. The peak day demand is spread throughout the entire system for modeling purposes by dividing the peak day demand flow by the number of system junction nodes found in the model. The model then analyzes the entire distribution system with a fire flow assigned in turn to each junction node.

Current Required Peak Day Demand	=	3,496	gpm
Fire Flow	=	1,500	gpm
Total Current System Design Flow From Storage.	=	**4,996**	**gpm**

B. Projected Distribution Requirement 20 year Planning Period:

Projected Required Peak Day Demand	=	6,419	gpm
Fire Flow	=	3,000	gpm
Total Projected System Design Flow From Storage.	=	**9,419**	**gpm**

Existing System H2O Net Model Data:	500	Fire Flow Nodes existing system model
	6.99	gpm per node peak day demand flow
Projected System H2O Net Model Data:	513	Fire Flow Nodes proposed system model
	12.51	gpm per node peak day demand flow

APPENDIX B

NEPHI CITY
AVERAGE WATER USAGE AND EDU DETERMINATIONS

Appendix B

Average Water Usage and Equivalent Domestic Unit Determinations

	Total residential connections	res conn without irrigation	res conn with irrigation		Percent without irrigation	Percent with irrigation
	1910	1210	700		63.4%	36.6%
Average gal/mo		26976	6434			
Weighted Average Usage =	26,976 x 63.4%	+	6,434 x 36.6%	=	Weighted Average Usage	
	17103	+	2355	=	19458	gallons per month per connection

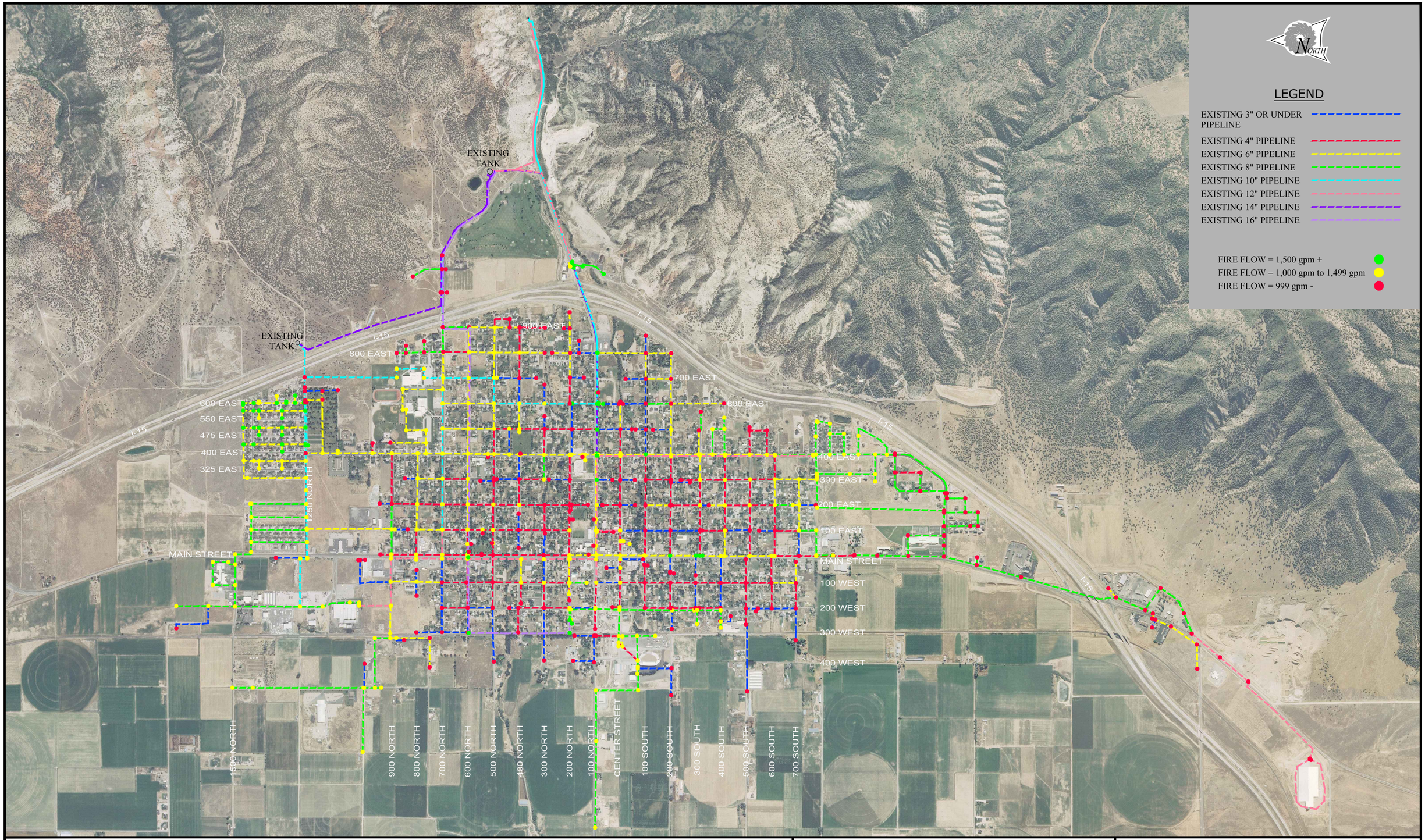
Weighted Average gal/mo/residential conn	**19458**

User Type	Number of connections	Ave Gal per mo per connection	Number of EDU Per Connection	Calculated Total EDU'S
Residential	1910	19458	1	1910
Commercial	189	72647	3.73	705
Industrial	1	3160166	162	162

TOTALS:	**2,100 Connections**	**2,777 EDUs**

APPENDIX C

EXISTING CULINARY WATER DISTRIBUTION SYSTEM MAP



NEPHI CITY

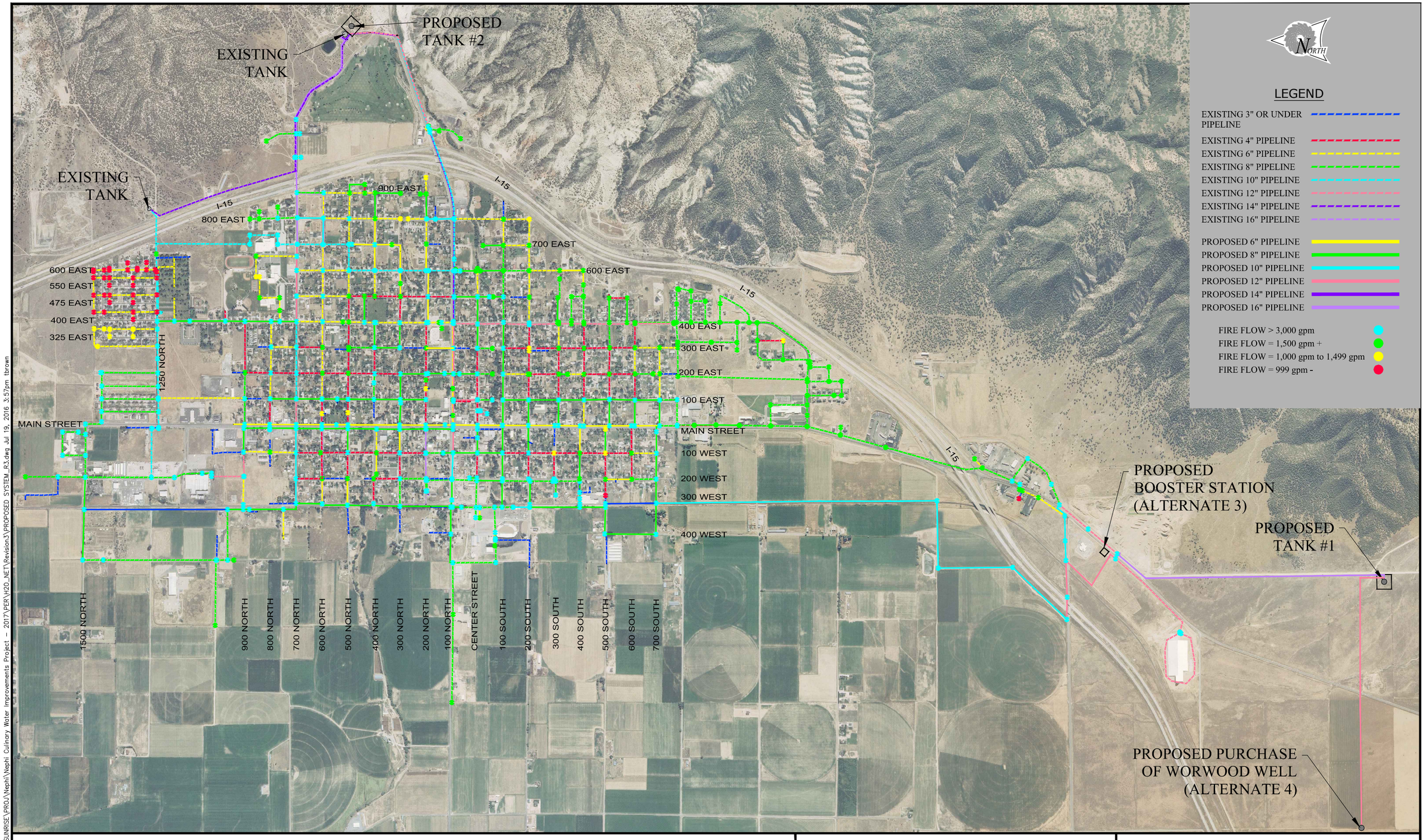
H20Net Model

Appendix C
Existing Water System

SUNRISE ENGINEERING
25 EAST 500 NORTH
FILLMORE, UTAH 84631
TEL 435.743.6151 • FAX 435.743.7900
www.sunrise-eng.com

