water & air RESEARCH, INC.

ch2m

TECHNICAL MEMORANDUM

To: Plum Creek Timber Co.

From: Water and Air Research, Inc. and CH2M

Date: June 16, 2015

Subject: EA-Hawthorne – Water and Wastewater

1.0 Introduction

This technical memorandum includes the data and analysis related to planning the water and wastewater facilities for the proposed amendment to the City of Hawthorne comprehensive plan known as EA-Hawthorne. The purpose is to provide the appropriate level of technical information to assist the City in review of the amendment. The conceptual level of detail presented here is consistent and appropriate for the comprehensive plan process. An outline of information included in this technical memorandum is presented below:

Contents

6821 SW Archer Road
Gainesville, FL 32608
Voice: 352/372-1500
Toll Free: 1/800/242-4927
Fax: 352/378-1500
businessdev@waterandair.com
www.waterandair.com

1.1 EA-Hawthorne and Envision Alachua

The proposed comprehensive plan amendment for EA-Hawthorne is based on the Envision Alachua community planning process that began in 2011. Envision Alachua is a community planning process that was developed to discuss future economic, environmental and community opportunities in Alachua County on lands owned by Plum Creek. It's an open dialogue with community leaders representing economic development, business, local government, education, environmental, conservation and residents in Alachua County.

To ensure broad community involvement, information sharing and opportunities for in-depth conversation, the Envision Alachua process has included a variety of community participation and informational activities. These include guided tours of Plum Creek lands, community workshops, educational forums, case examples, a project website and a Task Force composed of 31 community members. The Envision Alachua Task Force was established to provide input into the visioning process for developing a master plan for Plum Creek lands in Alachua County. The Task Force includes community leaders from the economic development, business, local government, education, faith-based, environmental and conservation communities throughout Alachua County. Members have met approximately every quarter since June of 2011 to hear technical presentations that provide background on current and future economic, environmental and community conditions in Alachua County. These presentations provide a baseline for discussion and guidance from the Task Force. The Task Force guiding principles and priorities are: 1) education and community, 2) economic opportunity, and 3) environmental conservation.

Plum Creek is the largest private landowner in Alachua County, with 65,000 acres. Nearly 24,000 of these acres are permanently conserved. The company's holdings are located throughout northern and eastern Alachua County. Plum Creek is considering future uses for its lands that could be aligned with community needs. Working with the 30-member Task Force and the general community, Phase I of the process yielded a community vision, goals and guiding principles to guide Plum Creek's decision-making as it explores potential opportunities for lands in eastern Alachua County inclusive of environmental uses and for uses other than timber.

During Phase II of the process, Plum Creek also worked with a Technical Advisory Group, the Task Force and members of the community to determine how to achieve the community's vision and goals that support economic development opportunities, environmental conservation and activities that meet community needs as expressed during the Envision Alachua process.

EA-Hawthorne has evolved out of the Envision Alachua process.

1.2 Integrated Water Resources Strategy

EA-Hawthorne recognizes that it is critical to address the long-term water quality and supply needs for these lands. To accomplish this, Plum Creek is developing a new water ethic standard based on the following principles:

- Conservation First
- Right Water for the Right Use
- Efficiency of Use
- Source Protection and Restoration
- Performance Monitoring over 50 Years

Plum Creek's policy stating that automatic irrigation systems will not be used for residential landscape irrigation in the EA Hawthorne area is ground-breaking and is an example of the type of leadership Plum Creek is providing on water management issues. The following are some key policies that will promote long-term sustainability in both quality and supply of water for these lands.

- The use of large water storage facilities for water harvesting and capture shall be encouraged.
- All Agriculture and Silviculture (forestry) activities shall follow the most recent applicable best management practices.
- Priority use of reclaimed water shall be given to environmental restoration projects and industrial users.
- State-of-the-art system components (e.g., water recycling) shall be incorporated where appropriate and feasible.
- The use of Florida-Friendly plant species shall be required for landscaping, with a preference for native species.

To guide and evaluate the effectiveness of the water management strategy, and also to provide comments on the approach, conservation techniques and potential alternative sources of water, Plum Creek convened a group of professionals with water expertise. The Water Management Technical Advisory Panel, the majority of members represented by University of Florida professors, was asked the following questions:

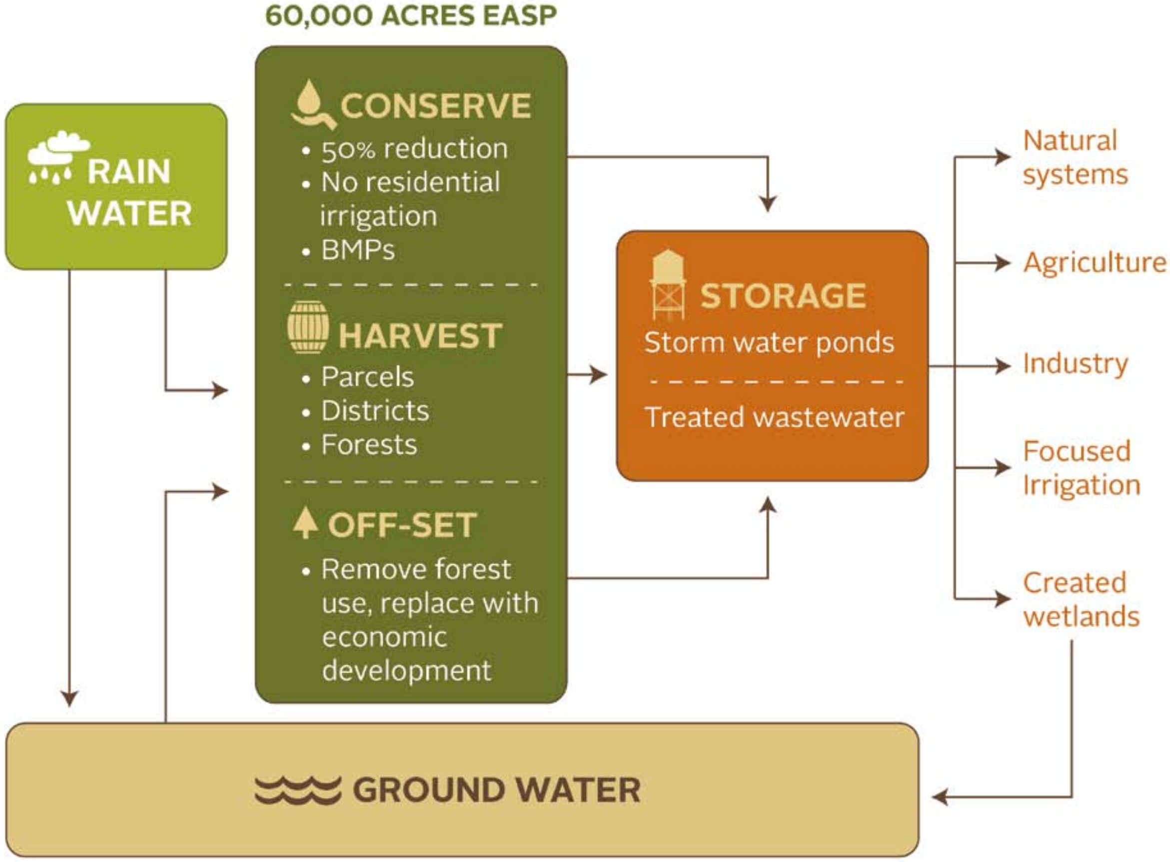
- Are the assumptions in the water strategy reasonable?
- Are the results and recommendations in the plan reasonable?
- Do the proposed solutions appropriately address the key issues?
- Are there solutions which have not yet been considered?
- Is there additional data, analysis or research needed?

The group met in mid-March 2014 and discussed these basic questions. At the meeting the water management concept shown in Exhibit 1-1 was presented. The concept includes water conservation, harvesting of rainwater, and removal of forests to off-set evapotranspiration. Reduction of evapotranspiration would potentially provide additional rainwater to be available for groundwater recharge. Storage through the use of stormwater ponds and treated wastewater in wetlands was also included as part of the concept. Potential water supply needs were discussed with the priority to minimize water use, apply the right water to the right use (based on availability and quality) and return as much water as possible to the natural environment.

The comments and suggestions from the panel provided guidance to Plum Creek in refining and improving the water strategy. The Water Management Technical Advisory Panel's summary report is available.

The result of both the water technical advisory panel and the water team formed the basis for a new water ethic that shaped the policies of the EA-Hawthorne comprehensive plan amendment.

Exhibit 1-1
Water Management Concept
EA – Hawthorne Water and Wastewater Data and Analysis



1.3 Principles

As a guide toward implementation, Plum Creek adopted the communities' water principles to align this water supply plan with the overall vision of the planned areas in eastern Alachua County. The main goal of water-use planning is to address long-term sustainable needs for water supply, water quality, and water conservation for future planned areas. To achieve this, an integrated water resource plan was created that would balance water supply, wastewater reclamation and reuse, stormwater, and natural systems to meet the water goal for the planned area. The five planning principles listed below were identified by the community and serve as the water goals for the EA-Hawthorne area. These principles are reflected in the policies stated above.

- Identify, protect and utilize groundwater recharge areas.
- Develop communities that optimize water conservation and achieve a reduction in water usage.
- Apply Florida-friendly guidelines for landscaping.
- Demonstrate leadership in resource management by promoting and adopting innovative ways to meet water needs.
- Capture, treat, and reuse stormwater to the maximum extent feasible – water will be used more than one time.

