Figure 6-1 depicts all of the identified recycled water alignments. The alignments were named based on the street where the POC to the existing recycled water distribution system is located. Each of the alignments is discussed in further detail, including pipe lengths, sizing, and costs, in **Section 7 and 9**. **Appendix J** contains the detailed market assessment for each alignment identified in **Table 6-1**.

6.3.3 Industrial Customers

Several alignments have the potential to serve industrial customers for cooling purposes. Those customers are located along Duane Avenue and Kifer Road West alignments as well as along the existing recycled water system alignments (considered "Infill") and include the following:

- Applied Materials Inc.
- Advanced Micro Devices
- Spansion LLC
- Northrop Grumman Corp
- Onizuka Air Station
- AMB Property

The total Industrial demand for the abovementioned customers is estimated to be an additional 214 AFY. It is noted that there are multiple customers along the Kifer Road East alignment that are located outside of the City limits within the City of Santa Clara have potential recycled water demands for both irrigation and industrial use. Customers located within the City of Santa Clara were not included in this market assessment as potential recycled water customers; however, future discussion with the City of Santa Clara and those customers may be worthwhile.

6.3.4 Moffett Field Customers

Initial metering data provided by the City indicates that there is the potential to convert a number of landscape services in the Moffett Field area to recycled water. There are currently two large users in the area including the Golf Club at Moffett Field and one of the Lockheed-Martin facilities. These two facilities have a demand of 119 AFY and 25 AFY respectively. There are a handful of other recycled water services that amount to less than five AFY. There are a number of metered landscape service location ID's in the Moffett Field area that may be potential retrofits; however, specific customer information for these location ID's was not available due to the fact that they are located outside of the City limits. The estimated potential demand for recycled water irrigation in the Moffett Field area is approximately 50 AFY.

Further discussion with the Moffett Field Business Group and a better understanding of where each of the services is located will determine the feasibility of each retrofit. **Appendix I** provides the list of existing customers, which includes existing Moffett Field customers.

6.4 Customers to Interview

Working face-to-face with potential key customers early in the process is critical to presenting the program in the best possible light. This first customer meeting would be intended for the City and HydroScience to assess how much potential recycled water demand truly exists and determine what requirements the customers have (typically related to issues such as water quality, complexity of onsite retrofits, supply reliability, return on investment, and pricing). Key customers can be used to "anchor" a geographic area within the City and support extension of recycled water supply to that area. Critical issues may include customers' perceived value and reaction to the new water type. Interviews will facilitate understanding public and customer perceptions and interfacing with potential customers and the surrounding community to best understand and mitigate their concerns.

These interviews would be coordinated with the outreach activities currently in place with other local recycled water entities as necessary, depending on the proposed future configuration of the City's recycled water distribution system. Customer interviews will be designed to assist in gauging user's perception and knowledge of the City's recycled water system, their price sensitivity, and to identify potential barriers to the marketing of recycled water. Below is a list of key potential customers to interview:

- Sunken Gardens Golf Course
- Sunnyvale School District
- City of Sunnyvale Parks and Recreation
- Moffett Field Business Group
- Industrial Customers such as AMD, Applied Materials, and Northrop Grumman Corp

HydroScience developed a Marketing Plan for the City to describe the potential marketing tools available to the City and to provide a plan for the City to market recycled water for industrial and irrigation purposes to its stakeholders including elected officials, the community, and potential recycled water customers. A marketing plan is an important element of a Feasibility Study and assures that the City has a plan to reach out to stakeholders and educate them about the project and resolve any potential or existing issues and concerns presented by them. Public perception is an important aspect of the project that can determine its success and a marketing plan can serve to help avoid potential controversy. The two primary goals of the marketing plan are to:

- Provide stakeholders with adequate information about the project to secure support; and
- Successfully market to potential customers to secure users.

The Marketing Plan is attached as **Appendix G**.

SECTION 7 – RECYCLED WATER ALIGNMENTS

Information within this section includes a description of the alignment and any key issues. Potential issues including canal crossings, expressways/freeways, and local railway systems were taken into consideration when routing pipeline alignments. Either pipelines were routed to avoid these areas or costs were included to account for special construction at these locations. Alignment routing was then optimized to maximize demands with the shortest length of pipe.

This section describes the sixteen recycled water alignments identified for recycled water distribution. Together, these alignments represent a total of 97,600 LF of pipe that would connect 131 customers and deliver approximately 1,726 AFY of recycled water. Infill customers that are currently located along existing recycled water pipelines would add an additional recycled water demand of 335 AFY, and potential customers in Moffett Field would demand an additional 50 AFY. Full buildout of these sixteen alignments, infill, and connection of Moffett Field would result in an additional 2,111 AFY of recycled water demand. The addition of the proposed pipelines would approximately double the length of the City's existing recycled water distribution system. **Figure 6-1** depicts all of the identified recycled water alignments. The alignments are grouped as follows:

- **Existing System Expansion:** These pipelines connect to the existing recycled water system and do not require the construction of either base alignment.
- **Base Alignments:** These alignments are intended to provide system reliability as well as a backbone to the system expansion to the south beyond the existing distribution system.
- **Wolfe Road Main Extensions:** These alignments first require the construction of the Wolfe Road Main prior to individual alignment construction.
- **Main Loop Extensions:** These alignments first require the construction of the Main Loop prior to individual alignment construction.

The alignments were named based on the street where the POC to the existing/proposed recycled water distribution system is located. Figures are provided at the end of this section. A description of each alignment follows below.

7.1 Existing System Expansion Alignments

There are five alignments that can be constructed utilizing the existing recycled water distribution system. The alignments include:

- Lakehaven Drive
- Maude Avenue
- Duane Avenue
- Kifer Road East
- Kifer Road West

Each of these alignments does not require prior construction of another pipeline alignment, and are further described below.

Lakehaven Drive

This alignment would include the construction of new 6-inch and 8-inch pipelines with a total length of 4,100 LF. The pipeline would connect to the existing 24-inch recycled water mainline located at Lakehaven Drive at the Sunnyvale East Channel, then continue east then north along Meadowlake Drive, and east along Lakechime Drive. **Figure 7-1** shows the pipeline alignment.

This alignment would serve several sections of the John W Christian Greenbelts along Lakehaven Drive, Lakewood Park, and Lakewood Elementary School. The 11 sites identified as potential retrofits have a combined irrigation demand of approximately 86 AFY. The construction of this alignment is expected to occur in a single phase. Some coordination with the District and SFPUC will be required as the existing distribution system pipeline runs along a District ROW, the Sunnyvale East Channel, and the new alignment will cross and serve the greenbelt that is an easement for the SFPUC Bay Division Pipelines No. 3 and 4.

Maude Avenue

This alignment would include the construction of approximately 6,800 LF of 6-inch pipeline to serve two sites with a combined irrigation demand of approximately 36 AFY. The POC for this alignment would be the existing 24-inch pipeline at the intersection of the Sunnyvale East Channel and Maude Avenue. **Figure 7-2** shows a map of this alignment.

From the POC, the pipeline would travel west along Maude Avenue to Bishop Elementary School. Additionally, a lateral would run north from Maude Avenue along Bayview Avenue, head west on Eaglewood Avenue, and then north on San Diego Avenue to serve the Columbia Middle School and Park.

If this alignment were to be extended west to connect to the existing 16-inch pipeline near the intersection of Maude Avenue and Macara Avenue to loop the northern recycled water service area, then it is expected that the pipeline diameter for the portion of the alignment that runs along Maude Avenue would be upsized accordingly. Additionally, there are multiple small customers along the pipeline alignment with less than one AFY of estimated recycled water demand that have been identified as optional retrofits. The construction of this alignment is expected to occur in a single phase.

Duane Avenue

This alignment would include the construction of approximately 16,500 LF of pipeline ranging in diameter from 6- to 12-inches. The new pipeline would connect to the existing 24-inch recycled water pipeline at two locations: Duane Avenue at the Sunnyvale East Channel and Arques Avenue at Wolfe Road. **Figure 7-3** shows a map of this alignment.

From these two POCs, the recycled water pipeline would extend to the east to provide recycled water to an area roughly bordered by Duane Avenue to the north, Lawrence Expressway to the east, Central Expressway to the south, and the existing 24-inch recycled water pipeline to the west. The pipeline would form a loop that would run east along Duane Avenue that loops south and west, becoming Stewart Drive. At the intersection of Duane Avenue and De Guigne Drive, the alignment runs south along De Guigne Drive across Stewart Drive to Arques Avenue. The alignment continues east along Arques Avenue to

Santa Trinita Avenue, which it runs north along before tying back into the pipeline at Stewart Drive. Major customers on this alignment include the Advanced Micro Devices (AMD) Campus and Applied Materials.

Twenty-three sites are identified as potential retrofits and have an estimated irrigation demand of 273 AFY and industrial demand of 156 AFY. The construction of this alignment is expected to occur in a single phase.

Kifer Road East

This alignment would include the construction of approximately 5,000 LF of pipeline ranging in diameter from 6- to 8-inches. **Figure 7-4** shows a map of this alignment.

From the POC to the existing 24-inch pipeline at the intersection of Kifer Road and Wolfe Road, the pipeline would run east along Kifer Road. Five commercial/industrial sites with a combined irrigation demand of approximately 51 AFY would be served by this alignment. Multiple optional customers were also identified. The construction of this alignment is expected to occur in a single phase.

Kifer Road West

This alignment would include the construction of approximately 1,900 LF of 6-inch pipeline from the existing 24-inch pipeline at the intersection of Kifer Road and Wolfe Road west along Kifer Road to Fair Oaks Avenue. **Figure 7-5** shows a map of this alignment.

This alignment would serve five sites with a combined recycled water demand of approximately 54 AFY. One of these sites, Northrup Grumman, would be an industrial user with an estimated recycled water demand of approximately 39 AFY. The other four sites would be irrigation customers with a combined irrigation demand of approximately 15 AFY. This alignment would cross the District's Sunnyvale East Channel, which will require special construction. The construction of this alignment is expected to occur in a single phase.

7.2 New Base Alignments

There are two base alignments that have been identified and analyzed as part of the Feasibility Study, including:

- Wolfe Road Main
- Main Loop

The Main Loop connects the east and west portions of the system to increase reliability. The Wolfe Road Main facilitates further expansion to the South and opens the door to regional connectivity with neighboring systems. Each alignment is described in further detail below.

7.2.1 Wolfe Road Main

The Wolfe Road Main pipeline alignment would include the construction of a new pipeline with a diameter ranging from 12- to 24-inches and have a total length of approximately 13,300 LF. The pipeline would connect to the existing 24-inch recycled water pipeline at the

San Lucar pump station, near the intersection of Kifer Road and Wolfe Road. **Figure 7-6** presents a map of this pipeline alignment.

The Wolfe Road Main pipeline would travel south along Wolfe Road from the San Lucar Pump Station to the intersection of Homestead Road, which is the boundary between the Cities of Sunnyvale and Cupertino. The pipeline would terminate within 100 ft of the intersection of Wolfe Road and Homestead Road, where it would serve the Apple® Campus 2 in Cupertino. A total of 11 sites have been identified along the Wolfe Road alignment and have a combined irrigation demand of approximately 110 AFY. It is estimated that the combined landscape irrigation and industrial demand for the Apple® Campus 2 is approximately 235 AFY. Another major customer on this alignment would be the Sunken Gardens Golf Course. This project is expected to be constructed as a single phase.

Construction of this alignment would require crossing the Peninsula Corridor Joint Powers Board (Caltrain) right-of-way (ROW) located just south of the San Lucar Pump Station, as well as the California Department of Transportation (Caltrans) ROW at El Camino Real (Highway 82). At both locations, a bore-and-jack method of pipeline construction complying with the respective Caltrain or Caltrans design standards is expected for construction.

Construction of this alignment would also facilitate the construction of multiple other alignments. Four potential alignments, including the proposed Main Loop, are connected to Wolfe Road Main. Additionally, the proposed Wolfe-Evelyn storage tank site is connected to the Wolfe Road Main.

It is noted that this pipeline is expected to be partially funded by others. Apple® has committed to funding the equivalent of a 12-inch recycled water pipeline along this entire alignment. This funding commitment was previously quantified to be equivalent to approximately $4.8M. Cal Water also has the potential to fund up to $1.5M of this project, depending on California Public Utilities Commission (CPUC) approval for funding of recycled water projects within its service area. Additionally, the District may also fund a portion of this pipeline, and potentially own this pipeline.

For the purpose of this analysis, the cost for the base Wolfe Road alignment is presented. Additional Wolfe Road pipeline alignment cost estimates for upsizing the 12-inch portion of this alignment to a 16-inch, 30-inch, or 42-inch are included in **Appendix K**. The cost-sharing options for the Wolfe Road Main and other potential pipeline alignments, are also included in the CIP.

7.2.2 Wolfe Road Main Extensions

The construction of the following alignments is contingent upon the construction of the Wolfe Road Main. There are three potential alignments including:

- Iris Avenue
- Marion Way
- Dartshire Way

Each of these alignments is described in further detail below.

Iris Avenue

This alignment would include the construction of approximately 2,300 LF of 6- and 8-inch recycled water pipeline connecting from the proposed Wolfe Road Main to the Ponderosa Elementary School and Ponderosa Park. **Figure 7-7** shows a map of this alignment.

The two sites identified as potential retrofits have a combined irrigation demand of approximately 55 AFY. Along this alignment, there are no known constructability issues. The construction of this alignment is expected to occur in a single phase.

Marion Way

This alignment would include the construction of approximately 2,600 LF of 6-inch recycled water pipeline connecting to the proposed Wolfe Road Main and extending east on Marion Way and Dunford Way to serve Peterson Middle School, Raynor Park, and Parent Preschool. **Figure 7-8** shows a map of this alignment.

The three sites identified as potential retrofits have a combined irrigation demand of approximately 30 AFY. Along this alignment, there are no known constructability issues. The construction of this alignment is expected to occur in a single phase.

Dartshire Way

This alignment would include the construction of approximately 5,500 LF of 6- and 8-inch pipeline from the proposed Wolfe Road Main to the Stocklmeir School, Ortega Park, and Panama Park. **Figure 7-9** shows a map of this alignment.

From the POC the pipeline would travel west along Dartshire Way to service Panama Park, then continue south along Flamingo Way, west on Dunholme Way to service Stocklmeir School, and an extension would head south off of Dunholme Way along Condor Way to feed Ortega Park. This alignment would cross the District’s Sunnyvale East Channel, which will require special construction.

The three potential retrofits have a combined irrigation demand of approximately 65 AFY. The construction of this alignment is expected to occur in a single phase.

7.2.3 Main Loop

The Main Loop alignment would connect the existing 16-inch recycled water distribution pipeline at Encinal Park to the proposed Wolfe Road Main pipeline alignment. This alignment would provide a loop to the northern zone of the City's recycled water distribution system; provide the backbone infrastructure required to significantly increase recycled water deliveries and operational flexibility; extend the recycled water pipeline to the two potential recycled water storage tank locations; and also connect additional customers. **Figure 7-10** shows the pipeline alignment. Major customers on this alignment include City Hall, Washington Park, and Las Palmas Park.

The total alignment length is approximately 24,800 LF. Pipeline diameters along this alignment would range from 16- to 24-inches. Along this Main Loop alignment, a pressure-reducing valve would interconnect the northern and southern recycled water zones. There

are 43 sites identified as potential retrofits directly on the Main Loop, which have a combined irrigation demand of approximately 335 AFY. Multiple optional retrofits were also identified.

Construction of this alignment would also facilitate the construction of multiple additional alignments. Seven alignments, including the proposed Wolfe Road pipeline are connected to the proposed Main Loop. Additionally, the Main Loop would facilitate connection and use of the Central storage tank site.

This alignment crosses multiple ROWs including the Caltrans ROW at Central Expressway and twice at El Camino Real (Highway 82), the Caltrain ROW at Mary Avenue, and the District's Sunnyvale East Channel near old San Francisco Road and Ironwood Terrace. For all of these crossings, a bore-and-jack method of pipeline construction is expected to be utilized that complies with the requirements of the respective property holder (i.e. Caltrans, Caltrain, or District). Despite the challenges mentioned above, the construction of this alignment is expected to occur in two phases to loop the northern and southern sections of the recycled water system.

It is also noted that construction of the Main Loop will increase the ability of the Sunnyvale recycled water distribution system to provide recycled water to a satellite advanced water treatment facility operated by the District. However, demands associated with this potential facility were not included in this Feasibility Study.

7.2.4 Main Loop Extensions

The construction of these alignments is contingent upon the construction of the Main Loop. There are six potential alignments including:

- Gail Avenue
- Old San Francisco Road
- Manet Drive
- Sunnyvale-Saratoga Road
- Remington Drive
- Carson Drive

Each of these alignments is described in further detail below.

Gail Avenue

This alignment would include the construction of approximately 1,700 LF of pipeline from the Main Loop to Braly Elementary School and Park. **Figure 7-11** shows a map of this alignment.

From the POC at the Main Loop, an 8-inch pipeline would run south along Gail Avenue to provide irrigation service to Braly Park. From Braly Park, a 6-inch pipeline would continue to the west along Gail Avenue and Daffodil Court to provide irrigation service to Braly Elementary School. Two additional HOAs would be connected to this pipeline alignment.