APPENDIX D

PROPOSED CULINARY WATER DISTRIBUTION SYSTEM MAP



NEPHI CITY

H20Net Model

Appendix D
Proposed Water System

SUNRISE ENGINEERING
25 EAST 500 NORTH
FILLMORE, UTAH 84631
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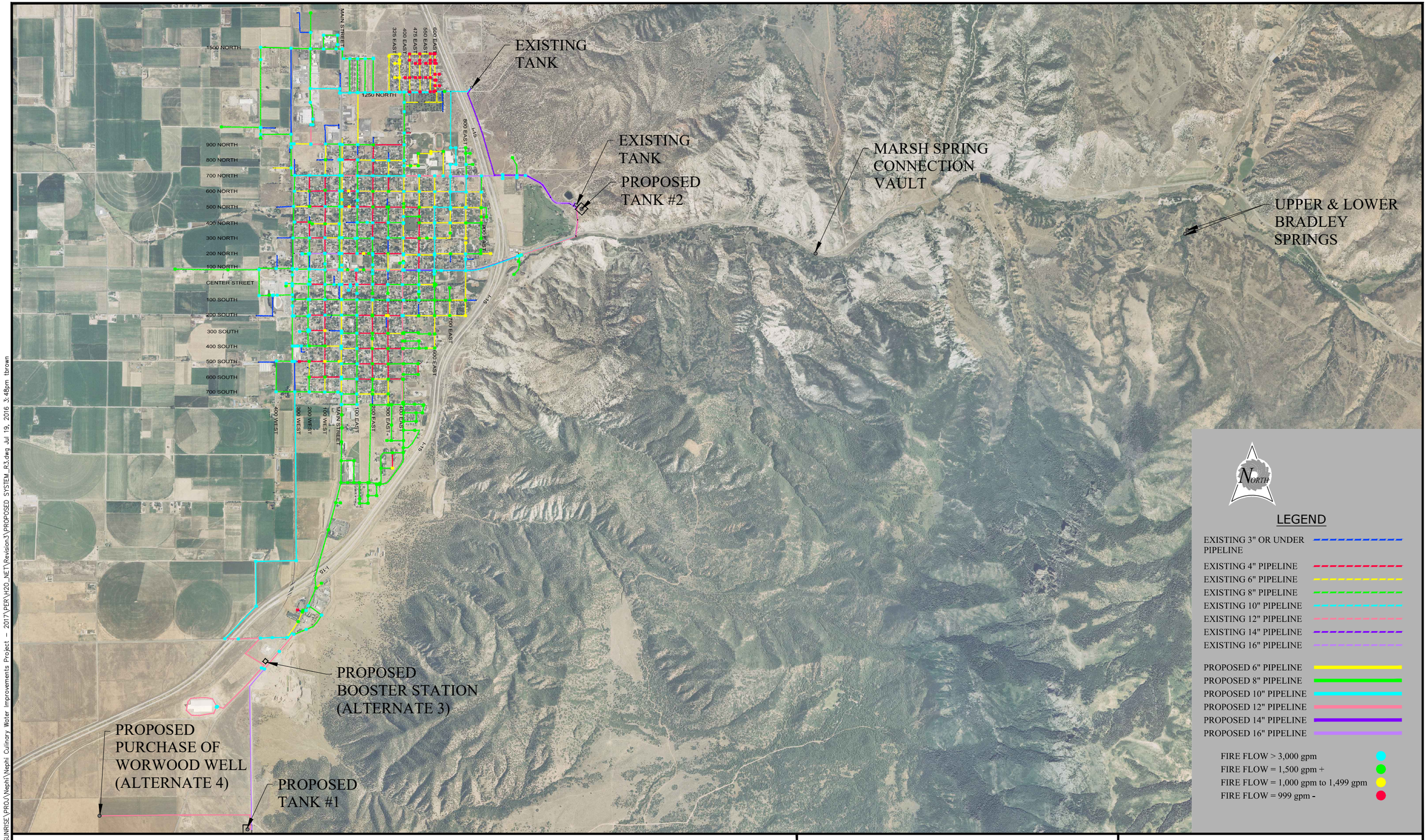
www.sunrise-eng.com

APPENDIX E

WIDE AREA SYSTEM MAP (INCLUDES LOCATIONS OF EXISTING FEATURES, SPRINGS, AND RECOMMENDED IMPROVEMENTS)



NEPHI CITY

H20Net Model

Appendix E
Wide Area System Map

SUNRISE ENGINEERING
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APPENDIX F

OPINIONS OF PROBABLE COST, PROPOSED FUNDING PLANS, & CASH FLOW PROJECTIONS FOR FEASIBLE ALTERNATIVES

ALTERNATIVE 3
OPINION OF PROBABLE COST

APPENDIX F
PER ALTERNATIVE 3
ENGINEER'S OPINION OF PROBABLE COST
NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

Well Improvements

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	L.S.	$ 95,000.00	95,000.00
2	Inspect & Evaluate Fire House Well for Rehabilitation	1	L.S.	25,000.00	25,000.00
3	26" Well Hole Drilling and Well Log Preparation	400	Ln Ft	290.00	116,000.00
4	20" Diameter Carbon Steel Well Casing	205	Ln Ft	150.00	30,750.00
5	20" SS Well Screen	200	Ln Ft	600.00	120,000.00
6	Gravel Pack	60	Cu. Yd.	1,200.00	72,000.00
7	2" Gravel Pack Carbon Steel Refill Tremie Pipe	400	Ln Ft	14.00	5,600.00
8	1.5 Inch Dia. 304 SS Screened Inst. Well Outside of Well Casing	360	Ln Ft	12.50	4,500.00
9	Sanitary Grout Seal ±120' feet	25	Cu. Yd.	1,040.00	26,000.00
10	Furnish and Install Test Pump and Power Unit Equipment	1	L.S.	15,000.00	15,000.00
11	Development Pumping & Surging	180	Hour	300.00	54,000.00
12	Test Pumping	32	Hour	300.00	9,600.00
13	Disinfection and Capping	1	L.S.	4,000.00	4,000.00
14	Aquifer Water Sample	1	L.S.	2,000.00	2,000.00
15	Site Work and Grading	1	L.S.	5,000.00	5,000.00
16	Untreated Road Base Course	600	Ton	15.00	9,000.00
17	Well Site Chain Link Fence (Inc. 20' double leaf and 3' Man Gate)	840	Ln Ft	22.00	18,480.00
18	Concrete Building	1	Each	85,000.00	85,000.00
19	Turbine Line Shaft Pump System	1	Each	90,000.00	90,000.00
20	Well Pump Control Panel with VFD	1	Each	50,000.00	50,000.00
21	Well Building Pipe Valves and Fittings	1	Each	50,000.00	50,000.00
22	Ultrasonic Flowmeter 12"	1	Each	9,000.00	9,000.00
23	Well Building Unit Heater	1	Each	2,000.00	2,000.00
24	16" C900 PVC Pipe and Fittings to Blue Tank	12,500	Ln Ft	55.00	687,500.00
25	16" Butterfly Valve	6	Each	4,400.00	26,400.00
26	3" Bituminous Surfacing for Street Crossings.	5,800	SQ.-YD.	28.00	162,400.00
27	Chlorination Equipment	1	L.S.	30,000.00	30,000.00
28	Pipe Bedding	12,500	Ln Ft	1.25	15,625.00
29	3" Combination Air Valve Assembly	6	EACH	$ 7,900.00	$ 47,400.00
30	Back-up Generator	1	L.S.	125,000.00	125,000.00
31	Nephi Power Company Upgrades to Power Fire House Well	1	L.S.	10,000.00	10,000.00
				Subtotal Well Improvements	**$ 2,002,255.00**

Distribution Improvement Projects

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	LS.	$ 425,000.00	$ 425,000.00
2	Pre-Construction Video	1	LS.	$ 1,500.00	$ 1,500.00
3	Traffic Control	1	LS.	$ 30,000.00	$ 30,000.00
4	Subsurface Investigation	300	HOUR	$ 200.00	$ 60,000.00
5	16" AWWA C900 PVC SDR 18 Pipe and Fittings	10700	LN.-FT.	$ 55.00	$ 588,500.00
6	16" Butterfly Valve Assembly	11	EACH	$ 4,400.00	$ 48,400.00
7	12" AWWA C900 PVC SDR 18 Pipe and Fittings	7200	LN.-FT.	$ 32.00	$ 230,400.00
8	12" Gate Valve Assembly	14	EACH	$ 2,800.00	$ 39,200.00
9	10" AWWA C900 PVC SDR 18 Pipe and Fittings	15700	LN.-FT.	$ 24.00	$ 376,800.00
10	10" Gate Valve Assembly	16	EACH	$ 2,400.00	$ 38,400.00
11	8" AWWA C900 PVC SDR 18 Pipe and Fittings	52500	LN.-FT.	$ 18.50	$ 971,250.00

Corrected 8/10/16

APPENDIX F
PER ALTERNATIVE 3
ENGINEER'S OPINION OF PROBABLE COST
NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

12	8" Gate Valve Assembly	142	EACH	$ 1,500.00	$ 213,000.00
13	8" AWWA C900 PURPLE PVC SDR 18 Pipe and Fittings	5000	LN.-FT.	$ 18.50	$ 92,500.00
14	8" PURPLE Gate Valve Assembly	20	EACH	$ 1,500.00	$ 30,000.00
15	6" AWWA C900 PVC SDR 18 Pipe and Fittings	28550	LN.-FT.	$ 13.00	$ 371,150.00
16	6" Gate Valve Assembly	116	EACH	$ 1,200.00	$ 139,200.00
17	Pipe Bedding	155917	LN.-FT.	$ 1.00	$ 155,917.00
18	Untreated Base Course	10500	TON	$ 16.00	$ 168,000.00
19	HY 132 & Main St. Xing Directional Bore w/Various HDPE	1800	LN.-FT.	$ 200.00	$ 360,000.00
20	Pavement Cutting Surface Street and UDOT Highway	254300	LN.-FT.	$ 0.50	$ 127,150.00
21	8" Bituminous Surfacing for UDOT Highway.	12000	SQ.-YD.	$ 65.00	$ 780,000.00
22	3" Bituminous Surfacing for Street Crossings.	60761	SQ.-YD.	$ 24.00	$ 1,458,264.00
23	RR Crossing Boring and Jacking 24 Inch Casing Pipe	500	LN.-FT.	$ 300.00	$ 150,000.00
24	New Fire Hydrant Assembly	139	EACH	$ 3,800.00	$ 528,200.00
25	Reconnect Existing Fire Hydrant	47	EACH	$ 2,000.00	$ 94,000.00
26	Service Connection Assembly (New or Reconnect 1")	1079	EACH	$ 450.00	$ 485,550.00
27	1"Meter Connection Assembly	1079	EACH	$ 250.00	$ 269,750.00
28	1" IPS Polyethylene Service Lateral Tubing	35607	LN.-FT.	$ 6.00	$ 213,642.00
29	Carson Heavy Wall Max Series Meter Box for 1" Meters	1079	EACH	$ 120.00	$ 129,480.00
30	Ring and Lid for 1" Meter Box	300	EACH	$ 150.00	$ 45,000.00
31	Service Connection Assembly (New or Reconnect 2")	20	EACH	$ 900.00	$ 18,000.00
32	2" Dual Check Meter Setter Assembly	20	EACH	$ 430.00	$ 8,600.00
33	2" IPS Polyethylene Service Lateral Tubing	660	LN.-FT.	$ 8.00	$ 5,280.00
34	2 " Meter Box	20	EACH	$ 1,200.00	$ 24,000.00
35	Ring and Lid for 2" Meter Box	10	EACH	$ 300.00	$ 3,000.00
36	3" Combination Air Valve Assembly	6	EACH	$ 7,900.00	$ 47,400.00
37	2" Combination Air Valve Assembly	4	EACH	$ 4,200.00	$ 16,800.00
38	1" Combination Air Valve Assembly	6	EACH	$ 3,000.00	$ 18,000.00
39	New Flow Meters for Well and Springs	4	EACH	$ 7,500.00	$ 30,000.00
40	SCADA RTU Tanks/Chlorinator Bldg	4	EACH	$ 12,000.00	$ 48,000.00
41	SCADA RTU Well	4	EACH	$ 18,000.00	$ 72,000.00
42	SCADA HMI City Office	1	EACH	$ 22,000.00	$ 22,000.00
				Subtotal Distribution Project:	**$ 8,933,333.00**

Storage Improvements

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	L.S.	$ 170,000.00	$ 170,000.00
2	Tank Site Earthwork, Subgrade, and Foundation	2	EACH	$ 90,000.00	$ 180,000.00
3	New 1,500,000 Gallon Concrete Storage Tank	2	EACH	$ 1,300,000.00	$ 2,600,000.00
4	Tank Piping and Appurtenances	2	EACH	$ 40,000.00	$ 80,000.00
5	Chainlink Fence & Gate	2,400	LN.-FT.	$ 22.00	$ 52,800.00
6	1,500 gpm Booster Pump System in Building with Chlorination Sys.	1	LS.	$ 225,000.00	$ 225,000.00
7	14" AWWA C900 PVC SDR 18 Pipe and Fittings Xmission Line	4,600	LN.-FT.	$ 50.00	$ 230,000.00
8	14" Butterfly Valve	4	EACH	$ 3,600.00	$ 14,400.00
9	Hy 28 Crossing Directional Bore w/16" HDPE for Xmission Line	60	Ln Ft	$ 300.00	$ 18,000.00
10	Nephi Power Company Power to New Booster Station	1	L.S.	$ 10,000.00	$ 10,000.00
11	Nephi Power Company Power to New South Tank	4,200	Ln Ft	$ 10.00	$ 42,000.00
12	Replace Existing Chlorination Building and Components	1	L.S.	$ 105,000.00	$ 105,000.00
13	Sand Blast & Recoat Blue Tank Interior	1	L.S.	$ 230,000.00	$ 230,000.00
				Subtotal Tank Project:	**$ 3,787,200.00**

