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CITY OF ST. PETERSBURG

INTEGRATED WATER RESOURCES MASTER PLAN

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JACOBS

City of St. Petersburg Integrated Water Resources Master Plan

Integrated Water Resources Master Plan

Regulatory Submittal

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City of St. Petersburg

City of St. Petersburg Integrated Water Resources Master Plan

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EXECUTIVE SUMMARY

Executive Summary

The Integrated Water Resources Master Plan (IWRMP) originated from the Consent Order the City of St. Petersburg (City) executed with the Florida Department of Environmental Protection (FDEP) on July 26, 2017. The Consent Order was entered to mandate infrastructure improvements to mitigate unauthorized sanitary discharges. During 2015 and 2016, the City experienced tropical weather that overwhelmed the wastewater collection system and the water reclamation facilities (WRFs). Since the unauthorized discharges were attributed to a combination of infrastructure challenges with the stormwater management and wastewater collection/treatment systems, an integrated planning approach was warranted to develop the appropriate long-term remedies to prevent similar discharges in the future.

The IWRMP extends beyond developing a plan that complies with the requirements of the Consent Order. In addition, the City desires to coordinate the IWRMP investments with multiple long-term City initiatives related to sustainability and resiliency. The City continues to advance initiatives targeted to improve the longevity, reliability, and management of the utility and its assets. Therefore, the IWRMP addresses long-term coordination with the following City initiatives.

Planning Considerations

The IWRMP was developed by considering many ongoing local and regional infrastructure and strategic planning activities, including but not limited to the following efforts:

- FDEP Consent Order and Amended Consent Order
- Wet Weather Overflow Mitigation Program
- Kriseman Infrastructure Plan
- Water Resources Asset Management Program
- American Public Works Association Program
- L.A. Consulting Management Review Study
- Tampa Bay Water (TBW) Regional Water Supply
- Pinellas County Wastewater/Stormwater Technical Working Group
- Stormwater Management Master Plan
- Shore Acres Flood Mitigation Study
- Integrated Sustainability Action Plan
- Biosolids Management Program
- STAR Community Rating System
- City's Sustainability Ordinance No. 359-H
- Envision and Leadership in Energy and Environmental Design Criteria
- Tampa Bay Climate Science Advisory Panel
- Tampa Bay Regional Resiliency Coalition
- Tampa Bay Nitrogen Management Consortium
- City's Complete Streets Program
- Local and State Transportation Improvement Programs
- City's Comprehensive Plan
- City's Vision 2050 Plan
- Jacobs final Facility Plans (potable water, collection system, WRF, reclaimed water)

The IWRMP will accomplish the following objectives.

- **Prepare an Integrated Plan**: Comply with Consent Order requirement to develop an integrated master plan that includes consolidated measures to address wastewater and stormwater needs in accordance with the U.S. Environmental Protection Agency's (EPA's) Integrated Planning Guidance Document issued in 2012.
- **Address Aging Assets**: Develop a comprehensive approach for addressing aging assets throughout all water resource classes including potable water, wastewater collection, wastewater treatment, reclaimed water, and stormwater management systems. Determine if it is the City's best interest to update existing infrastructure or pursue alternative approaches.
- **Develop Prioritization Methodology**: Create a methodology to prioritize where capital investments offer the best value for the City while keeping rates affordable for residents. Apply the methodology when the Water Resources and Stormwater Departments are developing draft annual Capital Improvement Plan (CIP) budgets for the City Council's consideration.
- **Incorporate Sustainability and Resiliency**: Incorporate sustainability and resiliency planning and design into the short-, mid-, and long-term CIP specifically for sea level rise (SLR), increased frequency and intensity of storm events, clean energy utilization, and water conservation.
- **Create Regulatory Compliance Strategies**: Proactively develop strategies for reliable compliance with existing and proposed future regulatory requirements including but not limited to surface water quality, reclaimed water quality, operational redundancy, potable water flushing, and conservation of regional water resources.

Cost Estimates

The cost estimates presented herein are planning level costs considered to be Class 5 estimates in the Association of the Advancement of Cost Engineering International (AACEI) classification system 18R-97 and as designated in American Society for Testing and Materials E 2516-06. Based on AACEI guidelines, these estimates are considered accurate to within minus 30 percent and plus 50 percent of the actual cost and should therefore only be used to compare multiple solutions. Planning level costs are used to eliminate solutions that are too costly to achieve and determine one or two solutions that should be analyzed in more detail. In addition, estimates will be prepared based on best available data and judgments at the time they are developed. More detailed estimates will be prepared as projects move to detailed planning or preliminary design stages.