The four sites identified as potential retrofits have a combined irrigation demand of approximately 39 AFY. The construction of this alignment is expected to occur in a single phase.

Old San Francisco Road

This alignment would include the construction of approximately 1,500 LF of 6-inch pipeline from the Main Loop to the three potential customers: St. Martin Elementary School, Ellis Elementary School, and the Palo Alto Medical Foundation. These customers are located on Old San Francisco Road and Central Avenue. **Figure 7-12** shows a map of this pipeline alignment.

The three sites have a combined irrigation demand of approximately 26 AFY. The construction of this alignment is expected to occur in a single phase.

Manet Drive

This alignment would include the construction of approximately 1,100 LF of 6- and 10-inch pipeline connecting to the Main Loop and extending south on Manet Drive. **Figure 7-13** shows a map of this alignment.

This alignment would provide recycled water to the Sunnyvale Community Center, Orchard Heritage Park, and two HOAs. The four sites identified as potential retrofits have a combined irrigation demand of approximately 86 AFY. The construction of this alignment is expected to occur in a single phase.

Sunnyvale-Saratoga Road

This alignment would include the construction of approximately 1,900 LF of 6-inch pipeline from the Main Loop to Fremont High School. **Figure 7-14** shows a map of this alignment.

The five sites identified as potential retrofits have a combined irrigation demand of approximately 14 AFY. It is noted that Fremont High School is a Cal Water customer and has undergone recent construction converting grass fields to artificial turf fields, and although the Fremont High School meter data demand is included in this total, it is expected that their actual irrigation demand may be higher than presented in **Appendix J**. The construction of this alignment is expected to occur in a single phase.

Remington Drive

This alignment would include the construction of approximately 7,100 LF of 6-inch pipeline from the Main Loop to Mango Park, De Anza Elementary School and De Anza Park. A lateral would extend north along Mango Avenue to provide irrigation service to Sunnyvale Middle School. **Figure 7-15** shows a map of this alignment.

The four sites identified as potential retrofits have a combined irrigation demand of approximately 59 AFY. The construction of this alignment is expected to occur in a single phase.

Carson Drive

This alignment would include the construction of approximately 1,500 LF of 6-inch pipeline from the Main Loop to Vargas Elementary School and St Cyprian Church. **Figure 7-16** shows a map of this alignment.

The two sites identified as potential retrofits have a combined irrigation demand of approximately 16 AFY. The construction of this alignment is expected to occur in a single phase.

7.3 Research Needs

The City does not anticipate conducting any further research for the recycled projects. The alternatives presented in the Feasibility Study are based on conventional pipeline, storage, and treatment technologies.

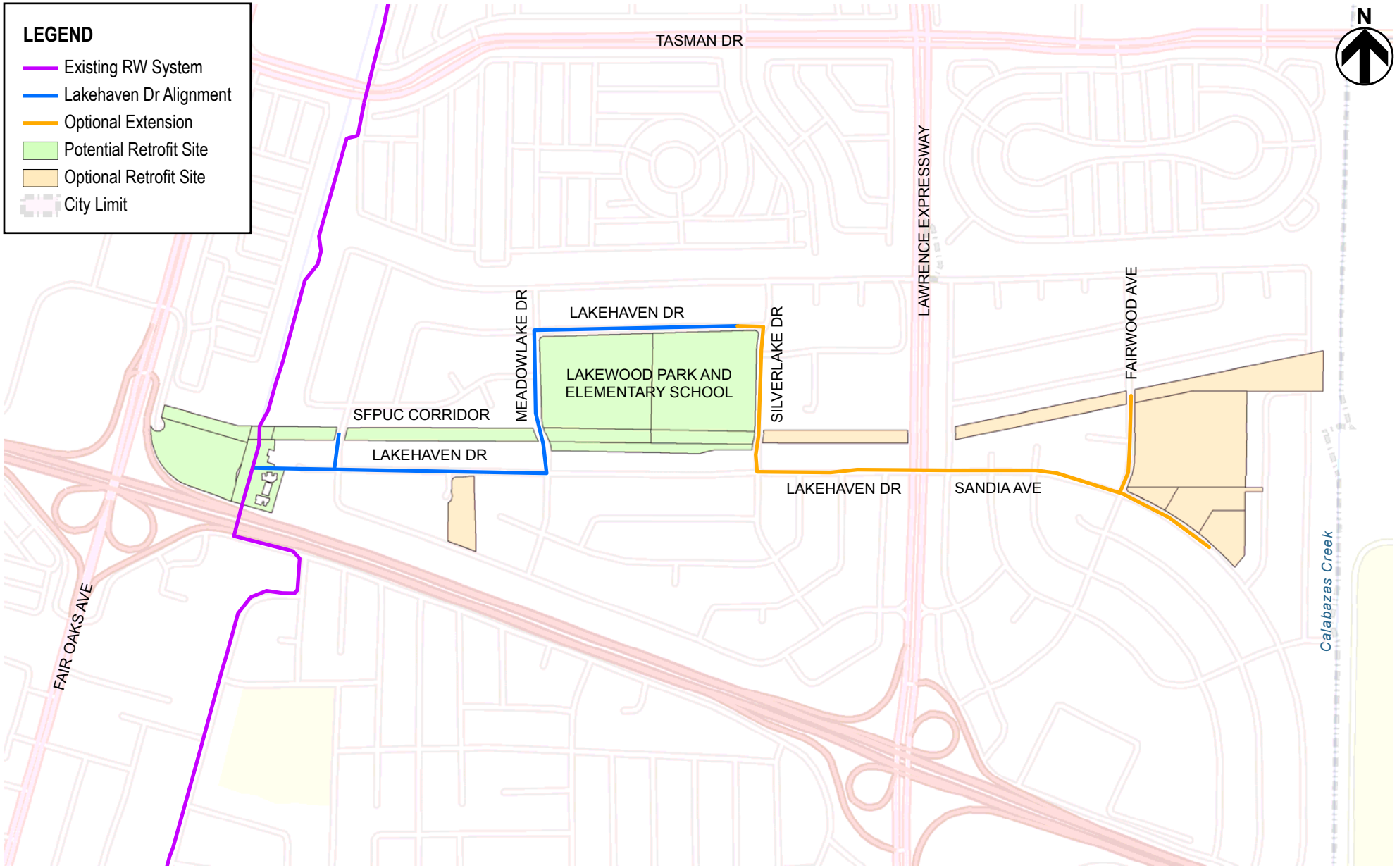


FIGURE 7-1
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
LAKEHAVEN DRIVE ALIGNMENT

HydroScience

FIGURE 7-2
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
MAUDE AVENUE ALIGNMENT

HydroScience

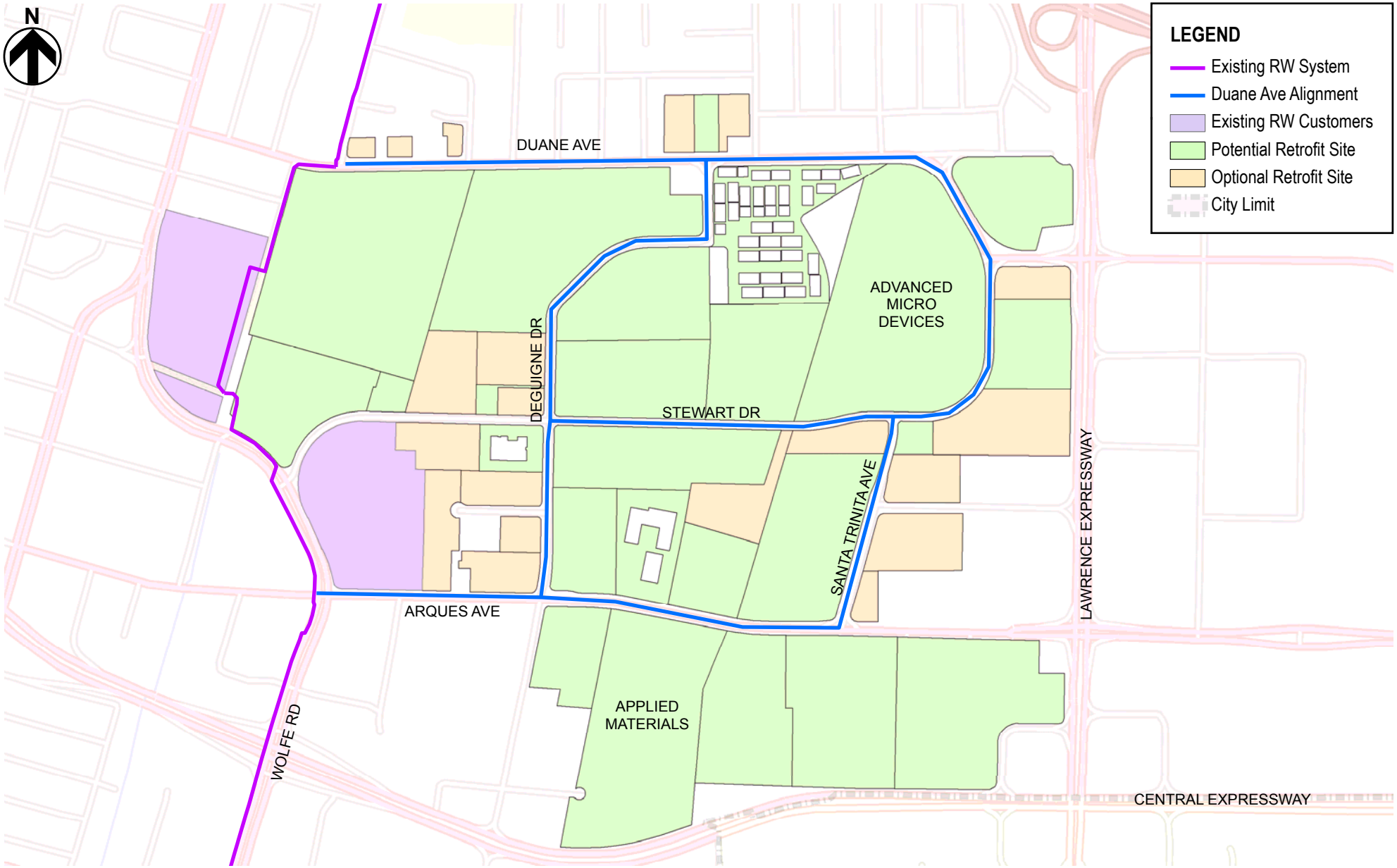


FIGURE 7-3
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
DUANE AVENUE ALIGNMENT

HydroScience

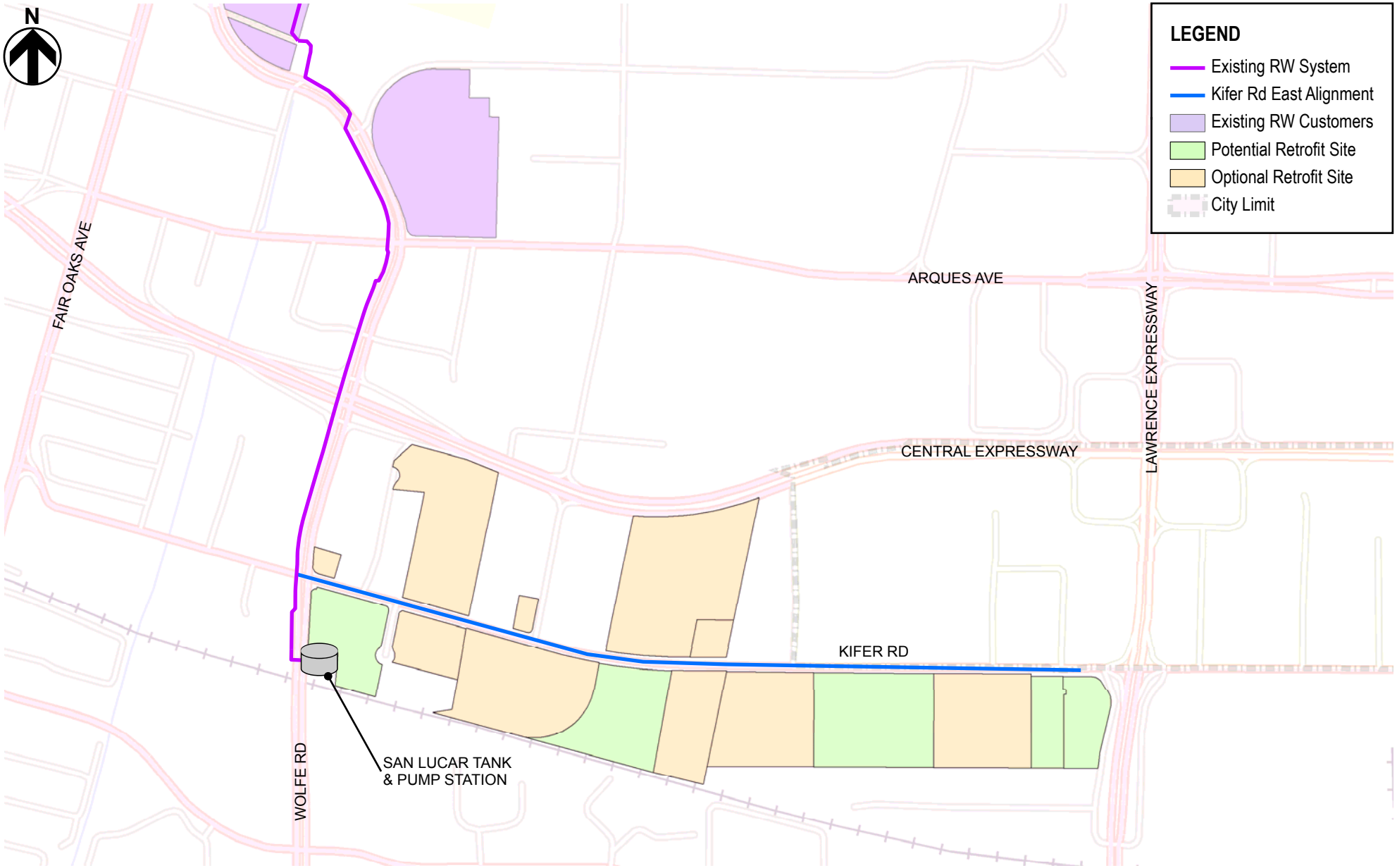


FIGURE 7-4
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
KIFER ROAD EAST ALIGNMENT

HydroScience

FIGURE 7-5
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
KIFER ROAD WEST ALIGNMENT

HydroScience

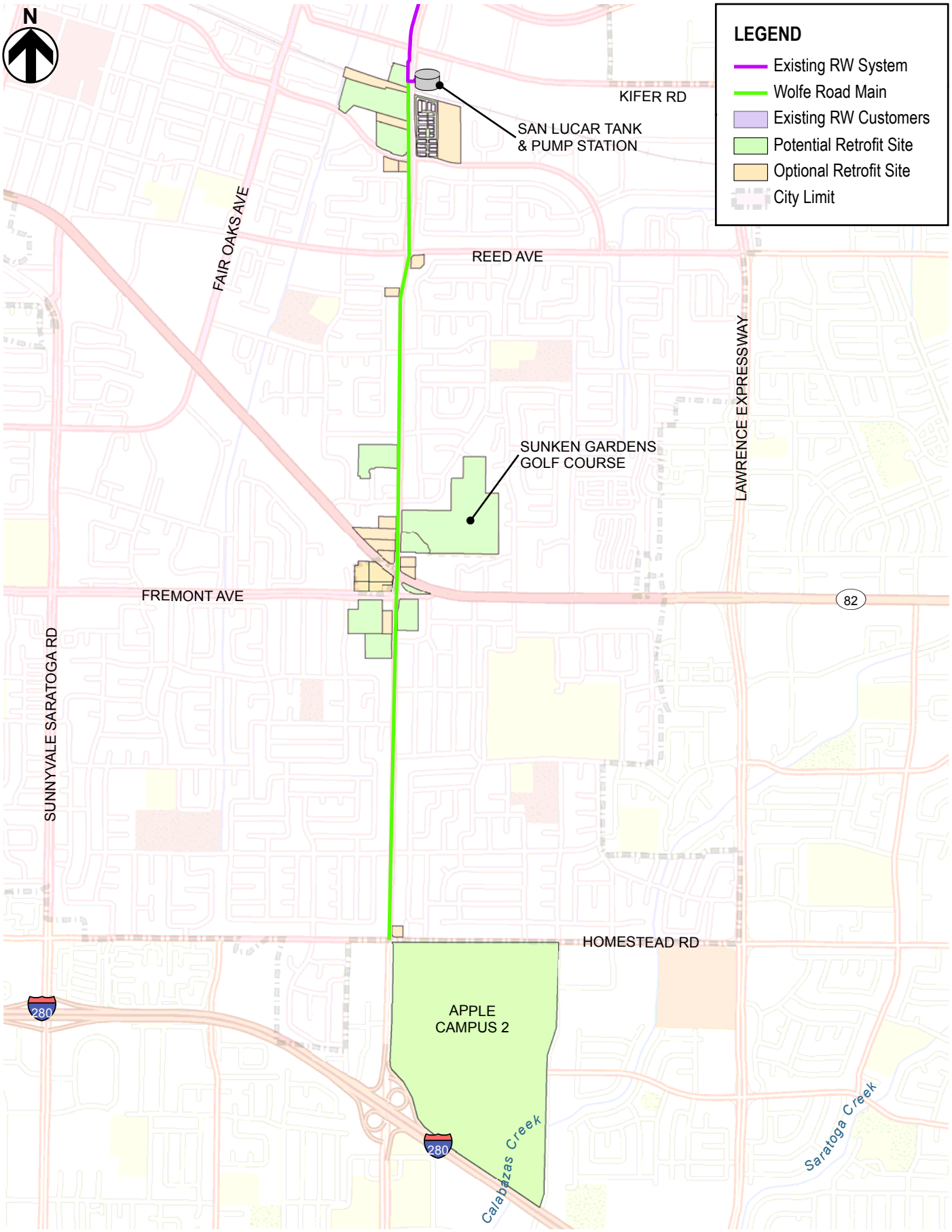


FIGURE 7-6
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
WOLFE ROAD MAIN ALIGNMENT