Corrected 8/10/16

APPENDIX F
PER ALTERNATIVE 3
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NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

Lower Bradley Spring Rehabilitation and Piping Revisions

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	LS.	$ 64,000.00	$ 64,000.00
2	New Lower Bradley Spring Collection and Control Box	2	EACH	$ 10,000.00	$ 20,000.00
3	New Powerhouse Head Box at Lower Bradley Elevation	1	L.S.	$ 30,000.00	$ 30,000.00
4	12" AWWA C900 PVC SDR 18 Pipe and Fittings	200	LN.-FT.	$ 32.00	$ 6,400.00
5	12" Gate Valve	2	EACH	$ 2,800.00	$ 5,600.00
6	Import Pipe Bedding	200	LN.-FT.	$ 1.20	$ 240.00
7	Altitude Control Valve for Park Tank in Manhole	1	EACH	$ 9,000.00	$ 9,000.00
8	Untreated Base Course	50	TON	$ 16.00	$ 800.00
9	Cut and Cap Old Spring Line in Existing Marsh Springs Vault	1	L.S.	$ 2,000.00	$ 2,000.00
	Subtotal Spring Line Improvements:				**$ 138,040.00**
	Subtotal Construction Costs:				**$ 14,860,828.00**
	10% Contingency:				**$ 1,486,372.00**
	TOTAL Construction Costs:				**$ 16,347,200.00**

Non-Construction Services

a.	Administration	1	L.S.	$ 30,000.00	$ 30,000.00
b.	Design Engineering	1	L.S.	$ 916,000.00	$ 916,000.00
c.	Construction Administration and Quality Control Observation	Proj Duration	Hourly	$ 1,307,800.00	$ 1,307,800.00
d.	Survey and Mapping	1	L.S.	$ 20,000.00	$ 20,000.00
e.	Preliminary Evaluation Report (PER) & Well Specification	1	L.S.	$ 10,000.00	$ 10,000.00
f.	Water Rights Services	1	L.S.	$ 50,000.00	$ 50,000.00
g.	PER and Environmental for RD Funding	1	L.S.	$ 48,000.00	$ 48,000.00
h.	Environmental Cultrual and Other Surveys	1	L.S.	$ 16,000.00	$ 16,000.00
i.	Land and Easement Acquisitions	1	L.S.	$ 100,000.00	$ 100,000.00
j.	Legal, Fiscal, and Interim Financing	1	L.S.	$ 100,000.00	$ 100,000.00
	TOTAL Non-Construction Services:				**$ 2,597,800.00**
	TOTAL PROJECT COST:				**$ 18,945,000.00**

$ 914,000.00

Corrected 8/10/16

ALTERNATIVE 3
PROPOSED FUNDING PLAN

APPENDIX F
PER ALTERNATIVE 3
PROPOSED FUNDING PLAN
NEPHI CULINARY WATER IMPROVEMENTS PROJECT - 2017

TOTAL PROJECT COST			**$ 18,945,000.00**
Proposed Funding:	**Rate**	**Term in Yrs.**	**Principal**
Self Help			197,000.00
USDA - RD Grant			8,436,600.00
USDA - RD Loan	2.50%	40	10,311,400.00
DWB Principal Forgiveness			-
DWB Loan	0.00%	30	-
BWR Grant			-
BWR Loan	0.00%	20	-
CIB Grant			-
CIB Loan	0.00%	20	-
TOTAL PROJECT FUNDING:			**$ 18,945,000.00**

RD	**DWB**	**BWR**	**CIB**	**SUM OF NEW FUNDING PACKAGE**
Annual Payment:	**Annual Payment:**	**Annual Payment:**	**Annual Payment:**	**Annual Payment:**
$ 410,767.00	$ -	$ -	$ -	$ 410,767.00
Total of Payments	**Total of Payments**	**Total of Payments**	**Total of Payments**	**Total of Payments**
$ 16,430,680.00	$ -	$ -	$ -	$ 16,430,680.00
Total Interest	**Total Interest**	**Total Interest**	**Total Interest**	**Total Interest**
$ 6,119,280.00	$ -	$ -	$ -	$ 6,119,280.00
Annual Interest	**Annual Interest**	**Annual Interest**	**Annual Interest**	**Annual Interest**
$ 152,982.00	$ -	$ -	$ -	$ 152,982.00
Annual Principal	**Annual Principal**	**Annual Principal**	**Annual Principal**	**Annual Principal**
$ 257,785.00	$ -	$ -	$ -	$ 257,785.00

SYSTEM EXPENSES: (FY 2014 When First Loan Payment is Due)		
Operation and Maintenance Expenses Projected 2018		
	(From Cash Flow Spreadsheet)	$ 856,549.36
Funded Depreciation @ 5% of total of System O&M plus Debt Service		
	(From Cash Flow Spreadsheet)	65,419.65
Subtotal O & M and Funded Depreciation:		**$ 921,969.01**
EXISTING SYSTEM DEBT SERVICE:		
Payment		$ -
Subtotal Annual Existing Debt Service:		**$ -**
NEW DEBT SERVICE		
New Loan Payment (From Sum of New Funding Package Above)		$ 410,767.00
New Loan Reserves (DWB & BWR=Payment/6) (CIB & RD=Payment/10)		41,076.70
Subtotal New Annual Debt Service:		**$ 451,843.70**
GRAND TOTAL (NEW + EXISTING) EXPENSES:		**$ 1,373,812.71**
PAYMENTS		
Total Number Of Connections (2015)		2,100
Required Average Monthly Culinary System User Fee		54.52
Ave In Town Monthly Secondary Water User Fee to Irrigation Company Per Connection		3.94
Total Average Monthly Water Payments (Culinary + Secondary)		**$ 58.46**

ALTERNATIVE 3
CASH FLOW SPREADSHEET

Appendix F
PER Alternative 3
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%				
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00	
3	Annual Commercial Growth Rate	1.75%				
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-	

5	**Fiscal Year Ending June**		**2015**		**2016**		**2017**
6	**BASE DATA:**						
7	**Base Residential Rate**	$	7.50	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	10.50	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	10.50	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		1,910		1,943		1,977
21	Commercial Connections In Town Only		189		192		196
22	Industrial		1		1		1
23	Total		2,099		2,135		2,173
24	**New Connections:**						
25	New Residential		33		34		35
26	New Commercial		3		4		3
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	339,834.60	$	992,544.00	$	1,010,014.80
30	Water Sales Commercial	$	163,906.20	$	235,593.60	$	239,844.00
31	Water Sales Industrial	$	21,126.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	52,200.00	$	55,100.00	$	55,100.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**577,066.80**	**$**	**1,304,717.60**	**$**	**1,326,438.80**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	221,033.00	$	227,663.99	$	234,493.91
37	Benefits	$	103,989.00	$	107,108.67	$	110,321.93
38	Materials and Supplies	$	61,924.00	$	63,781.72	$	65,695.17
39	Sundry Expenses	$	135,612.00	$	139,680.36	$	143,870.77
40	Capital Materials	$	95,595.00	$	98,462.85	$	101,416.74
41	Administration	$	63,000.00	$	64,890.00	$	66,836.70
42	Well Pumping Expense (Nephi Power)	$	102,711.00	$	105,792.33	$	108,966.10
43	**Sub-Total Operation & Maintenance**	**$**	**783,864.00**	**$**	**807,379.92**	**$**	**831,601.32**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements						
46	Payment Reserve (Annual Pmt./10 For 10 yr.)						
47	**Total Debt Service**	**$**	**-**	**$**	**-**	**$**	**-**
48	Funded Depreciation	$	-	$	40,369.00	$	41,580.07
49	**TOTAL EXPENSES:**	**$**	**783,864.00**	**$**	**847,748.92**	**$**	**873,181.38**
50	**Net Revenue less Expense**	$	(206,797.20)	$	456,968.68	$	453,257.42
51	**Cash on Hand**	$	(206,797.20)	$	250,171.48	$	703,428.90
52	Debt service coverage						
53	Funded Depreciation Account Balance:	$	-	$	40,369.00	$	81,949.06

Appendix F
PER Alternative 3
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2018		2019		2020
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,012		2,047		2,083
21	Commercial Connections In Town Only		199		203		206
22	Industrial		1		1		1
23	Total		2,211		2,250		2,289
24	**New Connections:**						
25	New Residential		35		36		37
26	New Commercial		4		3		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,027,738.80	$	1,045,716.00	$	1,064,199.60
30	Water Sales Commercial	$	244,094.40	$	248,344.80	$	252,595.20
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	56,550.00	$	56,550.00	$	59,450.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,349,863.20**	**$**	**1,372,090.80**	**$**	**1,397,724.80**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	241,528.73	$	248,774.59	$	256,237.83
37	Benefits	$	113,631.59	$	117,040.54	$	120,551.75
38	Materials and Supplies	$	67,666.03	$	69,696.01	$	71,786.89
39	Sundry Expenses	$	148,186.89	$	152,632.50	$	157,211.48
40	Capital Materials	$	104,459.24	$	107,593.01	$	110,820.81
41	Administration	$	68,841.80	$	70,907.06	$	73,034.27
42	Well Pumping Expense (Nephi Power)	$	112,235.08	$	115,602.14	$	119,070.20
43	**Sub-Total Operation & Maintenance**	**$**	**856,549.36**	**$**	**882,245.84**	**$**	**908,713.21**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	410,767.00	$	410,767.00	$	410,767.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,076.70	$	41,076.70	$	41,076.70
47	**Total Debt Service**	**$**	**451,843.70**	**$**	**451,843.70**	**$**	**451,843.70**
48	Funded Depreciation	$	65,419.65	$	66,704.48	$	68,027.85
49	**TOTAL EXPENSES:**	**$**	**1,308,393.06**	**$**	**1,334,089.54**	**$**	**1,360,556.91**
50	**Net Revenue less Expense**	$	41,470.14	$	38,001.26	$	37,167.89
51	**Cash on Hand**	$	744,899.04	$	782,900.31	$	820,068.19
52	Debt service coverage		1.20		1.19		1.19
53	Funded Depreciation Account Balance:	$	147,368.71	$	214,073.19	$	282,101.04