Prioritization Approach

This IWRMP provides the City with a structured approach for addressing water resources capital needs in the most cost-effective manner through integrated scenario planning and prioritization. Each scenario was prioritized and ranked based on a sound, transparent, consistent, and informed capital planning process using EPA's Integrated Planning Framework. This process will help the City make investment decisions that have the greatest return on investment, build credibility, manage change, reduce risk, avoid redundant activities (or planning gaps), and establish a foundation for future planning.

The scenarios developed under the IWRMP were prioritized and sorted by the benefit-cost ratio that each scenario delivers to the City. Scenarios with the greatest benefit-cost ratio would likely be scheduled for implementation earlier in the IWRMP, while those with lower benefit-cost ratio may be scheduled for later implementation or not implemented. To perform the scenario prioritization, a multi-attribute utility analysis (MUA), also known as decision analysis was conducted.

Scenarios Considered

Jacobs evaluated 33 scenarios for the City's water resources infrastructure. The types of scenarios are noted in Table ES-0-1. Details regarding each scenario including its purpose, merits, demerits, description, and estimated cost are provided in Table ES-0-2 through Table ES-0-8.

Table ES-0-1. IWRMP Scenario Evaluations

Scenario Category	Number of Scenarios Considered	IWRMP Report Section	Type of Scenarios Considered
Potable Water System	6	4	Continue using Cosme Water Treatment Plant (WTP); new technology at Cosme; new WTP(s) located within the City limits of varying technologies and locations
Wastewater Collection	5	5	Store peak flows within the collection system or at new tanks at the WRFs; express sewers connecting WRFs, offload flow from system; smart sewer technology
Wastewater Treatment	8	6	Flows needed for 2040 demands; nutrient removal technologies; peak flow management options
Reclaimed Water Distribution	6	7	New retail customers; potential large wholesale customer; interconnect with Pinellas County; storage options for reclaimed water; treatment wetland park
Stormwater Management	5	8	Drainage improvements for Basin C; stormwater management at WRFs, flood protection wall, policy revisions.
Natural Resources	1	9	Floating wetland islands (FWIs) for improved surface water quality
Sustainable Options	2	8, 10	Photovoltaic systems at treatment facilities, resiliency policy changes

The scenarios were selected for evaluation by the Public Works Leadership Team, Jacobs' subject-matter experts, Jacob' Global Technology Leaders, and peers of the team working to develop the IWRMP. The scenarios were intended to be comprehensive and address most "what if" situations. Operations , Maintenance, and Engineering staff were not involved with the scenarios selected for evaluation by Jacobs. This approach was taken to avoid inherent bias asset owners are likely to have toward their preferred technology, site locations, and capital cost. After the engineering evaluations were completed for the scenarios, Jacobs held multiple workshops with City staff to discuss and further vet the scenario concepts.