HydroScience

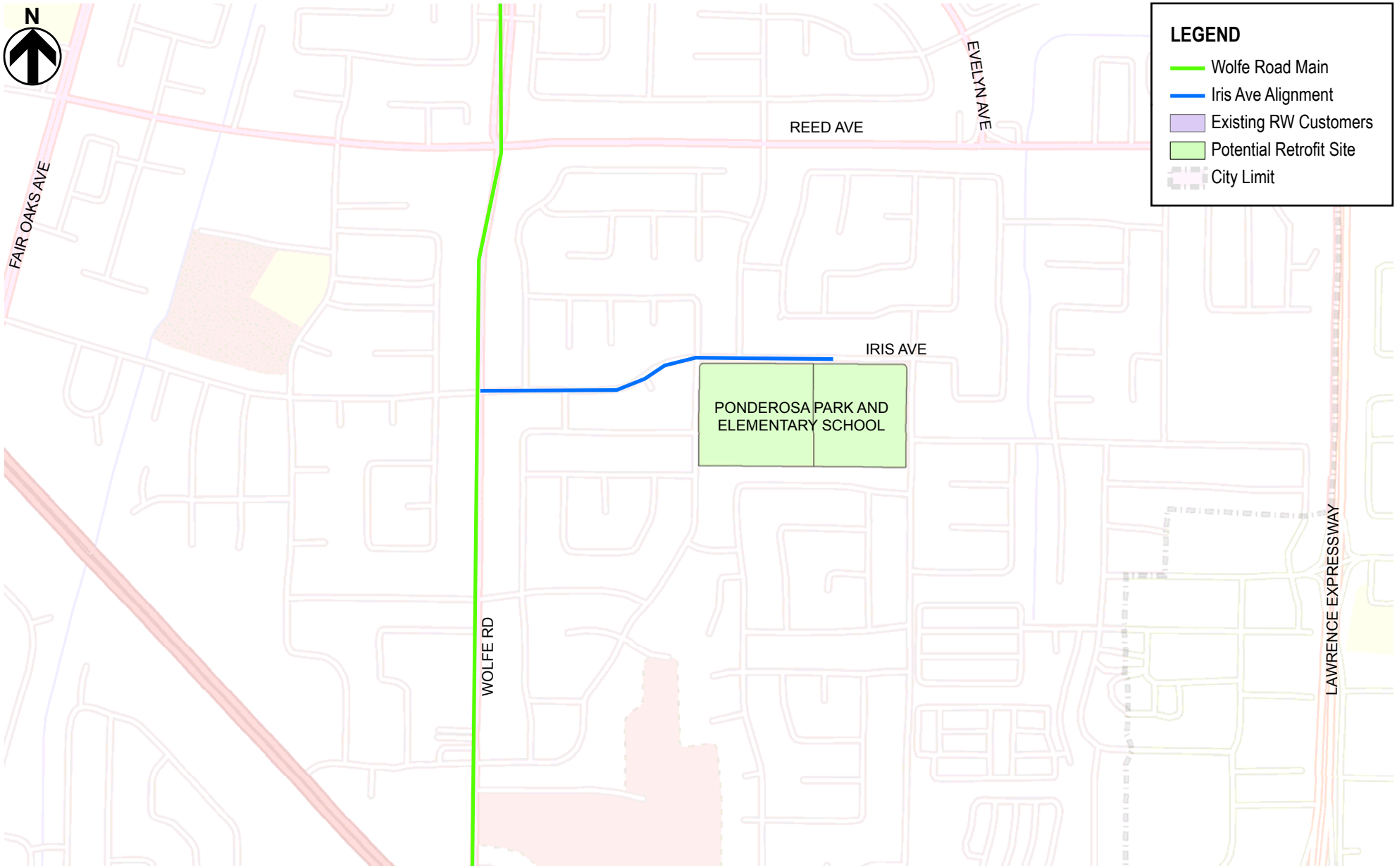


FIGURE 7-7
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
IRIS AVENUE ALIGNMENT

HydroScience

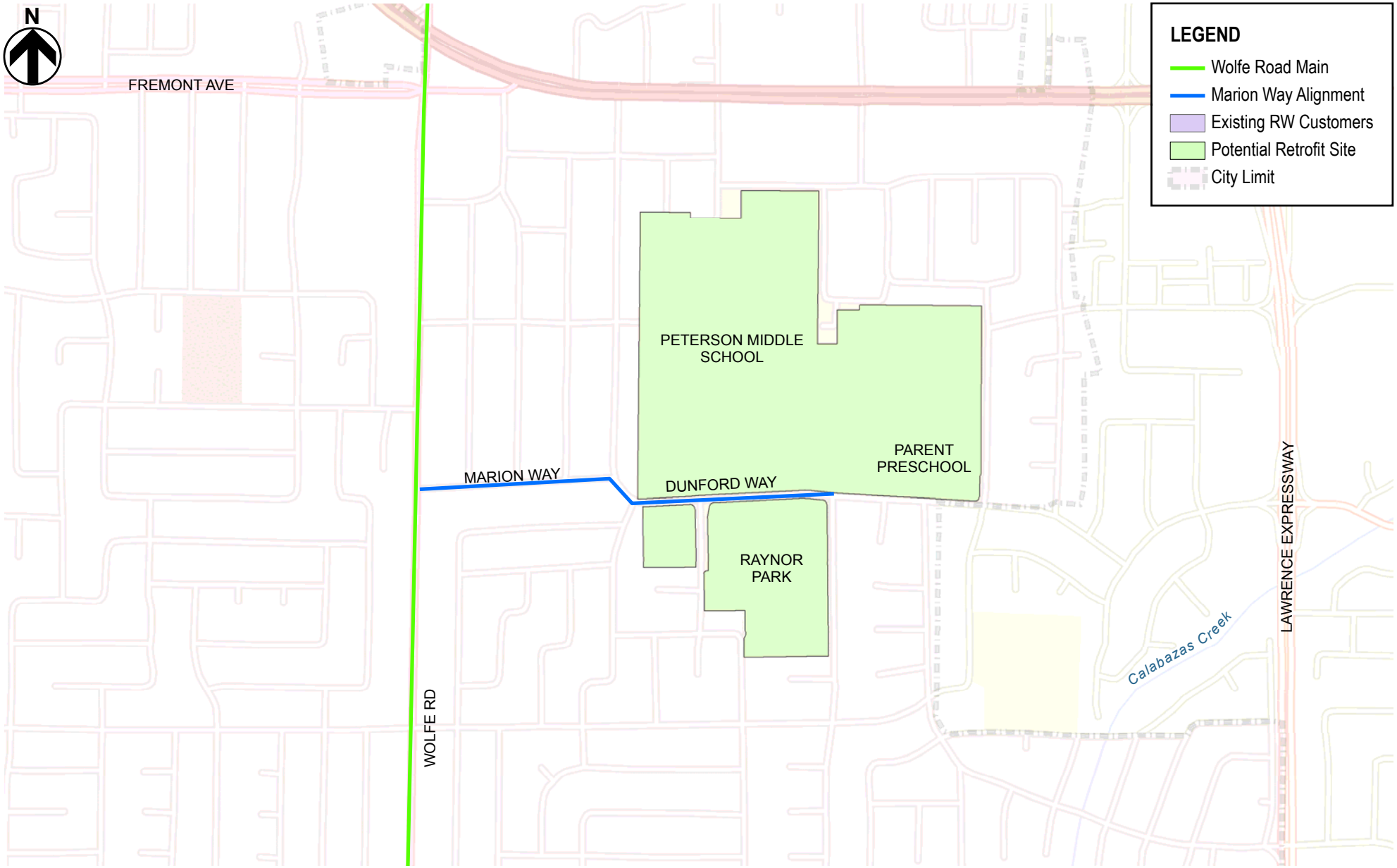


FIGURE 7-8
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
MARION WAY ALIGNMENT

HydroScience

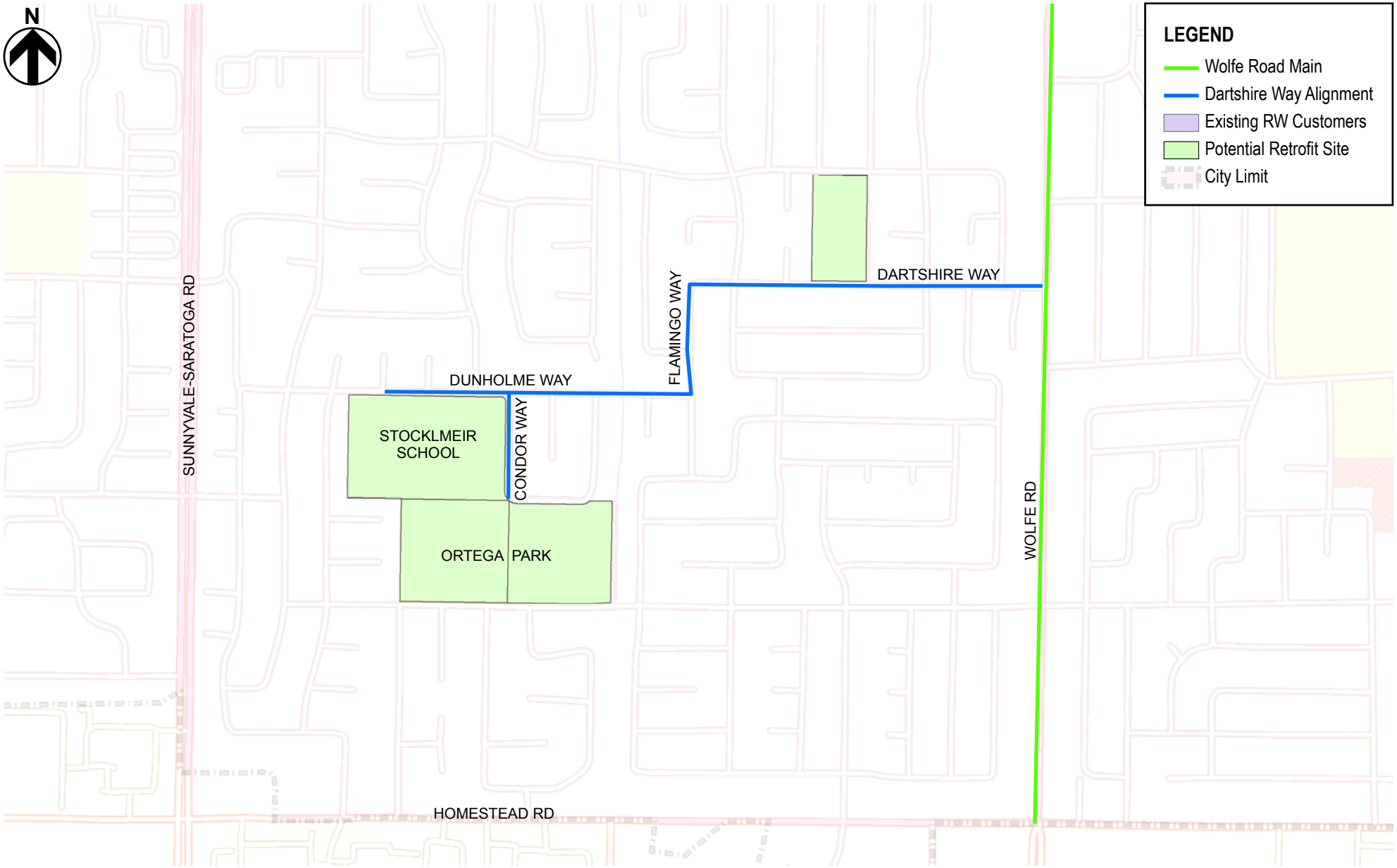


FIGURE 7-9
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
DARTSHIRE WAY ALIGNMENT

HydroScience

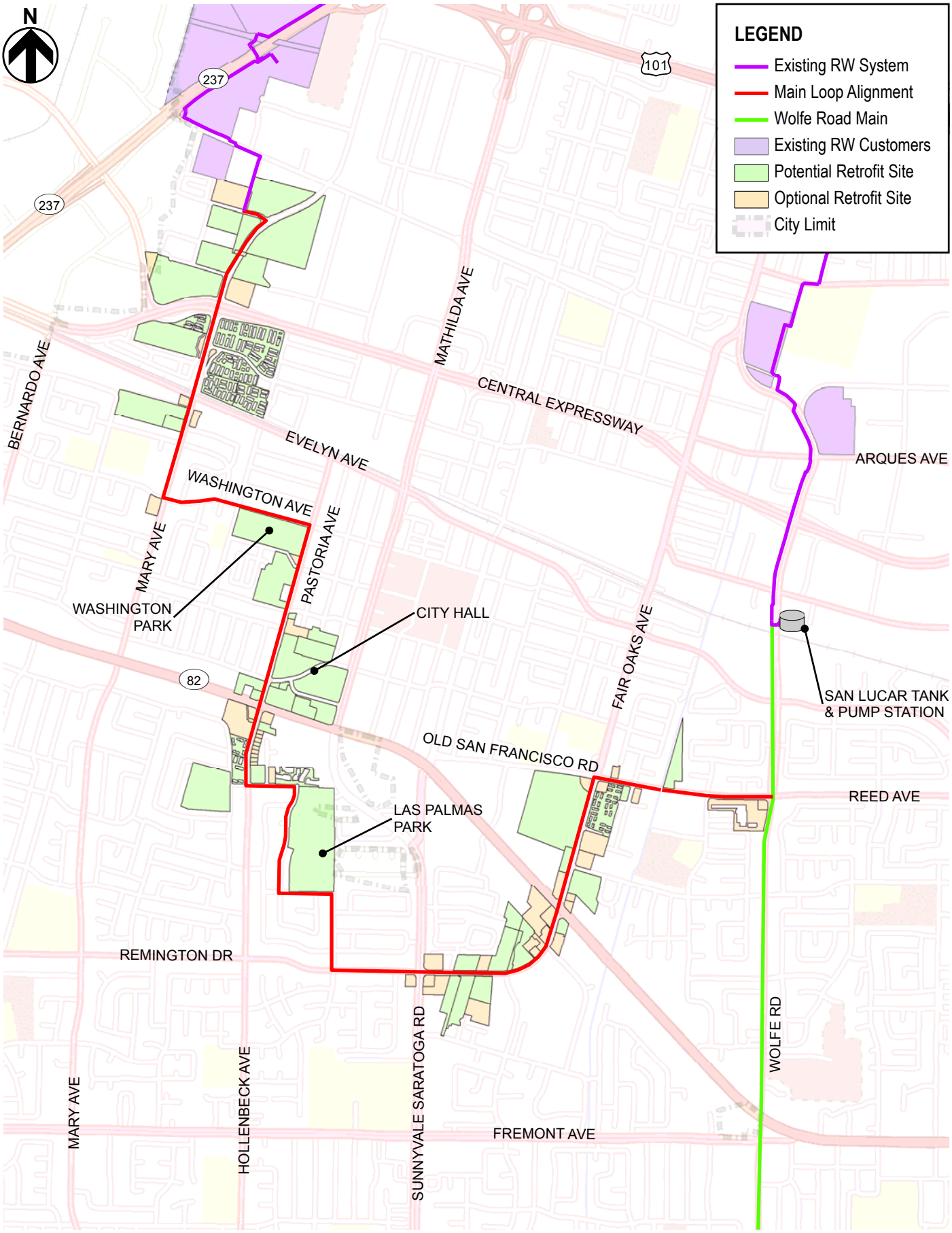


FIGURE 7-10
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
MAIN LOOP ALIGNMENT