While developing the water supply plan, these water principles were applied. Plum Creek recognizes that over the planning period the resources, communities and treatment technologies will continue to improve. The water supply plan and the initial implementation for supply, treatment, storage and reuse must be flexible to adapt to the future. The approach and technologies applied must remain flexible, but these principles remain constant.

Plum Creek will continue to seek input from experts at the University of Florida, St. Johns River Water Management District (SJRWMD), Gainesville Regional Utility, the City of Hawthorne, and other local governments, to evaluate the best and most sustainable solutions for water needs in eastern Alachua County. Education and outreach to the surrounding communities will be a priority to teach the public about water conservation methods for businesses and residents.

Water conservation will be incorporated into the design and construction of all buildings and facilities, into the type of landscaping allowed, the selection of industries and agricultural uses and, potentially, into the community covenants and restrictions and Zoning Master Plans. Opportunities to use additional wetlands for the storage of reclaimed water and stormwater within the planned areas will be evaluated. These wetlands will not only provide storage to better optimize the use of reclaimed water and stormwater, but can also provide a benefit to the community and surrounding wildlife.

2.0 Proposed Development Plan

As part of the comprehensive planning process, infrastructure must be planned and resources must be identified, including the water supply resources needed to serve the future activities, wildlife and people on those lands. With any new development areas being considered, the water supply needs must not adversely impact the existing water resources, the surrounding environment, or the local and regional communities. This supporting data and analysis report for the proposed amendment to the City of Hawthorne comprehensive plan summarizes the evaluation of water supply that is part of Plum Creek's future development areas in eastern Alachua County.

The first step in the evaluation was to identify potential water sources and quantify the range of specific water demands for the new planned area. North Central Florida has multiple groundwater aquifers at different depths with varying degrees of water quality. The upper Floridan aquifer is a high quality water source that has been used for many years for potable water by public utilities and for agricultural uses by small and large farming operations in the area. Another potential source is the deeper lower Floridan aquifer which is commonly used in other parts of the state. Other alternative water sources, including reuse and stormwater, were also identified for use within the development for non-potable water demands. A range of typical water demands for the development areas were estimated considering maximum water use rates by similar types of development to low end rates considering aggressive conservation techniques. Plum Creek's goal for the EA-Hawthorne area is to be a model of water stewardship and will include not only conservation methods for industries and residents, but also a fundamental water ethic that fosters wise water use. Identifying the optimum combination of water resources coupled with conservation methods was determined to be the best way to balance water resources in the region and reduce impact to the environment.

Therefore, a preliminary water resource development plan was created to identify the best approach to water supply based on these principles. Ranges of water demand for the EA-Hawthorne area were determined through 2030, the estimated year of buildout, based on a preliminary development planned program. A combination of water sources, treatment, reuse, and conservation methods were evaluated to balance regional water resources as the water demands change during the maturity of development areas. Reasonable solutions for water supply were determined for future development and environmental activities.

3.0 Water Supply and Facilities

3.1 Description of Community

The proposed land use within the EA-Hawthorne area is described as EA Hawthorne mixed use. This land use includes economic development via research and development, offices, and advanced manufacturing. These areas will also include residential units, retail space, schools and civic uses, recreation and open spaces. Areas are provided for related research facilities and environmental services in addition to silviculture and other activities.

The urban land uses create demands for potable water, irrigation, and industrial process water. There is a wide range of types of urban land use and water demands can vary greatly depending on the specific type of development activity.

3.2 Characteristics and Principles Related to Water Demands

3.2.1 Industrial and Commercial

Industrial water use can vary greatly depending on the type of industry. For example, the chemical production industry can require 10 to almost 400 times more water compared to some food and beverage industries. Industrial water use can be divided into four categories: process water, cooling or heating water, domestic use and irrigation. Maximizing process water use efficiency can have a significant impact on the overall water demand of a wet-process-type industry. Process water often can be reclaimed and reused within an industrial facility. However, best management practices tend to be industry or even facility specific. Restrictions can also be developed to require high water-use industries within the EA-Hawthorne mixed use area to implement water recycling technologies.

Cooling towers, boilers and steam systems for cooling and heating are other industrial components that typically consume larger quantities of water. These systems are common in many types of industry regardless of the production process. The water used in these cooling and heating systems can be recycled until the concentration of dissolved solids is high enough to cause scale or corrosion issues. Then the recycled water must be discharged, which is referred to as blowdown, and more water is added to the system. Monitoring and controlling recycle and blowdown are ways to significantly conserve water. Supplying reuse water for cooling towers is another conservation approach.

Additionally, some industries require little to no process water and mainly require domestic type water use and would have demands similar in volume to residential units. The ratio of employees to water use is an important factor when considering types of industry to welcome into the community. Additional guidelines encouraging low water use can be implemented to attract more low water demand type industries to the community.

A mix of various commercial and institutional water users can be expected in this community. The majority of these users except restaurants and other food industry related users have water demands similar to indoor residential demands. Thus, similar conservation techniques including low-flow fixtures and water efficient appliances in restaurants and cafeterias will be implemented to reduce water demand.

3.2.2 Residential

Water use, particularly indoor use, in single-family residences has been declining in recent years. The Florida Department of Environmental Protection (FDEP) Regional Water Supply Planning 2011 Annual Report showed a decline in domestic residential per capita water use from 106 gallons per capita per day (gpcd) to 87 gpcd from 2000 to 2010. An emphasis on water conservation, water use restrictions, increased use of reclaimed water, graduated rates, and Florida-friendly landscaping techniques have all contributed to the decrease in per capita water use in the state. Replacing older fixtures and appliances with high-efficiency fixtures and appliances that are more prevalent in the marketplace, will result in a continued decline of indoor water use. Additionally, plumbing codes are evolving to restrict the use of less efficient, high water use fixtures in new homes and businesses.

Florida-friendly landscaping will be required in the EA-Hawthorne area. Residential automatic landscape irrigation systems will not provided within the EA-Hawthorne area. Rainwater harvesting can be implemented to provide an independent, natural source for residential irrigation. Additionally, communal gardens or common green spaces can be provided within commercial districts, activity centers, and residential neighborhoods to provide a localized area where water use for irrigation can be monitored and controlled. These common areas can also be irrigated with harvested water to reduce the potable water demand.

3.2.3 Irrigation

Landscaping is an asset to the built environments and communities as a whole. Landscaping can help clean and cool the air, reduce stormwater runoff as well as glare and noise, and beautify communities. However, maintaining healthy conventional residential and urban landscapes requires irrigation which significantly contributes to the overall water demand of a community.

Outdoor water use is subject to the built environment style, the size of the landscaped areas and the type of vegetation planted. Florida-friendly landscaping involves planting vegetation that is native to the area or are amenable to water conversation. Applying xeriscape practices means implementing specific principles. It is the use of appropriate native and adapted plants, use of mulch, water use zones, and other water conservation practices. These landscaping choices and techniques not only will reduce or eliminate the need for irrigation, but also reduces the need to fertilize the landscapes.

Florida-friendly landscaping will be required throughout the EA-Hawthorne area. In addition to Florida-friendly, native, and smart-choice landscaping being principle components in the water plan, effective conservation irrigation practices can also reduce water demand and irrigation costs. To reduce irrigation water demands, automatic landscape irrigation systems will not be a part of the EA-Hawthorne residential community. For the public areas like parks, schools and others, various soil moisture-based irrigation systems can be implemented to maximize water use efficiency. Smart controllers and soil moisture sensors can be utilized to prevent the system from running while raining, after a recent rain, or if the moisture content in the soil is sufficient without irrigation. Water efficient irrigation techniques can also reduce nutrient runoff which can occur when too much water is applied.

3.3 Forecast Water Demands

Water demand projections for the fifteen year plan were developed for low, average and high water use as shown in Exhibit 3-1. The projected water demands are based on estimated land use and corresponding ranges of water use. Water demand projections were also estimated for the City of Hawthorne. Both EA-Hawthorne and the City of Hawthorne 2030 projected water demands are shown in Exhibit 3-2.

The high water demand estimate reflects water usage that is typical of existing communities in Alachua County that do not strictly implement water conversation principles. Low water demand reflects communities that implement water conservation principles. The residential water use for the EA-Hawthorne area assumes that no residential automatic landscape irrigation systems are in place. Advanced manufacturing water use values are based on typical usage for no or little wet-process-type industries. Recreation and open space irrigation is included in the total estimated water demand, as a reclaimed water system is not currently available to the City of Hawthorne or the EA-Hawthorne area. Additional assumptions are detailed in the footnotes of Exhibits 3-1 and 3-2.