Table ES-0-2. Potable Water Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
Continue Using Existing WTP	P-1	Do Nothing - Maintain Existing WTP	Continue using current technology	• Traditional lime softening technology well operated and maintained by City staff. • Could derate WTP to 40 million gallons per day (mgd) (versus maintaining 60 mgd WTP) as average daily flow in 2040 is 39 mgd; will save operation and maintenance costs. • Likely to be the lowest capital cost option. • System operation and treatment process familiar to TBW and City staff.	• Water quality challenges from total organic carbon (TOC) and hardness spikes would not be addressed. • Future droughts could exacerbate hardness, TOC, and alkalinity challenges. • Water age issues continue for City customers due to travel time from WTP. • Potential issue if lime softening cannot address future water quality regulations. • Continued challenge related to lime sludge handling, storage, and disposal. • Investment required to address 800 existing assets in very poor condition (parts outdated too); some processes would need upgrades to address safety (gas to liquid chlorine); replace media in filters (anthracite to granular activated carbon [GAC]) to lower TOC, reduce disinfection byproducts (DBPs) and address emerging contaminants. Option does not improve resiliency from drought conditions.	Under Alternative 1, treatment would continue to be provided by the upgraded, existing WTP. The upgrades would include enhancements to treatment (e.g., gas to liquid chlorine) and improvement to the assets identified in the repair and replacement (R&R) model.	Technology Cost: $184M Implementation Cost: $184M
	P-2	Sell Cosme to TBW for Regional WTP	Provide regional benefit from a water supply perspective	• TBW desires a regional solution near the Cosme WTP. • Pinellas County does not treat TBW water - Elders Wellfield - TBW Facility Plan has improvements for that supply. • Sale proceeds can be used to improve other utility infrastructure. • City no longer required to maintain and secure wellfield property.	• Water age issues continue for City customers due to travel time from WTP. • City relinquishes control of Cosme WTP and current City owned property. Uncertain if City staff would remain at Cosme or require reassignment elsewhere. • Option does not improve resiliency from drought conditions. • City is completely reliant upon TBW for water supply and treatment.	This scenario recognizes the interdependency the City has with Tampa Bay Water. The Cosme WTP could be used by TBW as a regional plant.	NA
	P-3	Upgrade Technology	Replace lime softening with nanofiltration (NF) membrane technology for improved water quality	• Significant improvement in water quality. • Could derate WTP to 40 mgd (versus maintaining 60 mgd WTP). • NF reduces total hardness by 90 percent, alkalinity by 85 to 90 percent and TDS by 85 percent. Excellent removal of DBP precursors e.g., color, dissolved organic carbon (DOC) thus reducing DBPs; can reduce endocrine disrupting chemicals (EDCs), pharmaceuticals and personal care products (P&PCPs) and perfluorinated compounds (PFCs) (address emerging contaminants). • Reliable technology that can handle varying source water quality.	• Water age issues continue for City customers due to travel time from WTP. • Requires a discharge point for membrane concentrate (e.g., deep well injection, Hillsborough County sewer, blend with reclaimed water), • Option does not improve resiliency from drought conditions, • Learning curve for staff with membrane WTP; Existing processes will have to be demolished (e.g., accelators, filters). Life-cycle costs will increase, requires new building to house membranes and ancillary equipment.	This alternative would decommission conventional treatment (lime softening) and replace with NF membranes at the Cosme WTP.	Technology Cost: $55M to $120M Implementation Cost: $170M to $241M

Table ES-0-2. Potable Water Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
Construct New WTP Located Within City Limits	P-4	Construct New WTPs at the Oberly & Washington Terrace Water Repump Stations	Better water quality for the City	• Significant reduction in water age and improved water quality. • Smaller footprint facilities located within City limits. • NF membrane technology can address current and emerging contaminants as explained above. • Reliable technology that can handle varying source water quality. • Could replace or reduce reliance upon Cosme WTP.	• Option does not improve resiliency from drought conditions. • City remains completely reliant upon TBW for water supply. • Need City staff at two separate locations to operate both WTPs. • Learning curve for staff with membrane WTP. • Requires discharge points for membrane concentrate (e.g., deep well, City sewer, blend with reclaimed water).	This alternative would build a new WTP with NF membranes at the City's Water Repump Station(s).	Technology Cost: $75M to $159M Implementation Cost: $141M to $209M
	P-5	Construct Surface Water WTP from Lake Maggiore at the Albert Whitted WRF	Indirect potable reuse system integrating potable water, reclaimed water, and stormwater systems	• Addresses area of the City with most potable water quality issues. • Augment surface water with advanced treated wastewater and stormwater while utilizing aquifer storage recovery (ASR) wells. • Diversification of TBW regional water supplies. • Reclaimed water mains located directly adjacent to lake (10-inch, 12-inch, and 16-inch). • Provides capture of localized stormwater and mitigates flooding near Lake Maggiore. • Potential funding from Southwest Florida Water Management District (SWFWMD), TBW, and Federal Emergency Management Agency. • Potentially provides salinity barrier for lake uses. • Improves water quality in Lake Maggiore.	• Capacity limited for WTP to 10 mgd due to supply; cannot get to future 40 mgd WTP. • Lake Maggiore likely to be reclassified from Class 3 to Class 1 water body and discharge to Lake Maggiore will have to meet stringent water quality limits (primary and secondary drinking water standards). • Lake Maggiore may become brackish by 2040. • Advanced treatment required at WRFs or near Lake Maggiore to meet stringent discharge water quality limits. • Learning curve for operation of surface water plant and management of water supplies; high capital and operating costs, life-cycle costs. • Uncertain public reaction to supplementing water supply with reclaimed water. • Requires a separate WTP to meet full potable water demand. • Long-term site concerns regarding SLR - mitigation will be required beyond 2040. • Public perception if City builds new plant on low-lying area.	This alternative would require advanced treatment of reclaimed water. The advanced treated water would be discharged to Lake Maggiore to augment existing water supply. Water would be withdrawn from Lake Maggiore and treated by a new surface WTP built at Albert Whitted WRF or a suitable location (indirect potable reuse).	Technology Cost: $205M Implementation Cost: $439M to $482M
	P-6	Construct Desalination WTP at the Albert Whitted WRF	More sustainable water supply	• Significant reduction in water age and improved water quality. • Provides drought-proof supply source for water; can build a 20 to 30 mgd plant. • Diversification of TBW regional water supplies. • Potential funding from SWFWMD and TBW.	• High capital and operating costs, life-cycle costs; energy intensive - but new technological advances are reducing energy costs. • Restricts future use of a portion of the Albert Whitted WRF site. • Potential messaging conflict with City of Tampa TAP project. • Long-term site concerns regarding SLR - mitigation will be required beyond 2040. • Public perception if City builds new plant on low-lying area.	This alternative would build a new desalination WTP at the Albert Whitted site.	Technology Cost: $250M to $620M Implementation Cost: $535M to $756M