HydroScience

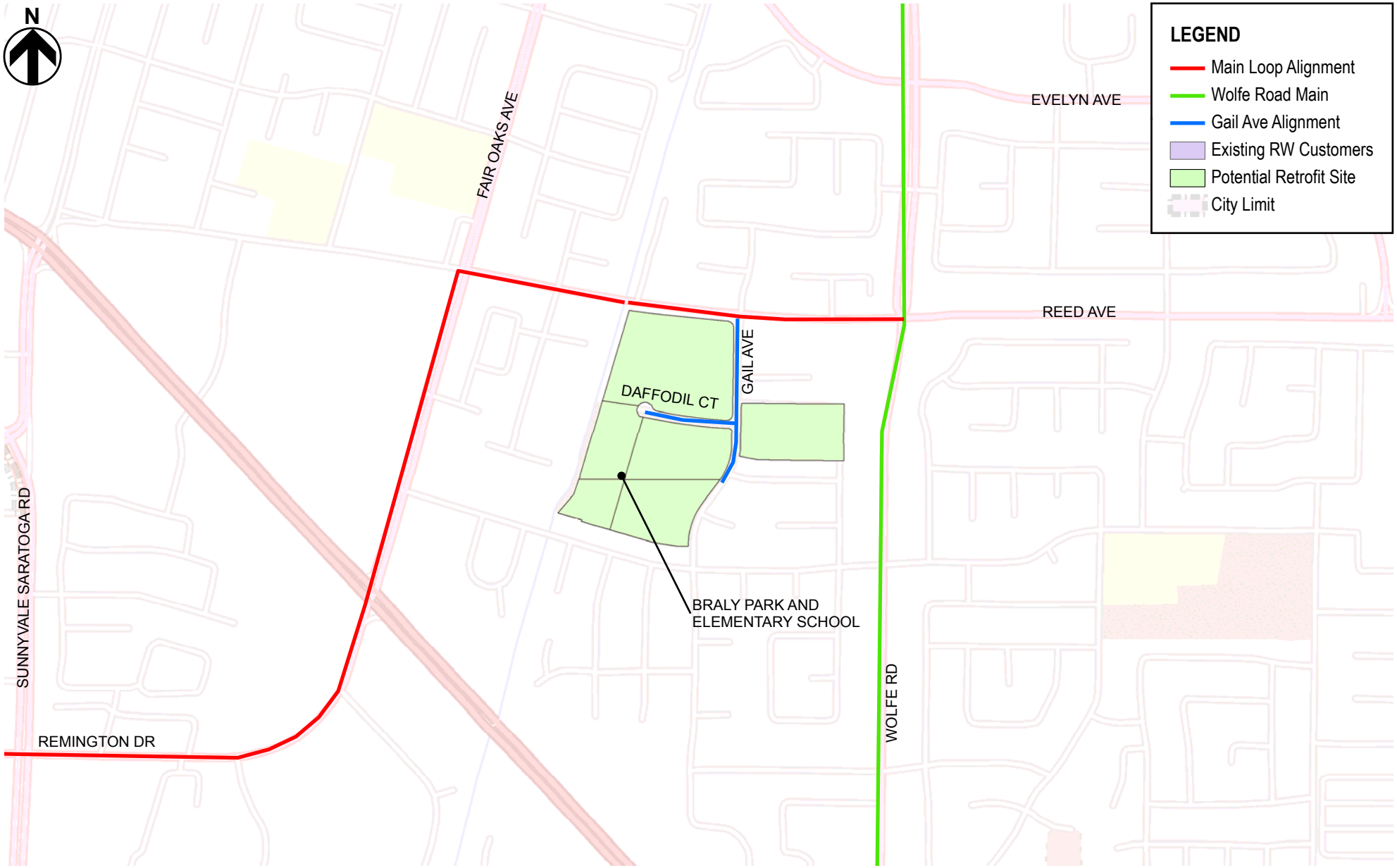


FIGURE 7-11
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
GAIL AVENUE ALIGNMENT

HydroScience

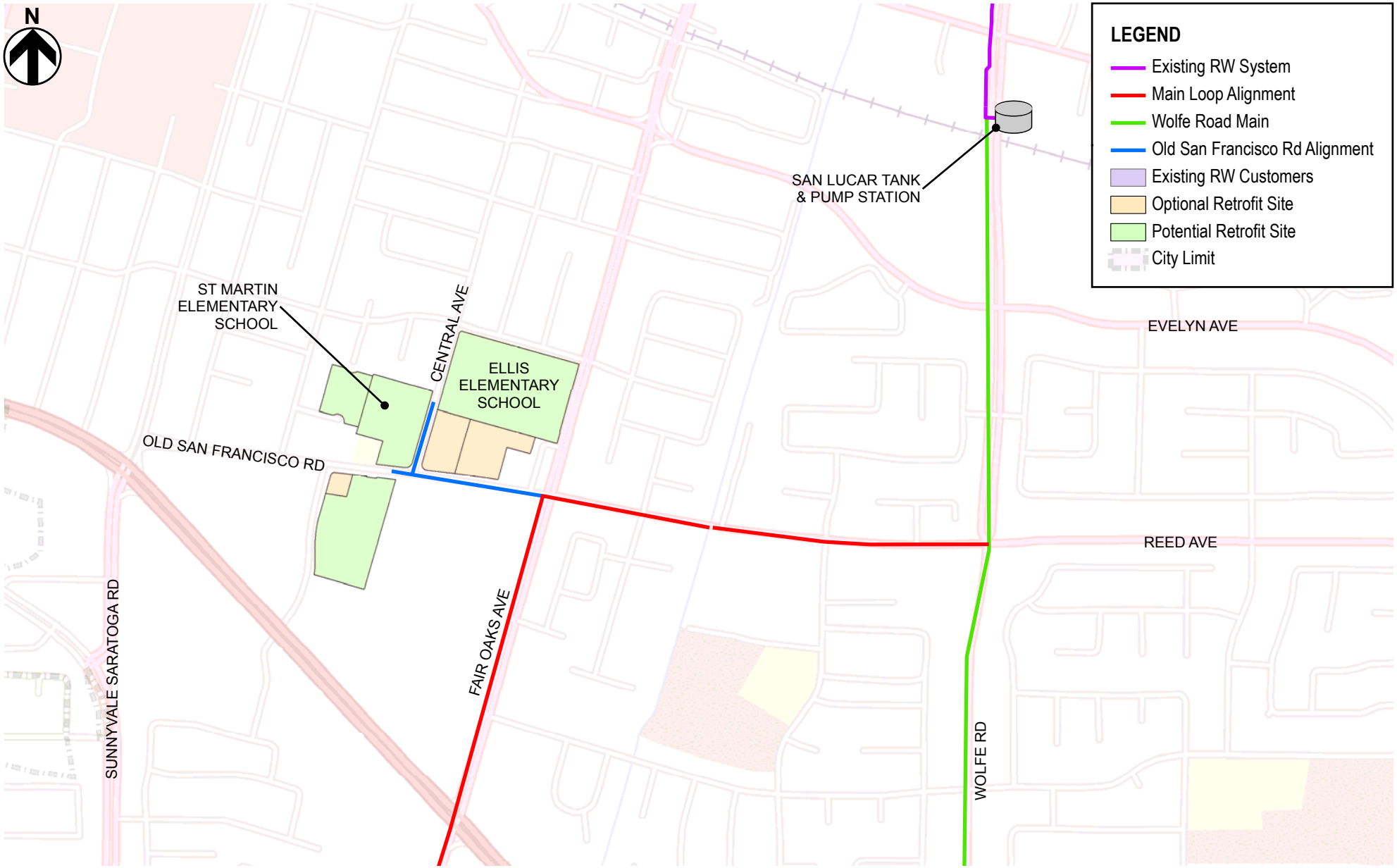


FIGURE 7-12
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
OLD SAN FRANCISCO ROAD ALIGNMENT

HydroScience

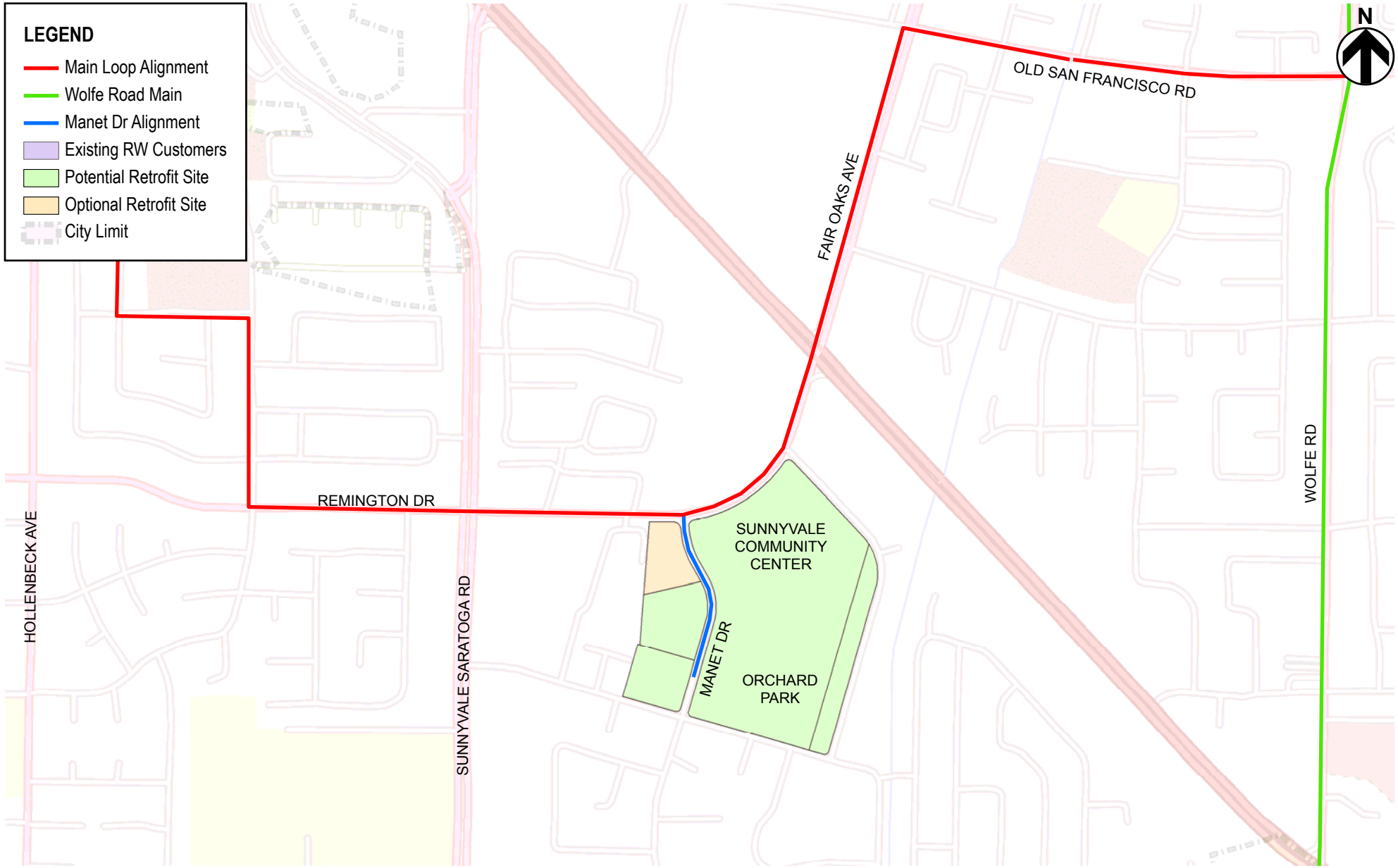


FIGURE 7-13
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
MANET DRIVE ALIGNMENT

HydroScience

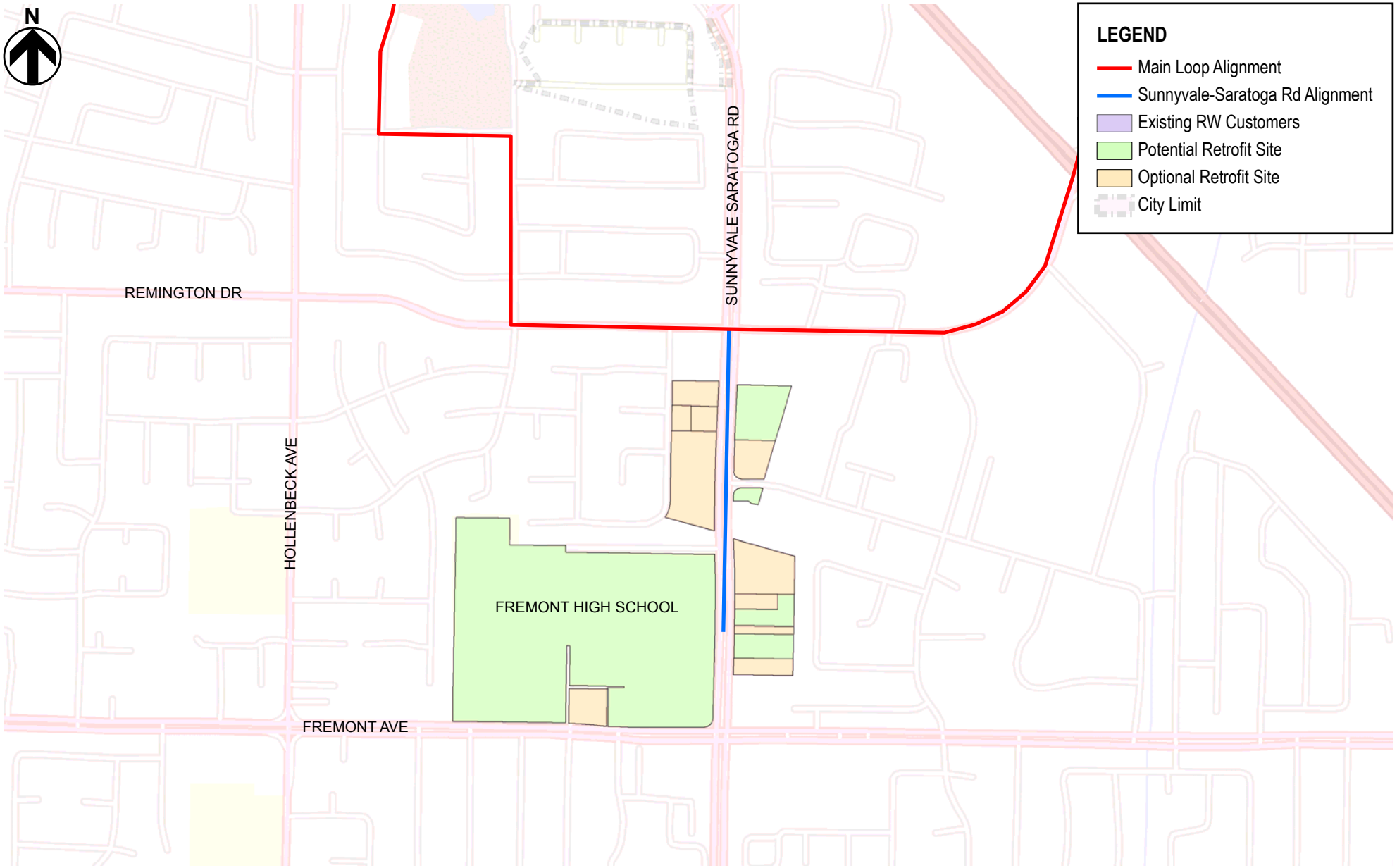


FIGURE 7-14
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
SUNNYVALE-SARATOGA ROAD ALIGNMENT

HydroScience

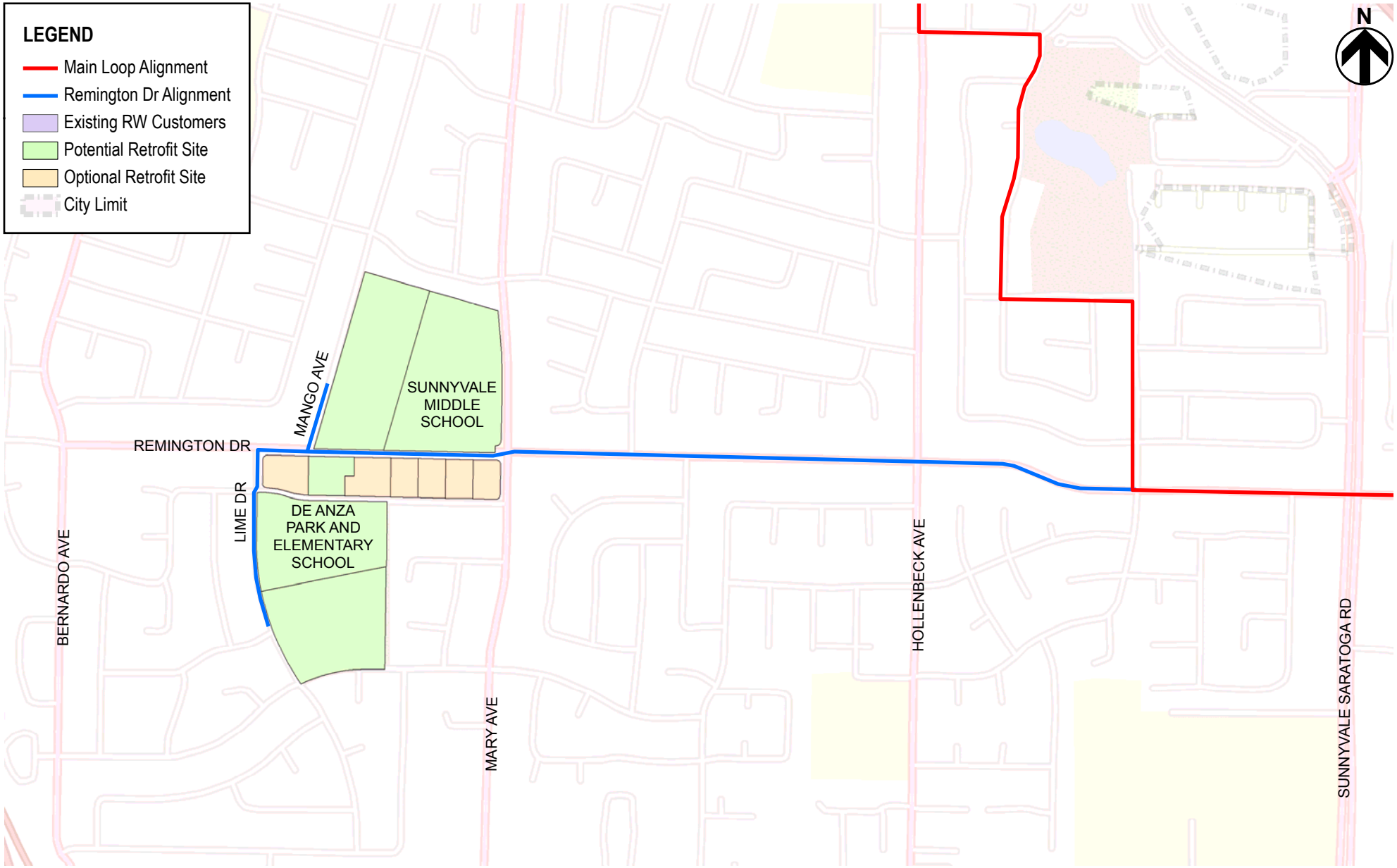


FIGURE 7-15
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
REMINGTON DRIVE ALIGNMENT

HydroScience

FIGURE 7-16
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
CARSON DRIVE ALIGNMENT

HydroScience

SECTION 8 – RECYCLED WATER STORAGE AND PUMPING

This section describes the existing recycled water storage and pumping facilities and describes the storage and pumping requirements to supply the City's expanded recycled water distribution system.