Exhibit 3-1
Build Out Year (2030) Projected Potable Water Demand
EA-Hawthorne Water and Wastewater Data and Analysis

Land Use	Unit	Water Demand, gal/unit-d Low	Water Demand, gal/unit-d Average	Water Demand, gal/unit-d High	Number of Units[a]	Total Demand, mgd Low	Total Demand, mgd Average	Total Demand, mgd High
EA Hawthorne								
Advanced Manufacturing								
General Manufacturing	Square feet	0.172[b]	0.315[c]	0.522[b]	1,425,000	0.245	0.449	0.744
Distribution Centers	Square feet	0.008[d]	0.025[e]	0.051[f]	1,425,000	0.011	0.036	0.073
R&D, Office Facilities	Square feet	-	-	-	0	0	0	0
Retail[g]	Square feet	0.02	0.025	0.04	150,000	0.003	0.0037	0.0055
Residential								
Single Family[h]	Capita	40	78	95	1,494	0.060	0.116	0.142
Multi Family[i]	Capita	35	58	77	350	0.012	0.020	0.027
Estimated Irrigation Demand[j]						0.1044	0.1044	0.1044
Total Water Demand						0.436	0.729	1.10

[a] Information provided by Plum Creek.
[b] The following no or little wet-process type industry and domestic wastewater flows are assumed for estimating low and high water demand, respectively: 1,000 gal/ac-d and 8 gpcd, 3,000 gal/ac-d and 25 gpcd *Wastewater Engineering – Treatment, Disposal, and Reuse* (Metcalf & Eddy, Inc., Fourth Edition, 2003). All water demand estimates assume 2,850 employees and wastewater flow accounts for 90% of water flows. It was assumed that the unit industrial wastewater flows from Metcalf & Eddy are for gross manufacturing area; a floor-to-area ratio of 20% was assumed to convert the unit wastewater flow from gross manufacturing (property) area to floor area.
[c] Estimated for general manufacturing using internal CH2M HILL data.
[d] Low unit water demand determined using water use data from multiple distribution centers in Alachua County, FL from May 2014 – April 2015.
[e] Average unit water demand estimated for warehouse type facilities using internal CH2M HILL data.
[f] High unit water demand determined using water use data from multiple distribution centers in Alachua County, FL from May 2014 – April 2015.
[g] The following is assumed for low, average and high water use, respectively: 8 gpcd, 10 gpcd, 15 gpcd *Wastewater Engineering – Treatment, Disposal, and Reuse* (Metcalf & Eddy, Inc., Third Edition, 1991). All water use estimates assume 333 employees.
[h] Estimated total usage assumes 2.49 people per household. Low water use is from *Wastewater Engineering – Treatment, Disposal, and Reuse* (Metcalf & Eddy, Inc., Third Edition, 1991). Average water use is based on an average wastewater flow of 70 gpcd and 90% capture of water flows. High water use from Envision Alachua Water Consumption Baselines, assumes maximum of non-irrigated residence and 3 people per household.
[i] Estimated total usage assumes 1.75 people per household. Per capita water use from apartment and condo water consumption from Envision Alachua Water Consumption Baselines.
[j] Highest projected annual average irrigation demand from Exhibit 3-3.

Exhibit 3-2
Projected Potable Water Max Day Demand – Build Out (2030)
EA–Hawthorne Water and Wastewater Data and Analysis

Land	Unit	Water Use, gal/unit-d	Number of Units	Total Usage, mgd
EA Hawthorne				1.09[a]
City of Hawthorne	Capita	204[b]	2,006[c]	0.41
Total Water Demand				1.50

[a] Estimated using the average total water demand in Exhibit 3-1 assuming a maximum day demand factor of 1.5.
[b] Per capita water use water estimated using the maximum day demand presented in *Water & Wastewater Capacities and Flows Plum Creek Industrial Park City of Hawthorne* (Mittauer & Associates, Inc., November 12, 2014) and the 2014 population presented in *Draft Evaluation and Appraisal Report of City of Hawthorne Comprehensive Plan* (February 23, 2011). Per capita water use is assumed to remain constant during the fifteen year planning period.
[c] The estimated 2030 population was presented in Draft Evaluation and Appraisal Report of City of Hawthorne Comprehensive Plan (February 23, 2011).

The estimated potential irrigation demands for the year 2030 are shown in exhibit 3-3. The assumptions used to estimate the range of irrigation needs for the EA Hawthorne community are also shown in this exhibit.

Exhibit 3-3
Estimated Irrigation Demands, 2030
EA – Hawthorne Water and Wastewater Data and Analysis

Land Use Category	*Estimated Irrigated Area (acres)*[a]	*Projected Annual Average Demand (mgd)*[b]	*Assumptions*[c]
Manufacturing	*19.2*	*0.0297 – 0.0371*[d]	*FFL*[f]
Distribution	*9.6*	*0.0149 – 0.0186*[d]	*FFL*
R&D/Office	*0*	*0*	*----*
Retail	*1.4*	*0.0022 – 0.0027*[d]	*FFL*
Multi-Family Residential	*0*	*0*	*----*
Schools	*7.5*	*0.0174 – 0.0290*[e]	*turfgrass*
Parks	*3.7*	*0.0086 – 0.0143*[e]	*turfgrass*
Civic	*0.7*	*0.0016 – 0.0027*[e]	*turfgrass*
Totals:	*42.1*	*0.0744 – 0.1044*	

[a] Provided by Plum Creek
[b] Demands (million gallons per day) based on typical gross irrigation rates for projected landscaping concept. Maximum daily rates may exceed annual average rates by a factor of ~ 1.5 – 2.5.
[c] Reclaimed water is preferred irrigation source but potable water may also be used for these land uses.
[d] Based on average gross irrigation rates of 0.4 - 0.5 inch/week (~ 1,547 – 1,934 gals/ac-day) considering research indicating FFL landscapes (which includes turfgrass cover) use approximately 30% to 50% less water than conventional turfgrass landscapes. (References: Boyer, M.J., et al., 2014, Irrigation Conservation of Florida-Friendly Landscaping Based on Water Billing Data, Journal of Irrigation and Drainage Engineering, American Society of Civil Engineers; Haley, M.B., et al, 2007, Residential Irrigation Water Use in Central Florida, Journal of Irrigation and Drainage Engineering, American Society of Civil Engineers.)
[e] Based on average gross irrigation rates of 0.6 - 1.0 inch/week (~ 2,321 – 3,868 gals/ac-day) for turfgrass in regional area. (References: Dukes, M.D., et al., 2014, Frequently Asked Questions about Landscape Irrigation for Florida-Friendly Landscaping Ordinances, IFAS Publication ENH1114; Romero, C.C. and M.D. Dukes, 2014, Net Irrigation Requirements for Florida Turfgrass Lawns, Part 3, IFAS Publication AE482; Haley, M.B., et al, 2007, Residential Irrigation Water Use in Central Florida, Journal of Irrigation and Drainage Engineering, American Society of Civil Engineers.)
[f] Florida-friendly landscaping

3.4 Potential Sources

3.4.1 Surficial Aquifer

The surficial aquifer system in this area of Florida includes any otherwise undefined aquifers that are present just below the land surface. This aquifer system is generally unconfined, consisting of sand deposits, and is typically less than 50 feet thick. The groundwater in this aquifer recharges from rainfall and typically flows toward the coast or streams where it can discharge as baseflow. There is also potential for water from the surficial aquifer to recharge deeper aquifers.

Because the surficial aquifer is recharged by rainfall, the long-term capacity and reliability of this system is unknown. Additionally, lower quality water can be expected due to the supply being under the influence of surface water.

3.4.2 Intermediate Aquifer

The intermediate aquifer system in this area of Florida lies between the surficial and Floridan aquifer systems. The intermediate aquifer is generally a semi-confined to confined system and typically consists of limestone and dolostone deposits. In most places, water percolates down from the surficial aquifer system to recharge the intermediate aquifer.

The long-term ability to use the intermediate aquifer as a main dependable water supply is questionable. However, the water quality is generally good due to natural filtration as water percolates down from the surficial aquifer through typically low permeability semi-confining units.

3.4.3 Upper Floridan Aquifer

The Floridan aquifer is found throughout Florida, extending into the southern portions of Alabama, Georgia and South Carolina. The Floridan aquifer is a highly productive system. The Floridan aquifer system has been divided into Upper and Lower aquifers which are commonly believed to be separated by a unit of lower permeability. The upper Floridan is a major water supply source in north and central Florida.

The upper Floridan aquifer typically produces good quality water, but high demand can impact flows and levels in nearby surface waters. There is also potential to impact the quality of water in the upper Floridan aquifer from excessive pumping, which can cause surface water influence from nearby recharge areas, migration of potentially poorer water quality from deeper zones in the Floridan aquifer, or salt-water intrusion close to coastal areas.

3.4.4 Lower Floridan Aquifer

The lower Floridan aquifer lies below the upper Floridan and a semi-permeable unit. The quality of water from the lower Floridan aquifer in this area is not well established because test and production wells in this aquifer are not common. Withdrawing from the lower Floridan aquifer can potentially produce lower quality water due to upwelling of deeper, lower quality water. However, withdrawing from the lower Floridan would likely have less impact to other users and surface water flows and levels compared to the upper Floridan aquifer.

3.4.5 Stormwater

Stormwater management is an important component of any new development, regardless of its size. Within the Plum Creek planned areas, stormwater management will consist of collection, conveyance, and storage facilities. At a minimum, these facilities will be designed to protect existing waters from degradation and ensure protection in the planned areas. In addition, as part of the stormwater management plan Plum Creek will look for opportunities to store and reuse stormwater. This may be in conjunction with reclaimed water or by using separate storage and distribution systems. The nature of stormwater, as it comes in sporadic events and often in high volumes, makes it more difficult to store and reuse. Furthermore, irrigation water demand is lower during times when stormwater is plentiful. Therefore, the opportunities to store and reuse stormwater may be at a local or community scale as opposed to the entire planned area; these would include the use of cisterns and other water harvesting methods by individual commercial parcels and commercial districts and by residential parcels and districts.