Table ES-0-3. Wastewater Collection Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
Wastewater Conveyance Options	WC-1	Construct Smart Sewer Technology	Real-time monitoring and operation of complex sewer system	• Enhancement of system's capacity and flexibility to manage spatially diverse wet weather. • Real-time performance monitoring can lead to operational improvements. • Maximize storage in system. • Operate flow controls and optimize treatment approach. • Relatively inexpensive option requiring minimal construction disruptions.	• Requires investment in a cloud-based supervisory control and data acquisition system. • Dedicated positions needed to maintain system components and review, verify, and interpret data.	This alternative would construct a network of sensors, monitors, and gates to inform operations staff of real-time system conditions.	Technology Cost: $12.8M Implementation Cost: $12.8M
	WC-2	Construct Storage in Collection System	Improve management of peak flows	• Provides flexibility to address peak flows. • Mitigates upsizing of downstream infrastructure (sewers, lift stations (LSs), WRFs). • Targeted rather than widespread disruption to the neighborhood. • May achieve level of service (LOS) more quickly.	• Public perception is poor for storage of sanitary sewage outside of a WRF. • Challenge to find property for siting storage remote from WRF. • May require aeration and mixing to prevent flow from becoming septic and to keep solids in suspension. • All conveyance options have some type of storage, so this is a base alternative coming out of the collection system facility plan.	This alternative would construct storage tanks throughout the wastewater collection system to hold peak flows until storms pass.	Technology Cost: $396M Implementation Cost: $396M
	WC-3	Construct Express Sewers Connecting WRFs	Improve management of wastewater	• Provides redundancy to direct flow to other WRFs if needed. • Provides flexibility to during dry weather flows. • Improves City's resiliency to handle planned maintenance without permit violations. • The improvements constructed under this scenario supports maintenance activities that will help reduce unauthorized discharges to the environment. • Need to verify if express sewers can be constructed within existing right-of-way. • Enables the City to take one WRF offline for short-term.	• Construction within urban corridors is expensive and causes disruptions. • Likely to require temporary construction easements. • Work will need to be coordinated with roadway improvements to minimize neighborhood impact.	This alternative would construct sewers to interconnect the three WRFs in order to redirect flow to areas having available capacity.	Technology Cost: $128M Implementation Cost: $128M
	WC-4	Send Coastal Flow to Pinellas County Cross Bayou WRF	Reduce impacts of chlorides on operation of Northwest WRF	• Anticipated to improve quality of reclaimed water produced at Northwest WRF (lower chlorides). • Reduces reliance on deep injection wells when chlorides are high in the reclaimed water. • South Cross Bayou WRF not subject to injection well chloride limitations (surface water discharge). • Cross Bayou WRF about 2 miles north of St. Pete's Pasadena Force Main. • Capacity freed up at Northeast WRF for peak flow management and future growth. • Promotes regional partnerships.	• Terms of wholesale Interlocal Agreement with County uncertain. • Requires revision of multiple Interlocal Agreements. • Reduces City's available reclaimed water quantities - treating less water.	This alternative would pipe coastal flows high in chlorides to the Pinellas County WRF in lieu of sending this water to the Northwest WRF.	Technology Cost: $12M to $24M Implementation Cost: $24M
	WC-5	Construct Low Pressure Force Mains in Salinity Impacted Areas	Protect sewer integrity in saltwater environments	• Offers means to mitigate saltwater intrusion into sewers. • Approach has been successfully implemented in the Florida Keys. • Less sewer maintenance necessary as pipe flows fill. • Low pressure force mains are resistance to inflow and infiltration (I/I).	• Requires new sewer lateral and grinder pump for each home. • Uses more localized electricity for pumps. • Requires partnership with residents for O&M needs. • City may need to establish guidelines for approval of installation of low-pressure force mains.	This alternative would construct new force mains in coastal communities experiencing corrosion.	Technology Cost: $166M Implementation Cost: $166M