8.1 Interim San Lucar Pump Station Improvements

Due to the timing of construction of the new Apple® Campus 2, the Wolfe Road pipeline is slated to be constructed prior to the construction of the new tank and pump station to serve the southern zone of the recycled water system (see **Section 11**, **Figure 11-2**). In this case, interim improvements will need to be made to the San Lucar tank and pump station site in order to adequately serve the Wolfe Road alignment and alignment extensions.

An additional pump station designed to deliver recycled water at pressure to the Wolfe Road alignment will need to be constructed. To adequately serve the Wolfe Road alignment and extensions, the new pump station will need to have a rated capacity of approximately 1,300 gpm and provide 250 ft of TDH. This is equivalent to approximately 110 hp, assuming 75% efficiency. It is recommended that this pump station include a jockey pump and all pumps be equipped with variable frequency drives (VFDs).

During peak irrigation hours, the pump station will draw peak flows from the tank to supply the Wolfe Road alignment and extensions. Due to the limited capacity of the existing San Lucar tank, limited site space, and the plan to build a 5.0 MG tank at either the Wolfe-Evelyn or Central Avenue Water Plant sites, it is assumed that the additional recycled water demand to supply the Wolfe Road alignment and extensions will be made available either by additional recycled water from the WPCP or supplementing the existing recycled water supply with the potable water back-up connection.

8.2 Recycled Water Storage Tank Requirements and Options

The expansion of the recycled water system requires additional storage facilities and pumping capacity. Two separate storage locations were analyzed as part of this Feasibility Study. The first location examined was the Wolfe-Evelyn Water Plant site and the second location examined was the Central Avenue Water Plant site. Both tank sites would include a pump station to serve the southern zone of the proposed recycled water distribution system. Since the tanks are relatively close to each other and at similar elevations, the pumping requirements for each site are similar, and described below.

Based on the estimated recycled water buildout demand of 3,123 AFY, the ADD is 2.8 MGD and the PDD for the recycled water system is approximately 6.5 MGD. Both the Wolfe-Evelyn and Central Avenue Water Plant sites have available area to construct a 5.0 MG tank, which, combined with the existing San Lucar Tank's operational storage volume of 1.5 MG, would provide the equivalent of one peak day of recycled water storage. This would also provide the operational flexibility to seasonally shut-down one tank and pump station site for maintenance and repair, as well as reduce the need for emergency potable water back-up to the storage tanks. Both tank sites would be designed to refill during the 15-hour off-peak irrigation period. The following sections provide a brief description of each site along with a table analyzing the pros and cons of utilizing each of the identified locations.

8.2.1 Wolfe-Evelyn Water Plant

The Wolfe-Evelyn Water Plant site is a 3.4 acre site located on Ajax Drive, east of Wolfe Road and south of Evelyn Avenue. The site has an operational 5.0 MG potable water tank and booster pump station. The site has sufficient space to construct a new 5.0 MG recycled water storage tank and a new recycled water booster pump station to supplement the San Lucar storage and pumping facilities with minimal impacts to the existing potable water facilities. To provide storage at the Wolfe-Evelyn Water Plant site, a 2,000 LF, 24-inch extension between Wolfe Road and the Water Plant site would be required. **Figure 8-1** shows the alignment to reach the proposed Wolfe-Evelyn Water Plant site.

The existing Wolfe-Evelyn Water Plant site is approximately half developed for the potable water storage tank and pump station. The remaining 1.7 acres of the site is undisturbed, and has space for a 5.0 MG recycled water tank and pump station. The proximity of this site to the potential Wolfe Road and Main Loop alignments makes it well suited to provide water system pressure to the higher elevation alignments. It is assumed the pipeline installation between the Wolfe-Evelyn recycled water tank and pump station and the Wolfe Road Main could use an existing easement from Wolfe Road through to Ajax Drive for a new recycled water pipeline. If the easement cannot be utilized, the pipeline can be routed along Palo Verde Way and Liquidamber Way to reach Ajax Drive and Wolfe-Evelyn using a 3,000 LF pipeline of the same diameter.

It is noted that the Wolfe-Evelyn Water Plant site is surrounded by a residential neighborhood and the construction of an additional storage tank will have a visual impact on surrounding homes. Additional trees can be planted around the perimeter of the site to visually shield both storage tanks from the neighbors.

Adding recycled water storage increases the ability of the City to provide recycled water to a satellite treatment facility to be operated by the District; however, demands associated with this facility were not included in this Feasibility Study.

8.2.2 Central Avenue Water Plant

The Central Avenue Water Plant site is a 1.2-acre parcel located at the corner of Central Avenue and McKinley Avenue. This site currently has two 0.5 MG potable water storage tanks that are not currently in use, as well as an inactive groundwater well that services the potable water system. The existing groundwater well and potable water distribution system could be connected to the new recycled water storage tank via an air-gap connection to provide a supplemental emergency water supply to the recycled water system. To construct the 5.0 MG storage tank, the two existing 0.5 MG potable water storage tanks would need to be demolished.

Connecting the Central Avenue Water Plant to the Main Loop/Wolfe Road Main would require constructing a total of 6,000 LF of 24-inch mainline between the Main Loop/Wolfe Road Main and the Central Avenue Water Plant site.

Figure 8-1 shows the alignment to reach the proposed Central Avenue Water Plant site. The alignment to supply the Central Avenue recycled water tank and pump station, similar to the Wolfe-Evelyn Water Plant site, would utilize the easement from Wolfe Road to Ajax Drive. The pipeline would continue through the Wolfe-Evelyn Water Plant site to McKinley

Avenue and continue on to the Central Avenue Water Plant site. This alignment requires crossing the District canal and PG&E easements. To connect to the southern zone and the Main Loop, a pipeline would be constructed from the Central Avenue Water Plant site. This alignment requires crossing the District canal and would continue down Central Avenue to Old San Francisco Road and connect to the Main Loop at the intersection of Old San Francisco Road and Fair Oaks Avenue. **Table 8-1** summarizes additional requirements, as well as advantages and disadvantages of the proposed storage tank locations.

Table 8-1: Proposed Storage Tank Locations

Storage Location	Potential New Tank Capacity	LF of RW Pipeline	Total Acreage	Available Acreage	Site Demolition and grading
Wolfe-Evelyn	5 MG [1]	2,000	3.4	1.7 [2]	No
Central	5 MG	6,000 [3,4]	1.2	1.2 [5]	Yes

Notes:
1. The Wolfe Evelyn Water Plant site could house a larger tank; however anything larger than 5 MG would exceed the overall system demand for one peak day.
2. Approximately half the parcel is occupied by the 5 MG potable water tank and pump station, which will remain.
3. 1,500 feet of the required mainline to service the Central Avenue tanks coincides with the Old San Francisco alignment and would require upsizing.
4. Special construction will be required to cross the Santa Clara Valley Water District canal.
5. The Central Avenue Water Plant site currently houses two 0.5 MG tanks. The City has indicated that these are no longer necessary and the site can be fully dedicated for recycled water storage.

8.3 Pumping Requirements

The new recycled water pump station will be designed to draw off of the new storage tank on a 24-hour basis and serve recycled water to the southern (elevated) zone. The two recycled water zones will be separated by a set of PRVs that will allow recycled water to be delivered to the southern zone at pressure.

During peak irrigation hours, the pump station will draw peak flows from the tank to supply the southern zone (the Wolfe Road Main, the Main Loop, and the respective extensions). Additionally, during peak irrigation season, and due to expansion in the north (existing) zone of the recycled water system, the new pump station will have the flexibility to pump back to the San Lucar tank and pump station through the PRVs as necessary to meet peak demand in the north. During off-peak irrigation hours, a jockey pump will draw significantly less flow from the tank to support the 24-hour industrial customers. Industrial customers in the north zone will be served directly by the WPCP while the new tank and the San Lucar tank refill.

To adequately serve the expanded recycled water distribution system, the new pump station will need to have a rated capacity of approximately 6,000 gpm and 275 ft of TDH. This is equivalent to approximately 560 hp, assuming 75% efficiency. It is recommended that all pumps have VFDs to cover the wide range of demands and for the energy savings that VFDs provide. This pump station will also require a jockey pump to handle low flows and to handle Industrial demands in off-peak irrigation hours. The pumping requirements would be similar for both the Central Avenue and Wolfe-Evelyn Water Plant sites due to their proximity to each other and similar elevation.

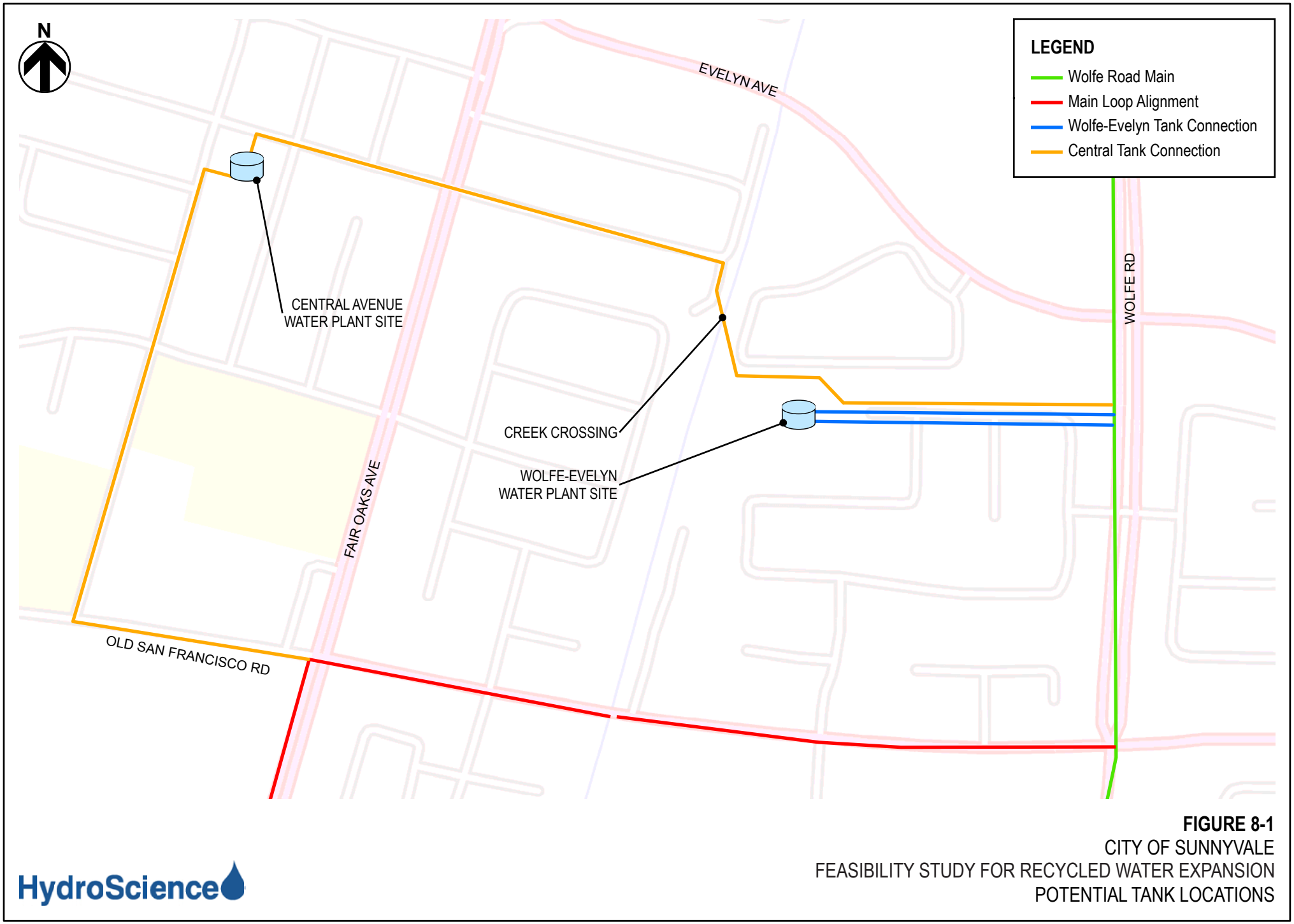


FIGURE 8-1
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
POTENTIAL TANK LOCATIONS

SECTION 9 – COST DEVELOPMENT

This section describes the basis for development of the unit costs and associated costs for the recycled water pipelines and retrofits. **Appendix K** contains details of the preliminary cost estimates for each phase of the alignments.

9.1 Pipeline Unit Cost Development

Unit costs for recycled water projects were estimated based on recent bidding experience for other similar Sunnyvale Capital Improvement Projects, local recycled water retailers, and HydroScience's experience estimating the cost of similar local projects. In general, recycled water pipeline projects are estimated to have a loaded construction cost estimate (fully inclusive of all construction components) of approximately $20-$22/inch-diameter per foot of pipeline. A loaded cost is the bid amount for a construction project divided by the total feet-inches (the length of pipe multiplied by the diameter in inches) within that project. Two proposed alignments do not fall into this range due to the length of pipeline in proportion to special construction required.

For conceptual planning and cost comparisons of pipeline extensions, the following parameters and associated unit costs in **Table 9-1**, were globally applied to aspects of each pipeline alignment to develop individual pipeline costs.

Table 9-1: Pipeline Cost Estimating Parameters

Cost Parameter	Cost	Applied to:
Pipeline	$14 per inch-diameter/LF	pipe length and diameter
Pipeline appurtenances	15%	pipeline cost
Street overlay/repair	$1.25 per inch/SF	pipeline width plus two feet
"hot-tap" connection	$15,000	flat fee as applicable
Special Construction: creek, railroad, highway or other crossings	2.5 x unit cost/ inch-diameter/LF	length and size of pipeline construction
Engineering design and permitting	8%	construction subtotal
Administrative and construction management	7%	construction subtotal
construction contingency	20%	project total

Pipeline costs for each alignment are detailed in **Appendix K**.

9.2 Retrofit Requirements and Costs

The following section describes the various components involved in designing and constructing a site retrofit to receive recycled water and the associated costs as they relate to a sites size and complexity.

Retrofit costs were estimated based on the number of sites, the size of the site proposed for retrofit, and projected complexity of that retrofit. Costs were approximated based on actual costs for retrofits performed in the San Francisco Bay Area.

9.2.1 Retrofit Requirements

A recycled water retrofit is the conversion of a system that is currently being supplied with potable water for non-potable uses to a system designed to receive recycled water. Retrofit construction typically includes the following components:

- Installing a new recycled water meter and strainer;
- Removing the existing meter;
- Separating the potable water supply from the irrigation system supply by ten feet;
- Labeling of irrigation valves and boxes with recycled water tags;
- Replacing existing quick couplers and hose bibbs with reverse threaded quick couplers;
- Relocating or protecting drinking fountains from recycled water overspray;
- Installing recycled water advisory signs; and
- Constructing new lines from the potable water system to potable water uses as necessary (e.g. restrooms or drinking fountains connected to the irrigation system).

9.2.2 Retrofit Costs

The cost to retrofit a typical site is highly dependent on the complexity of the site, existing pipeline separation conditions, the amount of on-site modifications required, and the demands of the customer, which is beyond the scope of this cost analysis. Generally, the larger users such as golf courses, residential complexes, and industrial users, have the highest retrofit costs, though there is no rule that universally applies.