3.4.6 Wastewater Reuse

The reuse of wastewater for beneficial purposes is a priority in the State of Florida and has been for many years. The focus and commitment on reusing wastewater by the FDEP and the hundreds of wastewater utilities producing reclaimed water have made Florida a national leader in this respect. The Florida Administrative Code (F.A.C.) outlined multiple means for beneficial reuse of wastewater including industrial, restricted use agricultural, rapid infiltration, and irrigation of public access use areas. Reuse of reclaimed water for public access reuse requires high level disinfection, which then allows reclaimed water to be used for irrigating private residences, parks, and other public spaces such as schools. The production and distribution of public-access-reuse, quality-reclaimed water is the most common type of reuse within the state of Florida, due to irrigation demands and the standard of water needed to meet this demand.

Based on the reasons above and the water demands listed in the previous section, all wastewater will be treated to a minimum of public-access-reuse standards. This will allow the opportunity for reclaimed water to be used for a variety of needs including industry, rapid infiltration, and irrigation of public areas. The beneficial reuse of reclaimed water will allow greater flexibility for additional industrial opportunities, return of this water to the environment, or possibly to assist with irrigation of common spaces, parks and athletic fields.

3.5 Alternative Water Solutions

3.5.1 Alternatives

Identifying and implementing alternative water supply projects is an important component of the SJRWMD Regional Water Supply Plan to help meet future water demands. Groundwater, primarily water from the upper Floridan aquifer, is the main source of water supply in the SJRWMD. However, over pumping groundwater can have adverse environmental impacts both on a local and regional scale, including degrading groundwater quality and impacting surface water flows and levels. Thus, the SJRWMD encourages utilities and local governments to incorporate alternative water supplies into their current practices.

There are a variety of alternative water supplies in addition to the lower Florida aquifer, reuse or reclaimed water, and stormwater discussed previously, including surface water, lower quality groundwater, and sea water. However, feasibility of these alternatives can vary depending upon location, cost and public perception.

3.5.2 Surface Water

Reservoirs or naturally occurring surface water bodies can be used to provide storage of stormwater and augment reclaimed water and potable water supplies. Surface water typically requires more extensive treatment processes compared to groundwater which can add complexity to an existing treatment system utilizing groundwater as a source. Moreover for a surface water to be a reliable source, it should be located nearby to minimize conveyance costs. A reservoir can be created to store surface water, but rainfall and stormwater drainage into the reservoir needs to be consistent to generate a reliable source. Withdrawing surface water needs to be planned and monitored closely so that flows and levels of downstream surface waters are not negatively impacted.

3.5.3 Seawater/Brackish Groundwater

Seawater and brackish groundwater are potential alternative water supplies, but they are not readily available in this area. Both of these sources require advanced treatment by desalination or reverse osmosis to remove elevated concentrations of minerals and salts. Desalination and other membrane processes can be more costly due to energy requirements and disposal of residuals (i.e., membrane concentrate) can be difficult particularly in inland areas. Typically, desalination plants are co-located with electric generating facilities due to the energy needs for the desalination process. Deep injection wells are commonly used for concentrate disposal, however not all locations are amenable to this disposal method. Evaporation to dry salt, and discharge to wastewater treatment plants, the ocean or other surface waters are other common disposal methods. However, the high concentration of salts in desalination and reverse osmosis concentrates can limit the methods of discharge and therefore the feasibility of these water sources.

3.5.4 Indirect and Direct Potable Reuse

Indirect potable reuse is a water solution that requires wastewater to be highly treated and discharged directly into surface or groundwater sources that are used for water supply. This approach requires an environmental buffer (for example, a water body or aquifer) between the treated wastewater effluent and the drinking water withdrawal. Direct potable reuse is a water solution that requires highly treated wastewater to be blended with the municipal water supply system. Potable reuse eliminates the need for an additional pipeline to be constructed for conveying recycled water. Indirect and direct potable reuse are alternatives that meet the need for additional water supply when other resources are not readily available. However, indirect and direct potable reuse can have strong public opposition and must meet the most stringent treatment and monitoring to protect against adverse health effects.

3.5.5 Reasonable Solutions

The alternative water supplies discussed above are not feasible in all regions of Florida. In this region of Florida, the lower Floridan aquifer is an alternative and potentially reasonable water supply to consider for more detailed hydrogeologic investigations. A higher level of treatment may be required compared to the upper Floridan aquifer, but more water quality data is needed to better define treatment requirements. If a membrane treatment process is needed to treat water from the lower Floridan, deep injection of residual concentrate may not be a feasible option in this area. Thus, developing an integrated solution that beneficially uses the residual concentrate through blending with reclaimed water or wetlands treatment is essential.

3.6 City of Hawthorne Levels of Service Standards

As part of the City of Hawthorne Comprehensive Plan, levels of service standards for planned water supply facilities are included. The adopted level of service for potable water is established as follows through Policy IV.2.8, which states that the level of service standard for the Hawthorne Community Potable Water System is 104 gallons per capita per day and 30 pounds per square inch of volume.

Note, as discussed previously, the per capita per day demand levels calculated and included here are less than the level of service standards for the City of Hawthorne. The reasons for this difference are discussed above and include the use of water conservation principles that prohibit the use of residential automatic landscape irrigation systems, the addition of Florida-friendly landscaping, and assumptions concerning advanced manufacturing water use. The system pressure standard will be met or exceeded, as indicated in the conceptual design described in the following sections of this document.

3.7 Conceptual Design and Phasing

3.7.1 Conceptual Design

Based on the assumed raw water quality, projected demands, and anticipated land use, a conceptual design of the expanded City of Hawthorne water supply system was developed. The proposed water supply and treatment system process flow diagram (PFD) for the water treatment plant (WTP) facilities is shown in Exhibit 3-4.

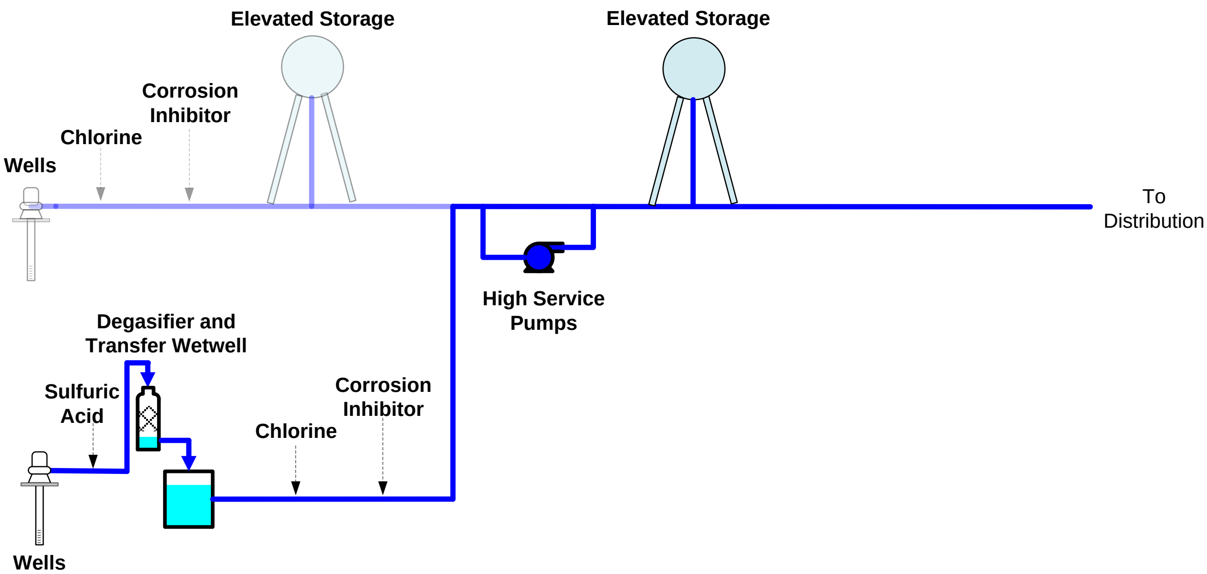
The upper Floridan aquifer (UFA) is proposed as the water supply source. One of the existing Hawthorne wells (Well #3) produces water with hydrogen sulfide which creates a higher chlorine demand and can require additional treatment. Because there is potential of hydrogen sulfide in the water sulfuric acid addition, a degasifier and transfer wet well are included in the treatment of new well water.

The UFA wells are estimated to be constructed to approximately 300 to 400 feet below land surface. The degasifier system equipment will be installed during initial construction and additional equipment will be installed during the next phase to increase production capacity and meet future demands. The degasifier tower effluent is conveyed directly into a transfer pump station wetwell sized for build out system capacity. Transfer pumps will be installed in the transfer pump station as needed to accommodate increasing demands. The transfer pumps convey degasified water to the distribution system.

Sodium hypochlorite and phosphoric acid will be injected downstream of the transfer pump station to provide disinfection and corrosion control, respectively. Chemical doses are preliminary and require further evaluation based on site-specific water quality data. The chlorine and phosphoric acid feed system sizing is based on the maximum daily flow, and chemical storage is sized for 30 days at the average daily flow. Free chlorine residual analyzers will be used for regulating chemical usage. Flow meters and/or chemical tote weight scales will be used for monitoring chemical usage. Further evaluation of the proposed design should be conducted to evaluate 1) chlorination for hydrogen sulfide removal, and 2) the need for corrosion control if degasification is provided.

