CHAPTER 11. CAPITAL IMPROVEMENT PROGRAM

11.1 Introduction

The purpose of this chapter is to discuss the potable water supply projects identified for the Capitol Improvement Program (CIP) for the City of Lincoln based on the City's build-out demand water modeling results, water supply portfolio, and water shortage planning. As the City of Lincoln's potable water system expands to meet additional needs, major infrastructure systems and pipelines will be constructed by affected developers in order for those developments to meet their fundamental project needs. In this chapter, these directly affected projects are termed "primary developments."[1] In some instances, additional developments are affected by the infrastructure needs located in a primary development. In this chapter, these additional developments are called "secondary developments." The interplay between the water infrastructure needs of primary developments and secondary developments, coupled with the overarching needs of the City to maintain water supply reliability, is critical to assessing long-term infrastructure planning. In short, the reliance of a secondary development and the City on the infrastructure that will be placed in a primary development requires system upsizing and expansion as well as the payment of the associated costs.

The City's existing infrastructure policies enable the City to pay for upsizing and expansion costs beyond those needed for a primary development. The secondary development, when it matures, reimburses the City for the costs (adjusted for inflation and interest charges) of the upsizing and expansion. If upsizing and expansion goes beyond the needs of the primary development and secondary development (e.g. is slated to satisfy a City need), then the City would pay for the incremental component on its own. Nevertheless, the critical issue for the City is identifying and developing the appropriate water infrastructure upsizing and expansion during the primary development phase so that all water delivery obligations can be met – both now and in the future. If these actions are circumvented, then upsizing and expansion must occur in the future to satisfy the secondary development's requirements and the City's additional needs – potentially at much greater effort and expense.

[1] The phrase "primary development" is used interchangeably with the phrase "primary developer" and "primary project." The phrase is used to only discern a project that is moving forward in time ahead of another development that was identified in the City's General Plan. Nothing in this memo is meant to indicate that a "primary" development has any special status that would separate it in some way from a "secondary development."

The projects listed in this chapter cover the CIP efforts that will be required for each major stage of City development. Many of these CIPs are categorized by and identified "Village" – the terminology associated with individual developments listed in the City's 2008 General Plan – in order to simplify the analysis and cost allocations.

11.2 Projects Underway

The projects listed in this subsection are already budgeted and underway. These projects are important as they form the foundation for all future projects that will be needed to serve the developments contemplated in the City's General Plan as well as additional supply conditions necessary to meet the City's water supply reliability objectives.

11.2.1 PCWA Phase III Pipeline and Metering Station at Catta Verdera North for Two New Points of Delivery for the City

The PCWA Phase III Pipeline and Metering Station (Phase III) is already budgeted and underway. The Phase III project is a foundational element of this modeling analysis because the model considers this water infrastructure component as completed for future condition model runs. The Phase III project must be completed in order for the City to increase its existing contract limit for treated surface water deliveries from Placer County Water Agency (PCWA) because the existing facilities have reached their capacity limits. In other words, the existing constraints on the City's delivery system prohibit additional water deliveries from PCWA beyond the existing contract numbers unless the Phase III project is completed. **Figure 11-1** shows the approximate location of the Phase III pipeline and metering station. The Phase III project is anticipated to be completed by 2018.

11.2.2 Tank #3 10 MG Tank at Catta Verdera North, 36-inch Transmission Line, and 16-inch High Pressure Connection to Catta Verdera Service Area (Catta Verdera North Project)

The Catta Verdera North Project is already underway and is not contemplated as a future project in this CIP analysis. The Catta Verdera North Project is already in the proposal stage and is a fundamental component of the CIP. As more development arises, the Catta Verdera North Project will be necessary to manage water system operational criteria and meet peaking demands. The 10 MG tank that is associated with this project is a critical component of the City's long-term storage needs. **Figure 11-1** shows the approximate location of the City infrastructure needed to utilize the Catta Verdera North Project.

Figure 11-1 – Capitol Improvements Underway

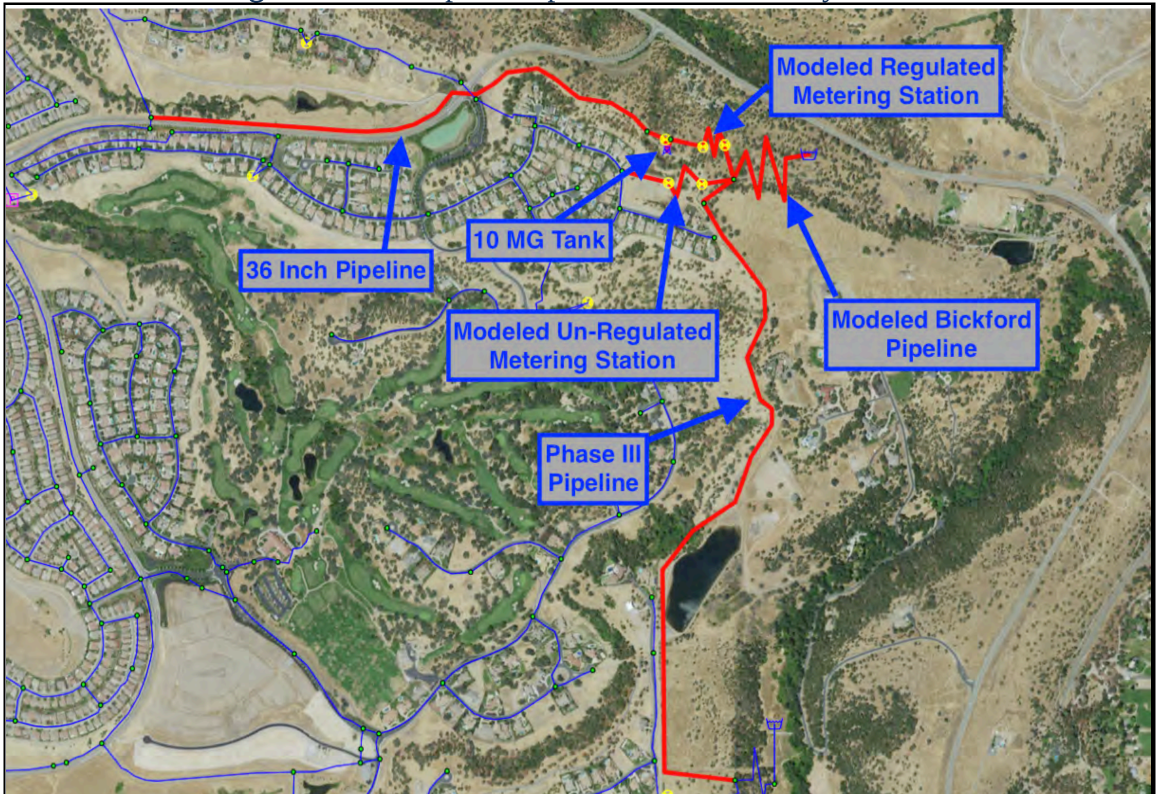

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Image Sources:
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The Nevada Irrigation District (NID) service area within the City of Lincoln and the Sphere of Influence includes Villages 1, 2, and 3 as well as additional areas. But the City's growth will incorporate additional areas beyond the NID service area. As such, the pipe sizes incorporated into the Catta Verdera North Project exceed the capacities needed to only serve Villages 1, 2, and 3. Specifically, the sizing of connecting pipes to the west of these areas is critical for system redundancy – meaning the looping of system capacity for service to Villages 4, 5, and the existing City. Additionally, the transmission mains are oversized in order to address water system redundancy considerations at build-out so that NID and PCWA water supply sources can be interchanged. Last, the sizing of the pipes is designed to include future potential PCWA water supply deliveries through the NID treatment and delivery system to service connections within the PCWA service area. This redundant design is analogous to the current NID water supply and delivery through PCWA's water supply infrastructure system.

11.3 Near-Term Projects

Near-Term projects are the additional CIP projects that are likely to be needed as development progresses in the City. Specifically, the initial development activities indicate that these near term projects will be required to address infrastructure needs that meet the primary development and secondary development needs as well as the City's longer-term needs. The projects listed in this subsection have some limited planning documents but have analyzed the associated developments and corresponding water infrastructure projects in more detail than longer term projects. These projects are important for the City's water infrastructure system as they form additional foundation elements for longer term projects described in **Section 11.4**. As such, this section provides a summary of the proposed near-term infrastructure. The details on the infrastructure of each identified project described in **Subsection 11.3** can be found in the project specific documentation.

11.3.1 Oak Tree Lane Transmission Main Replacement and Realignment

The Oak Tree Lane Transmission Main upgrade consists of new segments of 30-inch pipe running downhill from the 3 million gallon (MG) tank at the Reservoir 1 site, and an 18-inch transmission line running parallel to the existing 24-inch transmission line in Oaktree Lane. The two segments will allow the City to abandon the aging 20-inch asbestos cement pipeline installed in the 1970's. The new 18-inch segment will extend easterly along Highway 193 from Oaktree Lane to meet Village 1 as well as the NID services requirements in the City to the east. The Oak Tree Lane Transmission Main upgrade is incorporated into the Village 1 project. However, the inferior condition of the existing Oak Tree pipeline necessitate the new pipelines being activated before the Village 1 development schedule is completed.

Figure 11-2 – Oak Tree Lane Transmission Main

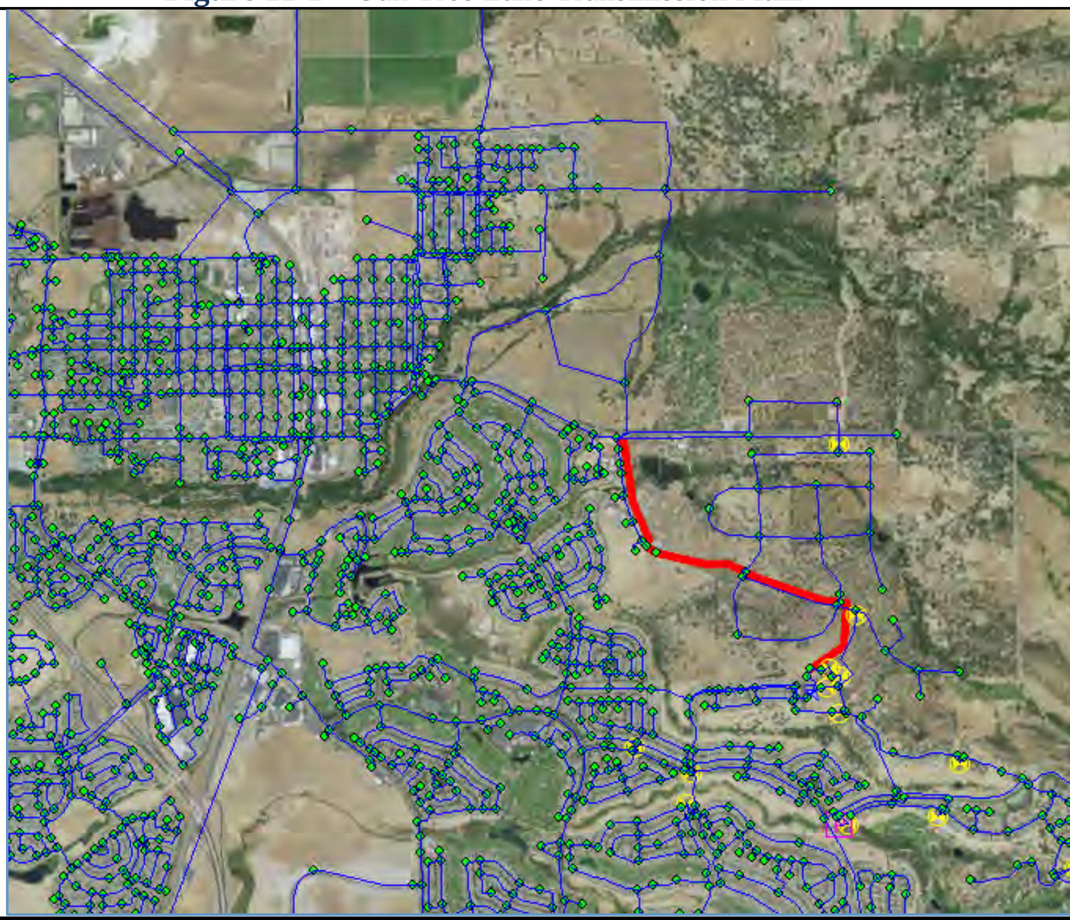

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Table 11-1 depicts the pipe lengths and diameters necessary for the Oak Tree Lane Transmission Main Replacement and Realignment Project.

Table 11-1 – Oak Tree Lane Pipe Table

ID (Char)	Length (ft)	Diameter (in)
P-6316	1,000	30
P-6330	6,800	30
P-6114	2,495	18

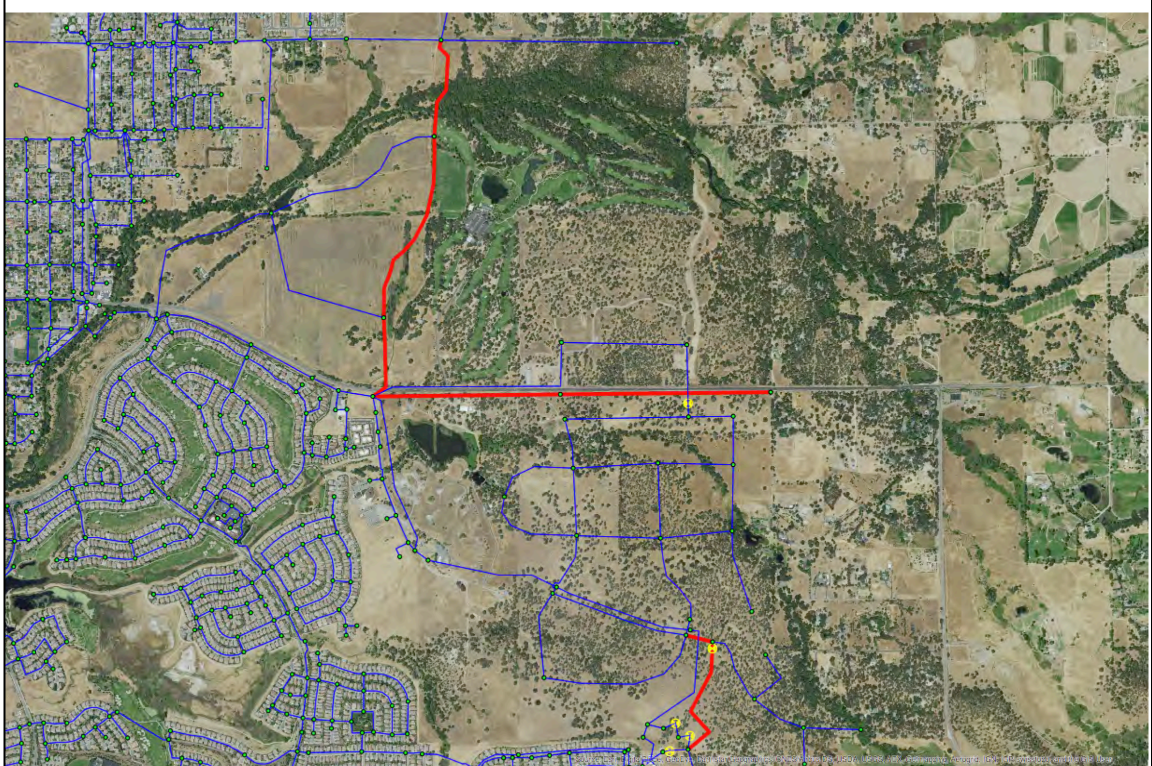
The proposed Oak Tree Lane Transmission infrastructure is a multi-purpose infrastructure improvement. The pipeline will mitigate an existing vulnerability in the City's current water system, provide a reliable transmission component that will support growth in the City, and allow for system redundancy when additional surface water delivery facilities come online. Total costs as presented in the final table account for approximately $6.4 million[2].