Appendix F
PER Alternative 3
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2021		2022		2023
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,120		2,157		2,194
21	Commercial Connections In Town Only		210		213		217
22	Industrial		1		1		1
23	Total		2,330		2,370		2,411
24	**New Connections:**						
25	New Residential		37		37		39
26	New Commercial		3		4		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,082,936.40	$	1,101,673.20	$	1,120,916.40
30	Water Sales Commercial	$	256,845.60	$	261,096.00	$	265,953.60
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	58,000.00	$	59,450.00	$	62,350.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,419,262.00**	**$**	**1,443,699.20**	**$**	**1,470,700.00**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	263,924.96	$	271,842.71	$	279,997.99
37	Benefits	$	124,168.30	$	127,893.35	$	131,730.15
38	Materials and Supplies	$	73,940.49	$	76,158.71	$	78,443.47
39	Sundry Expenses	$	161,927.82	$	166,785.65	$	171,789.22
40	Capital Materials	$	114,145.43	$	117,569.79	$	121,096.89
41	Administration	$	75,225.29	$	77,482.05	$	79,806.52
42	Well Pumping Expense (Nephi Power)	$	122,642.31	$	126,321.57	$	130,111.22
43	**Sub-Total Operation & Maintenance**	**$**	**935,974.61**	**$**	**964,053.85**	**$**	**992,975.46**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	410,767.00	$	410,767.00	$	410,767.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,076.70	$	41,076.70	$	41,076.70
47	**Total Debt Service**	**$**	**451,843.70**	**$**	**451,843.70**	**$**	**451,843.70**
48	Funded Depreciation	$	69,390.92	$	70,794.88	$	72,240.96
49	**TOTAL EXPENSES:**	**$**	**1,387,818.31**	**$**	**1,415,897.55**	**$**	**1,444,819.16**
50	**Net Revenue less Expense**	$	31,443.69	$	27,801.65	$	25,880.84
51	**Cash on Hand**	$	851,511.88	$	879,313.54	$	905,194.37
52	Debt service coverage		1.18		1.17		1.16
53	Funded Depreciation Account Balance:	$	351,491.95	$	422,286.83	$	494,527.79

Appendix F
PER Alternative 3
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2024		2025		2026
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,233		2,272		2,312
21	Commercial Connections In Town Only		221		225		229
22	Industrial		1		1		1
23	Total		2,454		2,497		2,541
24	**New Connections:**						
25	New Residential		39		40		40
26	New Commercial		4		4		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,140,666.00	$	1,160,668.80	$	1,180,924.80
30	Water Sales Commercial	$	270,811.20	$	275,668.80	$	280,526.40
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	62,350.00	$	63,800.00	$	63,800.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,495,307.20**	**$**	**1,521,617.60**	**$**	**1,546,731.20**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	288,397.93	$	297,049.87	$	305,961.37
37	Benefits	$	135,682.06	$	139,752.52	$	143,945.10
38	Materials and Supplies	$	80,796.77	$	83,220.68	$	85,717.30
39	Sundry Expenses	$	176,942.90	$	182,251.19	$	187,718.72
40	Capital Materials	$	124,729.79	$	128,471.69	$	132,325.84
41	Administration	$	82,200.71	$	84,666.73	$	87,206.73
42	Well Pumping Expense (Nephi Power)	$	134,014.56	$	138,035.00	$	142,176.05
43	**Sub-Total Operation & Maintenance**	**$**	**1,022,764.73**	**$**	**1,053,447.67**	**$**	**1,085,051.10**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	410,767.00	$	410,767.00	$	410,767.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,076.70	$	41,076.70	$	41,076.70
47	**Total Debt Service**	**$**	**451,843.70**	**$**	**451,843.70**	**$**	**451,843.70**
48	Funded Depreciation	$	73,730.42	$	75,264.57	$	76,844.74
49	**TOTAL EXPENSES:**	**$**	**1,474,608.43**	**$**	**1,505,291.37**	**$**	**1,536,894.80**
50	**Net Revenue less Expense**	$	20,698.77	$	16,326.23	$	9,836.40
51	**Cash on Hand**	$	925,893.15	$	942,219.38	$	952,055.78
52	Debt service coverage		1.15		1.14		1.12
53	Funded Depreciation Account Balance:	$	568,258.21	$	643,522.78	$	720,367.52

ALTERNATIVE 4
OPINION OF PROBABLE COST

APPENDIX F
PER ALTERNATIVE 4
ENGINEER'S OPINION OF PROBABLE COST
NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

Well Improvements

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	L.S.	$ 107,000.00	107,000.00
2	Inspect & Evaluate Fire House Well for Rehabilitation	1	L.S.	25,000.00	25,000.00
3	26" Well Hole Drilling and Well Log Preparation	400	Ln Ft	290.00	116,000.00
4	20" Diameter Carbon Steel Well Casing	205	Ln Ft	150.00	30,750.00
5	20" SS Well Screen	200	Ln Ft	600.00	120,000.00
6	Gravel Pack	60	Cu. Yd.	1,200.00	72,000.00
7	2" Gravel Pack Carbon Steel Refill Tremie Pipe	400	Ln Ft	14.00	5,600.00
8	1.5 Inch Dia. 304 SS Screened Inst. Well Outside of Well Casing	360	Ln Ft	12.50	4,500.00
9	Sanitary Grout Seal ±120' feet	25	Cu. Yd.	1,040.00	26,000.00
10	Furnish and Install Test Pump and Power Unit Equipment	1	L.S.	15,000.00	15,000.00
11	Development Pumping & Surging	180	Hour	300.00	54,000.00
12	Test Pumping	32	Hour	300.00	9,600.00
13	Disinfection and Capping	1	L.S.	4,000.00	4,000.00
14	Aquifer Water Sample	1	L.S.	2,000.00	2,000.00
15	Site Work and Grading	1	L.S.	5,000.00	5,000.00
16	Untreated Road Base Course	600	Ton	15.00	9,000.00
17	Well Site Chain Link Fence (Inc. 20' double leaf and 3' Man Gate)	840	Ln Ft	22.00	18,480.00
18	Concrete Building	1	Each	85,000.00	85,000.00
19	Turbine Line Shaft Pump System	1	Each	90,000.00	90,000.00
20	Well Pump Control Panel with VFD	1	Each	50,000.00	50,000.00
21	Well Building Pipe Valves and Fittings	1	Each	50,000.00	50,000.00
22	Ultrasonic Flowmeter 12"	1	Each	9,000.00	9,000.00
23	Well Building Unit Heater	1	Each	2,000.00	2,000.00
24	16" C900 PVC Pipe and Fittings to Blue Tank	12,500	Ln Ft	55.00	687,500.00
25	16" Butterfly Valve	6	Each	4,400.00	26,400.00
26	3" Bituminous Surfacing for Street Crossings.	5,800	SQ.-YD.	28.00	162,400.00
27	Chlorination Equipment	1	L.S.	30,000.00	30,000.00
28	12" C900 PVC Pipe and Fittings (Worwood Well to New Tank	5,200	Ln Ft	32.00	166,400.00
29	12" Gate Valve Assembly	4	EACH	$ 2,800.00	$ 11,200.00
30	Pipe Bedding	17,700	Ln Ft	1.25	22,125.00
31	HY 28 Xing Directional Bore w/HDPE	60	LN.-FT.	$ 200.00	$ 12,000.00
32	3" Combination Air Valve Assembly	6	EACH	$ 7,900.00	$ 47,400.00
33	Back-up Generator	1	L.S.	125,000.00	125,000.00
34	Nephi Power Company Power (From South Tank to Worwood Well)	5,000	Ln Ft	10.00	50,000.00
				Subtotal Well Improvements	**$ 2,250,355.00**

Distribution Improvement Projects

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	LS.	$ 425,000.00	$ 425,000.00
2	Pre-Construction Video	1	LS.	$ 1,500.00	$ 1,500.00
3	Traffic Control	1	LS.	$ 30,000.00	$ 30,000.00
4	Subsurface Investigation	300	HOUR	$ 200.00	$ 60,000.00
5	16" AWWA C900 PVC SDR 18 Pipe and Fittings	10700	LN.-FT.	$ 55.00	$ 588,500.00
6	16" Butterfly Valve Assembly	11	EACH	$ 4,400.00	$ 48,400.00
7	12" AWWA C900 PVC SDR 18 Pipe and Fittings	7200	LN.-FT.	$ 32.00	$ 230,400.00
8	12" Gate Valve Assembly	14	EACH	$ 2,800.00	$ 39,200.00

Corrected 8/10/16

APPENDIX F
PER ALTERNATIVE 4
ENGINEER'S OPINION OF PROBABLE COST
NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

9	10" AWWA C900 PVC SDR 18 Pipe and Fittings	15700	LN.-FT.	$ 24.00	$ 376,800.00
10	10" Gate Valve Assembly	16	EACH	$ 2,400.00	$ 38,400.00
11	8" AWWA C900 PVC SDR 18 Pipe and Fittings	52500	LN.-FT.	$ 18.50	$ 971,250.00
12	8" Gate Valve Assembly	142	EACH	$ 1,500.00	$ 213,000.00
13	8" AWWA C900 PURPLE PVC SDR 18 Pipe and Fittings	5000	LN.-FT.	$ 18.50	$ 92,500.00
14	8" PURPLE Gate Valve Assembly	20	EACH	$ 1,500.00	$ 30,000.00
15	6" AWWA C900 PVC SDR 18 Pipe and Fittings	28550	LN.-FT.	$ 13.00	$ 371,150.00
16	6" Gate Valve Assembly	116	EACH	$ 1,200.00	$ 139,200.00
17	Pipe Bedding	155917	LN.-FT.	$ 1.00	$ 155,917.00
18	Untreated Base Course	10500	TON	$ 16.00	$ 168,000.00
19	HY 132 & Main St. Xing Directional Bore w/Various HDPE	1800	LN.-FT.	$ 200.00	$ 360,000.00
20	Pavement Cutting Surface Street and UDOT Highway	254300	LN.-FT.	$ 0.50	$ 127,150.00
21	8" Bituminous Surfacing for UDOT Highway.	12000	SQ.-YD.	$ 65.00	$ 780,000.00
22	3" Bituminous Surfacing for Street Crossings.	60761	SQ.-YD.	$ 24.00	$ 1,458,264.00
23	RR Crossing Boring and Jacking 24 Inch Casing Pipe	500	LN.-FT.	$ 300.00	$ 150,000.00
24	New Fire Hydrant Assembly	139	EACH	$ 3,800.00	$ 528,200.00
25	Reconnect Existing Fire Hydrant	47	EACH	$ 2,000.00	$ 94,000.00
26	Service Connection Assembly (New or Reconnect 1")	1079	EACH	$ 450.00	$ 485,550.00
27	1"Meter Connection Assembly	1079	EACH	$ 250.00	$ 269,750.00
28	1" IPS Polyethylene Service Lateral Tubing	35607	LN.-FT.	$ 6.00	$ 213,642.00
29	Carson Heavy Wall Max Series Meter Box for 1" Meters	1079	EACH	$ 120.00	$ 129,480.00
30	Ring and Lid for 1" Meter Box	300	EACH	$ 150.00	$ 45,000.00
31	Service Connection Assembly (New or Reconnect 2")	20	EACH	$ 900.00	$ 18,000.00
32	2" Dual Check Meter Setter Assembly	20	EACH	$ 430.00	$ 8,600.00
33	2" IPS Polyethylene Service Lateral Tubing	660	LN.-FT.	$ 8.00	$ 5,280.00
34	2 " Meter Box	20	EACH	$ 1,200.00	$ 24,000.00
35	Ring and Lid for 2" Meter Box	10	EACH	$ 300.00	$ 3,000.00
36	3" Combination Air Valve Assembly	6	EACH	$ 7,900.00	$ 47,400.00
37	2" Combination Air Valve Assembly	4	EACH	$ 4,200.00	$ 16,800.00
38	1" Combination Air Valve Assembly	6	EACH	$ 3,000.00	$ 18,000.00
39	New Flow Meters for Well and Springs	4	EACH	$ 7,500.00	$ 30,000.00
40	SCADA RTU Tanks/Chlorinator Bldg	4	EACH	$ 12,000.00	$ 48,000.00
41	SCADA RTU Well	4	EACH	$ 18,000.00	$ 72,000.00
42	SCADA HMI City Office	1	EACH	$ 22,000.00	$ 22,000.00
				Subtotal Distribution Project:	**$ 8,933,333.00**