High service pumps will be provided to meet fire flow and peak hour demands.

Exhibit 3-4
EA-Hawthorne and City of Hawthorne Water System – General Process Flow Diagram
EA-Hawthorne Water and Wastewater Data and Analysis



3.7.2 Phasing

The EA-Hawthorne area is located just west of the City of Hawthorne, which presents mutually beneficial opportunities for Plum Creek and the City of Hawthorne. The City of Hawthorne water system is supplied by a 0.792 mgd (550 gpm) well and a 0.648 mgd (450 gpm) well, for a firm capacity of 0.648 mgd (450 gpm) and a total capacity of 1.44 mgd (1,000 gpm). Storage includes two 100,000 gallon elevated storage tanks. In 2014, the City of Hawthorne's maximum water demand was 0.34 million gallons per day (mgd), and the water treatment facilities currently have a permitted capacity of 1.28 mgd.

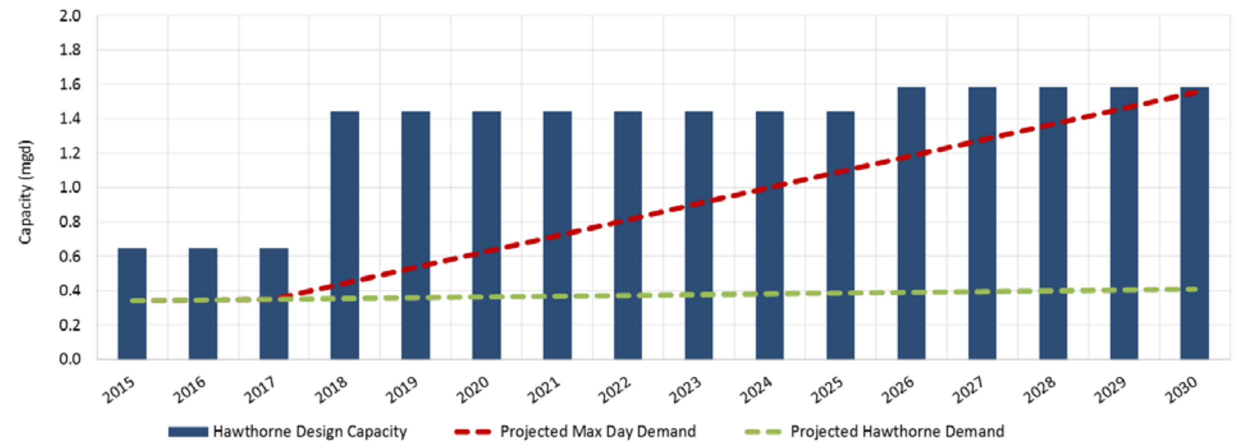
However, the City of Hawthorne's consumptive use permit (CUP) allows up to 0.3 mgd to be withdrawn from the Upper Floridan aquifer. The CUP specifies withdrawal amounts for different types of water use including residential, industrial and irrigation. For the EA-Hawthorne area to connect to the City of Hawthorne's water distribution system, the City of Hawthorne would need to revise their CUP to allow for higher production rates and different allocations of water use.

For planning purposes, the conceptual water supply system for the EA-Hawthorne area includes fire flow protection at a rate of 5.04 mgd (3,500 gpm) for a duration of 4 hours which is the recommended rate from the AWWA for commercial land use, and a peak hour demand factor of 4 was assumed.

Service connections to the City of Hawthorne's water distribution system and a distribution system within the EA-Hawthorne area will need to be constructed. Additional information about the City of Hawthorne's distribution system is needed to determine if additional high service pump stations will be needed to provide additional system pressure.

Projected maximum day demands and water treatment plant design capacity through 2030 for the EA-Hawthorne area and the City of Hawthorne are shown in Exhibit 3-5. Yearly water demands are based on the 2030 land use and population estimates, assuming linear growth. Required capacity for the EA-Hawthorne area and the available capacity of the City of Hawthorne's water system were estimated based on the projected demands and FDEP rules 62-555.315 and 62-555.320.

Exhibit 3-5
EA-Hawthorne and the City of Hawthorne Water Treatment Plant Phasing
EA-Hawthorne Water and Wastewater Data and Analysis



Note: Per capita water use water estimated using the maximum day demand presented in Water & Wastewater Capacities and Flows Plum Creek Industrial Park City of Hawthorne (Mittauer & Associates, Inc., November 12, 2014) and the 2014 population presented in Draft Evaluation and Appraisal Report of City of Hawthorne Comprehensive Plan (February 23, 2011). Per capita water use is assumed to remain constant during the fifteen year planning period. The 2030 population was estimated using information present in Draft Evaluation and Appraisal Report of City of Hawthorne Comprehensive Plan (February 23, 2011).
Maximum day demand estimated using the medium total water demand estimate and a maximum day factor of 1.5. Linear growth assumed from 2018 to 2030.

Two phases are defined for the 2030 plan. Phase one includes the design and construction of all of the new water treatment facilities, with operations beginning in 2018 when the first user is expected. This also includes tying into the City of Hawthorne's water system and installation of two 4.32 mgd high service pumps, one 0.936 mgd UFA well, degasifier, transfer wetwell and pumps, and chemical addition. The treatment facilities will be co-located with the new well. This will provide an additional firm high service pumping capacity of 5.04 mgd to provide fire flow and potable water for the EA-Hawthorne area. However, because this large flow could be supplied partially by the City of Hawthorne's system, a force main in their existing distribution system would likely need to be replaced with larger diameter pipe. Additionally two 500,000 gallon elevated storage tanks will be installed to provide the required storage for fire flow. Phase two includes upgrading the existing 0.792 mgd (550 gpm) City of Hawthorne well to 0.936 mgd (650 gpm) to increase the firm well capacity to meet the maximum day demand. Phase two assumes that the existing metering pumps will require upgrades, and the existing well house will be able to accommodate the new well and chemical equipment. The descriptions of the facilities to be included in the expansion are included in Exhibit 3-6.

Exhibit 3-6
Potable Water Treatment Plant Phasing Descriptions
EA-Hawthorne Water and Wastewater Data and Analysis

Phase	Year	Facility	Description
1	2018 – 2025	High Service Pumps	Connect to City of Hawthorne's distribution system for potable water supplies. Install two 4.32 mgd horizontal centrifugal pumps to meet fire flow requirements.
		Storage	Construct two 500,000 gallon elevated storage tanks.
		Well	One 0.936 mgd upper Floridan Aquifer well.
		Sulfuric Acid System	Storage includes two 300 gallon totes, sized for a minimum 30 days storage at 0.94 mgd and a dose of 90 mg/L. The feed system includes two metering pumps sized for 0.94 mgd at a dose of 90 mg/L. The storage and feed system are housed in a multiple chemical facility. Storage area sized for future.
		Degasifier/ Transfer Pump Station	One 0.94 mgd degasifier tower and blower, one biological scrubber and recirculation pump. Transfer wetwell sized for 3,200 gallons and two 0.94 mgd transfer pumps.
		Chlorine System	Storage includes one 300 gallon tote, sized for a minimum 30 days storage at 0.94 mgd and a dose of 3 mg/L. The feed system includes two metering pumps sized for 0.94 mgd at a dose of 3 mg/L. The storage and feed system are housed in a multiple chemical facility.
		Corrosion Inhibitor System	Assumes phosphoric acid is used for corrosion control. Storage includes one 55 gallon drum, sized for a minimum 30 days storage at 0.94 mgd and a dose of 3 mg/L. The feed system includes two metering pumps sized for 0.94 mgd at a dose of 3 mg/L. The storage and feed system are housed in a multiple chemical facility.
2	2026 – 2030	Well	Upgrade existing 0.79 mgd (550 gpm) Hawthorne well to 650 gpm. Assumes pump and electrical upgrades.
		Chlorine System	Assumes existing metering pumps will require upgrades to accommodate the increased well flow rate. Assumes the existing well house can accommodate the new equipment.
		Corrosion Inhibitor System	Assumes existing metering pumps will require upgrades to accommodate the increased well flow rate. Assumes the existing well house can accommodate the new equipment.

Notes: Firm well capacity required is the maximum day demand.
Constructed firm well capacity is the sum of the well capacities with the largest well out of service.
Firm high service pump capacity required is the max day demand plus fire flow demand.
Constructed firm high service pump capacity is the sum of the pump (well and high service) capacities with the largest pump out of service.
Storage required is 25% of the max day demand plus the design fire flow demand.

Exhibit 3-7 shows the general location of the existing City of Hawthorne water treatment facilities and distribution system.