[2] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.3.2 Village 1 Backbone Infrastructure

The Village 1 Backbone infrastructure consists of the pipelines north of Highway 193 to Virginia Town Road and the pipeline running east along 193 to the service area and SOI boundary. Depending on the phasing of the Village 1 project, it is possible that a portion of the backbone infrastructure key to the NID Regional Water Supply Project (RWSP) water deliveries will have to be completed by the City and require reimbursement from additional developments dependent upon that system at a later time. The Village 1 potable water infrastructure will include significant infrastructure oversizing beyond the size needed to meet Village 1 demands in order to provide third party capacity to Village 2, future NID service to the east, the ability to supply NID areas with PCWA supplies in emergencies, and connection to existing City infrastructure. **Figure 11-3** shows the Village 1 Backbone Infrastructure.

Figure 11-3 – Village 1 Backbone Infrastructure



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City Water System GIS, Licensed ESRI ArcGIS
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Table 11-2 identifies the pipelines incorporated into Village 1 including their lengths and diameters.

Table 11-2 – Village 1 Pipes

ID (Char)	Length (ft)	Diameter (in)
P-6062	2,907	18
P-6262	1,559	18
P-6318	3,263	18
P-6324	2,959	18
P-6326	1,289	18
P-6334	86	24
P-V1-100	424	24
P-V1H-100	1,892	24

The proposed Village 1 infrastructure will be critical to supporting Village 2 and 3 as well as future NID service to the east of the Village 1 project. Total costs as presented in the final table account for approximately $6.3 million[3]. For more details on the specifics of the Village 1 infrastructure, please refer to the Village 1 Water System Master Plan. Details of this Plan have been incorporated into the City's current build-out water model.

[3] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.3.3 Village 5/SUD B Backbone Infrastructure

The Village 5 Backbone infrastructure consists of the pipelines running from Nicolaus Road on the North side of the City across Auburn Ravine and in the south along Dowd and Fiddyment Roads. The Village 5 Backbone infrastructure also runs from the existing City infrastructure on the East out to the edge of the SOI on the West. Depending on the phasing of the Village 5/SUD B project, it is possible that a portions of the backbone infrastructure key to water deliveries for other current and future projects as well as the City's redundancy objectives will have to be completed as a specific City-financed project that will require reimbursement at a later time. The Village 5/SUD B potable water infrastructure will include key oversizing above Village 5/SUD B needs to provide third party capacity to Village 6, Village 4, and connection to existing City infrastructure. **Figure 11-4** depicts the Village 5/SUD B Backbone Infrastructure.

Figure 11-4 – Village 5/SUD B Backbone Infrastructure

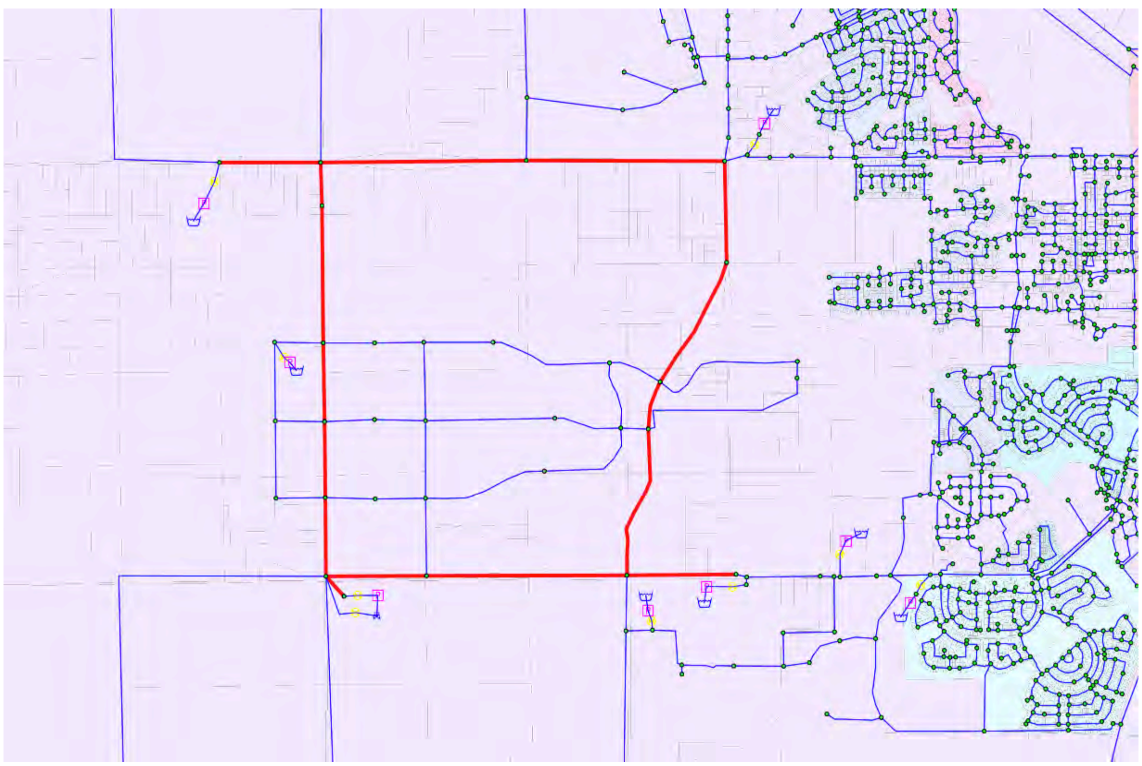

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

Table 11-3 shows the pipeline lengths and diameters associated with the Village 5/SUD B Project.

Table 11-3 – Village 5/SUD B Pipes

ID (Char)	Length (ft)	Diameter (in)
P-6278	691	18
P-V5A-100	2,570	18
P-V5A-102	3,510	18
P-V5A-108	1,250	18
P-V5A-124	2,852	24
P-V5A-126	5,221	18
P-V5A-128	2,622	18
P-V5F-122	3,871	18
P-V5F-142	5,174	18
P-V5F-144	5,365	18
P-V5F-146	2,639	18
P-V5F-150	1,997	18
P-V5F-152	1,927	18
P-V5F-154	1,997	18
P-V5F-156	3,485	18
P-V5F-158	1,094	18

The proposed Village 5/SUD B infrastructure is critical to support the Oak Tree Lane Transmission main upgrades (described in **Section 11.3.1**) and other adjacent City areas as well as future NID service to the East. Total costs as presented in the final table account for approximately $20 million[4]. For more details on the specifics of the Village 5/SUD B infrastructure, please refer to the Village 5/SUD B Water System Master Plan. Details of this Plan have been incorporated into the City's current build-out water model.

[4] This project cost will be determined upon further consultation with the City Staff.

11.3.4 Village 7 Backbone Infrastructure

The Village 7 Backbone infrastructure consists of the pipelines along Moore Road adjacent to the existing Sorrento development then south to the western edge of Lincoln Crossing. Depending on the phasing of the Village 7 project, it is possible that a portion of the backbone infrastructure that is essential for water deliveries to other projects and City redundancy will have to be completed as a specific City-financed project that will require reimbursement at a later time. The Village 7 potable water infrastructure will include significant oversizing above Village 7's needs in order to provide additional capacity to Village 5, SUD C, as well as a looping connection to the City's existing infrastructure. One important pipeline associated with the Village 7 Backbone Infrastructure plan runs along the southern edge of Lincoln Crossing and will connect into an existing Highway 65 crossing at Twelve Bridges Drive. This component expands the number of Highway 65 crossings and removes a supply redundancy bottleneck in the broader water system. **Figure 11-5** depicts the Village 7 Backbone Infrastructure described in this section.

Figure 11-5 – Village 7 Backbone Infrastructure

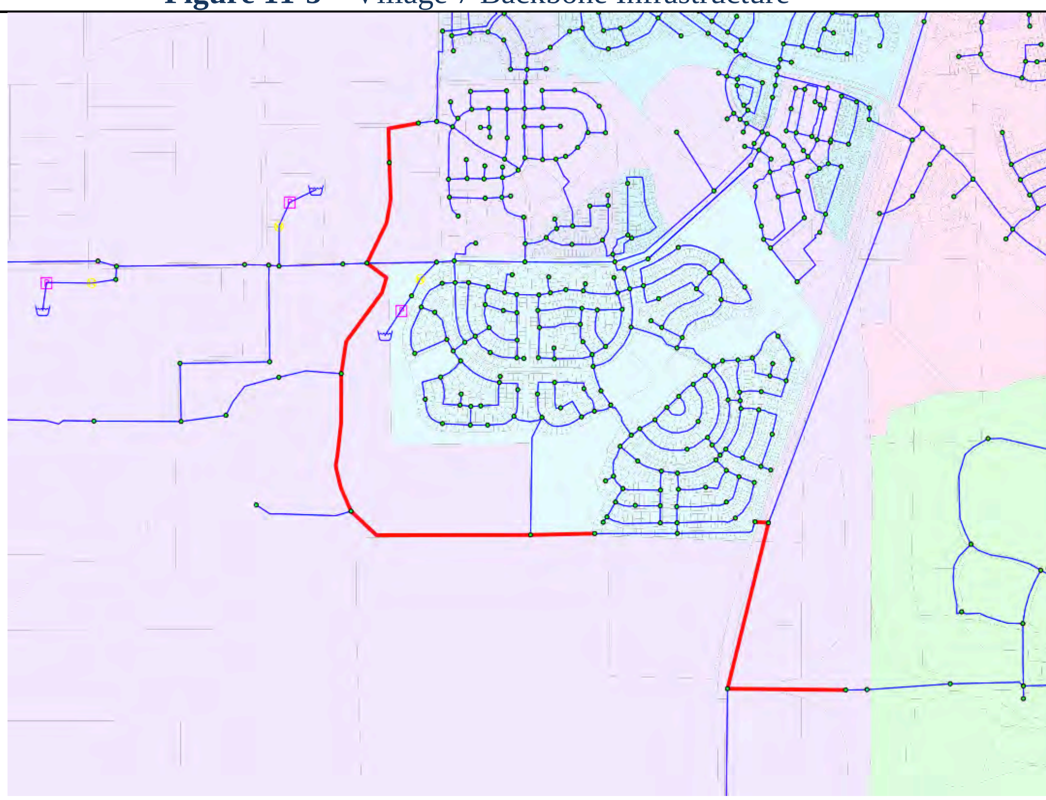

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

Table 11-4 identifies the specific pipeline lengths and diameters that are associated with the Village 7 project.

Table 11-4 – Village 7 Pipes

ID (Char)	Length (ft)	Diameter (in)
P-6018	1,770	18
P-6020	2,489	18
P-6030	2,820	18
P-6044	2,049	18
P-6046	1,949	18
P-6048	1,537	18
P-6052	950	18
P-6170	200	18
P-6386	960	18

The proposed Village 7 infrastructure will improve redundancy over Highway 65 and other adjacent City areas as well as future service to the south and east. Total costs as presented in the final table account for approximately $6.1 million[5]. For more details on the specifics of the Village 7 infrastructure, please refer to the Village 7 Water System Master Plan. Details of this Plan have been incorporated into the City's current build-out water model.

[5] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4 Long Term Projects

The projects listed in this section are considered longer term projects because they will only be constructed as future development progresses beyond the initial development thresholds. Specifically, none of the projects listed in this section have active or pending Water Supply Assessments (WSA's), specific plans, or any other pending development activity. These projects are examined on an individual Village basis that correlates with the 2008 General Plan designations for future development areas. In cases where the infrastructure may be necessary for more than one Village, the infrastructure is assigned to whatever Village is likely to be built first or whichever Village is adjacent to existing City infrastructure. It is likely that the Village(s) that seek land use changes or urbanization opportunities will be responsible for constructing the water mains incorporated as part of this analysis.

In addition to the individual Village infrastructure, overall system storage is a critical component of providing backup supply and proper system redundancy at build-out. Storage components, unlike in-village transmission infrastructure, are not individually necessary to supply the system at build-out but provide additional water system reliability and help manage peaking events. For example, in the event that the City's groundwater extraction was reduced as part of the newly adopted groundwater management rules, additional system storage would help the City provide sufficient water during high demand times – essentially taking the place of a portion of the burden carried by the groundwater wells. In this hypothetical example, the groundwater pumping restrictions would require additional water supplies from alternative locations. Thus, surface water storage would be necessary to meet the increased demands. This section serves as a long term planning guide that may change with future water system design and engineering standards.

11.4.1 Airport Water Storage and Pump Station

Before the City reaches build-out conditions, the City must develop water storage on the west side of the water system in order to ensure proper system operation, manage peaking events, and provide backup supply. An easy way to achieve system operation would be to use high elevation water storage, like water towers, where gravity maintains the system elevation pressures. However, the potential impacts of fire flow demands make the required tank sizing in a water tower cost prohibitive. One proposed project seen as the best option is the Airport Water Storage and Pump Station. This piece of infrastructure, on the west side of town near the Lincoln Airport, would allow for surface water to be delivered across town in low water use periods and pumped back into the system during peak demand periods. As currently modeled, this pumped storage would produce approximately 5,000 gallons per minute (gpm) under typical use with total pump time limited by the amount of water in the 5 MG tank at the time. The sizing of this tank and pump would allow for the project to supply an emergency fire flow situation at the airport or nearby industrial areas. Though the specific parcel designated for this tank has changed over the years based on available lands that are owned by the City, substantial pipe infrastructure was built with developments in the area anticipating the pumped storage would be installed in the future. **Figure 11-6** depicts the Airport Water Storage and Pump Station.