For the retrofits identified in this report, general costs were determined on a per site basis given the number of sites within a particular alignment, the size/AFY of use, the type of site (i.e. parks schools, industrial etc.) and HydroScience's recent bidding and construction retrofit cost experience with local retailers. Retrofit costs were not uniformly set and were applied as follows:

- Retrofit sites were given a base cost determined by one of four retrofit site types:
  - Park – $20,000
  - School – $25,000
  - Residential – $30,000
  - Industrial – $50,000
  - Other – $30,000
- A complexity factor was applied to each site based on projected demand and site size
- Sites with a larger area and/or usage rates generally have a higher than average retrofit construction cost

- Multi-family residential sites tend to represent higher than average retrofit cost. This is in part due to these sites typically requiring more in-depth cross-connection testing, and the potential for additional equipment (backflow preventers) being added to the potable water system
- Industrial customers also typically have higher retrofit costs

Generally, the larger the site or the more complex the on-site retrofit is estimated to be, the larger the cost for the design and construction of that retrofit. Generally, unit costs for retrofit design and construction was estimated to range from $30,000 to over $100,000 per site. For this project, retrofits were estimated for each customer based on the cost assumptions identified above.

9.3 Storage Tank and Pump Station Costs

Storage tank and pump station costs were estimated based on the gallons of storage and horsepower requirements. Soft costs such as design, administration, permitting, construction management, and contingency were added at the same levels described previously for the pipelines. Costs for the storage tank and pump station were also annualized using the same effective rate and lifespan as pipelines. Site specific considerations such as the pipe required to reach the tank site and the need to prepare each site for construction of a recycled water storage tank were added to these costs. The detailed cost estimates are included in **Appendix K** and summarized below.

The cost for storage was estimated to be approximately $0.80/gallon of operational storage. This unit cost includes all of the construction and material costs associated with a welded steel tank, foundation, and preparation of the site for the tank.

The cost for pumping was estimated to be equivalent to approximately $5,200/hp. This includes all of the construction and material costs for the yard piping, motors, pumps, appurtenances, controls, building, and other miscellaneous components required for the pump station.

9.4 Annualized Costs

The annualized unit cost is based on a 30-year lifetime for pipeline and facilities with a 7.2% discount rate. This rate was set to be equivalent to the Net Present Value (NPV) assumptions used in the City's Strategic Improvement Plan. To convert capital costs into annual costs, the following formula was used:

$$P \text{ to } A = \frac{i(1+i)^n}{(1+i)^n - 1}$$

$$= 0.08221 \text{ (for pipelines and other costs)}$$

Where:

i = *effective rate per year (0.072)*

n = *number of compounding periods (30 years for pipeline and other costs)*

The operations and maintenance (O&M) costs for the pipeline were estimated to be equivalent to approximately 2% of the pipeline capital cost. This cost was intended to account for annual maintenance and provide a fund to allow for the eventual replacement of this pipeline.

The O&M costs for the storage tank and pump station were estimated to be equivalent to 4% of the capital cost of the storage tank and pump station. The power cost was estimated based on the horsepower requirements, assuming the 560 hp pump station was operating nine hours per day at the design flow rate at an energy cost of $0.15/kWh. The energy cost for the new pump station at either the Central or Wolfe-Evelyn sites is estimated to be approximately $205,000 per year.

No cost savings associated with reduced potable water purchases was included in this cost estimate. Additionally, total project costs are presented with the understanding that others could potentially fund portions of this work, and the total cost to the City may be less.

9.5 Overall Summary

Provided below is a summary of the storage tank and pump station project costs as well as the pipeline project costs. **Table 9-2** presents a summary of the estimated storage tank and pump station costs. Detailed cost estimates are provided in **Appendix K**.

Table 9-2: Storage Tank and Pump Station Construction Cost Estimate

Storage Location	Tank Cost	Pump Station Cost	Site & Pipeline Costs	Soft Costs [1]	Total Cost	Annualized Cost
Wolfe-Evelyn	$4,000,000	$2,912,000	$1,163,000	$2,826,000	$10,901,000	$896,000
Central	$4,000,000	$2,912,000	$3,272,000	$3,565,000	$13,749,000	$1,130,000
San Lucar	$0	$572,000	$216,000	$276,000	$1,064,000	$87,000

Notes:
1. Soft costs include design/permitting, CA/CM, and contingency costs.

The City is exploring different funding sources for the recycled water projects, including grants, low-interest loans, and partnerships with neighboring agencies. User rates will provide the base funding mechanism for projects if no other funding option is available.

Table 9-3 provides a summary of the pipeline, retrofits, demands and the associated costs, as well as the total project costs. Each of the alignments was ranked according to the average project cost per AFY.

Table 9-3: Summary of Alignments and Cost Estimates

Alignment	Pipeline Length (ft)	Number of Retrofits	Demand (AFY)	Construction + Soft Costs	Total Retrofit Cost	Total Project Cost	Annualized Cost/AFY	Rank by $1K/AFY
Infill Sites	0	50	335	$0	$2,675,000	$2,675,000	$656	2
Extensions Proposed from Existing Pipeline System								
Lakehaven Drive	4,100	11	86	$876,000	$530,000	$1,406,000	$1,356	7
Maude Avenue	6,800	2	36	$1,217,000	$145,000	$1,362,000	$3,070	15
Duane Avenue	16,500	23	429	$3,956,000	$1,665,000	$5,621,000	$1,077	4
Kifer Road East	5,000	5	51	$1,022,000	$310,000	$1,332,000	$2,176	13
Kifer Road West	1,900	5	54	$411,000	$370,000	$781,000	$1,182	5
Base Alignments								
Wolfe Road Main	13,300	13	345	$6,399,000	$840,000	$7,239,000	$1,727	10
Main Loop	24,800	43	335	$13,504,000	$2,410,000	$15,914,000	$3,902	17
Alignments Requiring Wolfe Road Main								
Iris Avenue	2,300	2	55	$479,000	$155,000	$634,000	$943	3
Marion Way	2,600	3	30	$458,000	$190,000	$648,000	$1,772	11
Dartshire Way	5,500	3	65	$1,199,000	$170,000	$1,369,000	$1,733	9
Alignments Requiring Main Loop								
Gail Avenue	1,700	4	39	$328,000	$250,000	$578,000	$1,231	6
Old San Francisco Road	1,500	3	26	$265,000	$185,000	$450,000	$1,451	8
Manet Drive	1,100	3	86	$255,000	$190,000	$445,000	$432	1
Sunnyvale-Saratoga Road	1,900	5	14	$335,000	$260,000	$595,000	$3,551	16
Remington Drive	7,100	4	59	$1,476,000	$275,000	$1,751,000	$2,443	14
Carson Drive	1,500	2	16	$265,000	$105,000	$370,000	$1,852	12
Total	**97,600**	**181**	**2,061**	**$32,445,000**	**$10,725,000**	**$43,170,000**		

Notes:
1. Existing and potential recycled water customers and demands for Moffett Field sites were not included in this analysis

The relative cost to provide recycled water to users along the existing recycled water pipeline is lower than connecting users that are not currently located along the existing recycled water pipeline. The recycled water infill connections are the most cost-effective and provide the highest opportunity for near-term recycled water expansion.

The next levels of cost-effective construction are the branch alignments that would be connected to the existing recycled water main. These alignments can be constructed in the relatively near-term as they can connect to the existing transmission mainline located between Highway 237 and the San Lucar Tank and Pump Station site.

The Wolfe Road Main and the Main Loop alignments are not the most cost-effective in-and-of themselves; however, they enable the connection of various other alignments as well as provide system reliability and potential opportunities to provide service of recycled water to the Apple® Campus 2 and other users outside of the City limits.

SECTION 10 – WASTEWATER TREATMENT ALTERNATIVES

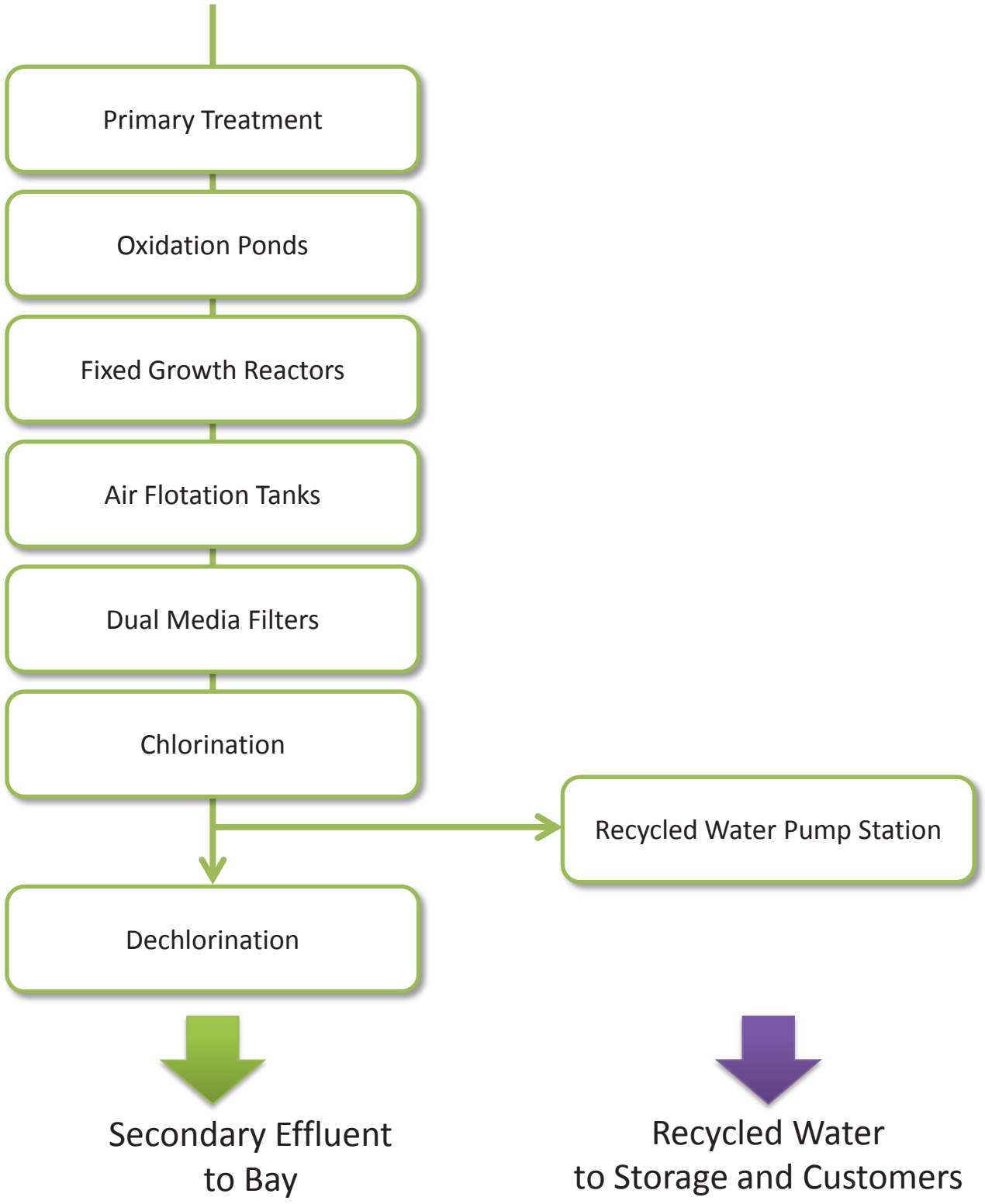
The City is interested in modifying the wastewater treatment process to continuously produce recycled water that will meet the near-term recycled water demand of City customers. Desired co-benefits of a recycled water project include TDS and color reduction. The water quality objectives were discussed in **Section 3.3**. Kennedy/Jenks Consultants (K/J) developed a TM describing four treatment alternatives for the City's consideration, of which, the City selected one for implementation.

This section presents the selected alternative to address the City's production reliability, capacity, water quality, O&M, and regulatory compliance needs. The TM prepared by K/J is included as **Appendix L** and provides a comprehensive description of each alternative.

10.1 Existing Wastewater Treatment Background

The WPCP treatment process includes influent grinders, pre-aeration/grit removal, primary sedimentation, oxidation ponds, fixed growth reactor nitrification, dissolved air flotation (DAF) with coagulation aided by polymer dosage, dual media filtration (DMF), chlorination, and dechlorination (EOA, 2012). Since 1998, the City has produced recycled water at its WPCP. The recycled water and secondary effluent production modes use the same treatment process but have different operational parameters, such as chemical dosage and disinfection level. The WPCP process flow schematic is shown in **Figure 10-1** and the site layout is shown in **Figure 10-2**. Due to operational issues, the WPCP runs in two alternating modes, as described below.

- **Mode 1 – Secondary Effluent Discharge:** The entire advanced secondary treated municipal effluent is discharged to the San Francisco Bay and no recycled water is produced. The secondary capacity of the WPCP is approximately 16 MGD. Due to less stringent regulatory limits for turbidity compared to recycled water use, less polymer and chlorine are required during the treatment process when effluent is discharged to the Bay. As a result, the WPCP realizes lower operating costs. However, the recycled water system is reliant upon stored recycled water, and the system frequently is supplemented with potable water when recycled water is not available.
- **Mode 2 – Recycled Water Batch Production:** The entire WPCP flow is treated to meet Title 22 of the California Code of Regulations for disinfected tertiary recycled water, which is a higher level than under Mode 1. The recycled water that is produced is stored for subsequent distribution to the City customers primarily for irrigation use. Approximately 1,100 AFY of recycled water is produced under this mode, and the City has several operational concerns associated with this batch mode recycled water production, including:
    - Operational complexity and labor required to switch between Mode 1 and Mode 2;
    - Limited recycled water storage capacity, which requires frequent batch production during the summer irrigation season to meet recycled water demands; and
    - Excessive chlorination during the transition from Mode 2 to Mode 1 raises concerns of potential negative effluent bioassay impacts.

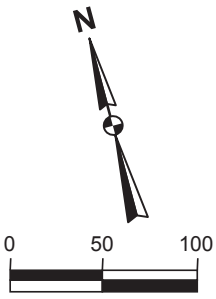


Source: TM#2 Treatment Alternatives Evaluation, Kennedy/Jenks Consultants, 2013

FIGURE 10-1
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
WPCP PROCESS FLOW SCHEMATIC

HydroScience

Source: TM#2 Treatment Alternatives Evaluation, Kennedy/Jenks Consultants, 2013



HydroScience

FIGURE 10-2
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
WPCP SITE LAYOUT

10.2 Recycled Water Objectives

The City plans to upgrade the secondary treatment processes as part of the Strategic Infrastructure Plan (SIP) over the next ten years. Following implementation of the SIP, the type of secondary treatment processes at the WPCP will change, which is expected to reduce the secondary TDS concentration to approximately 760 mg/L. Therefore, the evaluation of alternatives considered how the future need for TDS reduction technologies, such as reverse osmosis (RO), could change.

As described in **Section 6.3**, the near-term demand is estimated to increase to 3,123 AFY, with a targeted annual average day treatment demand of 3.6 MGD. The City's current objective is to develop a treatment system with the capacity to meet the near-term recycled water demand while being adaptable to future SIP processes; ideally resulting in no stranded assets. It is also the design objective to produce recycled water continuously, rather than via a batch process.

10.2.1 Strategic Infrastructure Plan Coordination

Three secondary treatment technologies were considered as a part of the SIP: MBR, activated sludge, and wetlands. The potential secondary treatment options presented in the SIP, and the recycled water production alternatives are interconnected and the benefits are interdependent. The TM evaluates how each recycled water alternative fits into the context of the overall SIP improvements and the combined cost. Specifically, the TM discussion addresses:

- The impact to the overall cost of SIP (considering the various SIP alternatives) by implementing the various recycled water alternatives; and
- The cost impact of stranded assets.

10.3 Recycled Water Treatment Alternatives

The following alternatives were identified and evaluated in the TM (K/J 2012):

- **Alternative 1 – Blending with Potable Water:** Blend recycled water with potable water to increase volume and reduce TDS.
- **Alternative 2 – Microfiltration/Ultrafiltration (MF/UF):** Treat a sidestream of WPCP secondary effluent with MF to eliminate batch recycled water production.
- **Alternative 3 – Microfiltration/Reverse Osmosis (MF/RO):** Treat a sidestream of WPCP secondary effluent with MF and RO to eliminate batch recycled water production and to reduce TDS.
- **Alternative 4 – Membrane Bioreactor (MBR):** Treat a sidestream of WPCP primary effluent with MBR to eliminate batch recycled water production, avoid TDS increase through secondary processes at WPCP. An option to add RO after the MBR system would reduce TDS.

After the initial consideration of alternatives, a workshop was held in September 2012 with the City to further understand long-term goals and preferences and to narrow the focus of the

evaluation. The staff attending the workshop included planners, engineers, and operators, which provided a variety of viewpoints and preferences. While discussing the various alternatives with the City, the City indicated that they do not want to consider Alternative 1 as a long-term option. As such, this alternative was eliminated from further consideration.

Furthermore, due to the operational challenges the City currently experiences, and based on the comprehensive evaluation of the SIP alternatives in conjunction with alternatives presented for the purpose of the Feasibility Study, the City has elected to proceed with the implementation of an MBR system (Alternative 4) since this would prevent stranded assets upon implementation of the SIP and the treatment capacity (and cost) can be phased with minimal operational challenges. In addition, implementing a MBR treatment system to produce recycled water would decrease the overall capacity requirements for the SIP. This would offset a portion of the water treated in the secondary process that was recommended as part of the SIP. The 22.4 MGD secondary treatment requirement for the SIP would be reduced to 18.8 MGD, since 3.6 MGD would be diverted and treated by MBR as part of the recycled water project.