Exhibit 3-7
Existing City of Hawthorne Water Facilities and Distribution System
EA-Hawthorne Water and Wastewater Data and Analysis

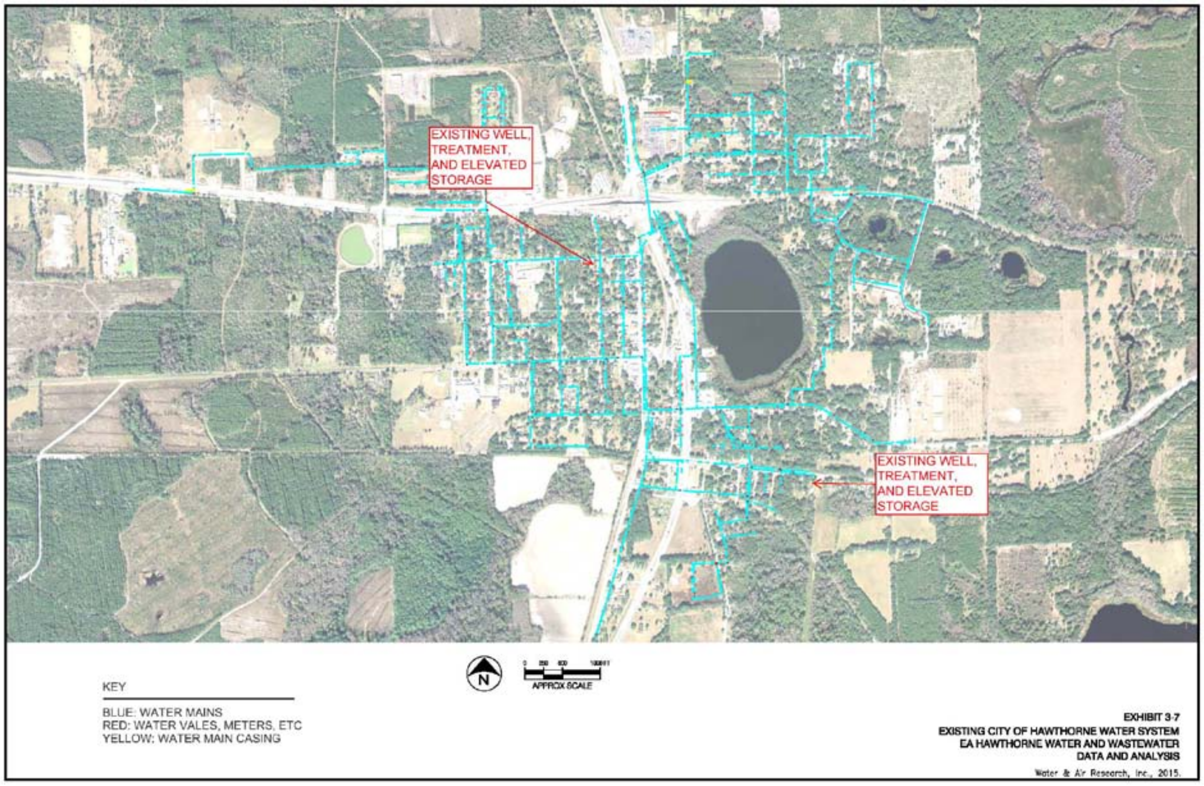
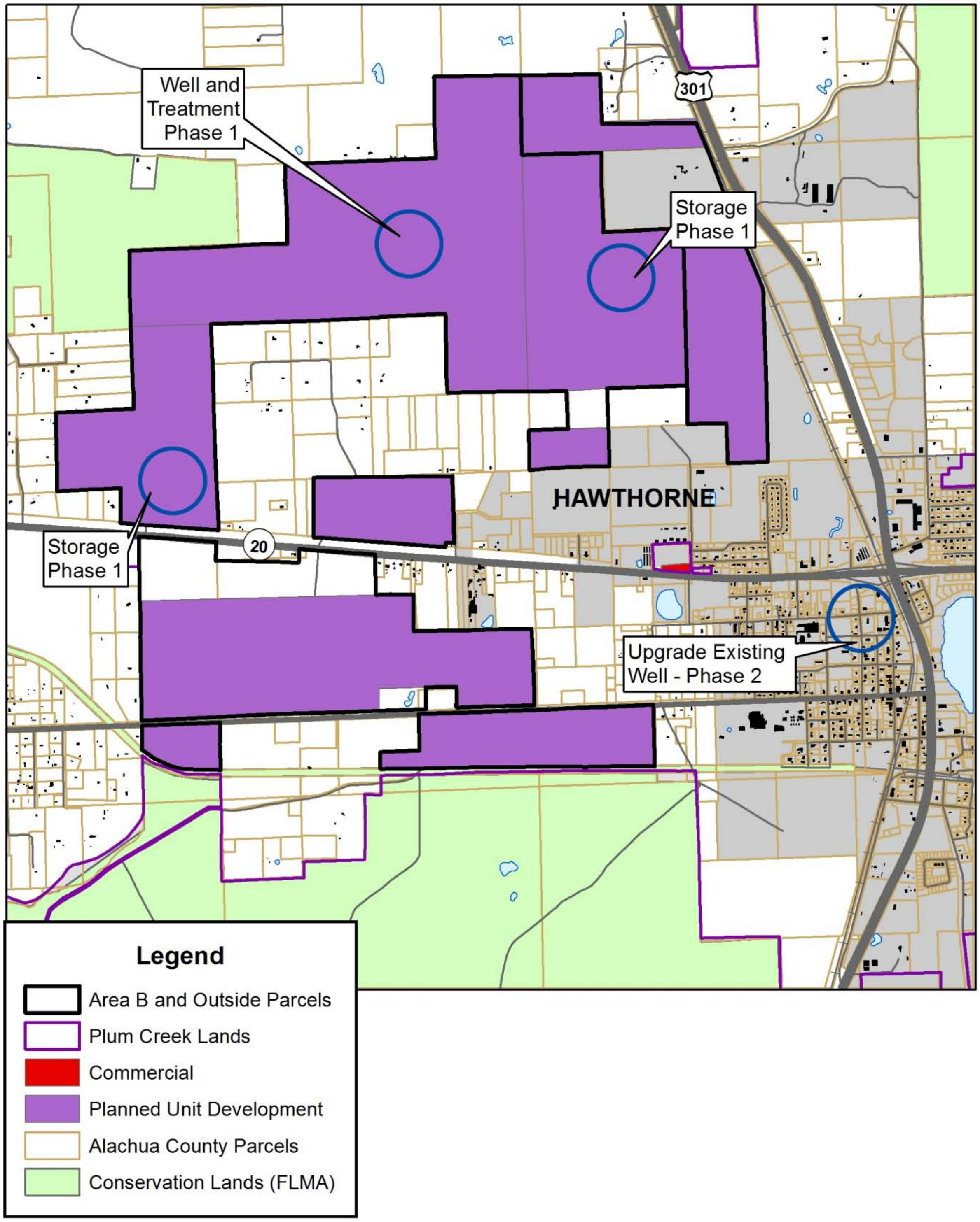


Exhibit 3-8 shows the potential location of future wells, storage tanks and treatment systems. The specific location of the future treatment plant and the other facilities is preliminary and may be revised based on anticipated growth patterns, land use designations, potential impacts to the surrounding environment or other reasons. Additional analysis is required to determine the optimum locations for the new wells and elevated storage tanks.

Exhibit 3-8
Preliminary General Area for Potential Location of Future Water Treatment Facilities
EA-Hawthorne Water and Wastewater Data and Analysis



3.8 Preliminary Cost Estimates

Preliminary construction costs were developed for the water supply and treatment system expansion to provide services through 2030. These costs are shown in Exhibit 3-9. These preliminary estimates do not include costs for the distribution system within the EA-Hawthorne area. The estimated costs were developed using engineering judgment and the CH2M Parametric Cost Estimating System (CPES) tool. CPES is a proprietary, conceptual cost estimate tool that is commonly used at the conceptual stage of a project. All costs are in 2015 dollars.

Exhibit 3-9
Water Supply and Treatment Cost Estimates
EA-Hawthorne Water and Wastewater Data and Analysis

Item	2016	2017	2018	2019	2020	2025	2030
Permitting (2 percent)	$230,000					$5,000	
Land ($10,000/acre)	$10,000						
Design (15 percent)	$1,700,000					$40,000	
Administrative (2 percent)	$115,000	$115,000				$5,000	
Construction (includes location adjustment)		$11,400,000				$250,000	
Total	$2,055,000	$11,515,000				$300,000	

The following assumptions were incorporated in the water supply and treatment estimates:

Construction cost assumptions:

- The new well is constructed on an undeveloped site
- Overall site work, plant computer system, yard electrical, and yard piping were estimated as a percentage of construction cost
- Contractor markups were estimated as: 10% overhead, 5% profit, 5% for mobilization/bonds/insurance, and 30% for contingency
- A location adjustment factor was included for local conditions in Gainesville, Florida
- Assumed that pile foundations are not required

The cost estimate is considered to be consistent with a Class 5 estimate as defined by the Estimate Classification system of the American Association of the Advancement of Cost Engineering International (AACE International). The estimates were developed without detailed engineering data and are considered approximate. Class 5 estimates are normally expected to be accurate within minus 50 percent to plus 100 percent. A contingency has been included in these cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope and for detailed design items that cannot be captured at this level of estimate.

4.0 Wastewater Demand and Facilities

4.1 Forecast Wastewater Flows and Loads

Exhibit 4-1 shows the estimated wastewater flows for wastewater treatment in 2030 (buildout). Wastewater flows were determined by assuming approximately 90% of the water demand will reach the wastewater treatment system. The 90% capture rate assumes that minimal potable water is used for landscape irrigation in the EA-Hawthorne area.