Storage Improvements

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	L.S.	$ 170,000.00	$ 170,000.00
2	Tank Site Earthwork, Subgrade, and Foundation	2	EACH	$ 90,000.00	$ 180,000.00
3	New 1,500,000 Gallon Concrete Storage Tank	2	EACH	$ 1,300,000.00	$ 2,600,000.00
4	Tank Piping and Appurtenances	2	EACH	$ 40,000.00	$ 80,000.00
5	Chainlink Fence & Gate	2400	LN.-FT.	$ 22.00	$ 52,800.00
6	Nephi Power Company Power to New South Tank	4,200	Ln Ft	$ 10.00	$ 42,000.00
7	Replace Existing Chlorination Building and Components	1	L.S.	$ 105,000.00	$ 105,000.00
8	Sand Blast & Recoat Blue Tank Interior	1	L.S.	$ 230,000.00	$ 230,000.00
				Subtotal Tank Project:	**$ 3,289,800.00**

Corrected 8/10/16

APPENDIX F
PER ALTERNATIVE 4
ENGINEER'S OPINION OF PROBABLE COST
NEPHI CITY CULINARY WATER IMPROVEMENTS PROJECT - 2017

Lower Bradley Spring Rehabilitation and Piping Revisions

	ITEM	QTY.	UNITS	UNIT COST	AMOUNT
1	Mobilization	1	LS.	$ 64,000.00	$ 64,000.00
2	New Lower Bradley Spring Collection and Control Box	2	EACH	$ 10,000.00	$ 20,000.00
3	New Powerhouse Head Box at Lower Bradley Elevation	1	L.S.	$ 30,000.00	$ 30,000.00
4	12" AWWA C900 PVC SDR 18 Pipe and Fittings	200	LN.-FT.	$ 32.00	$ 6,400.00
5	12" Gate Valve	2	EACH	$ 2,800.00	$ 5,600.00
6	Import Pipe Bedding	200	LN.-FT.	$ 1.20	$ 240.00
7	Altitude Control Valve for Park Tank in Manhole	1	EACH	$ 9,000.00	$ 9,000.00
8	Untreated Base Course	50	TON	$ 16.00	$ 800.00
9	Cut and Cap Old Spring Line in Existing Marsh Springs Vault	1	L.S.	$ 2,000.00	$ 2,000.00
	Subtotal Spring Line Improvements:				**$ 138,040.00**
	Subtotal Construction Costs:				**$ 14,611,528.00**
	10% Contingency:				**$ 1,460,972.00**
	TOTAL Construction Costs:				**$ 16,072,500.00**

Non-Construction Services

a.	Administration	1	L.S.	$ 30,000.00	$ 30,000.00
b.	Design Engineering	1	L.S.	$ 899,700.00	$ 899,700.00
c.	Construction Administration and Quality Control Observation	Proj Duration	Hourly	$ 1,285,800.00	$ 1,285,800.00
d.	Survey and Mapping	1	L.S.	$ 20,000.00	$ 20,000.00
e.	Preliminary Evaluation Report (PER) & Well Specification	1	L.S.	$ 10,000.00	$ 10,000.00
f.	Water Rights Services	1	L.S.	$ 50,000.00	$ 50,000.00
g.	PER and Environmental for RD Funding	1	L.S.	$ 48,000.00	$ 48,000.00
h.	Environmental Cultrual and Other Surveys	1	L.S.	$ 16,000.00	$ 16,000.00
i.	Purchase and Equip Worwood 1,200 gpm Well	1	L.S.	$ 400,000.00	$ 400,000.00
j.	Source Protection Plan Worwood Well	1	L.S.	$ 5,000.00	$ 5,000.00
k.	Land and Easement Acquisitions	1	L.S.	$ 100,000.00	$ 100,000.00
l.	Legal, Fiscal, and Interim Financing	1	L.S.	$ 100,000.00	$ 100,000.00
	TOTAL Non-Construction Services:				**$ 2,964,500.00**
	TOTAL PROJECT COST:				**$ 19,037,000.00**

$ 914,000.00

$ 92,000.00

Corrected 8/10/16

ALTERNATIVE 4
PROPOSED FUNDING PLAN

APPENDIX F
PER ALTERNATIVE 4
PROPOSED FUNDING PLAN
NEPHI CULINARY WATER IMPROVEMENTS PROJECT - 2017

TOTAL PROJECT COST			**$**	**19,037,000.00**
Proposed Funding:	**Rate**	**Term in Yrs.**		**Principal**
Self Help				197,000.00
USDA - RD Grant				8,478,000.00
USDA - RD Loan	2.50%	40		10,362,000.00
DWB Principal Forgiveness				-
DWB Loan	0.00%	30		-
BWR Grant				-
BWR Loan	0.00%	20		-
CIB Grant				-
CIB Loan	0.00%	20		-
TOTAL PROJECT FUNDING:			**$**	**19,037,000.00**

RD	**DWB**	**BWR**	**CIB**	**SUM OF NEW FUNDING PACKAGE**
Annual Payment:	**Annual Payment:**	**Annual Payment:**	**Annual Payment:**	**Annual Payment:**
$ 412,783.00	$ -	$ -	$ -	$ 412,783.00
Total of Payments	**Total of Payments**	**Total of Payments**	**Total of Payments**	**Total of Payments**
$ 16,511,320.00	$ -	$ -	$ -	$ 16,511,320.00
Total Interest	**Total Interest**	**Total Interest**	**Total Interest**	**Total Interest**
$ 6,149,320.00	$ -	$ -	$ -	$ 6,149,320.00
Annual Interest	**Annual Interest**	**Annual Interest**	**Annual Interest**	**Annual Interest**
$ 153,733.00	$ -	$ -	$ -	$ 153,733.00
Annual Principal	**Annual Principal**	**Annual Principal**	**Annual Principal**	**Annual Principal**
$ 259,050.00	$ -	$ -	$ -	$ 259,050.00

SYSTEM EXPENSES: (FY 2014 When First Loan Payment is Due)		
Operation and Maintenance Expenses Projected 2018		
(From Cash Flow Spreadsheet)	$	856,549.36
Funded Depreciation @ 5% of total of System O&M plus Debt Service		
(From Cash Flow Spreadsheet)		65,530.53
Subtotal O & M and Funded Depreciation:	**$**	**922,079.89**
EXISTING SYSTEM DEBT SERVICE:		
Payment	$	-
Subtotal Annual Existing Debt Service:	**$**	-
NEW DEBT SERVICE		
New Loan Payment (From Sum of New Funding Package Above)	$	412,783.00
New Loan Reserves (DWB & BWR=Payment/6) (CIB & RD=Payment/10)		41,278.30
Subtotal New Annual Debt Service:	**$**	**454,061.30**
GRAND TOTAL (NEW + EXISTING) EXPENSES:	**$**	**1,376,141.19**
PAYMENTS		
Total Number Of Connections (2015)		2,100
Required Average Monthly Culinary System User Fee		54.61
Ave In Town Monthly Secondary Water User Fee to Irrigation Company Per Connection		3.94
Total Average Monthly Water Payments (Culinary + Secondary)	**$**	**58.55**

ALTERNATIVE 4
CASH FLOW SPREADSHEET

Appendix F
PER Alternative 4
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%				
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00	
3	Annual Commercial Growth Rate	1.75%				
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-	

5	**Fiscal Year Ending June**		**2015**		**2016**		**2017**
6	**BASE DATA:**						
7	**Base Residential Rate**	$	7.50	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	10.50	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	10.50	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		1,910		1,943		1,977
21	Commercial Connections In Town Only		189		192		196
22	Industrial		1		1		1
23	Total		2,099		2,135		2,173
24	**New Connections:**						
25	New Residential		33		34		35
26	New Commercial		3		4		3
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	339,834.60	$	992,544.00	$	1,010,014.80
30	Water Sales Commercial	$	163,906.20	$	235,593.60	$	239,844.00
31	Water Sales Industrial	$	21,126.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	52,200.00	$	55,100.00	$	55,100.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**577,066.80**	**$**	**1,304,717.60**	**$**	**1,326,438.80**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	221,033.00	$	227,663.99	$	234,493.91
37	Benefits	$	103,989.00	$	107,108.67	$	110,321.93
38	Materials and Supplies	$	61,924.00	$	63,781.72	$	65,695.17
39	Sundry Expenses	$	135,612.00	$	139,680.36	$	143,870.77
40	Capital Materials	$	95,595.00	$	98,462.85	$	101,416.74
41	Administration	$	63,000.00	$	64,890.00	$	66,836.70
42	Well Pumping Expense (Nephi Power)	$	102,711.00	$	105,792.33	$	108,966.10
43	**Sub-Total Operation & Maintenance**	**$**	**783,864.00**	**$**	**807,379.92**	**$**	**831,601.32**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements						
46	Payment Reserve (Annual Pmt./10 For 10 yr.)						
47	**Total Debt Service**	**$**	**-**	**$**	**-**	**$**	**-**
48	Funded Depreciation	$	-	$	40,369.00	$	41,580.07
49	**TOTAL EXPENSES:**	**$**	**783,864.00**	**$**	**847,748.92**	**$**	**873,181.38**
50	**Net Revenue less Expense**	$	(206,797.20)	$	456,968.68	$	453,257.42
51	**Cash on Hand**	$	(206,797.20)	$	250,171.48	$	703,428.90
52	Debt service coverage						
53	Funded Depreciation Account Balance:	$	-	$	40,369.00	$	81,949.06

Appendix F
PER Alternative 4
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2018		2019		2020
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,012		2,047		2,083
21	Commercial Connections In Town Only		199		203		206
22	Industrial		1		1		1
23	Total		2,211		2,250		2,289
24	**New Connections:**						
25	New Residential		35		36		37
26	New Commercial		4		3		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,027,738.80	$	1,045,716.00	$	1,064,199.60
30	Water Sales Commercial	$	244,094.40	$	248,344.80	$	252,595.20
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	56,550.00	$	56,550.00	$	59,450.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,349,863.20**	**$**	**1,372,090.80**	**$**	**1,397,724.80**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	241,528.73	$	248,774.59	$	256,237.83
37	Benefits	$	113,631.59	$	117,040.54	$	120,551.75
38	Materials and Supplies	$	67,666.03	$	69,696.01	$	71,786.89
39	Sundry Expenses	$	148,186.89	$	152,632.50	$	157,211.48
40	Capital Materials	$	104,459.24	$	107,593.01	$	110,820.81
41	Administration	$	68,841.80	$	70,907.06	$	73,034.27
42	Well Pumping Expense (Nephi Power)	$	112,235.08	$	115,602.14	$	119,070.20
43	**Sub-Total Operation & Maintenance**	**$**	**856,549.36**	**$**	**882,245.84**	**$**	**908,713.21**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	412,783.00	$	412,783.00	$	412,783.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,278.30	$	41,278.30	$	41,278.30
47	**Total Debt Service**	**$**	**454,061.30**	**$**	**454,061.30**	**$**	**454,061.30**
48	Funded Depreciation	$	65,530.53	$	66,815.36	$	68,138.73
49	**TOTAL EXPENSES:**	**$**	**1,310,610.66**	**$**	**1,336,307.14**	**$**	**1,362,774.51**
50	**Net Revenue less Expense**	$	39,252.54	$	35,783.66	$	34,950.29
51	**Cash on Hand**	$	742,681.44	$	778,465.11	$	813,415.39
52	Debt service coverage		1.20		1.19		1.18
53	Funded Depreciation Account Balance:	$	147,479.59	$	214,294.95	$	282,433.68