A detailed description of each alternative as well as the expanded SIP evaluation is discussed in further detail in the attached TM (**Appendix L**).

10.3.1 Evaluation Criteria

Evaluation criteria were developed to provide a basis to compare the alternative treatment technologies that could enhance the production of recycled water at the WPCP and address the City's objectives. A short description of each criterion is provided in **Table 10-1**.

Table 10-1: Alternative Treatment Technologies Evaluation Criteria[1]

Criterion	Description
Eliminates Batch Operation	Identifies whether or not an alternative would eliminate the current batch production of recycled water. Alternatives with continuous operation are more favorable.
Eliminates Potable Blending	Identifies if an alternative would require blending of recycled water with potable water during non-peak demand periods. Additional potable water use conflicts with the purpose of recycled water to provide a reliable, drought-proof source to offset potable water use. Therefore, alternatives requiring blending are considered less favorable.
Degree of Operational Complexity	Identifies if an alternative simplifies current operations or introduces additional technologies that require staff training.
Capital, O&M and Lifecycle Costs	Estimates capital, annual O&M, and 30-year lifecycle costs for each alternative. These costs represent planning-level costs (Class 5 per standard AACE cost estimating guidelines) with an estimated range of -30 to +50 percent. O&M costs include energy, chemicals, and potable water. Assumes potable water is purchased from SCVWD starting at $625/AFY in 2013 and escalates over time (see **Appendix L**) and does not include the cost to purchase water to meet peak day demands (which is a cost to be shouldered by all alternatives). Lifecycle costs are calculated at net present value (NPV) and assume a 30-year life, 6% loan/bond rate, 13% loan/bond issuance cost, 2.5% inflation, and 3.1% real discount rate. Detailed lifecycle cost analyses are included in App. C of the TM (**Appendix L**).
Building/Equipment Footprint	Estimates the building and/or equipment footprint for each alternative.
Other	Identifies any additional benefits or concerns, such as removal of ammonia or potential future regulatory issues (i.e. constituents of emerging concern [CECs]).

10.3.2 Selected Alternative – Membrane Bioreactor (MBR)

The selected alternative (Alternative 4) consists of installing a MBR system to treat a sidestream of the WPCP flow. A MBR system combines activated sludge biological treatment with an integrated membrane system to provide both secondary treatment and tertiary filtration. A MBR system includes MF or UF membranes for solids/liquid separation, eliminating the need for separate secondary clarifiers and tertiary filtration to achieve a low turbidity effluent.

After initial degritting and primary sedimentation, a portion of the WPCP flow would be diverted to the MBR system, treated to tertiary quality, and then sent to the head of CCTs #1 and #2 for disinfection. The remainder of the WPCP flow would continue through the WPCP, treated to secondary standard, and then disinfected in CCTs #3 and #4 and discharged to the Bay.

A MBR system would eliminate the need for batch production and allow for continuous production of recycled water for distribution and/or storage. Only the portion of the WPCP flow necessary to meet customer demand would be diverted to the MBR system, allowing for continuous operation of the recycled water treatment system.

MBR systems do not remove salts and therefore must be followed by advanced treatment or potable blending for TDS reduction/removal, if desired; however, in this case, the WPCP flow diverted to the MBR system would bypass the oxidation ponds, which introduce algae and increase TDS in the WPCP flow thereby improving the color and the TDS of the recycled water.

The MBR system would treat 3.6 MGD to produce the desired amount of recycled water. A schematic of this scenario is presented in **Figure 10-3**. The demand and TDS characteristics of the various flow streams are presented in **Table 10-2**.

Table 10-2: Water Quality and Quantity Impacts

Parameter	MBR Treatment
Average Annual Demand	3,123 AFY
Average Day Design Flow	3.6 MGD
Average TDS	760 mg/L
MBR Design Capacity	3.6 MGD

At a planning level, this alternative is estimated to have a NPV capital cost of approximately $29M, an average annual O&M cost of $2.1M, and a NPV lifecycle cost of $85M. The unit cost would be $910 per AF of recycled water produced. The capital and life cycle costs represent the total estimated cost to develop an MBR treatment system to meet the 3.6 MGD capacity, and does not account for the potential cost-savings associated with reducing the necessary capacity of the proposed treatment process that will be recommended as part of the WPCP Master Plan. The footprint of a MBR system enclosed in a building or canopy is expected to be 47,000 SF for this alternative. The evaluation criteria for this alternative are summarized in **Table 10-3**.

Table 10-3: Summary of Evaluation Criteria

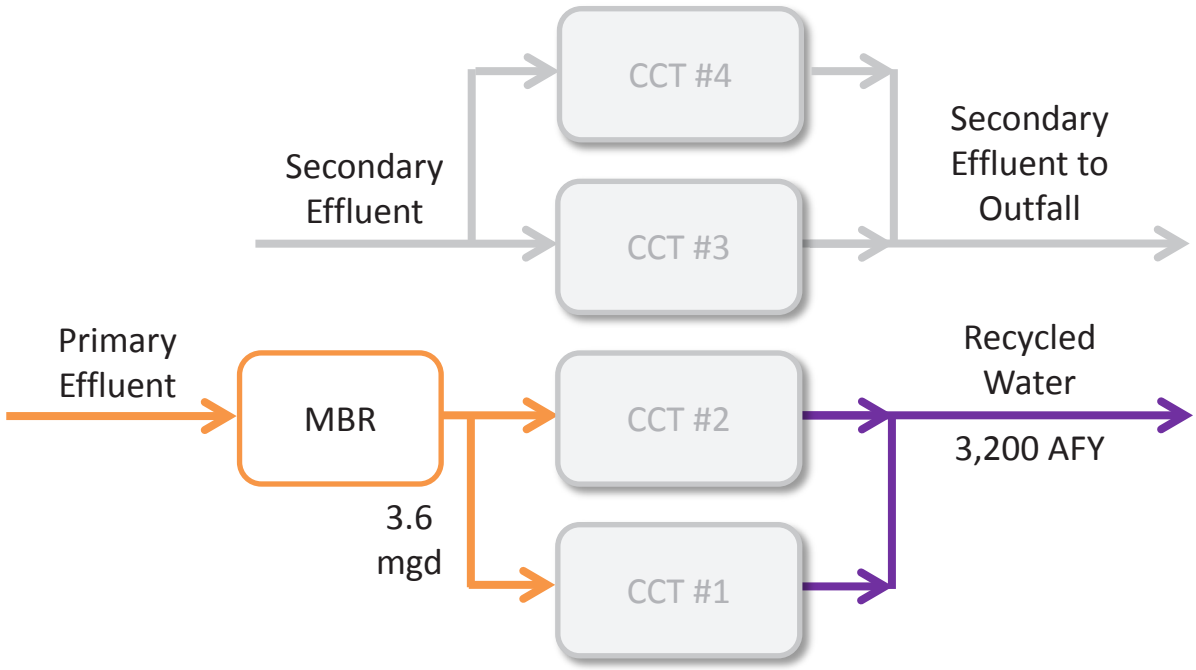
Evaluation Criterion	MBR Alternative
Eliminates Batch Operation	Yes
Eliminates Potable Blending	Yes
Operational Complexity	Moderate: Eliminates complexity of batch operation but introduces MBR technologies.
Capital Cost (NPV $M)	$29M
Average Annual O&M Cost ($/year over 30 years)	$2.1M/year
Lifecycle Cost (NPV $M)	$85M
Unit Cost ($/AF of recycled water produced)	$910/AF
Building/Equipment Footprint	47,000 SF
Other	There could be future regulatory concerns regarding CECs since MF does not remove all of these constituents.

10.4 Preliminary Siting

Preliminary discussions with the City indicate that the future MBR treatment equipment could be sited at the following locations:

- Administration building (to be demolished as part of the SIP); or
- Sludge lagoons

The administration building area is of a sufficient size to allow for the siting of a smaller system. The sludge lagoon and dewatering bed area occupies several acres of the site and could easily fit the MBR system. **Figure 10-4** indicates the preliminary siting for the MBR. Final siting of the MBR system will incorporate other improvements completed as part of the preparation of the WPCP Master Plan.



Source: TM#2 Treatment Alternatives Evaluation, Kennedy/Jenks Consultants, 2013

FIGURE 10-3
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
MBR FLOW SCHEMATIC

HydroScience

Source: TM#2 Treatment Alternatives Evaluation, Kennedy/Jenks Consultants, 2013

Legend

Preliminary Siting of MBR System

0 100 200 Feet

HydroScience

FIGURE 10-4
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
PRELIMINARY SITING OF MBR SYSTEM

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SECTION 11 – CAPITAL IMPROVEMENT PLAN

The proposed expansion of the recycled water distribution system would add approximately 18.5 miles of 6-inch to 24-inch pipe to connect an additional potential recycled water demand of 2,061 AFY. Together, these distribution system and on-site retrofit capital improvements represent an estimated project cost of approximately $43.2M.

Additional capital investment is needed for treatment, pumping, and storage facility improvements to support the expansion of the recycled water system. The pumping and storage improvements will be based on the selected site for the facilities, while the treatment costs may vary based on the treatment method selected. Therefore, the capital costs associated with treatment, pumping, and storage range from $99.5M to $114.1M.

This division of the overall recycled water system expansion project into multiple phases serves to create a Capital Improvement Plan (CIP) that is more fiscally manageable by implementing improvements over time and as they are necessary to further develop the recycled water system. Considering the ranking methodology and grouping alignments into projects within phases, the phases of the proposed CIP are described in the following sections. The original CIP was prepared by K/J and is included as **Appendix M**.

11.1 Project Prioritization

Prior to developing the phases for expansion, it is necessary to prioritize the alignments. The most practical factor used to determine the priority is the cost per AFY ($/AFY) of potential recycled water demand for each alignment. In **Section 9.5**, **Table 9-3**, the alignments were ranked by $/AFY.

The City is also pursuing opportunities to expand the system beyond the City limits to connect and collaborate with the District. As such, in terms of the CIP planning, the Wolfe Road Alignment Project has been given priority for implementation and is presented as the first phase of CIP implementation.

Based on previous rankings as well as the work the City is doing to potentially collaborate with the District, the proposed alignments were divided into four phases to provide a logical plan for expanding the recycled water system. Each phase is further divided into Critical Path (A) Projects, Supplemental (B) Projects, and Optional (C) Projects. Critical Path projects are those projects that must be completed in order for the Supplemental and Optional projects to function. Without the construction of the respective phases' Critical Path project, recycled water would not be available to subsequent projects (i.e. Supplemental and Optional Projects). Supplemental projects are those extensions ranked in the top ten by $/AFY. Optional projects are those remaining projects that rank below the top ten.

Table 11-1 below presents the same data previously presented in **Table 9-3** for the proposed distribution system alignments including the total alignment demand, total project alignment cost (including pipeline and retrofit costs), and the rank of the alignment relative to each other. The alignments are further organized in the table based on proposed phase, $/AFY, and criticality. **Figure 11-1** provides a map of the proposed phasing.

Table 11-1: Proposed Distribution System Alignments, Ranks, and Phases [1]

Alignment	Demand (AFY)	Total Project Cost [2]	Rank ($/AFY)	Priority (A, B, or C) [3]
Phase 1				
Wolfe Road Main	345	$7,239,000	10	A
Iris Avenue	55	$634,000	3	B
Dartshire Way	65	$1,369,000	9	B
Marion Way	30	$648,000	11	B
Phase 1 Totals	**495**	**$9,890,000**		
Phase 2				
Infill Sites	335	$2,675,000	2	B
Duane Avenue	429	$5,621,000	4	B
Phase 2 Totals	**764**	**$8,296,000**		
Phase 3				
Kifer Road West	54	$781,000	5	B
Lakehaven Drive	86	$1,406,000	7	B
Kifer Road East	51	$1,332,000	13	C
Maude Avenue	36	$1,362,000	15	C
Phase 3 Totals	**227**	**$4,881,000**		
Phase 4				
Main Loop	335	$15,914,000	17	A
Manet Drive	86	$445,000	1	B
Gail Avenue	39	$578,000	6	B
Old San Francisco Road	26	$450,000	8	B
Carson Drive	16	$370,000	12	C
Remington Drive	59	$1,751,000	14	C
Sunnyvale-Saratoga Road	14	$595,000	16	C
Phase 4 Totals	**575**	**$20,103,000**		

Notes:
1. Data originally presented as **Table 9-3** in **Section 9.5**.
2. Total project cost includes construction, design, permitting, construction management, and contingency of both the pipeline and associated customer retrofits.
3. Projects are further ranked as Critical Path (A) Projects, Supplemental (B) Projects, and Optional (C) Projects.

A breakdown of the phases by alignment and criticality provides the City with a plan for focusing funds and reduces dependencies between projects. This allows other projects to move forward if problems arise on higher priority projects. Also, preventing stranded assets by constructing alignments that will realize recycled water delivery can be accomplished following this model since it can allow the City to remove or postpone an alignment in a phase and still realize the benefits of the previously constructed system.

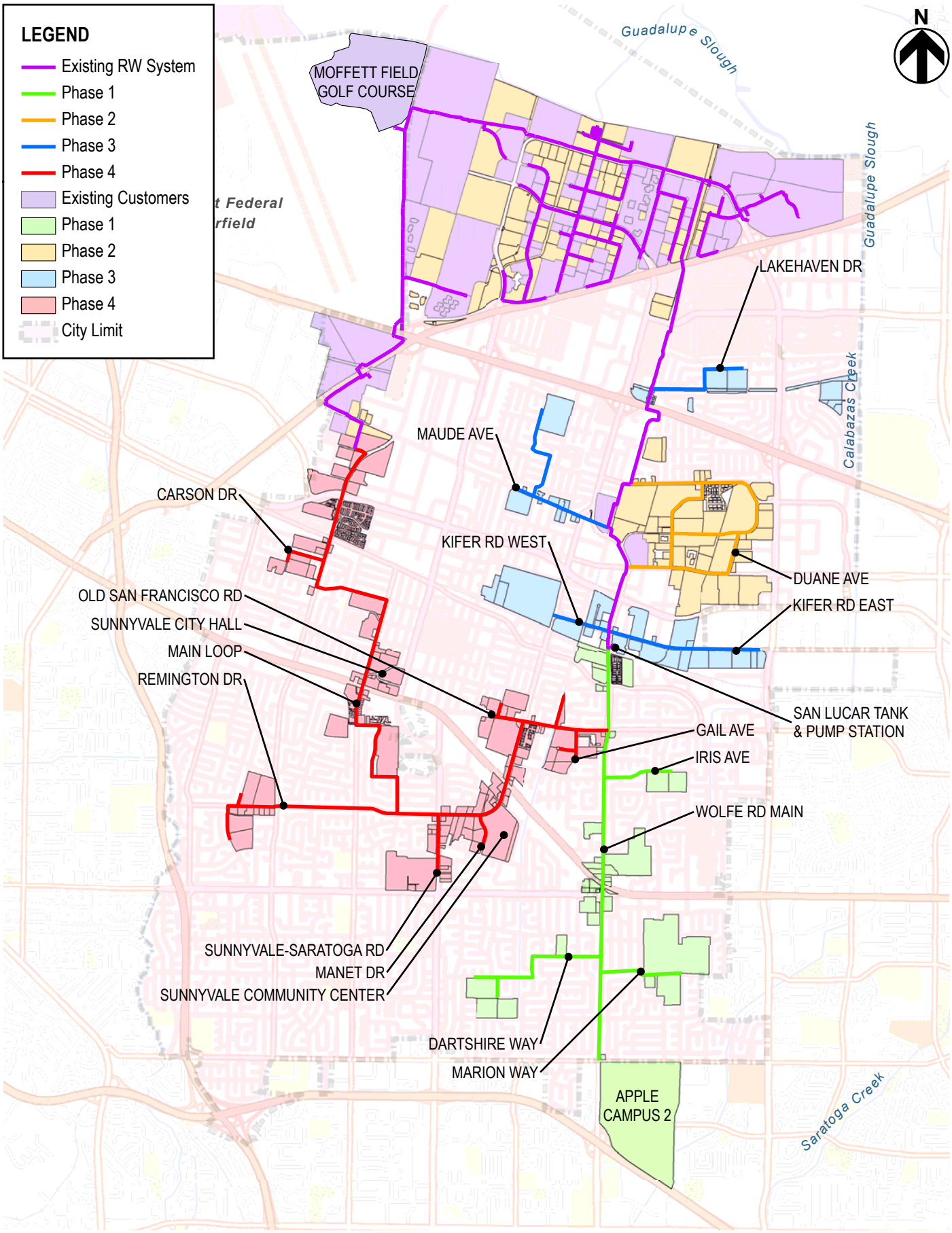

FIGURE 11-1
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
CIP ALIGNMENT PHASING

HydroScience

To fully realize the benefits of capital expenditure on the recycled water system, retrofitting identified users to receive recycled water is critical to achieving the anticipated recycled water demand; therefore, so too is customer cooperation and willingness to convert to recycled water. It is understood that design and construction work for customer retrofits differs from more traditional pipeline work; therefore customer retrofits would be designed, bid, and constructed separately from the pipeline projects. This also allows for competitive bids and accounts for the varying timeline for completion of customer retrofits. However, for the purpose of CIP planning, total cost and ranking represents costs for the pipeline and associated retrofits.