Table ES-0-4. Wastewater Treatment Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
Wastewater Treatment Options	WT-1	Baseline Option - Maintain Current Treatment Processes	Operate within current limitations	• Staff continue to actively plan and manage wet weather flow. • Likely to be the lowest cost option.	• Unable to expand reclaimed water users due to Tampa Bay nitrogen allocation. • Not able to treat projected 2040 flows with current infrastructure. • Lack of redundancy to take units offline for long periods of time while fully maintaining all permit conditions. • Not able to manage peak flows from collection system in response to 7-inch LOS event.	This alternative would continue operating the three WRFs with limited improvements to satisfy regulatory obligations and reliability criteria.	Technology Cost: $441M Implementation Cost: $441M
	WT-2	Construct Equalization Storage Tanks at WRFs	Improve management of peak flows	• Provides flexibility to address peak flows. • Minimizes impact on plant unit processes (headworks and aeration). • Optimizes efficiency of WRF operations. • Streamline chemical usage for downstream treatment processes.	• Limited footprint and space available on the existing WRF sites (no space at Southwest WRF). • Intermittent operation. • May require aeration and mixing to prevent flow from becoming septic and to keep solids in suspension. • All conveyance options have some type of storage, so this is a base alternative coming out of the collection system facility plan.	This alternative would construct storage at the three WRFs to store peak wet weather flow until storms pass.	Technology Cost: $109M Implementation Cost: $585M
	WT-3	Upsize Treatment Units for Higher Flows	Improve management of peak flows	• Provides flexibility to address peak flows. • Only need to upsize select units at each WRF to achieve 2040 peak flow capacity. • Maximizes the value from the City's current and future capital investments.	• Potential limit for upsizing existing structures and processes due to space constraints. • Some existing treatment units not conducive for upsizing.	This alternative would upsize the process units at the WRFs to accommodate peak flows in lieu of intermittently used storage tanks.	Technology Cost: $70.2M Implementation Cost: $511M
	WT-4	Decentralize Coastal WRF	Improve water quality delivered to Northwest WRF and reduce reliance upon deep injection wells	• Removes coastal I/I from Northwest WRF collection system. • Mitigates chlorides challenge at Northwest WRF (600 milligrams per liter [mg/L]). • Improved reclaimed water quality - could add ASR well at Northwest WRF. • Eliminate $40 million collection system upgrades having constructability concerns. • Northwest WRF struggles with peak flows without capacity upgrades to pipes. • Construct more ASR reclaimed water storage at Northwest WRF.	• Expensive reverse osmosis treatment process required. • Stranding existing treatment capacity at Northwest WRF. • Required to send concentrate discharge to deep injection well. • Potentially not able to reuse effluent from new WRF - sending all flow to deep well.	This alternative would construct a separate treatment plant to handle flows received from the coastal communities.	Technology Cost: $87M Implementation Cost: $590M