Appendix F
PER Alternative 4
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2021		2022		2023
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,120		2,157		2,194
21	Commercial Connections In Town Only		210		213		217
22	Industrial		1		1		1
23	Total		2,330		2,370		2,411
24	**New Connections:**						
25	New Residential		37		37		39
26	New Commercial		3		4		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,082,936.40	$	1,101,673.20	$	1,120,916.40
30	Water Sales Commercial	$	256,845.60	$	261,096.00	$	265,953.60
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	58,000.00	$	59,450.00	$	62,350.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,419,262.00**	**$**	**1,443,699.20**	**$**	**1,470,700.00**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	263,924.96	$	271,842.71	$	279,997.99
37	Benefits	$	124,168.30	$	127,893.35	$	131,730.15
38	Materials and Supplies	$	73,940.49	$	76,158.71	$	78,443.47
39	Sundry Expenses	$	161,927.82	$	166,785.65	$	171,789.22
40	Capital Materials	$	114,145.43	$	117,569.79	$	121,096.89
41	Administration	$	75,225.29	$	77,482.05	$	79,806.52
42	Well Pumping Expense (Nephi Power)	$	122,642.31	$	126,321.57	$	130,111.22
43	**Sub-Total Operation & Maintenance**	**$**	**935,974.61**	**$**	**964,053.85**	**$**	**992,975.46**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	412,783.00	$	412,783.00	$	412,783.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,278.30	$	41,278.30	$	41,278.30
47	**Total Debt Service**	**$**	**454,061.30**	**$**	**454,061.30**	**$**	**454,061.30**
48	Funded Depreciation	$	69,501.80	$	70,905.76	$	72,351.84
49	**TOTAL EXPENSES:**	**$**	**1,390,035.91**	**$**	**1,418,115.15**	**$**	**1,447,036.76**
50	**Net Revenue less Expense**	$	29,226.09	$	25,584.05	$	23,663.24
51	**Cash on Hand**	$	842,641.48	$	868,225.54	$	891,888.77
52	Debt service coverage		1.17		1.16		1.16
53	Funded Depreciation Account Balance:	$	351,935.47	$	422,841.23	$	495,193.07

Appendix F
PER Alternative 4
Cash Flow Spreadsheet
Nephi Culinary Water Improvements Project - 2017

1	Annual Industrial Growth Rate	2.00%			
2	Annual Residential Growth Rate	1.75%	Connection fee	$	1,450.00
3	Annual Commercial Growth Rate	1.75%			
4	Annual Inflation Rate	3.0%	Impact fee per ERC	$	-

	Fiscal Year Ending June		2024		2025		2026
6	**BASE DATA:**						
7	**Base Residential Rate**	$	35.00	$	35.00	$	35.00
8	Base Amount (gallons)		-		-		-
9	Overage Rate ($0.60per 1,000 gal.)	$	0.60	$	0.60	$	0.60
10	Ave. Month Water Use / Res. Conn. (Gal.)		12,000		12,000		12,000
11	**Base Commercial Rate**	$	40.00	$	40.00	$	40.00
12	Base Amount (gallons)		-		-		-
13	Overage Rate ($0.60) Per 1000 gal.)	$	0.60	$	0.60	$	0.60
14	Ave. Month Water Use / Com. Conn. (Gal.)		102,000		102,000		102,000
15	**Base Industrial Rate**	$	40.00	$	40.00	$	40.00
16	Base Amount (gallons)		-		-		-
17	Overage Rate ($0.35) Per 1000 gal. to 5 million gal.)	$	0.35	$	0.35	$	0.35
18	Ave. Month Water Use / Ind. Conn. (Gal.)		5,000,000		5,000,000		5,000,000
19	**System Users:**						
20	Residential		2,233		2,272		2,312
21	Commercial Connections In Town Only		221		225		229
22	Industrial		1		1		1
23	Total		2,454		2,497		2,541
24	**New Connections:**						
25	New Residential		39		40		40
26	New Commercial		4		4		4
27	New Industrial		0		0		0
28	**REVENUES:**						
29	Water Sales Residential	$	1,140,666.00	$	1,160,668.80	$	1,180,924.80
30	Water Sales Commercial	$	270,811.20	$	275,668.80	$	280,526.40
31	Water Sales Industrial	$	21,480.00	$	21,480.00	$	21,480.00
32	Water Connection Fees (Connection fees)	$	62,350.00	$	63,800.00	$	63,800.00
33	Impact Fees	$	-	$	-	$	-
34	**TOTAL REVENUE:**	**$**	**1,495,307.20**	**$**	**1,521,617.60**	**$**	**1,546,731.20**
35	**EXPENSES:** (Including O&M & Debt Serv.)						
36	Personnel Salaries	$	288,397.93	$	297,049.87	$	305,961.37
37	Benefits	$	135,682.06	$	139,752.52	$	143,945.10
38	Materials and Supplies	$	80,796.77	$	83,220.68	$	85,717.30
39	Sundry Expenses	$	176,942.90	$	182,251.19	$	187,718.72
40	Capital Materials	$	124,729.79	$	128,471.69	$	132,325.84
41	Administration	$	82,200.71	$	84,666.73	$	87,206.73
42	Well Pumping Expense (Nephi Power)	$	134,014.56	$	138,035.00	$	142,176.05
43	**Sub-Total Operation & Maintenance**	**$**	**1,022,764.73**	**$**	**1,053,447.67**	**$**	**1,085,051.10**
44	P&I Existing Loan	$	-	$	-	$	-
45	P&I New RD Loan for Recommended Improvements	$	412,783.00	$	412,783.00	$	412,783.00
46	Payment Reserve (Annual Pmt./10 For 10 yr.)	$	41,278.30	$	41,278.30	$	41,278.30
47	**Total Debt Service**	**$**	**454,061.30**	**$**	**454,061.30**	**$**	**454,061.30**
48	Funded Depreciation	$	73,841.30	$	75,375.45	$	76,955.62
49	**TOTAL EXPENSES:**	**$**	**1,476,826.03**	**$**	**1,507,508.97**	**$**	**1,539,112.40**
50	**Net Revenue less Expense**	$	18,481.17	$	14,108.63	$	7,618.80
51	**Cash on Hand**	$	910,369.95	$	924,478.58	$	932,097.38
52	Debt service coverage		1.14		1.13		1.12
53	Funded Depreciation Account Balance:	$	569,034.37	$	644,409.82	$	721,365.44

APPENDIX G

NON-MONETARY COMPARISON OF FEASIBLE ALTERNATIVES

APPENDIX G
NON-MONETARY COMPARISON OF FEASIBLE ALTERNATIVES

		ALTERNATIVE 3		ALTERNATIVE 4	
TYPE OF IMPACT	**WEIGHT VALUE**	**IMPACT VALUE**	**TOTAL**	**IMPACT VALUE**	**TOTAL**
ENVIRONMENTAL					
Cultural Resources	5	0	0	0	0
Flood Plains & Wetlands	10	0	0	0	0
Agricultural Lands	5	0	0	0	0
Wild & Scenic Rivers	10	0	0	0	0
Aquatic and Terrestrial Wildlife	10	0	0	0	0
Endangered Species	10	0	0	0	0
Air Quality	10	0	0	0	0
Water Quality and Uses	10	0	0	1	10
Noise, Odor, & Aesthetics	10	0	0	0	0
Land Use	5	0	0	0	0
Waste Disposal	5	0	0	0	0
Energy Requirements	5	0	0	0	0
OTHER IMPACTS					
Implementation and Constructability	10	1	10	1	10
Expandibility	10	1	10	1	10
Reliability	5	0	0	0	0
System Management	5	0	0	1	5
Site Location	5	0	0	0	0
Service Area	10	0	0	0	0
Need/Political Acceptability	10	0	0	0	0
Support of Future Development	10	1	10	2	20
TOTALS:			**30**		**55**

LEGEND:	**Weight Value**		**Impact Value**	
	1	Minimal Importance	-2	Strongly Negative
	5	Important	-1	Mildly Negative
	10	Very Important	0	Neutral
			1	Mildly Positive
			2	Strongly Positive

APPENDIX H

NET PRESENT VALUE ANALYSIS OF FEASIBLE ALTERNATIVES

APPENDIX H
NET PRESENT VALUE EVALUATION OF FEASIBLE ALTERNATIVES

Description	Capital Cost	Salvage Value At Planning Period End	Present Worth of Salvage Value	Annual O&M Cost (See Note 1)	Present Worth of O&M	Net Present Worth
Alternative 3	$ 18,945,000.00	$ 7,931,076.12	$ 2,989,139.00	$ 784,000.00	$ 9,770,373.00	$ 25,726,234.00
Alternative 4	$ 19,037,000.00	$ 7,793,961.12	$ 2,937,462.00	$ 784,000.00	$ 9,770,373.00	$ 25,869,911.00

Discount rate used in analysis 5.000%

Capitol Cost = Total Project Cost

See Salvage Value Comparison For Calculated Salvage Values At Planning Period End

Present Worth of Salvage Value = Calculated Salvage Value At Planning Period End x (1/(1+.05)^20)

Present Worth of O&M = {Year 1 O&M Cost[(1+.05)^20)-1]/[.05((1+.05)^20)]}

Net Present Worth = Capitol Cost + present worth of O&M - Present Worth of Salvage Value

Note 1: The difference in the annual system wide O&M cost of these two options is considered negligible.

Alternative 3 Salvage Value (Based on straight line depreciation from the initial cost to the end of the planning period.)

Item Description	Design Life in years	Estimated Inflation Rate %	Present Capital Cost $	Salvage Value At Planning Period End $
Balance of Project Cost	40		$ 15,500,930.00	$ 7,750,465.00
Engineering and Other Costs Except Land	N/A		$ 2,426,100.00	$ -
Decommissioning Cost	N/A			$ -
Land		3.0%	$ 100,000.00	$180,611.12
TOTAL:			$ 18,027,030.00	**$ 7,931,076.12**

Alternative 4 Salvage Value (Based on straight line depreciation from the initial cost to the end of the planning period.)

Item Description	Design Life in years	Estimated Inflation Rate %	Present Capital Cost $	Salvage Value At Planning Period End $
Balance of Project Cost	40		$ 15,226,700.00	$ 7,613,350.00
Engineering and Other Costs Except Land	N/A		$ 2,792,800.00	$ -
Decommissioning Cost	N/A			$ -
Land		3.0%	$ 100,000.00	$180,611.12
TOTAL:			$ 18,119,500.00	**$ 7,793,961.12**