All proposed treatment, pumping, and storage improvements proposed for each phase is considered a Critical Path project in order to serve the alignments proposed for the respective phase. Treatment and pumping and storage improvements and costs are discussed in detail in **Sections 8** and **9**, respectively. Costs for treatment, storage, and pumping by phase are summarized in **Table 11-2**.

Table 11-2: Treatment, Storage, and Pumping Cost Summary by Phase

Phase/Improvements	Treatment Capacity (MGD)	Treatment Costs	Storage & Pumping Costs	Total Capital Cost
Phase 1 – New MBR San Lucar Site Improvements	1.67	$20,000,000	$1,064,000	$21,064,002
Phase 2 – MBR Expansion	0.51	$11,000,000	$0	$11,000,001
Phase 3 – MBR Expansion Wolfe-Evelyn Site	1.42	$25,000,000	$10,901,000	$35,901,001
Phase 4 – Central Avenue Site	0	$0	$2,848,000	$2,848,000
Total	**3.60**	**$56,000,000**	**$14,813,000**	**$70,813,004**

Each phase is discussed in the following sections and addresses treatment, pumping, and storage facility improvement projects necessary to support the increased recycled water demand realized within each phase.

11.2 Phase 1 – Wolfe Road

This phase includes the construction in the Wolfe Road alignment and associated extensions and retrofits to increase recycled water delivery by 495 AFY. It is anticipated this phase will begin during 2013, and be completed within five years requiring from $24.7M to $31M in capital cost. The distribution system improvements, treatment improvements, and pumping and storage requirements to support this expansion are discussed in the following sections.

11.2.1 Phase 1 Distribution System

Critical Path Project: The Wolfe Road Main consists of the construction of a new 13,300 LF pipeline with a diameter ranging from 12- to 24-inches. The pipeline would connect to the existing 24-inch recycled water pipeline at the San Lucar pump station, near the intersection of Kifer Road and Wolfe Road to the new Apple® Campus 2. At build-out, this alignment would deliver 345 AFY recycled water at an estimated cost of $6.4M for pipeline construction. Thirteen retrofits along the Wolfe Road Main are estimated to cost $840,000.

Supplemental Projects: The three branch alignments along Iris Avenue, Dartshire Way, and Marion Way includes approximately 10,400 LF of 6-inch to 8-inch pipeline at an estimated cost of $2.1M to deliver 150 AFY. Eight retrofits along the three branch alignments are estimated to cost $515,000.

The distribution system improvements in this phase are expected to be partially funded by others. For the purposes of the CIP development it is assumed the City will receive funding from Apple® and Cal Water, totaling $6.3M, to offset total capital costs for the pipeline construction.

It is noted that the improvements in this phase may change in scope due to the potential to serve the SCVWD. The CIP does not incorporate potential service to SCVWD as this service would impact subsequent plans for expansion of the recycled water system within the City limits as the amount of recycled water available to City customers would be reduced.

11.2.2 Phase 1 Treatment

To meet current and near-term recycled water demand associated with this phase, a 1.67 MGD MBR system would be required. This treatment system would fulfill the average day demands while potable water would be used to supplement on peak days when demand cannot be met by storage alone.

The treatment improvements would begin with the construction of the Wolfe Road Main and be completed by 2016 to meet the increased demand. The treatment system will have an estimated capital cost of $20M and annual operating costs of $0.5M, which includes the potable water needed to meet peak day demands.

11.2.3 Phase 1 Pumping and Storage

Improvements to the San Lucar tank and pump station will be required to meet the increased recycled water demands brought online in this phase. These improvements will require $1.1M in capital cost and will be completed in parallel with the construction of the Wolfe Road Main in order to meet the increases pumping and storage requirements of the pipeline and pipeline extensions.

11.3 Phase 2 – Infill and Duane Avenue

This phase consists of customer retrofits of sites along the existing distribution system and construction of the Duane Avenue branch alignment, increasing recycled water demand by 764 AFY. This phase has an estimated capital cost of $19.3M and is expected to take six years to complete, commencing in 2015. The distribution system improvements, treatment upgrades, and pumping and storage requirements required for this phase are discussed in the following sections.

11.3.1 Phase 2 Distribution System

Supplemental Projects: The distribution system improvements in this phase are broken into two projects to allow for the focused efforts by the City: Infill retrofits project and Duane Avenue pipeline and retrofits project. The first project would consist entirely of infill customer retrofits. Approximately $2.7M in capital costs is estimated for the 50 retrofits projected to deliver 335 AFY. As no additional infrastructure is necessary for this project, it is anticipated that this project would be complete in the next five years.

Due to the number of retrofits included in this project, it may prove advantageous to the City break this project into smaller projects based on site similarities/street alignments to assist in management and progress. Smaller projects can be created by grouping the type of retrofit site/use into the following: parks, schools, and municipally-owned sites; commercial landscape use; residential landscape use; and industrial use. Retrofits for industrial use of recycled water tend to be more complex, requiring more design and construction time as compared to parks, schools, and other municipally-owned sites.

The second project, the Duane Avenue pipeline and retrofits, includes approximately 16,500 LF of 6-inch to 12-inch pipe and would be constructed with an estimated $4M in pipeline capital cost. The 23 sites along the alignment would be retrofitted for an estimated capital cost of $1.7M. The total demand is estimated to be 429 AFY.

11.3.2 Phase 2 Treatment

It would be necessary to increase the MBR treatment capacity by 0.51 MGD to meet the increased recycled water demand brought online in this phase. The associated capital cost for the additional MBR units is estimated at $11M with $300,000 in annual O&M costs, which include the potable water necessary to meet peak day demands that cannot be met by storage alone.

11.3.3 Phase 2 Pumping and Storage

There are no pumping and/or storage facility improvements proposed for this phase.

11.4 Phase 3 – Extensions

The four remaining branch extensions from the existing distribution system are included in this phase. An estimated 227 AFY of recycled water demand would be realized over a nine year period, starting in Year 7 (2019), for a total estimated capital cost of $38.1M to $40.8M in distribution system improvements, treatment upgrades, and pumping and storage additions. The elements of this phase are described in the sections below.

11.4.1 Phase 3 Distribution System

The distribution system improvements are divided into four projects, two Supplemental projects and two Optional projects. It is anticipated Phase 3 will begin in Year 7 and is expected to be complete by Year 15, bringing total recycled water delivery to City customers

to 2,548 AFY. If the City proceeds with serving SCVWD, it should be determined before Year 5 (prior to construction of Duane Avenue branch extension) to prevent stranding assets.

Supplemental Projects: These projects include the Lakehaven Drive and Kifer Road West pipeline and retrofits Approximately 6,000 LF of 6-inch an 8-inch pipe would be constructed to serve 16 sites with an estimated capital cost of $1.3M. The associated retrofits are estimated at a capital cost of $900,000. This project would increase recycled water demand by 140 AFY.

Optional Projects: The Kifer Road East and Maude Avenue pipeline and retrofits are optional. Approximately 11,800 lf of 6-inch and 8-inch pipe would be constructed for an estimated capital cost of $2.2M. Seven customer retrofits would be included for an estimated $455,000 to deliver 87 AFY of recycled water.

11.4.2 Phase 3 Treatment

This phase will include adding MBR units to bring the recycled water treatment system capacity up to the full 3.6 MGD build-out capacity to handle the increased demands associated with this phase and the future phase. A total of 1.42 MGD capacity will be added with an estimated capital cost of $25M and annual O&M costs of $500,000.

11.4.3 Phase 3 Pumping and Storage

To meet the increased demands of the recycled water system, new pumping and storage facilities will be necessary and are included in this phase. Due to the proximity of the existing recycled water system and the anticipated construction work through Phase 3 as well as the pumping and storage facilities discussed in **Section 8**, it is recommended that the Wolfe-Evelyn site be used to meet the needs of the system. The estimated project cost for this site is $10.9M.

If this site proves to be problematic a small portion of Phase 4, as describe below, could be completed early to allow service to the Central Tank site in place of the Wolfe-Evelyn site. Additional supplemental funds will be necessary for the Central Tank site which is accounted for in Phase 4.

11.5 Phase 4 – Main Loop Area

Phase 4 consists of the Main Loop pipeline and area with an estimated capital cost of $17.4M to $23M to increase recycled water demand by 575 AFY. This phase is anticipated to begin in Year 13 (2025) and take nine years to be completed.

11.5.1 Phase 4 Distribution System

The distribution system improvements in Phase 4 are divided into seven projects; one critical path project, three supplemental, and three optional, to assist in management, priority, and design and construction process.

Critical Path Project: The first project includes construction of the Main Loop pipeline and associated customer retrofits. The pipeline project consists of the 24,800 LF of 16-inch to 24-inch pipeline with an estimated cost of $13.5M. There are 43 retrofit sites identified as customers served directly by the Main Loop pipeline with an estimated $2.4M in construction cost to increase recycled water delivery by 335 AFY.

To limit cost, staffing, and construction impacts to the City with one large pipeline project, the Main Loop pipeline project may be completed in two segments. One segment would consist of the eastern-most portion of the Main Loop from Wolfe Avenue to Sunnyvale-Saratoga Road and the second segment would be the remainder of the pipeline from Sunnyvale-Saratoga Road to the terminus of existing distribution system at Encinal Park. Dividing the alignment into two segments would allow the first group of branches, as described below, along the Main Loop to be constructed before completing the entire Main Loop alignment. The first group of branches has a high recycled water demand and would allow the use the Central Tank site for pumping and storage facilities if this site becomes the best option. Then the second group of branches can follow the completion of the Main Loop.

Supplemental Projects: The three westernmost branches from the Main Loop, including Gail Avenue, Old San Francisco Road, and Manet Drive pipeline and retrofits. Approximately 4,300 LF of 6-inch and 8-inch pipeline would be constructed to deliver 151 AFY of recycled water with an estimated construction cost of $848,000. Ten retrofits along these branches are included with an estimated cost of $625,000.

Optional Projects: The projects consist of the Sunnyvale-Saratoga Road, Remington Drive, and Carson Drive pipelines and retrofits, which are the remaining branches off of the Main Loop. At an estimated construction cost of $2.1M, approximately 10,500 LF of 6-inch to 8-inch pipe would deliver 89 AFY to customers along these alignments. Customer retrofits include 11 sites along these branches with an estimated construction cost of $640,000.

11.5.2 Phase 4 Treatment

The treatment system upgrades necessary for supporting the demand associated with this phase will have already been completed as described in Phase 3.

11.5.3 Phase 4 Pumping and Storage

The necessary pumping and storage facilities needed for the expansion of the recycled water system are included under Phase 3; no additional facilities are needed to meet the demands under this phase. If it is determined that the Central Tank site is the preferred location for the pumping and storage facilities, a small portion of the Phase 3 – Main Loop branches pipeline, under this phase, could be constructed to make the service to this site feasible. Therefore, some cost of this phase may be realized sooner but this consideration is not included in an earlier phase. The estimated cost for the Central Tank site is approximately $2.8M greater than the Wolfe-Evelyn site. For the purposes of CIP planning of capital expenditure, this additional capital cost is accounted for in this phase since the Central Tank site could not be served by the distribution system until portions of this phase are completed.

11.6 CIP Overview

A summary of the phases and associated projects and improvements (treatment, pumping, and storage) is provided in **Table 11-3**. **Figure 11-2** provides a timeline of implementation and associated costs for the CIP.

Table 11-3: Proposed Phases and Projects

Projects	Demand (AFY)	Pipeline Cost	Retrofit Cost	Total Capital Cost
Phase 1				
Wolfe Road	345	$6,399,000	$840,000	$7,239,000
Apple Contribution [1]		-$4,800,000		-$4,800,000
Wolfe Road Extensions	150	$2,136,000	$515,000	$2,651,000
Cal Water Contribution [2]		-$1,500,000		-$1,500,000
Treatment Improvements				$20,000,000
Pumping/Storage Improvements – San Lucar Site				$1,064,000
Phase 1 Total (without external contributions)	495	$8,535,000 ($2,235,000)	$1,355,000 ($1,355,000)	$24.7M ($31.0M)
Phase 2				
Infill Retrofits	335	$0	$2,675,000	$2,675,000
Duane Avenue	429	$3,956,000	$1,665,000	$5,621,000
Treatment Improvements				$11,000,000
Phase 2 Total	764	$3,956,000	$4,340,000	$19.3M
Phase 3				
Extensions	140	$1,287,000	$900,000	$2,187,000
Optional Extensions	87	$2,239,000	$455,000	$2,694,000
Treatment Improvements				$25,000,000
Pumping/Storage Improvements – Wolfe-Evelyn Water Plant Site				$10,901,000
Phase 3 Total (including optional extensions)	140 (227)	$1,287,000 ($3,526,000)	$900,000 ($1,355,000)	$38.1M ($40.8M)
Phase 4				
Main Loop	335	$13,504,000	$2,410,000	$15,914,000
Main Branch Extensions	151	$848,000	$625,000	$1,473,000
Optional Extensions	89	$2,076,000	$640,000	$2,716,000
Pumping/Storage Improvements [3] – Central Avenue Water Plant Site				$2,848,000
Phase 4 Total (including optional extensions and Central site)	486 (575)	$14,352,000 ($16,428,003)	$3,035,000 ($3,675,000)	$17.4M ($23.0M)
CIP Total [4] (including all optional extensions) [5]	**1,885 (2,061)**			**$99.5M ($114.1M)**

Notes:
1. CIP assumes Apple® will provide $4.8M in funding.
2. CIP assumes Cal Water will provide $1.5M in funding for this phase.
3. This cost would only be incurred if the Central Avenue Water Plant site was selected and is considered an addition to the $10.9M for pumping/storage improvements under Phase 3.
4. This cost includes all Critical Path and Supplemental Projects as well as contributions from Apple® and Cal Water.
5. This cost includes all Projects and excludes potential contributions.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Phase 1: Wolfe Road	Capital: $24.7M ($31.0M)[1]																				
Pipeline - Wolfe Road	$1.6M																				
Customer Retrofits - Wolfe Road			$0.8M																		
Pipeline - Wolfe Road Extensions			$0.6M																		
Customer Retrofits - Wolfe Road Extensions				$0.5M																	
Treatment Improvements	$20M																				
Pump/Storage Improvements - San Lucar	$1.1M																				
Phase 2: Infill & Extension			Capital: $19.3M																		
Customer Retrofits - Infill			$2.7M																		
Pipeline - Duane Ave					$4.0M																
Customer Retrofits - Duane Ave							$1.7M														
Treatment Improvements						$11.0M															
Phase 3: Extensions							Capital: $38.1M ($40.8M)[2]														
Pipeline - Extensions							$1.3M														
Customer Retrofits - Extensions										$0.9M											
Pipeline - Optional Extensions													$2.2M								
Customer Retrofits - Optional Extensions														$0.5M							
Treatment Improvements													$25.0M								
Pump/Storage Improvements - Wolfe-Evelyn								$10.9M													
Phase 4: Main Loop													Capital: $17.4M ($23.0M)[2,3]								
Pipeline - Main Loop													$13.5M								
Customer Retrofits - Main Loop																	$2.4M				
Pipeline - Main Branch Extensions																	$0.8M				
Customer Retrofits - Extensions																			$0.6M		
Pipeline - Optional Main Branch Extensions																			$2.1M		
Customer Retrofits - Optional Extensions																				$0.6M	
Pump/Storage Improvements - Wolfe-Evelyn														$2.8M							

1 Assumes Apple and Cal Water Funding is not available
2 Assumes optional projects are incorporated
3 Includes additional cost to use Central Water Plant Site

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FIGURE 11-2
CITY OF SUNNYVALE
FEASIBILITY STUDY FOR RECYCLED WATER EXPANSION
CIP IMPLEMENTATION TIMELINE

11.7 Funding Options

The City is committed to funding these projects by pursuing a combination of funding options including grants, low-interest loans, partnerships with neighboring agencies, and user rates.

Construction grants and low-interest loans are available through the Water Recycling Funding Program, which is administered through the California State Water Resources Control Board (SWRCB). Grants include up to 25% of the construction costs up to $5M. Loans include an interest rate of 1/2 the rate of the general obligation bond for a 20-year repayment period.

Low-interest loans are also available through the California Clean Water State Revolving Fund (CWSRF) which has a $25M loan limit per agency. The CWSRF rates and repayment period are the same as the SWRCB rates and repayment period.

Construction grants are also available through the United States Bureau of Reclamation (USBR). USBR grants include up to 25% of the construction costs, or $20M, whichever is less.

Examples of partnerships with other agencies include a cost share agreement with Apple® and Cal Water to fund portions of the Wolfe Road Main pipeline alignment. As discussed in **Section 11.2.1**, Apple® may provide funding for a 12-inch recycled water pipeline along this alignment, which has an estimated cost of $4.8M. Cal Water may also fund up to $1.5M of this project, subject to funding approval from the CPUC.

User rates may also be used to fund recycled water projects. User rates will only be used if other funding sources are not available.

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