Figure 11-6 – Airport Water Storage and Pump Station

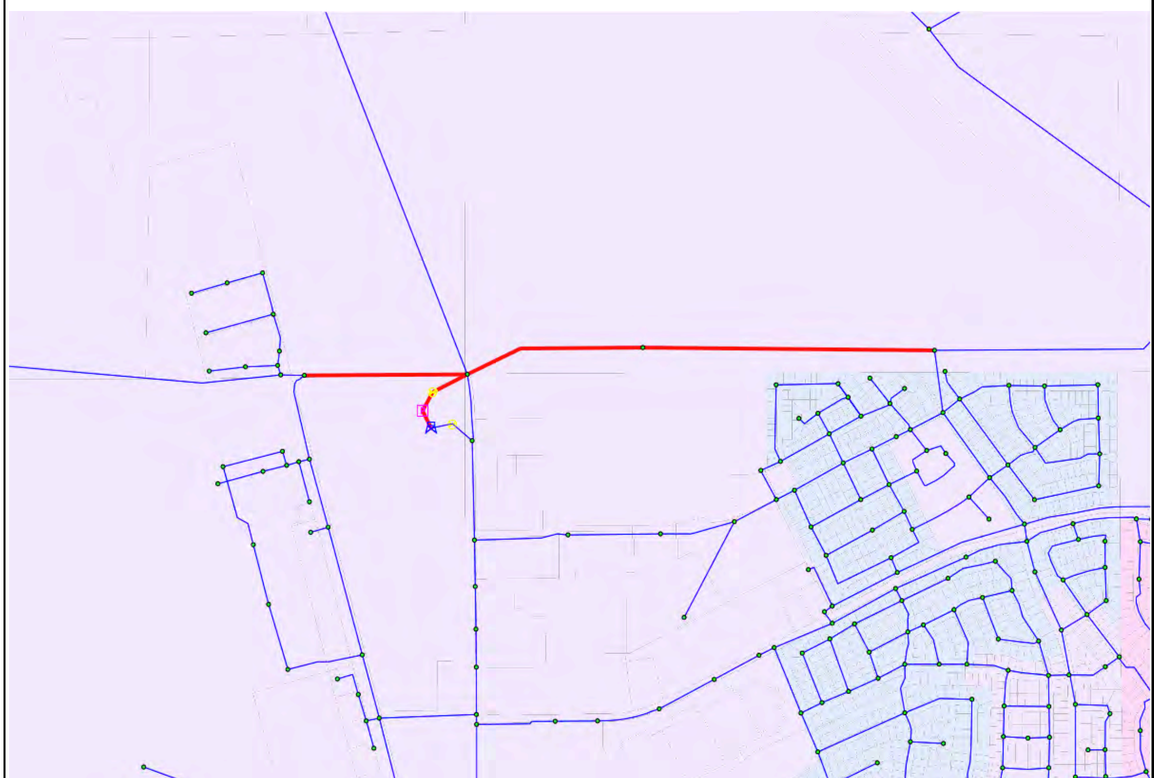

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

Table 11-5 identifies the lengths and diameters of pipe necessary to deliver water from the proposed Airport Water Storage and Pump Station.

Table 11-5 – Airport Water Storage and Pump Station Associated Pipe Infrastructure

ID (Char)	Length (ft)	Diameter (in)
P-1230	1,206	18
P-5980	2,374	18
P-5982	1,473	18
P-6240	155	18
P-6242	168	18
P-6244	316	18

The proposed Airport Pumped Storage in the western portion of the water system is currently the best option to support future build-out and address groundwater pumping restrictions. Total costs as presented in the final table account for approximately $2.3 million at current costs[6].

11.4.2 Reservoir 1 Expanded Storage

Prior to attaining build-out, water storage on the east side of the water system is important to ensure proper system operation, manage peaking events, and provide backup supply. One proposed project currently under consideration is expanded storage on the east side of town at the Reservoir 1 site. This piece of infrastructure would allow for expanded surface water use and proper storage capacity to be maintained to handle peaking conditions. As currently modeled, this project would add approximately 10 MG of additional storage at the Reservoir 1 site. The sizing of this tank would allow for the City to expand beyond the 10 MG storage capacity limits covered in the other project at that location described in **Section 11.2.2**. As modeled, this tank could be built at the Catta Verdera North site and provide the same level of service so long as delivery pipelines were adequately upsized. The Reservoir 1 site is the more efficient choice as the land requires far less grading and there is capacity in the planned and existing pipelines not fully utilized by the existing 3 MG tank. **Figure 11-7** depicts the Reservoir 1 Expanded Storage project.

[6] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

Figure 11-7 – Reservoir 1 Expanded Storage

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Image Sources:
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Table 11-6 identifies the additional pipe lengths and diameters that would be required as part of the Reservoir 1 Storage Tank project.

Table 11-6 – Reservoir 1 Pipe Table

ID (Char)	Length (ft)	Diameter (in)
P-6388	162	18
P-6390	615	36

The proposed Reservoir 1 Expanded Storage in the eastern portion of the water system is currently the best option to support future build-out and comply with storage capacity design criteria. Total costs as presented in the final table account for approximately $0.6 million at current costs[7].

[7] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4.3 Village 2 Backbone Infrastructure

The Village 2 Backbone infrastructure consists of the pipelines north of the existing City and Village 1 as well as the main transmission lines from the future NID regional water treatment facilities to serve the NID service area of Villages 1 and 2. Due to the current lack of City-developer activity on the Village 2 project, it is possible that a portion of the backbone infrastructure that is critical for the NID RWSP will be completed as a specific City-financed project that will require reimbursement at a later time. The Village 2 potable water infrastructure will include significant oversizing above the Village 2 water supply needs to provide third party capacity to Villages 1 and 3 as well as connection to existing City infrastructure. **Figure 11-8** shows the Village 2 Backbone Infrastructure components.

Figure 11-8 – Village 2 Backbone Infrastructure

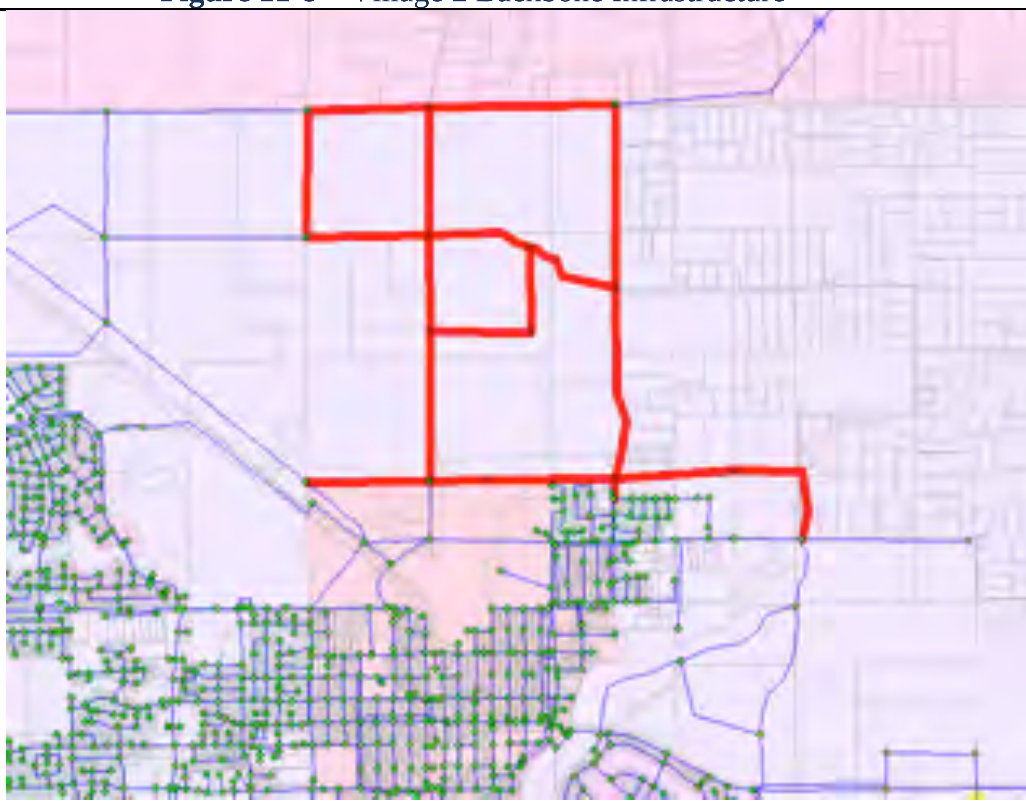

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Table 11-7 shows the pipe lengths and diameters associated with the Village 2 Backbone Infrastructure project.

Table 11-7 – Village 2 Pipes

ID (Char)	Length (ft)	Diameter (in)
P-5046	448.1	18
P-5946	4152.2	30
P-5948	3896.3	30
P-5950	4090.4	36
P-5952	2743.1	18
P-5956	2055.7	18
P-5958	2852.2	18
P-6074	2660.8	24
P-6094	1198.4	18
P-6112	2686.1	18
P-6178	2219.6	18
P-6180	1821.4	16
P-6256	2626.1	18
P-6258	2944.6	18
P-6272	3210.1	18

The proposed Village 2 infrastructure will be cornerstone project for serving the Village 3 development and other adjacent City areas as described above. Total costs as presented in the final table account for approximately $21 million[8].

[8] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4.4 Village 3 Backbone Infrastructure

The Village 3 Backbone infrastructure consists of the pipelines north of the existing City and west of Village 2 as well as the transmission lines from the future NID regional water treatment facilities to serve the NID service area that includes Village 3. Due to the current lack of City-developer activity on the Village 3 project, it is possible that a portion of the backbone infrastructure key to the NID RWSP will have to be completed as a specific City-financed project. The Village 3 potable water infrastructure will require oversizing above Village 3 needs to provide redundancy to other adjacent villages, and connection to existing City infrastructure. **Figure 11-9** depicts the Village 3 Backbone Infrastructure project.

Figure 11-9 – Village 3 Backbone Infrastructure

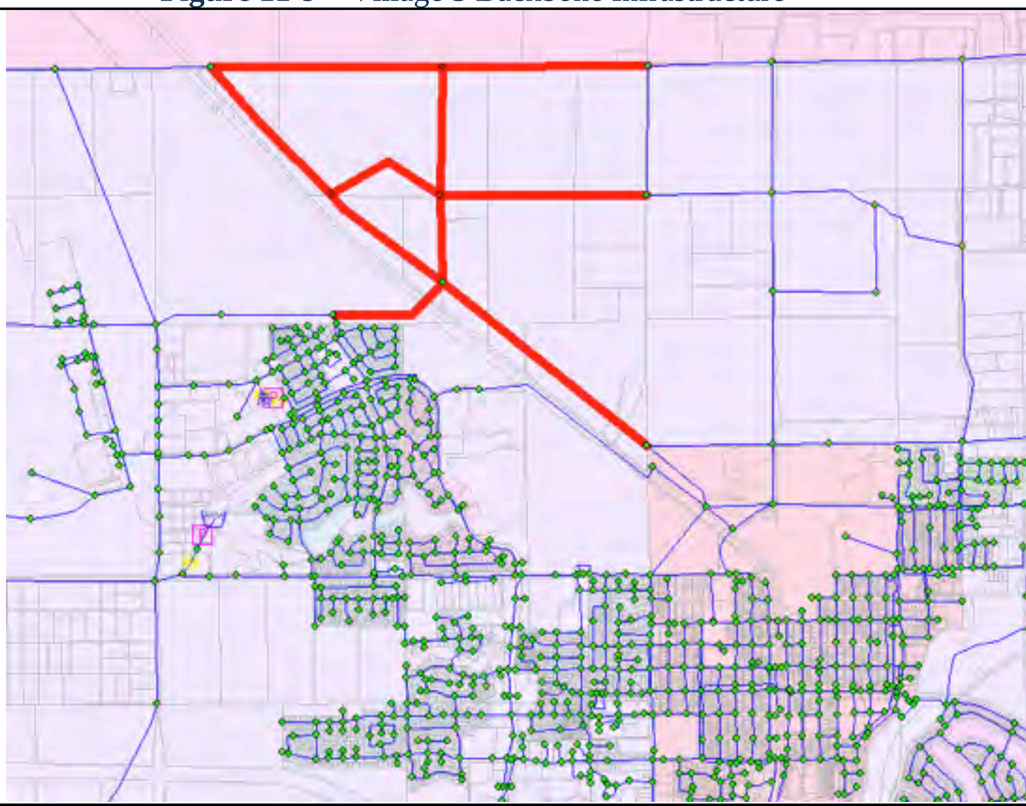

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Table 11-8 shows the pipe lengths and diameters associated with the Village 3 Backbone Infrastructure project.

Table 11-8 – Village 3 Pipes

ID (Char)	Length (ft)	Diameter (in)
P-5968	1819.7	18
P-5970	4394.6	24
P-5972	4987	24
P-5976	2657.7	18
P-6078	4427.1	18
P-6352	2680.8	18

The proposed Village 3 infrastructure is a critical component for providing redundant service to the Village 4 development and other adjacent City areas as described above. Total costs as presented in the final table account for approximately $10 million[9].

[9] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4.5 Village 4/SUD A Backbone Infrastructure

The Village 4/SUD A Backbone infrastructure consists of the pipelines west of Village 3, at least 2 wells, and major north-south water supply connector pipelines near the airport. Due to the current lack of City-developer activity on the Village 4 project, it is possible that a portion of the backbone infrastructure key to looping supplies out to the western edge of the City will have to be completed as a specific City-financed project that will require reimbursement at a later time. The Village 4/SUD A potable water infrastructure will include significant oversizing above specific development needs to provide third party capacity to Villages 5 and 3 as well as a connection to existing City infrastructure around the airport. **Figure 11-10** shows the Village 4/SUD A Backbone Infrastructure Project.