APPENDIX I

NEPHI CITY CULINARY WATER SYSTEM SHORT LIVED ASSETS

APPENDIX I
NEPHI CITY CULINARY WATER SYSTEM SHORT LIVED ASSETS

	Item Identification	Expected Asset Life	Qty.	Unit	Current Estimated Unit Replacement Cost	Current Estimated Replacement Cost
1	Jones Well Pump 350 HP	10-15 Year	1	Each	$ 18,000.00	$ 18,000.00
2	Jones Well 12" Line Shaft & Column Piping	10-15 Year	1	Each	$ 28,000.00	$ 28,000.00
3	Jones Well 350 HP Pump Motor	10-15 Year	1	Each	$ 40,000.00	$ 40,000.00
4	Jones Well Pump Control Equipment	10-15 Year	1	Lot	$ 25,000.00	$ 25,000.00
5	Proposed Jones Well Output Ultrasonic Flow Meter	5-10 Year	1	Each	$ 7,500.00	$ 7,500.00
6	Proposed Jones Well Chlorine Disinfection System	10-15 Year	1	Each	$ 12,000.00	$ 12,000.00
7	Proposed Jones Well SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
8	Equipment Shed Well Pump 350 HP	10-15 Year	1	Each	$ 18,000.00	$ 18,000.00
9	Equipment Shed Well 12" Line Shaft & Column Piping	10-15 Year	1	Each	$ 28,000.00	$ 28,000.00
10	Equipment Shed 350 HP Well Pump Motor	10-15 Year	1	Each	$ 40,000.00	$ 40,000.00
11	Equipment Shed Well Pump Control Equipment	10-15 Year	1	Lot	$ 25,000.00	$ 25,000.00
12	Proposed Equipment Shed Well Output Ultrasonic Flow Mete	5-10 Year	1	Each	$ 7,500.00	$ 7,500.00
13	Proposed Equipment Shed Well Chlorine Disinfection System	10-15 Year	1	Each	$ 12,000.00	$ 12,000.00
14	Proposed Equipment Shed Well SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
15	Reconstructed Fire House Well Pump 350 HP	10-15 Year	1	Each	$ 18,000.00	$ 18,000.00
16	Reconstructed Fire House 12" Line Shaft & Column Piping	10-15 Year	1	Each	$ 28,000.00	$ 28,000.00
17	Reconstructed Fire House Well Pump Motor	10-15 Year	1	Each	$ 40,000.00	$ 40,000.00
18	Reconstructed Fire House Well Pump Control Equipment	10-15 Year	1	Lot	$ 25,000.00	$ 25,000.00
19	Reconstructed Fire House Well Output Ultrasonic Flow Meter	5-10 Year	1	Each	$ 7,500.00	$ 7,500.00
20	Reconstructed Fire House Well Chlorine Disinfection System	10-15 Year	1	Each	$ 12,000.00	$ 12,000.00
21	Reconstructed Fire House Well SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
22	Tank Inlet Pipeline From Springs UltrasonicMain Line Meter	5-10 Year	1	Each	$ 7,500.00	$ 7,500.00
23	Tank Inlet Pipeline From Springs Chlorine Disinfection Syste	10-15 Year	1	Each	$ 12,000.00	$ 12,000.00
24	Blue Tank Multi-Source Chlorinator & Equipment	5-10 Year	1	Each	$ 10,000.00	$ 10,000.00
25	Blue Tank Chlorine Scales	10-15 Year	1	Each	$ 5,000.00	$ 5,000.00
26	Blue Tank Chlorine Alarm System	5-10 Year	1	Each	$ 4,000.00	$ 4,000.00
27	Blue Tank Chlorination Pressure Pump	1-5 Year	1	Each	$ 1,000.00	$ 1,000.00
28	Proposed Blue Tank SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
29	Proposed Silver Tank SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
30	Proposed New Tank SCADA Equipment	5-10 Year	1	Lot	$ 12,000.00	$ 12,000.00
31	Shop HMI and SCADA Equipment	5-10 Year	1	Lot	$ 15,000.00	$ 15,000.00
32	Nebo Heights Subdivision Booster Pumps CR 90-2-1 40 HP	5-10 Year	2	Each	$ 7,500.00	$ 15,000.00
33	Nebo Heights Subdivision Booster Pumps CR 45-3-2 25 HP	5-10 Year	2	Each	$ 7,500.00	$ 15,000.00
34	Nebo Heights Subdivision Booster Pumps VFD Control Panel	5-10 Year	1	Each	$ 20,000.00	$ 20,000.00
35	Silver Tank Altitude Control Valve	5-10 Year	1	Each	$ 8,000.00	$ 8,000.00
36	Silver Tank Interior NSF Epoxy Coating System	10-15 Year	1	Lot	$ 127,000.00	$ 127,000.00
37	Silver Tank Exterior Urethane/Epoxy Coating System	10-15 Year	1	Lot	$ 100,000.00	$ 100,000.00
38	Blue Tank Interior NSF Epoxy Coating System	10-15 Year	1	Lot	$ 224,000.00	$ 224,000.00
39	Blue Tank Exterior Urethane/Epoxy Coating System	10-15 Year	1	Lot	$ 200,000.00	$ 200,000.00
40	RPZ Cross Connection Control Valves	5-10 Year	5	Each	$ 8,000.00	$ 40,000.00
41	Fire Hydrants	10-15 Year	10	Each	$ 2,300.00	$ 23,000.00
42	Residential & Small Commercial Radio Read Water Meters	10-15 Year	2100	Each	$ 300.00	$ 630,000.00
43	Residential & Small Commercial Meter Boxes	10-15 Year	25	Each	$ 120.00	$ 3,000.00
44	Golf Course Pressure Pump	1-5 Year	1	Each	$ 2,000.00	$ 2,000.00
			TOTAL:			**$ 1,925,000.00**

Note: The above list does not include consumables

APPENDIX J

NEPHI CITY CONSUMER CONFIDENCE DATA REPORT

Consumer Confidence Data Report
2015

NEPHI CITY UTAH12003

This report provides your water system with the required EPA language, data table, definitions, violation information, and source water descriptions that are required in your annual Consumer Confidence Report (CCR). In order to meet all of the requirements of the CCR, you must include the following additional information if it pertains to your water system:

- *The report must include the telephone number of the owner, operator, or designee of the community water system as a source of additional information concerning the report.*
- *In communities with a large proportion of non-English speaking residents, as determined by the Primacy Agency, the report must contain information in the appropriate language(s) regarding the importance of the report or contain a telephone number or address where such residents may contact the system to obtain a translated copy of the report and/or assistance in the appropriate language.*
- *The report must include information about opportunities for public participation in decisions that may affect the quality of the water (e.g., time and place of regularly scheduled board meetings).*
- *If your water system purchases water from another source, you are required to include the current CCR year's Regulated Contaminants Detected table from your source water supply.*
- *If your water system had any violations during the current CCR Calendar year, you are required to include an explanation of the corrective action taken by the water system.*
- *If your water system is going to use the CCR to deliver a Public Notification, you must include the full public notice and return a copy of the CCR and Public Notice with the Public Notice Certification Form. This is in addition to the copy and certification form required by the CCR Rule.*
- *The requirements on how to make this report available to your customers are in R309-225-7 at http://rules.utah.gov, or you may contact the Division of Drinking Water at (801) 536-4200.*
- *If you have questions about this report and the CCR requirements please contact the CCR manager, Colt Smith, at (801) 536-4155 or acsmith@utah.gov.*
- *In addition to the information provided below you must also include in your CCR a list of current significant deficiencies, the date you plan to have them corrected, the date they were identified, and how you plan to fix them.*
- *If your system has 5%-10% or greater than 1,000 consumers who are non-English speakers then this report must be provided in that common language.*
- *You may submit a copy of the CCR and the certification letter to ddwreports@utah.gov.*

For more information regarding this report contact:

Name: JUSTIN M BLACKETT

Phone: 435-623-0822

Source of Drinking Water

- The sources of drinking water for our system include **(pick the applicable source types for your system: rivers, lakes, streams, ponds, reservoirs, springs, and wells)**. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pickup substances resulting from the presence of animals or from human activity.

- Contaminants that may be present in source water include:

1. Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
2. Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
3. Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
4. Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.
5. Radioactive contaminants, which can be naturally-occurring or be the result of oil and gas production and mining activities.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPAs Safe Drinking Water Hotline at (800) 426-4791.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. FDA regulations establish limits for contaminants in bottled water which must provide the same protection for public health. Some people may be more vulnerable to contaminants in drinking water than the general population.

Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800) 426-4791.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. We cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

CONSTITUENT TABLE DEFINITIONS

In the following table you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:

Non-Detects (ND) - Laboratory analysis indicates that the constituent is not present.

ND/Low - High - For water systems that have multiple sources of water, the Utah Division of Drinking Water has given water systems the option of listing the test results of the constituents in one table, instead of multiple tables. To accomplish this, the lowest and highest values detected in the multiple sources are recorded in the same space in the report table.

Parts per million (ppm) or Milligrams per liter (mg/l) - One part per million corresponds to one minute in two years or a single penny in $10,000.

Parts per billion (ppb) or Micrograms per liter (ug/l) - One part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.

Parts per trillion (ppt) or Nanograms per liter (nanograms/l) - One part per trillion corresponds to one minute in 2,000,000 years, or a single penny in $10,000,000,000.

Parts per quadrillion (ppq) or Picograms per liter (picograms/l) - One part per quadrillion corresponds to one minute in 2,000,000,000 years or one penny in $10,000,000,000,000.

Picocuries per liter (pCi/L) - Picocuries per liter is a measure of the radioactivity in water.

Millirems per year (mrem/yr) - Measure of radiation absorbed by the body.

Million Fibers per Liter (MFL) - Million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.

Nephelometric Turbidity Unit (NTU) - Nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Action Level (AL) - The concentration of a contaminant which, if exceeded, triggers treatment or other

Maximum Contaminant Level (MCL) - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG) - The "Goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Date - Because of required sampling time frames i.e. yearly, 3 years, 4 years and 6 years, sampling dates may seem out-dated.

Waivers (W) - Because some chemicals are not used or stored in areas around drinking water sources, some water systems have been given waivers that exempt them from having to take certain chemical samples, these waivers are also tied to Drinking Water Source Protection Plans.

Source Water Information

Source Water Name	Type Of Water	Source ID
MARSH SPRING	GW	WS001
BRADLEY SPRING	GW	WS002
EQUIPMENT SHED WELL	GW	WS003
JONES WELL	GW	WS005
LOWER BRADLEY SPRING	GW	WS006

TCR Tables

Coliform Bacteria	Year Sampled	+ Sample Count	MCLG	MCL	Violation	Likely Source of Contamination
Coliform Bacteria	2015	0	0	5	N	Naturally present in the environment.

Lead And Copper

	Year Sampled	MCLG	Action Level (AL)	90% tiles	# Sites Over AL	Units	Violation	Likely Source of Contamination
Copper	2015	1.3	1.3	0.16	0	ppm	Y	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.
Lead	2015	0	15	2.9	0	ppb	Y	Corrosion of household plumbing systems; Erosion of natural deposits.

Regulated Contaminants

Disinfectants and Disinfection By-Products	Year Sampled	Lowest Level	Highest Level	MCLG	MCL	Units	Violation	Likely Source of Contamination
Total Trihalomethanes	2015	7.5	7.5	0	80	ppb	N	By-product of drinking water disinfection.

Inorganic Contaminants	Year Sampled	Lowest Level	Highest Level	MCLG	MCL	Units	Violation	Likely Source of Contamination
Arsenic	2013	0.8	0.8	0	10	ppb	N	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
Barium	2013	0.092	0.092	2	2	ppm	N	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
Fluoride	2013	0.2	0.2	4	4	ppm	N	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories.
Nitrate	2015	0.3	3.1	10	10	ppm	N	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits.

Selenium	2013	2.4	2.4	50	50	ppb	N	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines.
Sodium	2013	118	118	500	None	ppm	N	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines.
Sulfate	2013	81	81	1000	1000	ppm	N	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills, runoff from cropland
Total Dissolved Solids (TDS)	2013	856	856	2000	2000	ppm	N	Erosion of natural deposits

Lead and Copper	Year Sampled	Lowest Level	Highest Level	MCLG	MCL	Units	Violation	Likely Source of Contamination
Copper	2015	0.017	0.202	1.3	1.3	ppm	N	Erosion of natural deposits; Leaching from wood preservatives; Corrosion of household plumbing systems.
Lead	2015	0	4.4	0	15	ppb	N	Corrosion of household plumbing systems; Erosion of natural deposits.

Turbidity	Year Sampled	Lowest Level	Highest Level	MCLG	MCL	Units	Violation	Likely Source of Contamination
Turbidity	2013	0.08	0.08	0	0.3	NTU	N	Soil runoff.