Table ES-0-4. Wastewater Treatment Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
	WT-5	Add Nitrogen Removal Facilities at Northwest WRF & Northeast WRF	Improve water quality and free up Tampa Bay nitrogen allocation for the City	• Enables the City to expand its reclaimed water system. • Improves quality of effluent sent to the deep injection wells. • Combination of upgrades to existing processes and new construction.	• Space limitations. • Orchestrated effort to maintain full WRF operations while existing processes are improved.	This alternative would modify two WRFs to add treatment improvements to reduce nitrogen concentration in the reclaimed water.	Technology Cost: $74M Implementation Cost: $532M
	WT-6	Add Nitrogen Removal Facilities at all 3 WRFs	Improve water quality and free up Tampa Bay nitrogen allocation for the City	• Enables the City to expand its reclaimed water system. • Improves quality of effluent sent to the deep injection wells. • Combination of upgrades to existing processes and new construction.	• Severe space limitations at the Southwest WRF. • Orchestrated effort to maintain full WRF operations while existing processes are improved.	This alternative would modify all three WRFs to reduce nitrogen concentrations in the reclaimed water.	Technology Cost: $117M Implementation Cost: $577M
	WT-7a	Construct Small AWT WRF at Albert Whitted WRF	Improve management of peak flows	• Provides flexibility to address peak flows. • Compact footprint available for 5 mgd facility (base flow); 10 to 12 mgd peak flow. • Reduced sludge production than traditional WRF. • Improved reclaimed water quality; effluent can be discharged to Tampa Bay or irrigation or deep well injection. • Technology is robust, reliable, and easy to operate.	• Uncertain future viability of existing deep wells at Albert Whitted WRF site. • AWT system necessary to avoid off-specification storage requirement (need to verify). • Public perception if City builds new plant on low-lying area. • Long-term site concerns regarding SLR - mitigation will be required beyond 2040.	This alternative would construct a new small treatment plant at the Albert Whitted site to process peak flows.	Technology Cost: $119M Implementation Cost: $652M
	WT-7b	Wet Weather Storage Facility at Albert Whitted WRF	Store wet weather flows otherwise going to Southwest WRF	• Store wet weather flows otherwise going to Southwest WRF • Quick startup schedule compared to other alternatives. • City personnel are experienced and trained with storage • Lower cost than other alternatives	• Odor control will be needed as plant is next to airport • Need higher level of automation	This alternative would construct permanent storage facilities at the Albert Whitted site for emergency wet weather events.	Technology Cost: $25M Implementation Cost: $25M
Improve Reclaimed Water Quality	WT-8	Construct Treatment Wetland for Northeast WRF	Improve water quality, public education, divert flow from the Northeast WRF to created wetland	• Improve surface water quality from higher reclaimed water quality. • Free up Tampa Bay nitrogen allocation - allowing expansion of reclaimed system. • Treated wetland can handle the Northeast WRF 2040 annual average daily flow incremental increase. • Wetlands work well with peaky flows. • Public education opportunity. • Potential funding from SWFWMD for reuse and nutrient reduction scope.	• Facilities required to nitrify need to be further quantified. • Denitrification required at WRF for deep wells. • Requires City to decommission golf course. • Requires an above grade wetland due to the former onsite landfill. • Potential future SLR concerns for this area - beyond 2040. • Improve waterbodies surrounding the golf course if converted to wetland.	This alternative would construct a treatment wetland to reduce nitrogen concentrations in the reclaimed water produced by the Northeast WRF within an urban park setting.	Technology Cost: $16M Implementation Cost: $45M

Table ES-0-5. Reclaimed Water Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Estimated Cost ($)
	R-1	Expand Reclaimed Distribution System	Expand Reclaimed Distribution System	• Increase reclaimed water utilization	• Provides piping to new residential reclaimed customers. • Increases reclaimed water utilization that would normally be disposed via the injection well system.	This alternative would expand the existing reclaimed water system.	Technology Cost: $15M Implementation Cost: $89M
Expand Annual Average Reclaimed Water Utilization	R-2	Construct ASR Wellfield for Storage	Increase reclaimed water utilization	• Provides means for storage of large volumes of under-utilized reclaimed water. • Reduces use and reliance upon deep injection wells. • Reclaimed and Potable water ASR wells in use throughout Florida and United States. • ASR wellfields work best adjacent to water bodies per U.S. Army Corps of Engineers ASR Regional Study.	• Short-term concern with arsenic groundwater contamination for ASR wells. • Potential challenge to site ASR wellfield along environmental area south of Lake Maggiore. • Recovery of stored water could be limited over time.	This alternative would construct an ASR wellfield to store reclaimed water during the wet season for use during the dry season.	Technology Cost: $44M Implementation Cost: $114M
	R-3	Interconnect with Pinellas County	Increase reclaimed water utilization	• Potential to expand utilization of reclaimed water and reduce injected volumes to deep wells. • Opportunity to supplement County's reclaimed water shortages and potential new development. • Improves resiliency of City's reclaimed water supply. • City of Largo would be interested if City could get to AWT could go to Largo's surface water disposal or send it to City's injection wells if excess reclaim water.	• City must improve quality of reclaimed water for an interconnect to be viable.	This alternative would interconnect the City's reclaimed water network with Pinellas County's reclaimed water system.	Technology Cost: $13M Implementation Cost: $65M
	R-4	Pursue Wholesale Customers (Duke, TECO)	Increase reclaimed water utilization	• Increased revenue for City - particularly if take or pay contract terms. • Reduced reliance on local water supplies by using reclaimed water. • Common arrangement between water utilities and power companies in Florida.	• Contractual commitments may limit availability for residential customers sometimes. • Many industrial users require a higher quality of reclaimed water than the City currently produces.	This alternative would provide reclaimed water to wholesale customers for use in boilers and equipment.	Technology Cost: $16M Implementation Cost: $86M
	R-5	Construct Reclaimed Water Salinity Barrier System	Combat salinity impacts in localized areas	• Barrier wells system to buffer salinity intrusion into low-lying areas. • Potential to minimize external pipe corrosion from salt-water. • Need to verify local groundwater is Class G-1, or G-2 (F.A.C. 62-610.562) <10,000 mg/L TDS. • Trade those credits to Clearwater or Dunedin.	• Effectiveness of these systems need to be further researched. • Communities may not take ownership for O&M of system. • Requires a demonstrated need to control landward/upward migration of saltwater. • Reclaimed water quality must be improved to 10 mg/L nitrogen. • Requires a balance of public dollars being used for general public purpose - not localized benefit.	This alternative would use reclaimed water to mitigate salt water intrusion in coastal neighborhoods.	Technology Cost: $51M Implementation Cost: $51M
	R-6	Pipe Reclaimed Water to Pasco County During Wet Season	Increase reclaimed water utilization, improve regional water supply	• Potential to expand utilization of reclaimed water and reduce injected volumes to deep wells. • Reduced reliance on local water supplies by using reclaimed water.	• Expensive alternative and high energy utilization to transfer flow at least 30 miles. • Construction within urban corridors is expensive and causes disruptions. • May require additional right-of-way, easements, or property along route. • Unknown subsurface conditions (soils, sinkholes, groundwater). • Uncertain if Pasco County desires additional reclaimed water.	This alternative would send unused reclaimed water to Pasco County's reclaimed water reservoir.	Technology Cost: $174M Implementation Cost: $174M