Figure 11-10 – Village 4/SUD A Backbone Infrastructure

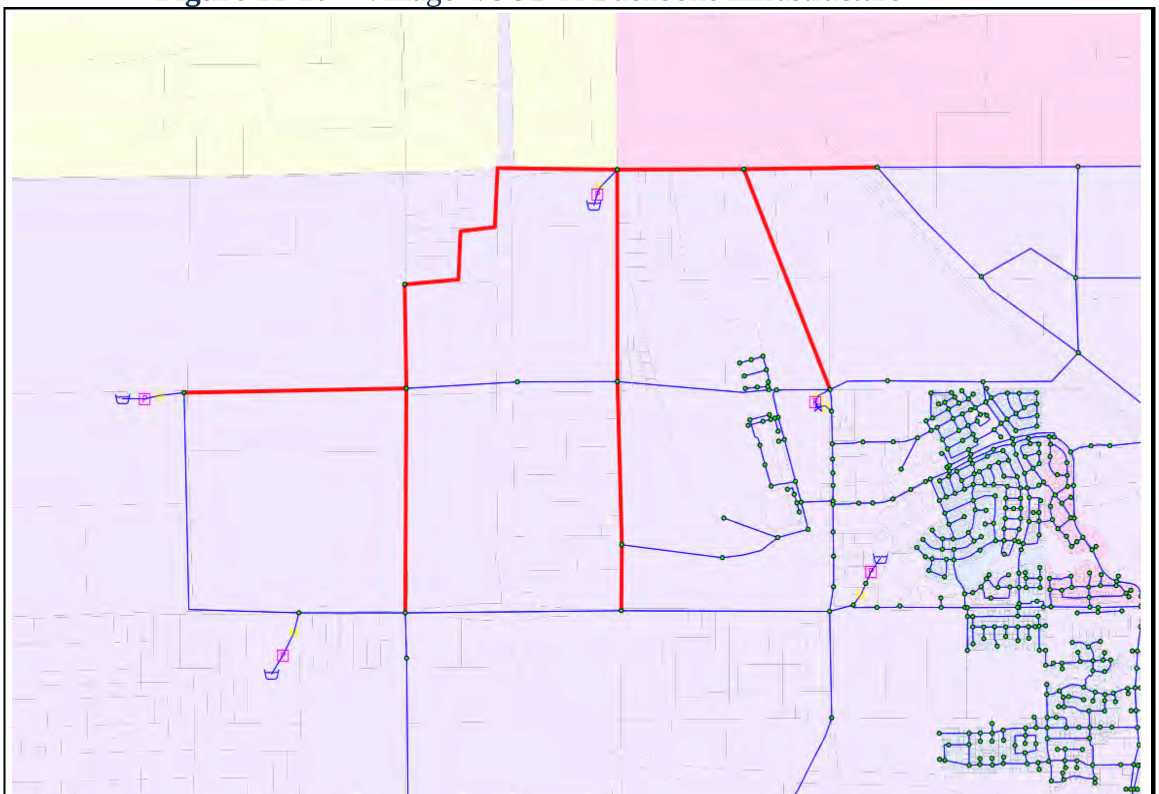

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Table 11-9 shows the pipe lengths and diameters associate with the Village 4/SUD A Backbone Infrastructure Project.

Table 11-9 – Village 4/SUD A Pipes

ID (Char)	Length (ft)	Diameter (in)
P-5984	3,315	24
P-5986	5,745	18
P-5988	3,144	24
P-5990	5,124	18
P-5992	3,949	18
P-5996	1,595	18
P-6002	7,758	18
P-6072	5,429	18
P-6082	5,522	18
P-6110	2,513	18

The proposed Village 4/SUD A infrastructure components are important for looping City-wide system supplies and serving other adjacent City areas as described above. Total costs as presented in the final table account for approximately $19 million[10].

[10] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4.6 Village 6 Backbone Infrastructure

The Village 6 Backbone Infrastructure consists of the pipelines running through Village 6 and connecting Village 5 to SUD C as well as completing the southern loop in the City's water system. These connections are necessary in order to meet system requirements commensurate with PCWA completing a potential surface water treatment plant. Due to the current lack of City-developer activity on the Village 6 project, it is possible that a portion of the backbone infrastructure key to PCWA treatment plant will have to be completed as a specific City-financed project that will require reimbursement at a later time. The Village 6 potable water infrastructure will include significant oversizing above Village 6 needs to provide third party capacity to Villages 5 and SUD C. **Figure 11-11** below depicts the Village 6 Backbone Infrastructure described in this section.

Figure 11-11 – Village 6 Backbone Infrastructure

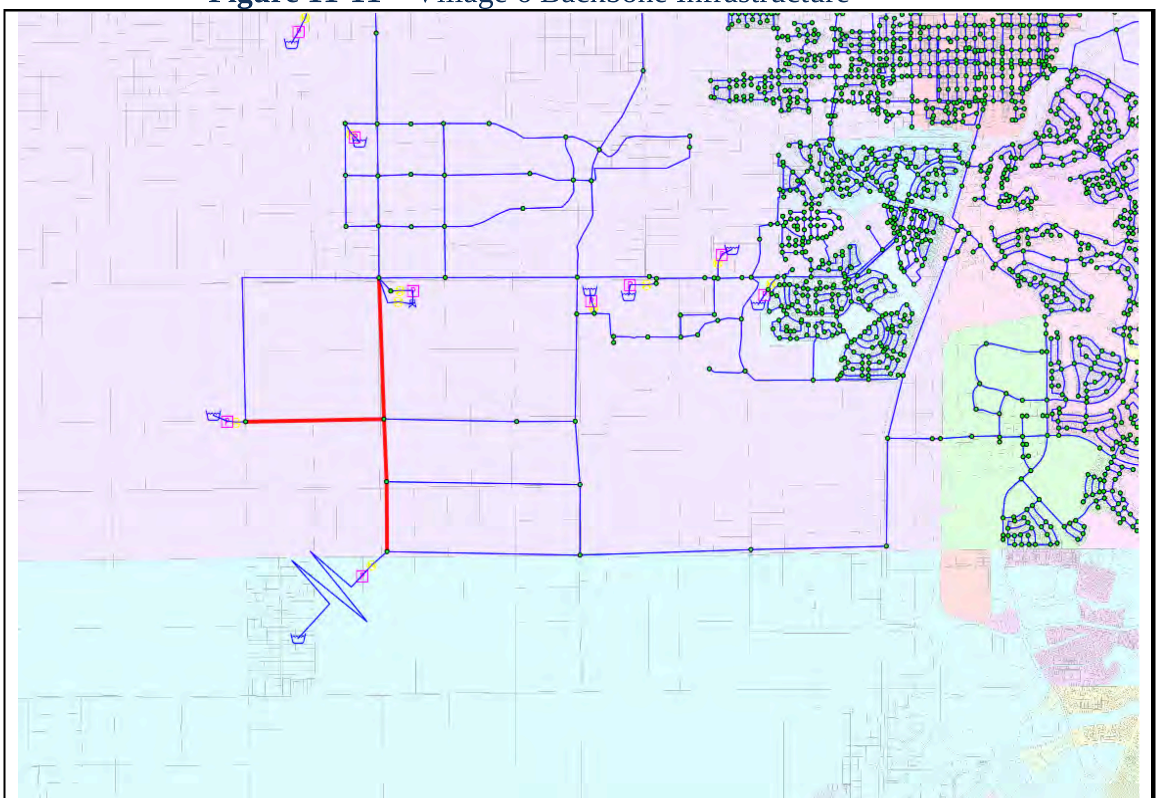

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Image Sources:
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City Water Model, Innovyze InfoWater

Table 11-10 below shows the pipe lengths and diameters needed to develop the Village 6 Backbone Infrastructure project.

Table 11-10 – Village 6 Pipes

ID (Char)	Length (ft)	Diameter (in)
P-6010	5,431	18
P-6066	2,412	18
P-6084	5,470	18
P-6274	2,685	18

The proposed Village 6 infrastructure will be key to serving the south-west City development and other adjacent City areas as described above. Total costs as presented in the final table account for approximately $8 million[11].

[11] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.4.7 SUD C Backbone Infrastructure

The SUD C Backbone infrastructure consists of the pipelines along the southern City boarder west of Highway 65. Due to the current lack of City-developer activity on the SUD C project, it is possible that a portion of the backbone infrastructure key to Village 6 and a PCWA treatment plant connection will have to be completed as a specific City-financed project that will require reimbursement at a later time. The SUD C potable water infrastructure will include significant oversizing above SUD C requirements in order to provide third-party capacity to Villages 5 and 6, a possible PCWA treatment plant, and connection to existing City infrastructure. **Figure 11-12** depicts the SUD C Backbone Infrastructure project.

Figure 11-12 – SUD C Backbone Infrastructure

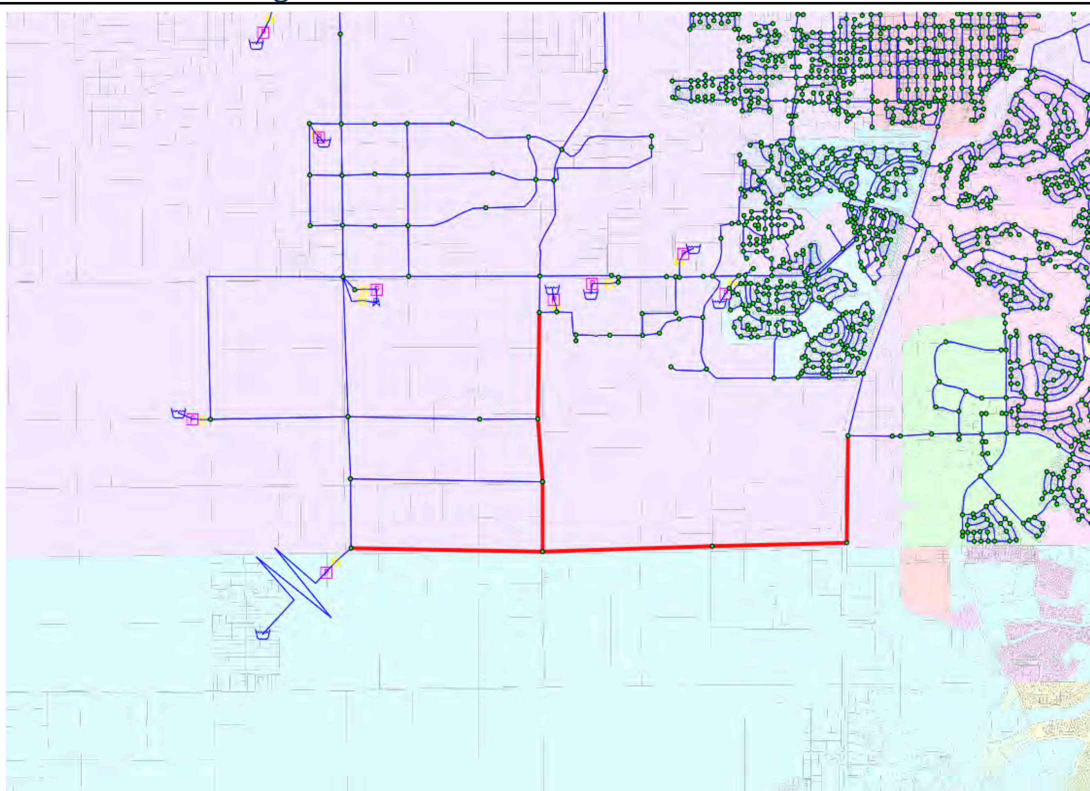

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

Table 11-11 shows the pipe lengths and diameters associated with the SUD C Backbone Infrastructure project.

Table 11-11 – SUD C Pipes

ID (Char)	Length (ft)	Diameter (in)
P-6012	7,630	18
P-6014	6,758	18
P-6016	4,147	18
P-6104	2,708	18
P-6304	2,445	18
P-6346	4,126	18
P-6372	5,358	18

The proposed SUD C infrastructure will be instrumental for serving the Village 6 development and other adjacent City areas as described above. Total costs as presented in the final table account for approximately $13.8 million[12].

[12] Cost does not include the extra costs arising from crossings of creeks, highways, railroads, or other significant barrier.

11.5 Groundwater Projects

Prior to reaching build-out, the City will need a number of groundwater projects to be constructed in order to maintain the City's peaking and backup groundwater supplies. Specifically, as noted in Chapters 3 and 6, the City anticipates deriving approximately 10% of its average annual supply from groundwater. Moreover, the City anticipates having the ability to pump as much as 75% of its average day demand in order to handle emergency conditions. **Chapter 9** depicts the model presentations and assumptions as related to the City's groundwater peaking and backup supplies. With the recent Well #2 and Nelson well upgrades the City now has adequate groundwater capacity to meet its system objectives for all near-term development that is underway or planned to be underway in the near future. Projects currently in the general near-term planning stages would likely need only one additional well. Currently, this additional well is planned to be located at the western portion of Village 5.

Long-term groundwater planning as modeled for build-out conditions includes five (5) additional wells located throughout the groundwater bearing areas in the City. The northernmost well is generally located in the SUD A area northwest of the airport. Two additional wells are planned for Village 4. And the two final wells are planned for the western and southern portions of Village 6.[13] No specific well locations in these general areas have yet been determined but initial investigations should be undertaken. No wells are planned for the SUD C area due to the distance from landfill and sewage treatment facilities. **Figure 11-13** depicts the potential future well locations as considered in the Innovyze model.

[13] The southern most well as modeled could also be considered a connection to a future PCWA Sacramento River water supply. Although these two sources would be significantly different when they come to fruition, the model allows both scenarios to be considered with the only differences being the size of the pump and delivery pipes. The potential for a potable surface water supply connection to the Sacramento River through the PCWA system is discussed in **Chapter 5**.

Figure 11-13 – Long Term Groundwater Projects

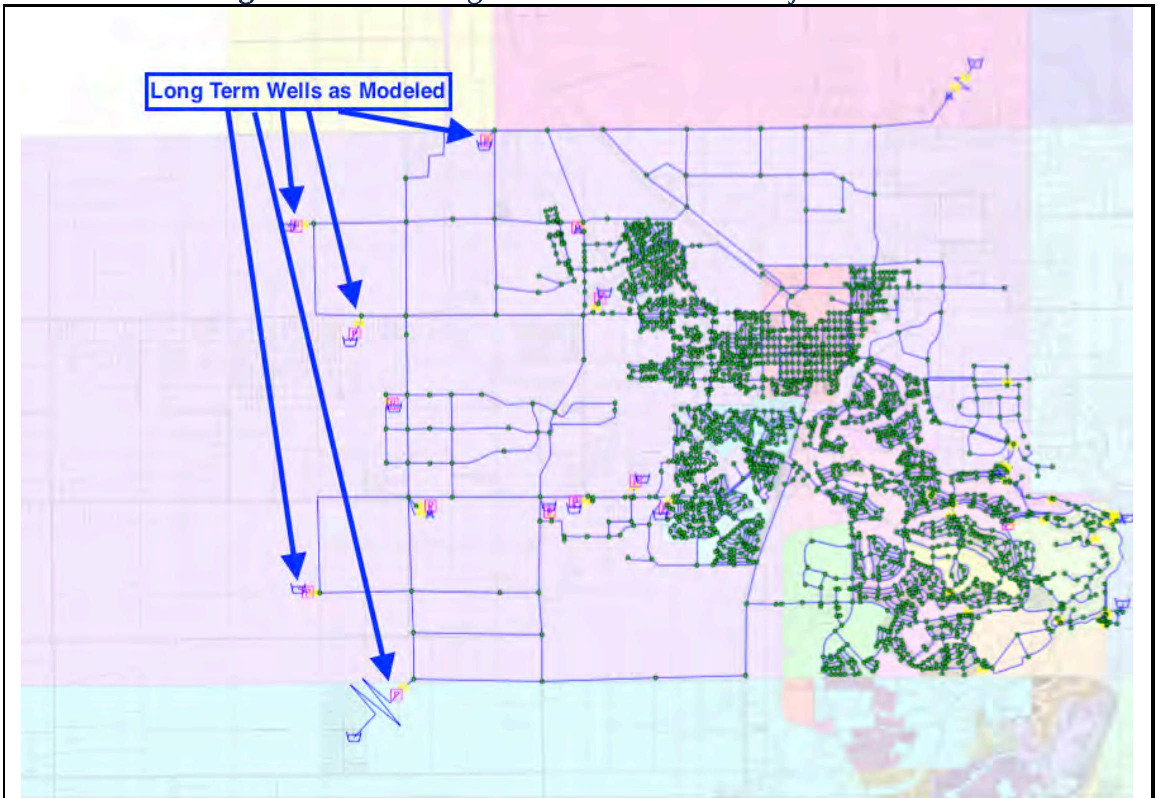

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

11.6 Long-Term Major Infrastructure Outside of City

The City has been participating in the initial planning stages of PCWA's and NID's major infrastructure projects. The current proposals involve the City financially participating in the planning and feasibility studies as well as design and construction. For PCWA, the projects include the Bickford Ranch Pipeline, the Ophir Water Treatment Plant and the Sacramento River Diversion Project.[14] For NID, the project is the Regional Water Supply Project and the numerous raw water and treatment system components of that project. All of these projects are considered long-term projects for purposes of this analysis despite having been in the planning phases for many years. The development of both of these projects have a significant impact on the City's water supply reliability objectives – as noted in Chapter 7 – as well as large financial investments needed in order

[14] The December 2015 financial syllabus for the Bickford Pipeline and Ophir Water Treatment Plant indicates that the costs associated with the PCWA project will also include reimbursements for other previously constructed portions of the PCWA system that are linked to those facilities.

to bring them to fruition. As such, special consideration should be given to these projects.