The long-term WWTP capacity is projected to be 0.70 mgd based on a maximum month average daily flow (MMADF) factor of 1.25 times the average daily flow of 0.56 mgd. The MMADF factor of 1.25 is a typical value commonly used in planning. However, policies concerning residential use, industry types, and irrigation can reduce the overall wastewater quantity. But the pollutant load would not change because this is mainly determined by the population served. Load is one of the main factors that determine treatment plant sizing in addition to flow.

Exhibit 4-1
Projected Wastewater Flows for Plum Creek EA-Hawthorne in 2030
EA-Hawthorne – Water and Wastewater Data and Analysis

	Total Wastewater Flow, mgd		
Land Use	**Low**	**Average**	**High**
Advanced Manufacturing			
General Manufacturing	0.22	0.40	0.67
Distribution Centers	0.01	0.03	0.07
R&D, Office Facilities	-	-	-
Retail	0.003	0.003	0.005
Residential			
Single Family	0.05	0.10	0.13
Multi Family	0.01	0.02	0.02
Total Wastewater Flow	0.30	0.56	0.90

Exhibit 4-2 shows assumed loads per person for the development. These loads were based on standard values from Metcalf and Eddy, 2004.

Exhibit 4-2
Load per Person
EA-Hawthorne Water and Wastewater Data and Analysis

Influent Parameter	Load per person (lb/d)
$CBOD_5$	0.22
TSS	0.25
TKN	0.04
TP	0.006

Exhibit 4-3 shows the loads for influent wastewater to the WWTP for 2030. The number of people for advanced manufacturing, office, retail and schools load types was determined based on the low range of flow per resident of Plum Creek. The loads for commercial and industrial areas were determined using a 0.2 factor on the load per person by assuming that 33% of the work force lived in the development, and thus, this loading was already accounted for and the remaining workers were only there a portion (30%) of the day.

Exhibit 4-3
Influent Wastewater Load
EA-Hawthorne Water and Wastewater Data and Analysis

Load Type	Number People for	$CBOD_5$ (lb/d)	TSS (lb/d)	TKN (lb/d)	TP (lb/d)
Residential	1,844	406	461	74	11
Advanced Manufacturing	2,850	126	143	23	3
Office	0	-	-	-	-
Retail	333	15	17	3	0
Total Load for 2030		547	621	100	14

Note: Loadings for advancing manufacturing, office, and retail included a 0.3 factor per person due to work hours and assumed that 33% were already included as a resident.

4.2 City of Hawthorne Levels of Service Standards

As part of the City of Hawthorne Comprehensive Plan, levels of service standards for planned sanitary sewer (wastewater) facilities are included. The adopted level of service for sanitary sewer is established as follows through Policy IV.2.1, which states that the level of service standard for the Hawthorne Community Sanitary Sewer System is 100 gallons per capita per day.

As discussed previously, the per capita per day demand levels calculated and included here are less than the level of service standards for the City of Hawthorne. The reasons for this difference are discussed above and include the addition of water conservation principles that prohibit the use of residential automatic landscape irrigation systems, the addition of Florida-friendly landscaping, and assumptions concerning advanced manufacturing water use.

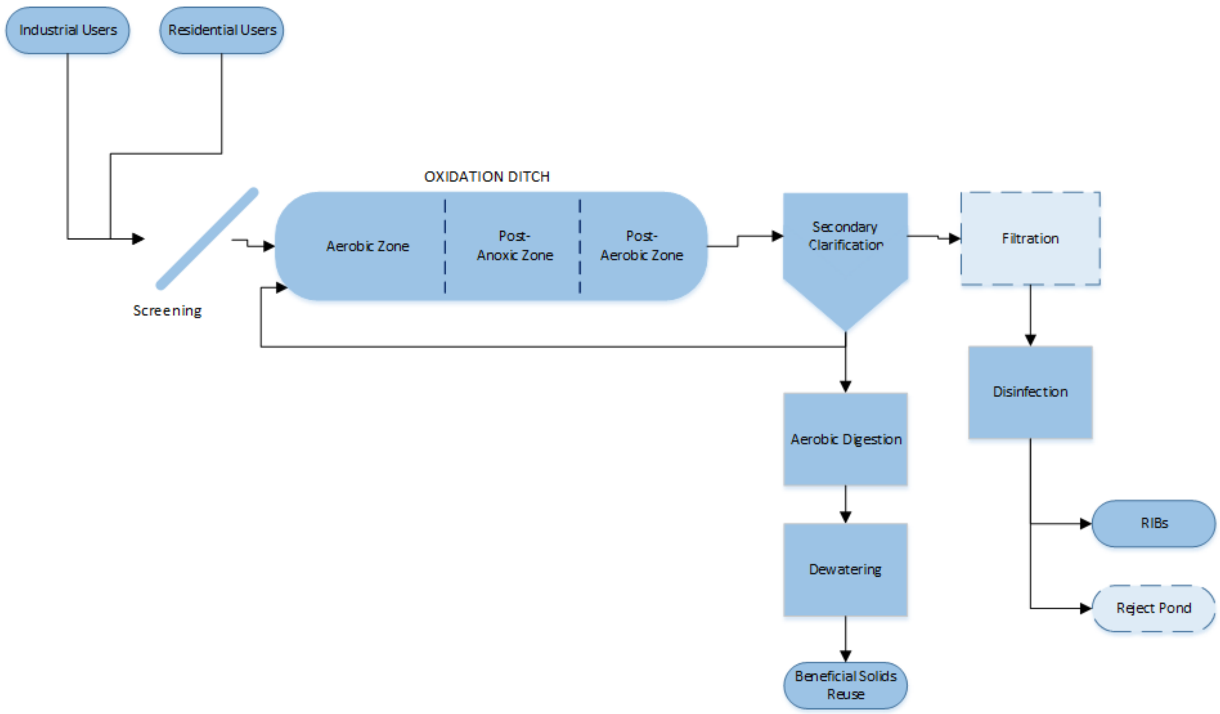
4.3 Conceptual Design and Phasing

4.3.1 Conceptual Design

A conceptual design for 2030 was created for a basis of phasing process equipment and cost estimate.

The expansion of the Hawthorne WWTP was based on a facility designed to produce effluent that meets Public Access Reuse standards and can be provided to the community for beneficial reuse (for example, irrigation, industrial). A process flow diagram (PFD) of the proposed wastewater treatment and reuse system is shown in Exhibit 4-4.

Exhibit 4-4
Wastewater Treatment Process Flow Diagram
EA-Hawthorne Water and Wastewater Data and Analysis



Wastewater will enter the treatment plant and flow through a screen to remove large debris. The screened wastewater will then proceed to secondary treatment, beginning with biological reactors configured similar to the existing WWTP. The biological process consists of an aeration zone for nitrification followed by a post-anoxic zone and post-aeration zone. Wastewater then flows to secondary clarification for solids-liquid separation. The liquid effluent from the secondary clarifiers proceeds to filtration, followed by a high-level disinfection system, in order to meet public access reuse standards. Effluent can be returned to the environment through discharge to the rapid infiltration basins (RIBs). Effluent that does not meet Public Access Reuse Standards will be sent to a reject pond. Water from the reject pond will be pumped back to the headworks for treatment.

Settled solids from the secondary clarifiers will either be returned back to the aeration zone or wasted to be to aerobic digestion prior to dewatering. Aerobic digesters treat sludge to meet Class B Standards to allow beneficial reuse for agricultural purposes.

In order to meet Public Access Reuse Standards, Class I reliability and redundancy requirements must be met. In order to meet these requirements major process equipment must have a back-up component that can handle the peak flow or a percentage of the peak flow.

4.3.2 Phasing

Exhibits 4-5 and 4-6 show the projected flow and phasing of the WWTP for the community, assuming average calculated values used. The 2030 planning period was divided into two phases for WWTP development. Phases were determined assuming linear growth and that the next phase would be implemented 1 year before the projected MMADF will exceed the previous treatment plant capacity. It is assumed that the first users from the EA-Hawthorne area will begin in 2018. Flow will be collected and transported to the Hawthorne WWTP. The existing Hawthorne WWTP has a capacity of 0.2 mgd MMADF and the ability to expand to a 0.5 mgd plant using the design that has been completed. For the purpose of this TM, it was assumed that the Hawthorne plant will be expanded prior to EA-Hawthorne development and the additional 0.3 mgd will be available.