Table ES-0-6. Stormwater Scenarios

Potential Option			Purpose	Merits	Demerits	Description	Cost Estimate ($)
Manage Stormwater	SW-1	Early Action Projects - Basin C	Enhance conveyance, pump station before outfall, secondary outfall off Salt Creek	• Addresses one area of highest concern for the City for flooding. • Alternative can be phased over time. • Improves lake storage and conveyance capacity. • Completes neighborhood storm sewer improvements. • Basin separate from impacts of tidal influences. • Increased pumping capacity for operational flexibility.	• High capital investment $53 million. • Likely to require easements and property acquisition. • Construction within urban corridors is expensive and causes disruptions. • Changes nature of Salt Creek from brackish to fresh water - impacting environmental conditions. • More energy costs for pumping. • Potential for environmental mitigation.	This alternative would construct stormwater management improvements in Basin C.	Technology Cost: $53M Implementation Cost: $53M
Manage Stormwater	SW-2	Replace Stormwater Management Systems at WRFs	Improve stormwater management	• Clean out silt from the existing storm system and improve grates. • Install curbing to stop dirt from entering the stormwater system. • Low-lying slabs can be raised while system is under construction. • Improved internal access to treatment units for City staff during wet weather.	• Tidal gates may be needed for the stormwater points of discharge. • Construction required throughout entire WRF sites.	This alternative would replace the on-site stormwater management systems at the WRFs.	Technology Cost: $3M Implementation Cost: $3M
Manage Stormwater	SW-3	Construct Seawall at Northeast WRF	Long-term strategy for mitigating localized sea level rise	• Phased approach viable - could defend perimeter with short seawall to start with future flood barriers on top of the walls. • Eco-engineered seawall can improve marine habitat and levels of biodiversity. • Opportunity for local beautification/public art project.	• Stormwater pump station required with a seawall. • Requires long-term maintenance by the City.	This alternative would construct a seawall barrier in the future to mitigate sea level rise at the Northeast WRF.	Technology Cost: $5.6M Implementation Cost: $5.6M
Utilize Stormwater	SW-4	Construct Stormwater ASR Wellfield	Utilize stormwater as a resource for water supply	• Provides means for storing and conserving large volumes of stormwater. • FDEP has permitted stormwater ASR wells (Peace River ASR). • Stormwater ASRs are advocated by the SWFWMD. • Potential funding from FDEP and SWFWMD.	• General concern with arsenic groundwater contamination for ASR wells. • Uncertain of requirements for treatment prior to injection into ASR wells • High cost of pumping	This alternative would construct an ASR wellfield to store stormwater.	$5M (per well)
Policy Revisions	SW-5	Revise City Policy	Require owners to raise elevation for new and retrofit construction	• Potential to establish a future marine conservation area in low lying coastal areas • Minimizes the City's risk for mitigating flood impacts to residences at/below the base flood elevation. • Educates the public regarding the risks associated with living in coastal areas.	• Property owners not allowed to build/rebuild to current elevations because it is more expensive. • Potentially controversial subject for local property owners. • May be a challenge to apply policy uniformly. • Areas such as policy may apply will continue to expand over time if SLR propagates.	This alternative recommends policy revisions related to stormwater management.	NA