The City's eight water workshops spanning from October 2014 to December 2015 considered the total max day water system facilities that the City should consider for its long-term water supply reliability (See **Chapter 7** that describes the considerations addressed in determining water supply reliability). The workshop results determined that the City should develop a reliable water supply system capable of delivering 67 MGD max day demand of which 57 MGD would meet potable water demands. **Figure 11-14** is a large-scale model map depicting the 57 MGD potable water delivery system.

Figure 11-14 – 57 MGD Potable Model Map

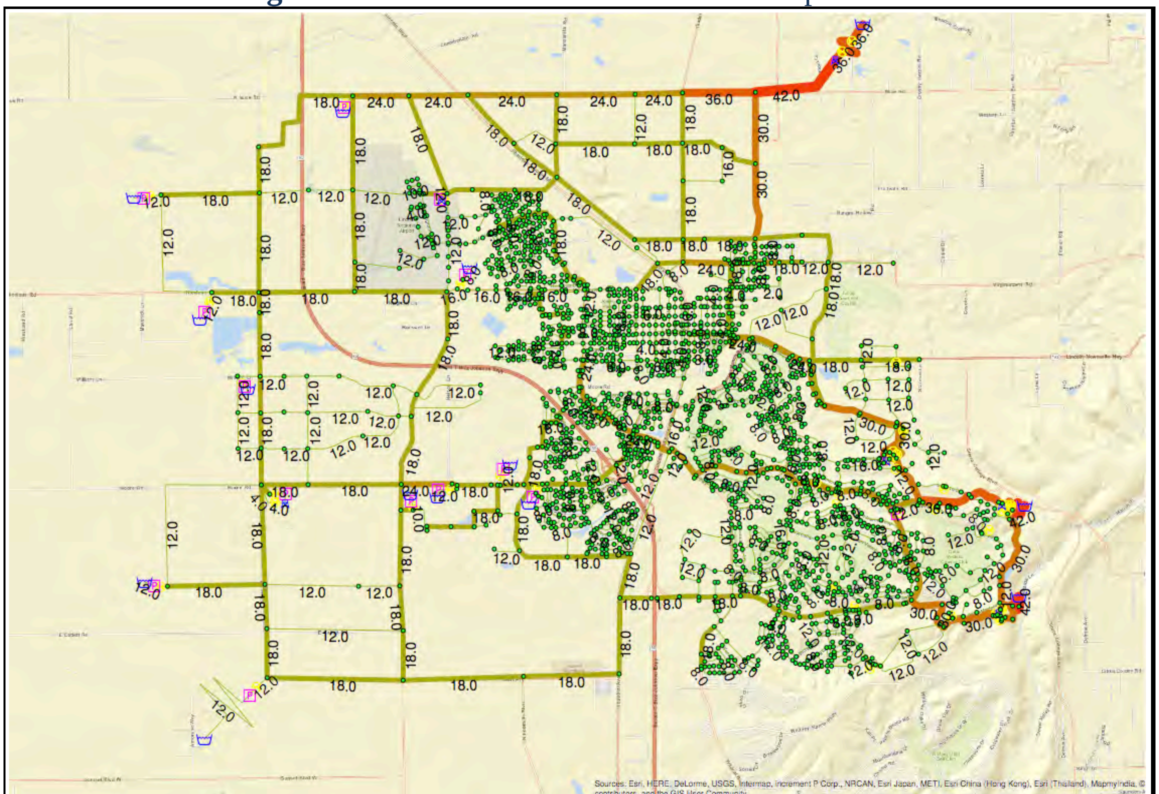

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Image Sources:
City Water System GIS, Licensed ESRI ArcGIS
City Water Model, Innovyze InfoWater

The City Council considered the options to deliver between 26 and 33 MGD of that 57 MGD through PCWA's treated water system and between 18 and 25 MGD through the NID treated water system. The City Council did not conclude where in this system build-out configuration it should choose until further information is developed. **Table 11-12** shows the summary supply scenarios for purposes of meeting the City's overall demand.

Table 11-12 – Alternatives Chosen to Meet City's 57 MGD Potable Demand

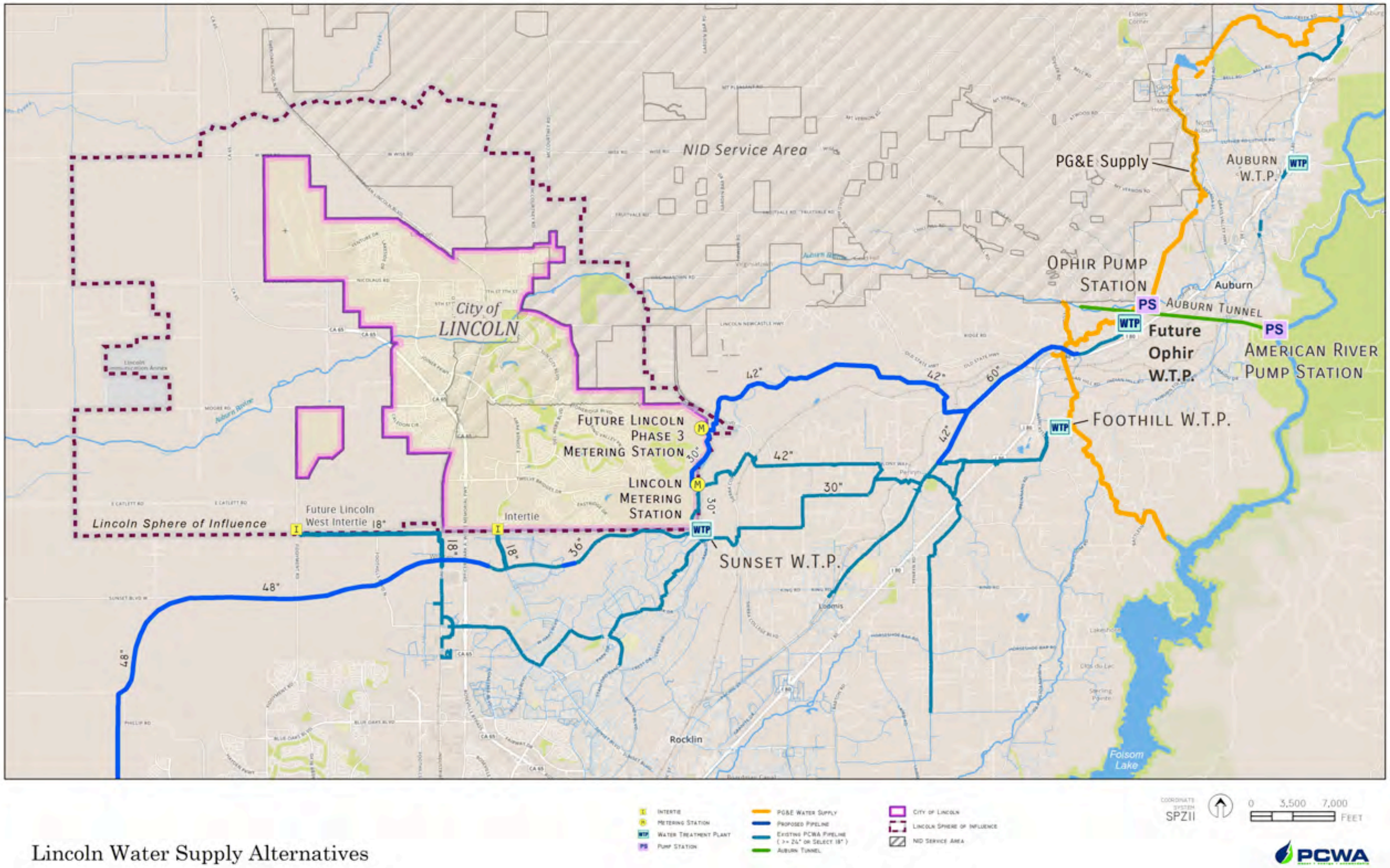
Capacity (MGD)	Scenario 3	
	Alt 1	**Alt 2**
PCWA Treated	33	26
NID Treated	18	25
Potable Groundwater	6	6
Non-Potable	10	10
Total	**67**	**67**

The treated water deliveries from PCWA's system could be derived from a number of sources but the primary additional source would be the Ophir Water Treatment Plant and the associated infrastructure. The treated water deliveries from NID's system would be derived from the Regional Water Supply Project.

11.6.1 PCWA Facilities

As described in Chapter 3, the City is considering major capital investments in facilities that will be owned and operated by PCWA. These facilities include the PCWA Ophir Water Treatment Plant and 60-inch transmission line, the 42-inch Bickford Pipeline, and the Sacramento River Diversion Project. **Figure 11-15** shows the Ophir Water Treatment Plant and 60-inch transmission line as well as the 42-inch Bickford Pipeline planned alignment.

Figure 11-15 – PCWA Future Ophir Water Treatment Plant and Transmission Facilities



The Ophir Water Treatment Plant, the 60-inch transmission main, and the 42-inch Bickford Pipeline are incorporated into the cost assessment provided by PCWA in December 2015.[15] These cost assessments are shown below, collectively with the NID RWSP cost assessments, in **Table 11-13**.

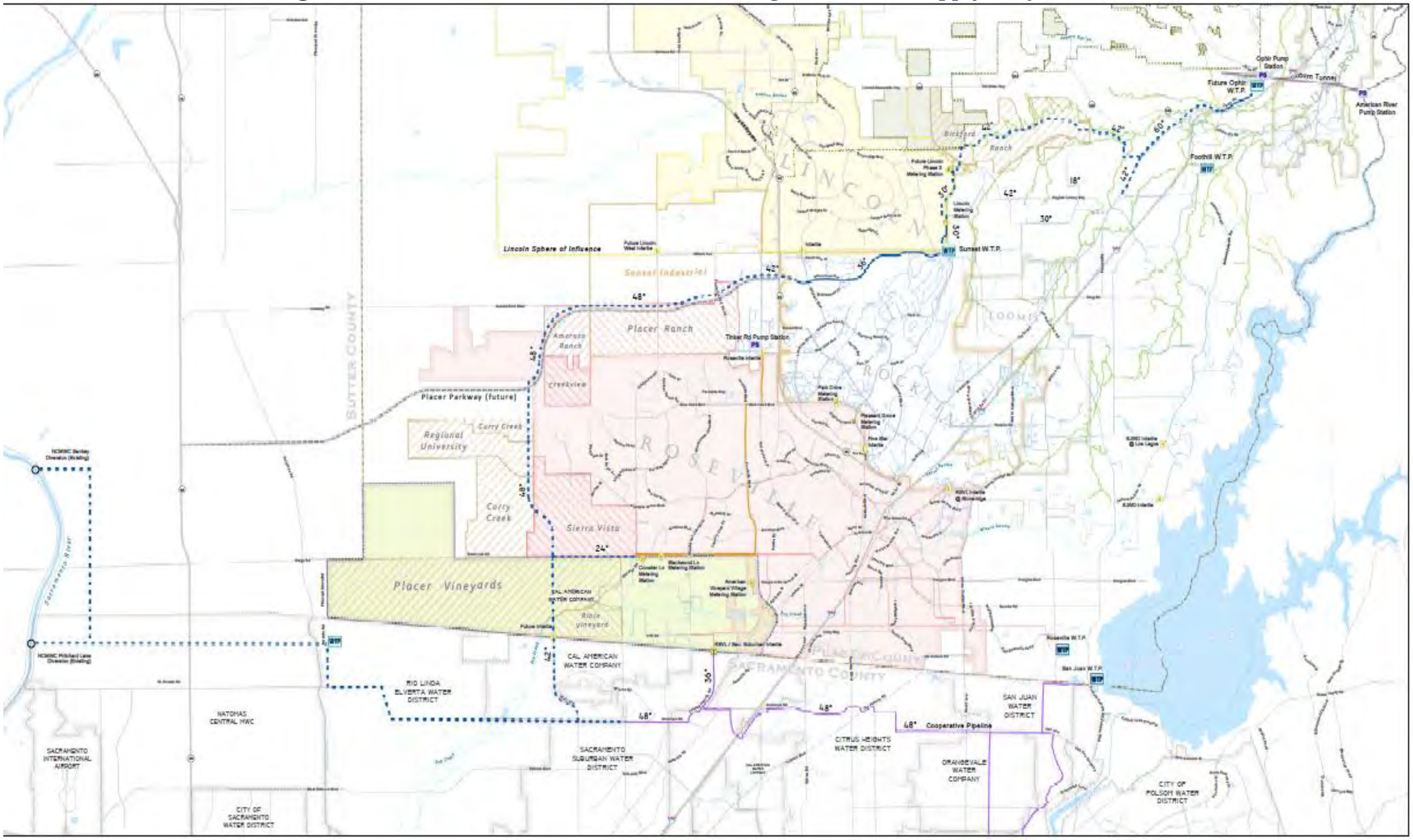
Table 11-13 – PCWA and NID Treatment and Conveyance Cost Table[16]

Costs ($ Millions)	Scenario 3	
	Alt 1	Alt 2
PCWA Treated	143 – 218	72 - 113
NID Treated	120	*166
Potable Groundwater	25	25
Non-Potable	38 - 55	38 - 55
Total	**326 - 418**	**301 - 359**

Also relevant to this discussion is the possibility of eventually receiving water from PCWA's Sacramento River Diversion Project. Although the City has decided to not consider this project in its long-term water supply reliability planning, it is important to consider in order to understand the potential for PCWA wholesale water deliveries derived from this facility in the future. **Figure 11-16** shows the one alignment of the pipeline supplying water from the Sacramento River Regional Water Supply Project. There are no cost assessments considered for this project at this time.