Exhibit 4-5
Wastewater Treatment Plant Phasing
EA-Hawthorne Water and Wastewater Data and Analysis

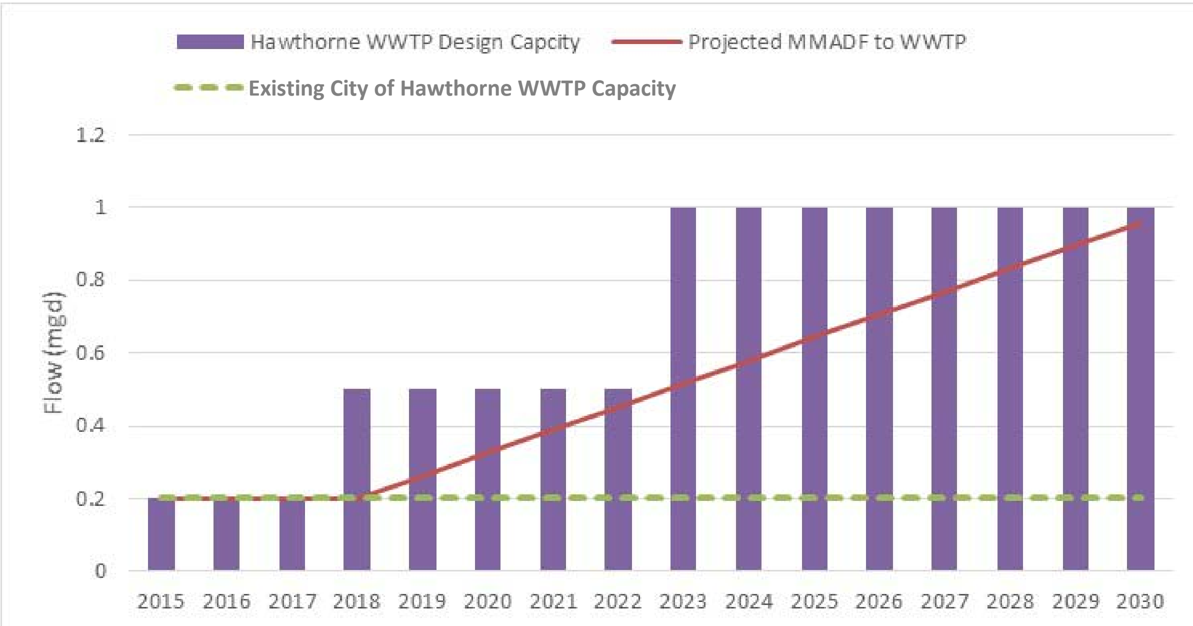


Exhibit 4-6
Wastewater Treatment Plant Flows
EA-Hawthorne Water and Wastewater Data and Analysis

	City of Hawthorne WWTP Additional Flow from Area		Hawthorne WWTP Design Capacity (mgd)[b]
Phase-Year	Annual Average Daily Flow (mgd)[a]	Max Month Average Daily Flow (mgd)[a]	
1-2018	0.20	0.25	0.50
2-2023	0.61	0.76	1.0

[a] Annual average daily flow and maximum month average daily flow corresponds to the last year in the design phase.

[b] Wastewater treatment plant design flow is based on the maximum month daily flow projections. Flow values roundec to the nearest tenth.

Phase 1 is projected from 2018 to 2022 and will encompass all wastewater flows from Area B being sent to the Hawthorne WWTP. Phase 2 is projected from 2023 to 2030 and will include a 0.5 mgd expansion of the Hawthorne WWTP. The expansion will be designed and constructed with Class 1 reliability requirements in order to meet public access reuse standards. The phasing time frames and capacities may need to be adjusted if large water users are developed early than the 2030 planning period.

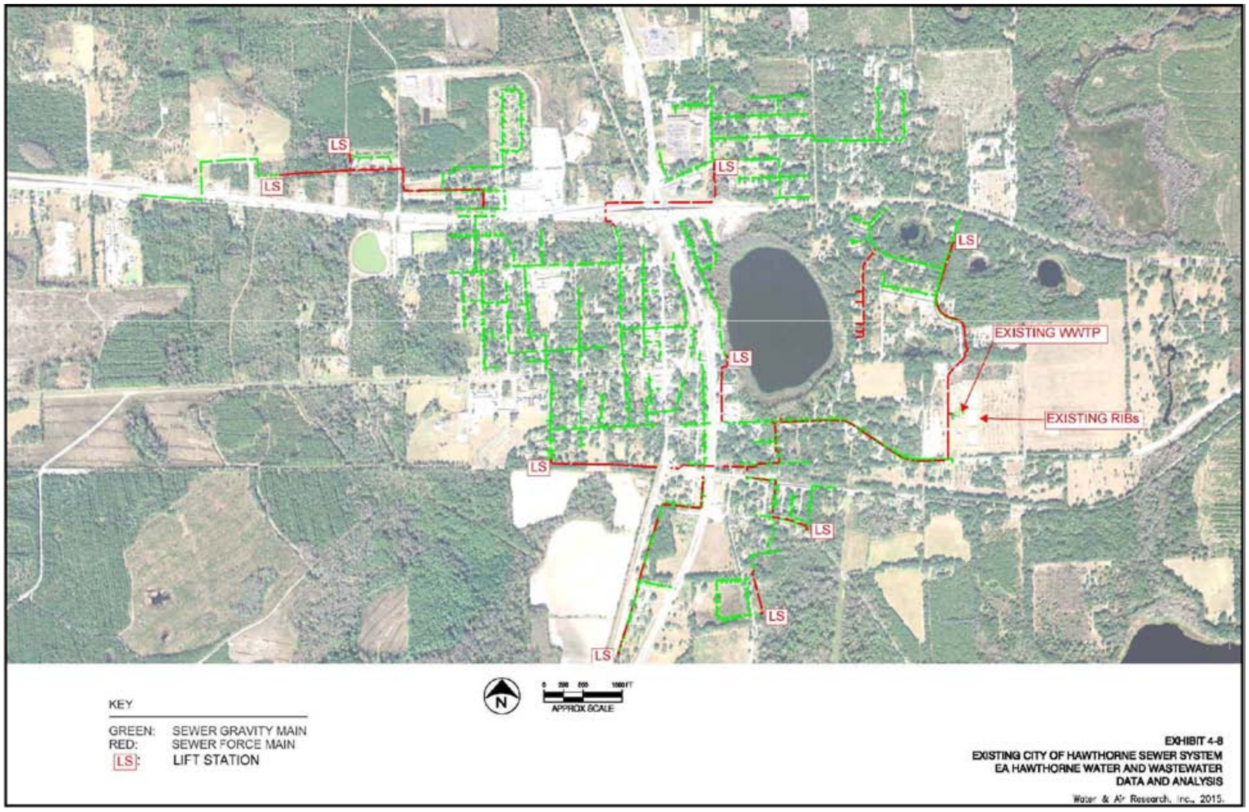
More detail descriptions of phasing are included in Exhibit 4-7.

Exhibit 4-7
Wastewater Treatment Plant Phasing Descriptions
EA-Hawthorne Water and Wastewater Data and Analysis

Phase	Year	Facility	Description
1	2018-2022		All flow will be diverted to the already designed and constructed 0.5 mgd expansion of the Hawthorne WWTP. Hawthorne collection system will be expanded into Area B. Additional lift stations will be added.
2	2023-2030	Screens	One additional screen will be installed in the influent structure during Phase 2.
		Secondary Treatment	An additional oxidation ditch will be constructed to handle flows from Phase 2. The two clarifiers constructed already for redundancy for the initial expansion will be able to handle the flow from Phase 2. Additional RAS/WAS pumps will be installed at the pump station.
		Filters	Space is made available if filtration plans to be added in the future.
		Disinfection	Chlorine contact basins will be expanded to meet Phase 2 capacity with Class 1 reliability requirements. Additional storage tanks/totes and pumps for phase 2 will be provided.
		Solids Disposal	No new solids storage required. Existing package plant converted to solids storage in initial expansion.
		Reuse System	Pump station will be constructed. Reuse main distribution lines to Area B will be constructed during Phase 2.

Exhibit 4-8 shows the location of the existing City of Hawthorne WWTP and the existing distribution system.

Exhibit 4-8
Location of the Existing City of Hawthorne WWTP and Existing Distribution System
EA – Hawthorne Water and Wastewater Data and Analysis



4.4 Preliminary Cost Estimates

Preliminary construction costs were developed for each phase of the wastewater treatment system through 2030. These costs are shown in Exhibit 4-9. The initial expansion of the Hawthorne WWTP has been designed and has an estimated construction cost of $6,500,000, *Water & Wastewater Capacities and Flows Plum Creek Industrial Park City of Hawthorne, Mittauer & Associates*, November 12, 2014.

Preliminary estimates do not include costs for distribution and collection systems. Costs were developed using engineering judgment and the CH2M Parametric Cost Estimating System (CPES) tool. CPES is a proprietary, conceptual cost estimate tool that is commonly used at the conceptual stage of a project. All costs are in 2015 dollars.

Exhibit 4-9
Wastewater Treatment Construction Cost Estimates
EA-Hawthorne Water and Wastewater Data and Analysis

Item	2016	2017	2018	2019	2020	2021	2022
Constructed Wastewater Treatment Plant		$6,500,000					$6,890,000
Subtotal							
Permitting (2%)	$106,000						
Design (10%)	$265,000	265,000					
Land	-	-					
Administration (2%)	$53,000	53,000					
Total	$424,000	$6.818,000					$6,890,000

The following assumptions were incorporated in the wastewater treatment estimates:

Construction cost assumptions:

- The WWTP is constructed on an undeveloped site
- Backup power generators were assumed to run the plant critical loads
- Structure wall thicknesses were estimated using typical guidelines based on depth of water within the structure
- Overall site work, plant computer system, yard electrical, and yard piping were estimated as a typical percentage of construction cost
- Contractor markups were estimated as: 10% overhead, 5% profit, 5% for mobilization/bonds/insurance, and 30% for contingency
- A location adjustment factor was included for local conditions in Gainesville, Florida
- Pile foundations are not required
- Operations and maintenance building size were assumed

The cost estimate is considered to be consistent with a Class 5 estimate as defined by the Estimate Classification system of the American Association of the Advancement of Cost Engineering International (AACE International). The estimates were developed without detailed engineering data and are considered approximate. Class 5 estimates are normally expected to be accurate within minus 50 percent to plus 100 percent. A contingency has been included in these cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope and for detailed design items that cannot be captured at this level of estimate.