APPENDIX K

NEPHI CITY PUBLIC WATER SYSTEM INVENTORY REPORT

DEQ | Drinking Water

Public Water System Inventory Report

Nephi City | PWS ID: UTAH12003 | Rating: Approved | 08/06/1980

Status: Active

Contacts

Type: Administrative Contact
Name: JUSTIN M BLACKETT
Office: 435-623-0822
Emergency:
Email: jmblackett@nephi.utah.gov

Site Information

Address: 21 E 100 N , NEPHI, UT 84648
Phone: 435-623-2349
County: JUAB COUNTY
System Type: Community
Population: 5025

Site Updates

Last Inventory Update: 06/07/2016
Last Surveyor Update: 07/30/2013
Surveyor: JJ TRUSSELL
Operating Period: 1/1 - 12/31
Last IPS Update: 06/24/2016 07:00:00

Consumptive Use Zone

Irrigation Zone: 4
Date: 02/15/2013

SERVICE CONNECTIONS

Type	Meter Type	Meter Size	Number of Connections
Residential	Metered	0	1500

Total Service Connections: 1500

TREATMENT PLANTS

ID	Plant Name	Bin	Status	Date	Design Cap	Status	Treatment Purpose
TP001	MARSH SPRING CHLORINATOR	0				Active	

Treatment Purposes

DISINFECTION

Total Treatment Plants: 1

STORAGE

ID	Name	Type	Effective Volume	Material	Status	Status Reason
ST001	SILVER TANK	Ground	600,000 GAL	Steel	Active	
ST002	BLUE TANK	Ground	2,000,000 GAL	Steel	Active	

Total Effective Volume: 2,600,000

PUMPING STATIONS

ID	Station Name	Status	Reason	Capacity	Availability
PF001	NEBO HEIGHTS BOOSTER STATION	Active			Permanent

Total Capacity: 0

SOURCES

ID	Source Name	Status	Status Reason	Source Type	Water Type	Period of Operation
WS001	MARSH SPRING	Active		Spring	Groundwater	
WS002	BRADLEY SPRING	Active		Spring	Groundwater	1/1 - 12/31
WS003	EQUIPMENT SHED WELL	Active		Well	Groundwater	4/1 - 9/30
WS005	JONES WELL	Active		Well	Groundwater	
WS006	LOWER BRADLEY SPRING	Active		Spring	Groundwater	1/1 - 12/31
WS007	AIRPORT WELL	Inactive		Well	Groundwater	
WS008	MONUMENT SPRING	Inactive		Spring	Groundwater	
WS009	ROWLEYS SPRING	Inactive		Spring	Groundwater	

Total Sources: 8

GROUPED SOURCE SAMPLING STATIONS

Sample Group ID	Sample Group	Facility Details
8109	UTAH12003-02 SS109	View Details

DISTRIBUTION SYSTEM

ID	System Name
DS001	UTAH12003 DISTRIBUTION SYSTEM

Total Distribution Systems: 1

SITE VISIT HISTORY

Date Visited	Survey Type	Surveyor	Notified Date	Next Inspection
05/02/2002	Sanitary Survey, Finished	SURVEYOR, DDW		
10/20/2006	Sanitary Survey, Finished	FOISY, ROGER	10/24/2006	09/30/2013
08/23/2010	Sanitary Survey, Finished	CHARTIER, JOHN L	08/25/2010	09/30/2013
07/30/2013	Sanitary Survey, Finished	TRUSSELL, JJ	08/30/2013	

FACILITY EXCEPTIONS

Facility	Type	Name	Rule	Issue Date	Expiration Date	eDocs Refrence	Plan Review#

APPENDIX L

NEPHI CITY CULINARY SYSTEM
WATER QUALITY DATA

Chemtech-Ford Laboratories

Serving the Intermountain West Since 1953

Certificate of Analysis

Nephi City Corp.
Attn: Justin Blackett
21 East 100 North
Nephi, UT 84648

Sampler: Justin Blackett
Phone: (435) 623-0822
Fax: (435) 623-5443
Email: jmblackett@nephi.utah.gov

Sample ID: 537 N 600 E — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-01	6/13/2016 7:35	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-01	6/13/2016 7:35	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-01	6/13/2016 7:35	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Sample ID: 21 E 100 N — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-02	6/13/2016 7:40	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-02	6/13/2016 7:40	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-02	6/13/2016 7:40	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Sample ID: 425 W Sheeplane Rd — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-03	6/13/2016 7:45	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-03	6/13/2016 7:45	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-03	6/13/2016 7:45	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Sample ID: 1250 N 400 E — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-04	6/13/2016 7:50	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-04	6/13/2016 7:50	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-04	6/13/2016 7:50	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Reed Hendricks, Senior Project Manager

Chemtech-Ford Laboratories

Serving the Intermountain West Since 1953

Certificate of Analysis

Nephi City Corp.
Attn: Justin Blackett
21 East 100 North
Nephi, UT 84648

Sampler: Justin Blackett
Phone: (435) 623-0822
Fax: (435) 623-5443
Email: jmblackett@nephi.utah.gov

Sample ID: 950 N 400 W — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-05	6/13/2016 7:55	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-05	6/13/2016 7:55	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-05	6/13/2016 7:55	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Sample ID: 100 N 500 W — **Report to State:** Yes
Comments: — **Sample Type:** Routine
System No.: UTAH12003 — **Sample Source:** DS001
Sample Point: DS001 — **Field Res. Chlorine:**

Lab No.	Sampled	Parameter Name	Result	Units	Method	Test Started	Test Ended
16F0647-06	6/13/2016 8:00	Chlorine Residual, Total	Absent	mg/L	Ortho-Tolidine	6/13/2016 15:00	6/13/2016 15:00
16F0647-06	6/13/2016 8:00	Coliform, Total	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00
16F0647-06	6/13/2016 8:00	E. Coli	Absent	Org/100 mL	SM 9223 B-PA	6/13/2016 15:00	6/14/2016 15:00

Reed Hendricks, Senior Project Manager

DRINKING WATER SAMPLES ONLY

CHEMTECH - FORD ANALYTICAL LABORATORY

CHAIN OF CUSTODY

COMPANY: Nephi City
ADDRESS: 21 E 100 N.
CITY/STATE/ZIP: Nephi UT 84648
PHONE #: 435-660-0630 FAX:
CONTACT: Justin Blackett PROJECT:
EMAIL: jmblackett@nephi.utah.gov

BILLING ADDRESS: Same
BILLING CITY/STATE/ZIP:
PURCHASE ORDER #:

TURNAROUND REQUIRED:*
* Expedited turnaround subject to additional charge

CHEMTECH-FORD LABORATORIES

STATE SYSTEM #	SEND TO STATE?
12003	☒ YES ☐ NO

Bacteria
R = Routine
I = Investigative
TR = Trigger Source

REPEAT
OR = Original Location
UP = Upstream
DN = Downstream

Lab Use Only	CLIENT SAMPLE INFORMATION						TESTS REQUESTED				
F0647	LOCATION	DATE	TIME	FACILITY ID (source code)	POINT CODE (DBP)	Field: Residual Chlorine	Total Coliform + E. coli (Present/Absent)	Total Coliform + E. coli (Enumerated)	HPC (Plate Count)		
01	1. 537 N. 600 E	6-13-16	735 AM	DS001			X			R	
02	2. 21 E 100 N.	6-13-16	7:40 AM	DS001			X			R	
03	3. 425 W. Sheephaven Rd	6-13-16	7:45 AM	DS001			X			R	
04	4. 1250 N. 400 E	6-13-16	7:50 AM	DS001			X			R	
05	5. 950 N. 400 W	6-13-16	7:55 AM	DS001			X			R	
06	6. 100 N. 520 W.	6-13-16	8:00 AM	DS001			X			R	
	7.										
	8.										
	9.										
	10.										

Sampled by: [print] Justin Blackett
Sampled by: [signature]

Special Instructions:

ON ICE NOT ON ICE Temp (C°): 10.0

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

#443
-W-

	Date/Time		Date/Time
Relinquished by: [signature]	6-13-16 11:39 AM	Received by: [signature] Justin Nahrent	6/13/16 1042
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time

CHEMTECH-FORD
9632 South 500 West
Sandy, UT 84070

801.262.7299 PHONE
866.792.0093 FAX
www.chemtechford.com

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum)
Client agrees to pay collection costs and attorney's fees.

APPENDIX M

NEPHI CITY PUBLIC WATER SYSTEM IPS REPORT

(DDW IMPROVEMENT PRIORITY REPORT & FACILITY EVALUATION)

DEQ | Drinking Water

Public Water System IPS Report

Nephi City PWS ID: UTAH12003 Rating: Approved 08/06/1980

Status: Active

Contacts

Type: Administrative Contact
Name: JUSTIN M BLACKETT
Office: 435-623-0822
Emergency:
Email: jmblackett@nephi.utah.gov

Site Information

Address: 21 E 100 N , NEPHI, UT 84648
Phone: 435-623-2349
County: JUAB COUNTY
System Type: Community
Population: 5025

Site Updates

Last Inventory Update: 06/07/2016
Last Surveyor Update: 07/30/2013
Surveyor: JJ TRUSSELL
Operating Period: 1/1 - 12/31
Last IPS Update: 06/24/2016 07:00:00

Consumptive Use Zone

Irrigation Zone: 4
Date: 02/15/2013

IPS SUMMARY

Total IPS Points	Admin & Physical Facilities	Quality & Monitoring	Operator Certifications	Significant Deficiency Violations
0	0	0	0	0

PHYSICAL FACILITY POINTS

Code	Description	Severity	Points Effective	Details
M001	CURRENT EMERGENCY RESPONSE PROGRAM	REC	-10	Hide Details (1)

Facility	comments	Status	Determined Date	Point Not Effective	Point Assessed
	CURRENT EMERGENCY RESPONSE PLAN		05/06/2002		-10

Code	Description	Severity	Points Effective	Details
SS02	SPRING COLLECTION AREA NOT FENCED	MIN	10	Hide Details (1)

Facility	comments	Status	Determined Date	Point Not Effective	Point Assessed
WS001 MARSH SPRING		Active	08/23/2010		10

Code	Description	Severity	Points Effective	Details
SSL2	VENT NOT PRESENT BUT RECOMMENDED	REC	0	Hide Details (2)

Facility	comments	Status	Determined Date	Point Not Effective	Point Assessed
WS008 MONUMENT SPRING		Inactive	08/23/2010	0	
WS009 ROWLEYS SPRING		Inactive	08/23/2010	0	

Code	Description	Severity	Points Effective	Details
V019	STORAGE FACILITY INTERIOR PEELING OR CRACKED	REC	0	Hide Details (1)

Facility	comments	Status	Determined Date	Point Not Effective	Point Assessed
ST002 BLUE TANK		Active	10/20/2006		0

Total Effective Points: 0

TREATMENT TECHNIQUE VIOLATIONS

ID	Violation	Code	Deficiency	Determined	Points Effective

Total Effective Points: 0

LEAD COPPER MONITORING AND QUALITY VIOLATIONS

Violation No.	Period	Code	Description Name	Points Effective

Total Effective Points: 0

CHEMICAL MONITORING RULE VIOLATIONS

Facility	Violation No	Period	Code	Violation Type	Analyte Group	Determined	Seasonality	Points Effective

Total Effective Points: 0

MICROBIAL RULE VIOLATIONS

Date Range Start: 04/01/2015

Determine Date	Compliance Period	Code	Violation Type	Return To Compliance	Points Effective

Total Effective Points: 0

OPERATOR CERTIFICATION POINTS

Type	Level Required	Highest Certificate	Points Effective
Distribution	Dist 3	Dist 3	0
Treatment			0

Total Effective Points: 0

IPS COMPLIANCE SCHEDULES

Type	Required Activities	Severity	Created	Due