[15] Additional cost assessments that may be available related to this project have not been considered in this CWMP but should be assessed as the projects progress.
[16] This table also depicts the approximate costs of 6 MGD of groundwater well capacity as well as 10 MGD of non-potable water supplies derived from raw and recycled sources.

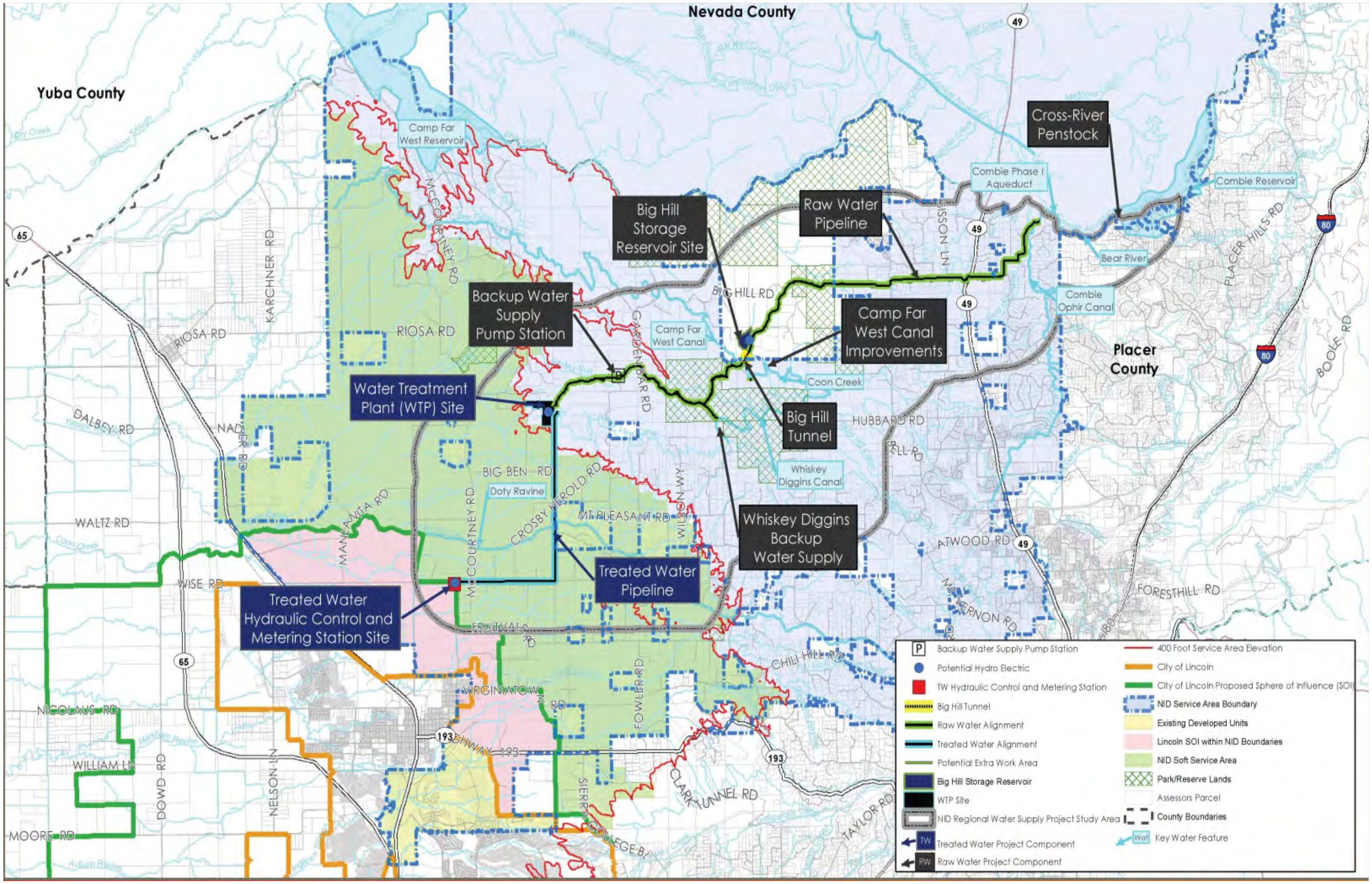
Figure 11-16 – PCWA's Sacramento River Regional Water Supply Project



11.6.2 NID Regional Water Supply Project

The NID Regional Water Supply Project incorporates a number of project improvements to NID's overall system as well as construction of a water treatment plant that would result in potable water deliveries to the City of Lincoln. All of these components are considered in the cost phasing provided by NID. **Figure 11-17** shows the planned alignments of infrastructure for the NID Regional Water Supply Project.

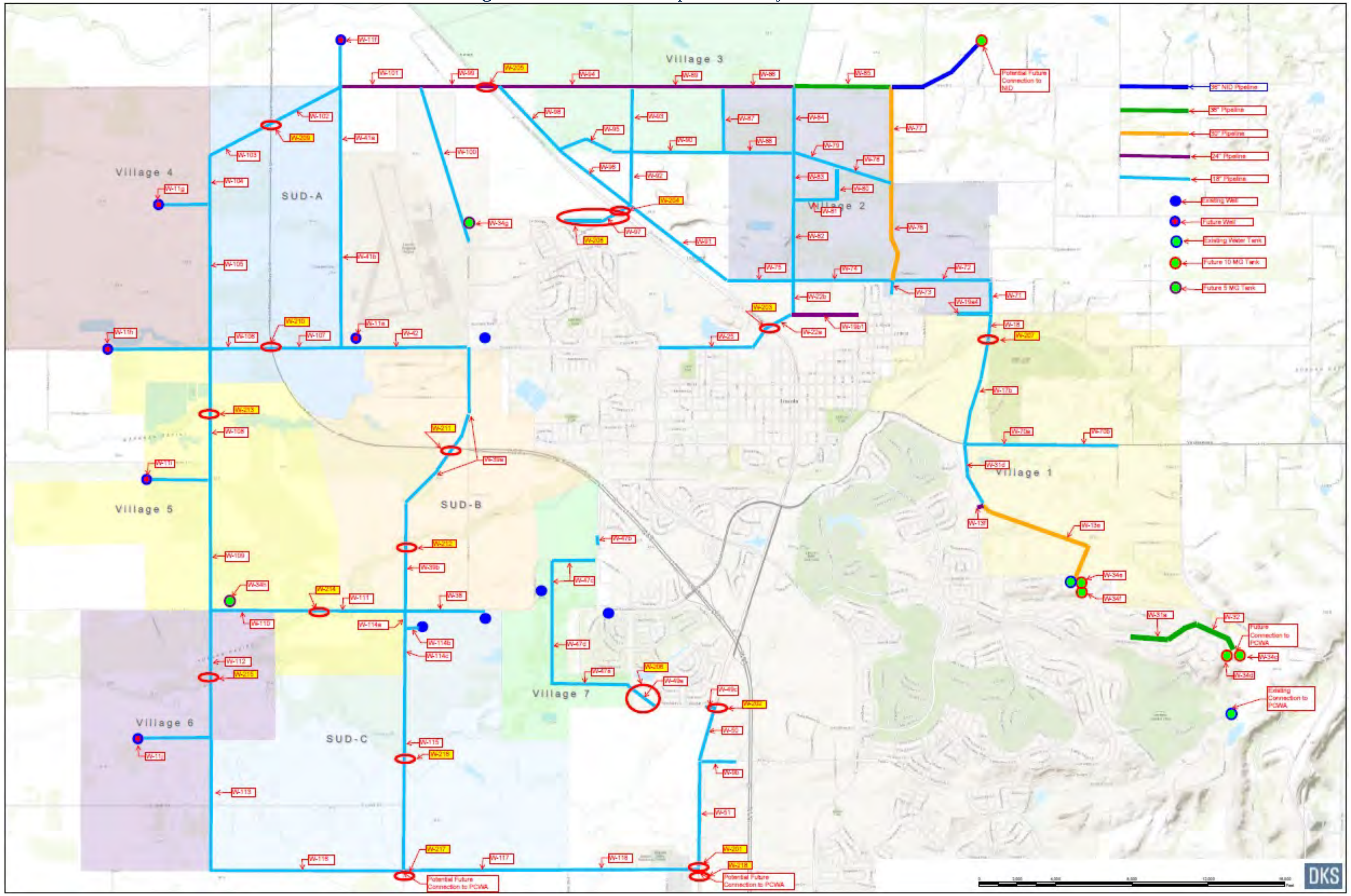
Figure 11-17 – NID Future Transmission Facilities



11.7 Summary of CIP Projects Necessary for Build-out

All of the internal City projects considered in this Chapter are currently planned for development in order to meet build-out demands in the City of Lincoln. The projects are collectively shown in the following map shown in **Figure 11-18**. This figure does not depict the major infrastructure projects that were noted in **Section 11.6**. The City will continue to investigate the feasibility of the identified external projects and consider those projects in the context of the City's water supply reliability assessments as noted in **Chapter 7**.

Figure 11-18 – Master Map of CIP Projects[17]



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[17] Map as of February 22, 2016

The details of all pipes included in this analysis are detailed in the table below. Total costs are estimated in 2015 dollars to be about $120 million before accounting for the extra costs of creek, rail, and highway crossings[18].

Table 11-14 – PFE Pipes

* BO *	PFE Proj. No.	Length (ft)	Dia. (in)	Estimate Cost
E. Wise Road	W-85	4,090	36	$ 3,416,302.08
D/S Reservoir 1-repl 20"	W-13e	6,800	30	$ 4,732,800.00
D/S Res 1 Tank-repl 20"	W-13f	1,000	30	$ 696,000.00
S. off P-5948	W-76	4,152	30	$ 2,889,931.20
S off NID 36" at Wise Rd	W-77	3,896	30	$ 2,711,824.80
Wise Rd, w of P-5984 & P-5946	W-101	3,145	24	$ 1,751,136.00
Virginiatown, W of East@McCoffin	W-19b1	2,672	24	$ 1,487,602.56
Moore Rd , e of Nelson	W-38	2,851	24	$ 1,587,436.80
Wise Rd, east of P-5972	W-86	7,055	24	$ 3,928,224.00
Wise Rd , east of old H65	W-94	4,987	24	$ 2,776,761.60
Wise Rd west of old H65	W-99	3,315	24	$ 1,845,624.96
W of H65, s from Wise Rd	W-100	5,745	18	$ 2,398,944.96
Wise to Dowd, nw corner	W-102	3,800	18	$ 1,586,880.00
	W-103	3,958	18	$ 1,652,860.80
Dowd Rd, N P-6072 from Nicolaus	W-104	2,513	18	$ 1,049,261.76
Dowd Rd, N of Nicolaus	W-105	5,430	18	$ 2,267,568.00
Nicolaus Rd E from Dowd	W-106	2,600	18	$ 1,085,760.00
"	W-107	2,770	18	$ 1,156,752.00
Dowd, s of Nicolaus Rd	W-108	4,579	18	$ 1,912,190.40
Dowd Rd, n of Moore Rd	W-109	5,920	18	$ 2,472,192.00
Moore Rd, e of Dowd Rd	W-110	2,843	18	$ 1,187,236.80
"	W-111	5,000	18	$ 2,088,000.00
Dowd Rd, s of Morre Rd	W-112	5,430	18	$ 2,267,568.00
Dowd Rd, n of Athens	W-113	5,096	18	$ 2,128,089.60
Fiddyment Rd, s of Moore Rd	W-114	700	18	$ 292,320.00
To FiddmntRd from FiddmntWell	W-114b	691	18	$ 288,436.32
Fiddymnt, s of Well tie-in	W-114c	1,000	18	$ 417,600.00
Fiddyment Rd, n of Athens Rd	W-115	9,000	18	$ 3,758,400.00
Athens Rd, e of Dowd Rd	W-116	7,600	18	$ 3,173,760.00
Athens Rd , w of Industrial Rd	W-117	6,614	18	$ 2,762,006.40
"	W-118	5,500	18	$ 2,296,800.00
Oaktree Lane, n of H193	W-17b	4,768	18	$ 1,991,116.80
	W-18	1,000	18	$ 417,600.00
Crossing old Hiway 65 at Pottery	W-22	3,300	18	$ 1,378,080.00
S of Vtown, e of Old H65	W-22b	1,263	18	$ 527,428.80
Verify W-25 w of Pottery/Old H65	W-25	4,000	18	$ 1,670,400.00
Nelson Rd, s of Nicolaus Rd	W-39a	6,080	18	$ 2,539,008.00
Nelson Rd, n from Moore Rd	W-39b	5,120	18	$ 2,138,112.00
S from Wise Rd, off P-5988	W-41a	5,124	18	$ 2,139,782.40
Airport Rd, n of Nicolaus	W-41b	5,545	18	$ 2,315,592.00
Nicolaus Rd E of P-V5F-144	W-42	5,180	18	$ 2,163,168.00
N frm Moore Rd & P-6044	W-47c	4,500	18	$ 1,879,200.00
S frm Moore Rd, e of Linc Crossing	W-47d	4,000	18	$ 1,670,400.00
S end of Lincoln Crossing, frm ex 18"	W-47e	3,860	18	$ 1,611,936.00
RR Crossing in Industrial to LCrssng	W-49c	200	18	$ 83,520.00
Industrial Rd, n of Athens Rd	W-51	4,150	18	$ 1,733,040.00
Highway193, e of Oaktree	W-70a	2,907	18	$ 1,214,130.24
H193, e of P-6062	W-70b	3,263	18	$ 1,362,754.08
North of P-6324	W-71	1,450	18	$ 605,520.00
East of s end of 30-inch P-5946	W-72	4,090	18	$ 1,707,984.00
S off 30" & W-72-tie to ex.	W-73	300	18	$ 125,280.00
West of s end 30"-P-5946	W-74	4,050	18	$ 1,691,280.00
W of W-74, e of old H65	W-75	3,000	18	$ 1,252,800.00
18" e of 30"	W-78	2,201	18	$ 919,304.64
Verify Diagonal pipe w of 30"W-77	W-79	2,300	18	$ 960,480.00
S of Diagonal Pipe, w of 30" W-76	W-80	1,300	18	$ 542,880.00
"	W-81	1,400	18	$ 584,640.00
	W-82	3,210	18	$ 1,340,537.76
S of P-5952 off w end of 36' in Wise	W-83	2,056	18	$ 858,460.32
S from Wise Rd, P-5970 & P-5950	W-84	2,743	18	$ 1,145,518.56
S of Wise Rd, E of old Hiway 65	W-87	2,700	18	$ 1,127,520.00
E of H65,parallel to Wise (orP6078)	W-88	3,113	18	$ 1,299,988.80
Wise Rd, east of P-5972	W-89	4,300	18	$ 1,795,680.00
E of H65,parallel to Wise (orP6078)	W-90	4,000	18	$ 1,670,400.00
E of & parallel to old H65, n of W-75	W-91	5,800	18	$ 2,422,080.00
S., Crossing H65, from P-6352	W-92	1,500	18	$ 626,400.00
S from Wise Rd - P-5984 & 5970	W-93	2,681	18	$ 1,119,502.08
Dogleg s of Wise, e of old H65	W-95	3,800	18	$ 1,586,880.00
Wise Rd , east of old H65	W-96	4,200	18	$ 1,753,920.00
Wise Rd , east of old H65	W-97	3,000	18	$ 1,252,800.00
Twelve Bridges Dr, e of Industrial Rd	W-98	1,770	18	$ 739,152.00
				$ 118,030,547.52

[18] This preliminary cost estimates in the document are based on a $16 per inch diameter per foot with an additional 45% soft cost for design and engineering.

Chapter 12. Water Management Recommendations

The purposes of this chapter are to summarize the strategic recommendations derived from the previous eleven chapters of the Water Master Plan that meet the City's long-term water management objectives. These fundamental objectives include protecting the City's water supply reliability, improving water planning and management, and constructing the necessary infrastructure to meet current and future demands. As described in **Chapter 1**, the ever-changing California Water Framework coupled with the City's rapid expansion necessitate continued diligence on water management issues in order to protect the City's water interests. Maintaining reliable long-term water supplies requires persistent efforts to stabilize the water asset acquisition, finance and build key infrastructure, create system flexibility to adapt to changed conditions, and stabilize internal water management efforts. All of these points are fundamental to the detailed recommendations in the pages that follow.

Chapter 1. Recommendations

Chapter 1 outlined the California Water Framework's primary components and provided a brief history of the City of Lincoln's water use and management efforts. The primary recommendations derived from **Chapter 1** are to continue to monitor the big-picture issues that constitute California's Water Framework and identify additional issues as they arise and are integrated into the Water Framework. In this implementing these recommendations, the key areas that the City should continue monitoring in California's Water Framework are:

- Demographic trends and urbanization growth rates.
- Climate change and statewide hydrological pattern changes.
- Water rights law and the continuous changes to those laws.
- Water governance including the intrusion of additional State and Federal regulatory agencies into the water realm.
- Trends in integrated land and water planning, including new laws and regulations that further intertwine the two specialty fields.
- Opportunities to develop long-term infrastructure projects that may be funded by alternative sources.

From an historical perspective, and as recommended in **Chapters 10** and **11**, the City should assess the projects associated with its long-term Capital Improvement Program and replace aged infrastructure through its Facilities Replacement Program. The City should also remain cognizant of the continuous changes in water use that have permeated the City's history and anticipate that additional water use changes will occur in the future as California's economy, and the City of Lincoln, continue to evolve. Recognizing the potential for change in how and where water is used in the City translates into more intelligent and flexible water system infrastructure design.

Chapter 2. Recommendations

Chapter 2 overviewed the City's organization as it relates to water management as well as the numerous planning documents associated with water management that affect the City. The primary recommendation from this chapter is to fully integrate the land planning staff and water planning staff in future planning efforts in order to produce a logical and thorough progression for specific land planning processes. Specifically, the City should:

- Improve communications through all vertical and horizontal layers of the City's governance through the City Manager's strategic organizational staff placement and coordinated project management.
- Identify and rectify critical water cross-over issues in each department, like the importance of documenting water demand for the City Engineer and Community Development Department for infrastructure and water reliability planning as well as the billing needs of the Support Services Division.
- Create a strategic planning process for organizing and synthesizing all planning documents as described in **Chapter 2**.
- Develop a reasonable timeline to regularly modify overarching planning documents so as to best inform more detailed planning documents and development agreements. For instance, update the Water Master Plan and Urban Water Management Plan on a joint cycle every 5 years.
- Assign key staff organizational authority and consultation privileges as they are applicable to water and land planning documents.
- Create a specific land and water planning procedure that is applicable to all large and small development projects within the City. Cross-reference planning documents in the context of this planning procedure.
- Update important planning documents on a timely basis like the Housing Element of the 2008 General Plan.

- Track updates to the California Environmental Quality Act (CEQA) that are applicable to the water and land planning efforts to the City – like the California Supreme Court's *Vineyard* Decision.

- Update planning policies that are relevant to the City's ongoing water planning efforts. For example, clarifying and formalizing the policy related to the groundwater percentage that will be available for the City's annual and emergency uses.

- Establish water management and planning protocols related to low threshold projects – those that do not meet the statutory minimum for preparing water planning documentation.

- Enhance the City's water reclamation plan and develop strategies for utilizing reclaimed water either through direct delivery to City end-users or to other users so that alternative supplies can be created for additional City use.

These recommendations require a synthesized assessment of City governmental communications and departmental utility through the City Manager's office. Creating a thoughtful planning process and integrating key staff into that process requires inter-disciplinary management communication and a coordinated substantive planning review processes.

Chapter 3. Recommendations

Chapter 3 described PCWA's and NID's wholesale water facilities used by the City and planned for the City as well as the City's retail water system. The primary recommendation derived from this Chapter is to continue to document the City's specific water infrastructure so as to have accurate system representations for purposes of model development (**Chapter 9**), the Facilities Replacement Program (**Chapter 10**), and Capitol Improvement Program (**Chapter 11**). Inaccurate or incomplete information related to the City's water system may lead to poor infrastructure planning and emergency conditions. For instance, as described in **Section 3.2.2.4**, the Catta Verdera Booster Pump provides water from the City's regulated system into the Catta Verdera development. A failure of this Booster Pump station would create dire conditions for Catta Verdera as there is currently no redundant system to deliver water. The City's understanding of this infrastructure constraint led to a fast-track for the Phase III project that would direct more water assets into the Catta Verdera development from an alternative location and allow the booster pump station to become a back-up facility. Accurate mapping and cataloguing of the City's system is a foundational element for all project planning activities and should be regularly updated as new information becomes available.

Chapter 4. Recommendations

Chapter 4 details the City's water demands as needed for assessing long-term City urbanization water supplies as well as peaking factors needed for infrastructure sizing. The recommendations derived from this Chapter are as follows:

- Complete a comprehensive customer meter study every 5 years to evaluate any necessary refinements to land-use based demand factors.
- Regularly update the **Master Demand Spreadsheet Tool** in order to keep real-time demands and future demand predictions updated for project development and implementation.
- Track addresses of residential and commercial water use audits and rebate programs and analyze before and after conditions to assess the benefits of audits (including non-audited customers can help evaluate the benefits of the audit compared to naturally occurring changes in water use).
- Increase the information and functionality of the existing City SCADA system to obtain more data points to further improve pressure and flow management.
- Calibrate system meters and replace undersized system meters.
- Install additional meters on main transmission lines in key areas of the system to enable improved understanding of customer water use dynamics.
- Expand support for PCWA and NID raw water supplies to offset potable demands. Use of raw water will reduce the demands on the City's potable water infrastructure and reduce Max Day and peak hour demands.
- Expand use of recycled water and raw water to also reduce the demand on the City's potable water infrastructure.
- Investigate potential water use policies that can help manage peak hour and Max Day demands in a manner that can decrease pipeline sizing and other infrastructure expansion.

Chapter 5. Recommendations

Chapter 5 analyzes the City's surface water assets, including supplies available for potable and non-potable uses. The primary recommendation from this section is that the City should take all reasonable efforts to maintain its surface water assets from all sources. In order to implement this recommendation, the City should take the following actions:

- Assess and rectify potential discrepancies in the PCWA Treated Water Supply Contract. Such discrepancies may include the delivery status and costs associated with regulated and unregulated water supplies as well as the availability of water under certain ambiguous conditions.

- Monitor and support PCWA's permit renewal process for water right permits 13856 and 13858.

- Assess the long-term reliability of PCWA permitted water rights in light of increased demand on the American River watershed system and the water right priority date of 1958. Consider reliability in light of other regulatory demands, including those associated with maintaining endangered and threatened species in the American River and Sacramento River watersheds as well as Bay-Delta water quality requirements (discussed in **Chapter 8**).

- Fortify the City's desire to receive water assets from the Eastern Sierra watersheds rather than the Sacramento River watershed and assess the City's ability to link supply reliability to PCWA's PG&E contract entitlements as well as storage diverted into PCWA's surface water storage facilities.

- Support PCWA water system upgrades related to improving delivery reliability to the City from PCWA's American River and Yuba/Bear Rivers water assets. The Phase III pipeline and new metering station is an example of this system support.

- Assess PCWA's ability to deliver its CVP contract entitlements to areas within PCWA's service area. Such assessment may include understanding PCWA's future ability to divert and use CVP contract entitlement water from the American River watershed system as well as the Sacramento River system.

- Understand PCWA's long-term demand for its water assets throughout PCWA's service area. Assess growth rates and patterns to understand whether growth in PCWA's service area may impact the reliability of PCWA supplies delivered to the City.

- Coordinate with PCWA in its efforts to assess water supply reliability issues associated with climate change and variable hydrological runoff patterns as they change over time.

- Support PCWA and NID conveyance agreements where redundancy is created in both entities water systems in order to deliver surface supplies derived from both entities into the City from both delivery systems.

- Secure PCWA's raw water deliveries to the City of Lincoln and its SOI in order to reduce costs and demands on the potable water system and maintain a broad water supply portfolio.

- Support PCWA's decision to design and construct the Ophir Water Treatment Plant.

- Correct the potential reliability issues associated with the NID Temporary Water Service Contract to the City of Lincoln. The City should immediately meet with NID management in order to gain further assurances of the water services provided by the service contract.

- Monitor filings and developments associated with NID's pre-1914 and post-1914 appropriative water rights. Specifically, the City should continue to review the legally required filings provided by NID and assess the usability of NID's water assets in the City over time.

- Assess the long-term reliability of NID water rights in light of increased demand in Placer County and Nevada County, including demands associated with maintaining endangered and threatened species as well as Bay-Delta water quality requirements (discussed in **Chapter 8**).

- Fortify the City's desire to receive NID water assets from the Eastern Sierra watersheds.

- Support NID water system upgrades related to improving delivery reliability to the City from the American River and Yuba/Bear Rivers water assets. Improvements in conveyance through components associated with the NID Regional Water Supply Project (depicted in **Figure 3-4**) would improve delivery reliability.

- Understand NID's long-term demand for its water assets throughout NID's service area in both Placer and Nevada counties, including NID's "soft-service area." Assess growth rates and patterns to understand whether growth in NID's service area may impact the reliability of NID supplies delivered to the City. Assess the water supply reliability impacts from converting agricultural lands to urban lands.

- Coordinate with NID in its efforts to assess water supply reliability issues associated with climate change and variable hydrological runoff patterns as they change over time. Specifically, support NID's additional water rights filings as well as its commitment to build additional surface water storage to handle impacts associated with climate change.

- Secure NID's raw water deliveries to the City of Lincoln and its SOI in order to reduce costs and demands on the potable water system and maintain a broad water supply portfolio.

- Support NID's desire to design and construct the Regional Water Treatment Plant in order to create surface water supply reliability within the City of Lincoln as well as create redundant infrastructure systems capable of supporting the City in emergency outage conditions.

- Continue to develop and enhance the City's recycled water supply and develop associated uses for that supply that relieve tension on the potable water system.

- Identify non-potable demands both within and without the City of Lincoln and its SOI that may be available to use recycled water supplies.

- Update the City's master reclamation permit in order to increase the opportunities for conveyance and use of reclaimed water to areas in and around the City of Lincoln.

- Secure the City's wastewater discharges into Auburn Ravine by formally identifying those waters as foreign, developed, and salvaged supplies and documenting the utility of the supplies for the City.

- Preserve surface water assets associated with lands scheduled for development. Assign developmental water assets to the City in order to meet potable and non-potable water supply needs.

All of these recommendations will require the City management and staff to take affirmative actions in order to best protect the City's water assets for current and future uses. Preservation of the City's water supply portfolio is a fundamental component to ensure well-planned growth within the City and its SOI.

Chapter 6. Recommendations

Chapter 6 analyzes the City's groundwater system by defining the groundwater basin, assessing the City's groundwater infrastructure and uses, and highlighting the groundwater governance issues associated with the City's groundwater rights. The primary recommendation derived from this chapter is that the City should secure and preserve its groundwater rights for long-term water supply reliability. Accordingly, the City should take the following actions:

- Alter the City's water management efforts in order to meet 10 percent of its average annual demands by increasing pumping in the summer months under peaking conditions rather than throughout the course of the year. This would require revising or drafting new policies governing the quantity of groundwater available at different times throughout the year and how those supplies can be accessed. It may also require some level of infrastructure improvement in the City's water system, including additional wells.

- Identify exact volumes of groundwater needed to meet short-term and long-term water needs, including needs in emergency conditions. The City is moving from a long-term projected annual groundwater demand of approximately 11,800 acre-feet per year under the 2008 General Plan to closer to 3,500 acre-feet per year. Peaking management will require evaluation of the utility of this number over regular increments.

- Quantify the City's backup groundwater demand need. The City has historically considered emergency backup groundwater supply to be 75 percent of average day demand. With multiple surface water and groundwater sources planned in the future, assessing total groundwater needs for emergencies, including pumping durations, is a priority.

- Develop emergency water management protocols and backup electrical and treatment systems to handle water supplies in case of a large-scale outage. Emergency protocols should include identification and installation of backup generators, automated water quality testing, and redundant system management.

- Identify the best locations for peak management and emergency back up wells in the western part of the City and SOI. This assessment should coincide with the development approvals in various areas within the City and its SOI, especially those associated with active specific plan areas such as Village 5. The groundwater well identification should consider both potable and non-potable water sources.

- Preserve the agricultural wells that may be available for non-potable uses as development progresses. Numerous agricultural wells cover a broad area where General Plan development is planned. The City should work with the landowners where development is set to occur as well as the development community to identify and map the agricultural wells for potential future use.

- Conduct regular independent well system testing to ensure basin hydrology is sustained. The City should further its existing policies to monitor groundwater basin health and evaluate groundwater recharge.

- Monitor groundwater quality issues. The contamination sites already in and around the City need continued attention to ensure that any contamination area is wholly contained and meeting clean-up objectives. The City should also be diligent in monitoring its groundwater network to identify any further contamination potential.

- Assess threats to resources from industrial development as well as existing groundwater plumes. Inappropriately located industrial facilities – like mining operations – have the potential to disrupt groundwater migration and natural basin recharge. Accordingly, managing locations and operations of industrial facilities will help sustain the long-term health of the Subbasin.

- Create formal City Council policy that maintains 10 percent average annual groundwater use for City water supply operations that is calculated on a 10-year running average. The City's current policy is ambiguous to the measurement of the usage of groundwater. The running average over the course of a 10-year period would allow for fluctuations in groundwater usage based upon hydrological and climatological conditions that may impact how surface water deliveries are made.

- Preserve and store groundwater as a contingency source during drought conditions. The preservation and storage of groundwater requires developing a mechanism to account for groundwater offsets attributable to investments in surface water projects. The City should develop initial protocols to address opportunities to preserve groundwater for additional uses.

- Utilize naturally percolating groundwater to manage peaking and emergency issues. Peaking issues are associated with short-term high demand on a water system that is generally made during the high-water using months in the summer. Peaking is most acute on the hottest days of the year. The City should also preserve the percolating groundwater to handle unforeseeable emergency conditions.

- Develop groundwater recharge projects and policies beyond in-lieu recharge efforts. The City should assess the opportunities to recharge groundwater systems with systematic application of raw surface water, recycled water and potable water to spreading basin or ASR projects within and around the City. The City of Roseville was successful in developing an ASR project that may be worth considering in the City.

- Account for the regional benefits to the groundwater basin that the City's acquisition of surface water resources has created. The accounting could include an assessment of total water usage over the course of the last 10 years coupled with a reasonable calculation of loss factor. The improvement to the groundwater levels in and around the City of Lincoln should be evidence of the benefits that the City's modified water use ethic is having on regional systems.

- Assess the issues associated with increased groundwater pumping on the west side of the North American Subbasin. Long-term continued drawdown not only impacts the City's conjunctive use efforts and groundwater banking, but also changes the overall dynamics of the groundwater basin – potentially permanently. The City should actively engage the additional groundwater pumping and basin drawdown to assess potential opportunities to improve basin conditions.

- Protect local and regional flood plains in local drainage systems in order to improve opportunities for groundwater recharge.

- Engage Federal, State, and regional agencies on their governing interests in the North American Subbasin. The Federal and State agencies have diverse interests in the management of these basins and engaging these entities before problems develop should be a priority.

- Assess regional and local governing agency involvement in creating sustainability agencies. SGA has already submitted to create its own GSA under the SGMA. Since SGA's new GSA will impact groundwater planning in the North Area Subbasin, it is critical for the City to continue to be involved with the GSA formation process. As such, the City should actively participate in the formation of GSA's within the North Area Subbasin boundary.

- Coordinate GSA formation with SGA and other regional agencies. Coordinating efforts, aligning interests, and assessing opportunities should be of paramount importance over the course of the next few months.

- Facilitate stakeholder participation in creating the WPCGMP sustainability agency. The stakeholder groups may have unique perspectives in managing regional water assets and early engagement may quell unnecessary political opposition. Existing trepidation between private rural citizens and urban areas should be curtailed at the earliest possible time.

- Preserve decision-making authority for the City on any governing body formed out of SGMA. The City's groundwater rights must be preserved through active City governance in a GSA.

- Lead any GSA formation and provide staff support to execute tasks and achieve governance outcomes. Development of a political plan to work with regional entities to ensure local control of groundwater resources is paramount.

- Formulate groundwater banking protocols for the North American Subbasin through the GSA in order to allow the City to preserve and protect its existing groundwater assets. The City's financial and institutional investments to secure and deliver surface water resources have been a significant policy effort over the course of the last decade. The City must assume the benefits of its investments with the support of a robust groundwater accounting effort in the Western Placer area of the Subbasin.

- Develop a groundwater sustainability plan (GSP) under the SGMA that outlines key criteria for basin management. Such criteria should be derived from the 5 existing Groundwater Management Plans in the North American Subbasin. These GMP's provide insight on the key substantive issues relevant to neighboring agencies. The GSP must incorporate the key policy criteria from the City and follow governance objective set by the City.

- Maintain local control of groundwater resources in the GSP. Ceding groundwater assets to a regional authority may jeopardize the long-term viability of the asset to the City. Quantification of assets may be a preferred alternative to ceding reasonableness of use of assets – where the City maintains control over its quantified allocation.

- Avoid basin adjudication as an outcome of the SGMA processes of forming a GSA and GSP. This effort will require integrating local agencies, regional agencies and individual well owners into a sustainability plan. A long-term adjudication process will drain resources from all entities involved and likely result in a negotiated basin settlement. Accordingly, identifying key parameters of interested groups and stakeholders may help avoid basin adjudication.

As described in **Chapter 6**, the City's groundwater rights are important to preserve. Moreover, opportunities to better manage groundwater in the basin – both naturally occurring groundwater and banked groundwater – could help the City save money and further its long-term water management objectives.

Chapter 7. Recommendations

Chapter 7 analyzed Water Supply Reliability and whether the City's current management efforts meet this fundamental objective. In short, the chapter concluded that the City's water supply is reliable. The primary recommendation from that chapter is to continue to monitor the City's water demands, assess and fortify its water supplies, and develop infrastructure plans in light of changing conditions within and around the City. Moreover, the City should regularly synthesize these analyses in order to determine present and future water supply reliability. To further this recommendation, the City should:

- Continue to assess its water demands as drafted in **Chapter 4**.

- Continue to examine and augment its water supply portfolio as discussed in **Chapters 5** and **6**.

- Continue to analyze the City's infrastructure conditions and need in the context of **Chapters 3**, **9**, **10** and **11**.

Chapter 8. Recommendations

Chapter 8 focused on the key strategic issues affecting the City's water assets that have statewide significance. California's water management system is fluid. Regulatory issues continue to emerge and evolve, changing the oversight landscape. The purpose of this chapter is to outline the list of issues and prioritize City actions related to those issues, enabling the City to take appropriate steps to protect its water assets and secure long-term supply reliability. The primary recommendation of this chapter is to engage in these ongoing broad water management issues through the listed venues while continuing to re-prioritize engagement as emerging issues take precedence. The City should engage as follows:

- Regional Water Authority – The City should continue to be a leading entity in RWA. The evolution of that entity from implementation of the WFA to a regional advocacy and IRWMP implementation program direct impacts the City's long-term water asset management strategy.

- WPCGMP – The City should take a leadership role in the WPCGMP as that entity is developing the Western Placer County region's efforts in complying with the 2014 Sustainable Groundwater Management Act.

- Bay Delta Water Quality Control Plan Update – The City should engage with regional stakeholders on the WQCP Update. This effort could implicate all of the City's water assets directly and permanently. RWA should work diligently to engage this issue with City support.

- Sustainable Groundwater Management Act (SGMA) – The City should work to influence the SGMA implementation. The stakes to the City's groundwater assets are high and, as described in **Chapter 6**, the creation of a Groundwater Sustainability Agency (GSA) and Groundwater Sustainability Plan (GSP) will have lasting implications to the City.

- Regional Groundwater Use and Quality – The City should be constantly vigilant about groundwater use and quality in the North American Subbasin. Monitoring within the City is paramount but assessing plume migration, water rights issues, and associated uses within and without all of Placer County should also be closely monitored.

- SWRCB Authority – The City should be addressing the expansion of SWRCB authority of surface water and groundwater. The demand reduction order in 2015 indicates that the SWRCB believes in authoritative management of water supplies and demands. And SWRCB's incursion into groundwater regulation should be carefully monitored. Specifically, the City should be particularly interested in the application of the public trust doctrine to the North Basin groundwater resources (see **Chapter 6**).

- Water Conservation and Water Use Efficiency – The City should continue to implement its water conservation and water efficiency measures. Importantly, the City should document the water savings under Water Code sections 1010 and 1011 and assert control over the conserved water assets for City benefit.

- PCWA Permit Renewal Process – The City should support PCWA in all aspects of its permit renewals on water right permits 18356 and 18358 so as to preserve the supplies available under those rights for uses in the City of Lincoln and its SOI as well as other areas in PCWA's service area.

- City Groundwater Banking – The City should continue to develop and refine its conjunctive use efforts. The City should work one-on-one with neighboring agencies to gather support for developing groundwater banking protocols and incorporating those protocols into any GSA or GSP affecting the North American Subbasin. The City should be working with RWA and SGA in the context of those entities current development of groundwater banking programs.

- Water Forum – The City should work with PCWA to monitor implementation of the WFA and PCWA's PSA. The City's leadership position within RWA may provide political support to PCWA's efforts and provide for a more active role for the City in supporting the WFA. The LAR may be an important component to afford particular attention.

- WaterFix and EcoRestore Programs – The City should continue to monitor the WaterFix and EcoRestore Programs and understand the implications of the construction of the tunnels on City's water assets. The City should work with RWA and encourage RWA staff to prepare regular reports on this effort. The City should consider joining regional litigation efforts through participating agencies in order to further support the City's interests in regional supply reliability.

- Climate Change – The City should monitor scientific studies on climate change and the impacts of climate change to the American River and Yuba/Bear Rivers watersheds. The City may seek to work with RWA to commission an assessment of such impacts.

- Delta Plan – The City should work with RWA staff to obtain regular updates on the Delta Stewardship Council and the implementation of the Delta Plan. The City should monitor legislative efforts aimed at expanding the authority of the Delta Stewardship Council and the influence of the Delta Plan to upstream watersheds.

- ACWA – The City should consider joining ACWA in order to better position itself as a leader in water asset management issues. The City's projected buildout population coupled with the development of the regional water treatment facility necessitate broader participation in statewide water management activities.

All of these issues and venues impact the City's water supply reliability. Strategic engagement in the appropriate venues may prove more beneficial in protecting the City's water interests than a full engagement approach where the City attempts to be involved in all venues at all times. Importantly, teaming with other local and regional interests could provide more substantive engagement with coordinated issue identification and monitoring.

Chapter 9. Recommendations

Chapter 9 delineated the primary model representations and assumptions associated with the City's infrastructure system. The items below are the recommended actions needed to maintain the quality of the City's treated water model and improve its accuracy.

- Conduct normal year max day fire flow tests and re-calibrate the model to within 10% of the test calibration.
- Continue O&M operations and update the model with system changes created in this process.
- Continue to update model with as-builts and maps of areas that lack thorough information, especially related to components of the existing system.
- Establish records of areas without redundancy or fire flow capacity and plan for field upgrades.
- Update the model incrementally with each new development to document needed infrastructure to meet supply criteria.
- Integrate new operations technologies such as AMI or advanced SCADA into the model as they become available.
- Check alternate pipe alignments and pipe designs against build-out and intermediate phase models to identify potential impacts.
- Ensure treated water models reflect all City-planned Capital Improvements and Facility Replacements for the treated water system.
- Formally review, update, and adopt updated system design and engineering standards for the water system.

- The City should require developers through newly adopted policies to perform and submit development specific water modeling with defining parameters and product expectations.

- Siting, design, and construction of the City's CIP projects involving storage tank, well production and booster pump station facilities, along with PCWA and NID water supply contracts should be thoroughly vetted and coordinated with City Staff and Management.

- Revise the policy language so that the design standards follows the design and operational criteria set in the most recent version of the California Fire Code, dated 2013.

- Establish a City Policy of well use for peaking and minimized use in non-peak demand periods (see **Chapter 6**).

- Establish a City Policy of total well pumping capacity to be greater than or equal to 75% of average day demand in order to manage emergency conditions.

- Establish a City Policy that well pumping capacity must account for 1 well to be offline as backup for every 3 in operation.

- Establish a City Policy that well pumping target should be 10% of average annual demand as seen on a 10 year running average.

- Establish a Design Standard that City Wells should be capable of producing at least 1 MGD (1,400 GPM for 12 hrs. per day).

- Establish a Design Standard that new a City Well shall operate on Variable Frequency Drive (VFD).

- Establish a City Policy that minimum storage shall provide 50% of average day capacity, plus fire flow storage, as well as an emergency storage volume while leaving 10% of average day minimum head space.

- Establish a City Policy that additional storage facilities shall be constructed as additional demands are placed on the system.

- Establish a Design Standard of no mains smaller than 8 inches.

- Establish a Design Standard of no non-looped mains longer than 2,000 feet.

- Establish a Design Standard of no looped mains smaller than 12 inches.

- Establish a Design Standard that pipes shall follow the criteria set **Section 9.5.2.**

- Establish a City Policy that demand multipliers shall be monitored yearly and updated as system operations change.
- Establish a City Policy that future system infrastructure shall not require frequent PRV adjustment in order for the system to remain balanced.
- Establish a Design Standard of operating pressures between 50 and 130 psi.
- Establish a Design Standard of operating pressures during peak hour of maximum day shall not drop below 40 psi.
- Establish a Design Standard of operating pressures during a maximum day fire flow event shall not drop below 20 psi.
- Establish a Design Standard of operating velocities maintained below 7 ft/sec during maximum day demands.
- Establish a Design Standard of operating velocities maintained below 10 ft/sec in maximum day fire flow demands.
- Establish a Design Standard of operating velocities maintained below 10 ft/sec in maximum day peak hour so long as all other hours follow the 7 ft/sec standard.

Chapter 10. Recommendations

Chapter 10 described the City's Facilities Replacement Program needed to address aging and undersized water infrastructure facilities in the City. The primary recommendation derived from this Chapter is that the City continue its efforts to update system infrastructure replacement by identifying and prioritizing vital components of its water system management. The FRP outlined in Chapter 10 identifies the ongoing efforts of the City and can be used as the primary reference for City FRP-related actions.

Chapter 11. Recommendations

Chapter 11 described the City's Capitol Improvement Program (CIP). This program requires analyzing and assessing the City's long-term infrastructure needs and expenditures based upon the City's growth projections. The primary recommendation from this Chapter is to continually assess the City's long-term capitol improvement project needs and assign costs associated with those projects to development interests before the projects are finalized. As such, we recommend the following actions:

- Refine the meaning of water supply reliability as described in Chapter 7 in the context of the major water infrastructure projects that are being considered for development. As refinements occur, adjust CIP projects to meet projected needs.

- Undertake rigorous cost assessment of major potable water infrastructure projects – specifically, NID’s Regional Water Supply Project and its associated infrastructure as well as PCWA’s Ophir Water Treatment Plant project and its associated infrastructure.
- Develop a strategic assessment team that will organize CIP potable water projects and create processes to determine each project’s utility. Utilize strategic assessment team to allocate costs for projects in coordination with City finance team.
- Complete long-term financial assessment that addresses the mechanisms to pay for CIP projects.
- Analyze CIP projects for non-potable water supply systems that may have dual utility to the City for emergency potable supply purposes.
- Coordinate CIP projects with Waste Water Treatment and Reclamation Facility improvement projects.
- Continue to utilize City water infrastructure model outlined in **Chapter 9** to analyze major in-City water infrastructure improvements that are needed for incorporation in major City development projects.
- Coordinate CIP project development with PCWA and NID in order to address long-term infrastructure planning as well as financial considerations.

The City’s CIP projects have been analyzed in the context of the City’s 2008 General Plan land uses as well as more recently adopted specific plans relevant to City growth. Projects assessed in this section should continually be reviewed based upon long-term growth projections assessed by the City.