Table ES-0-7. Natural Resources Scenario

Potential Option			Purpose	Merits	Demerits	Description	Cost Estimate ($)
Enhanced Surface Water Quality	NR-1	Floating Wetland Islands	Improve surface water quality and raise community awareness of natural resources	• Improving wetland habitats. • Improving water quality by reducing nutrient considerations. • Algae reduction from nutrient reduction, shading of the water column, and enhancing physical sedimentation of algal cells. • Science, technology, engineering, and mathematics events and other public education opportunities.	• Potential wildlife entanglement.	This alternative would construct float wetland islands in a few lakes within the City to improve water quality.	$6.5M (Crescent Lake or Mirror Lake) $0.65M (Round Lake) $11.8M (Lake Maggiore Demonstration Project)

Table ES-0-8. Resiliency & Sustainability Scenarios

Potential Option			Purpose	Merits	Demerits	Cost Estimate ($)
Policy	RES-1	Enhanced City Resilience Policy	Elevate standards	• Establishes consistent procedures to promote smart capital investment to improve the City's resilience over time. • Having a resilience policy will assist with changing the culture for City staff and the general public beyond current needs. • From a long-term perspective, the policy will assist with further reducing flood risk and further lowering flood insurance premiums for the entire City.	• Forward looking improvements require advanced investment at times for a benefit that may not be immediately realized. • Some may not fully understand the value associated with the application of resilience and may disagree with the established policy.	$0.15M - $0.25M
Alternative Energy	SUS-2	Photovoltaic (PV) Electric Power Generation and Storage	To improve electric power reliability through diversified sources	• City has set a goal of Net-Zero energy. • Large land holding of the plant provides opportunity to construct PV Solar Panels. • By generating enough electric power to offset the plant operations on an average annual basis, this will help move the City toward its goal. • Siting would need to avoid preserves or future plant expansion areas. • Reduced risk to staff and equipment from ultraviolet (UV) exposure if portions of site are covered.	• Additional capital costs required to implement. • Possible issue with current power supplier contract(s) and net metering agreements (Duke, FPL). • Need to understand net metering rates and feasibility versus battery storage. • Need to avoid canopies from becoming projectiles during high wind events. • Additional staff training may be warranted to maintain systems.	$2M to $2.5M (Cosme) $2M to $3.2M (Southwest WRF) $2M to $2.5M (Northwest WRF) $2M to $4.8M (Northeast WRF)

Scenario Recommendations

The benefits, costs, and resiliency for the scenarios were reviewed to create the suite of recommended scenarios as shown in Table ES-0-9. These recommendations represent the grouping that best satisfies the City's objectives noted in Section 1.

Table ES-0-9. Recommended IWRMP Scenarios

Scenario Category	Recommended Scenarios	Comments
Potable Water System	P-2: Sell Cosme to TBW P-4: Construct WTP at Water Repump Stations	Selling Cosme to TBW will provide a regional water supply benefit. Membrane technology provides more assurances that future regulations regarding more stringent potable water quality standard will be satisfied. Locating the WTP(s) within City limits will eliminate issues associated with water age.
Wastewater Collection	WC-1: Smart Sewers WC-3: Express Sewers	The Smart Sewer Technology will equip the City with the ability to divert flow from surcharged sewers to sewers having available capacity. The Express Sewers Scenario provides the benefit of taking one WRF offline for a short period during dry weather periods. The improvements constructed under this scenario supports maintenance activities that will help reduce unauthorized discharges to the environment.
Wastewater Treatment	WT-3: Upsize WRFs WT-5: Nutrient Reduction WT-7b: Wet Weather Storage at the Albert Whitted WRF WT-8: Treatment Wetland	The City must increase the capacity of various treatment processes at each WRF to meet the projected 2040 average daily flow demand. Upsizing select components at each WRF will further improve the ability of each WRF to manage peak wet weather flows. Nitrogen reduction facilities are recommended to improve the quality of reclaimed water produced at the WRFs. An improved quality will provide the City with more diverse options for increasing utilization and minimizing injection well reliance.
Reclaimed Water Distribution	R-1: Expand Distribution System R-3: County Interconnect	The City could receive more revenue by expanding its residential customer base, entering into wholesale agreements, and interconnecting its reclaimed water system with Pinellas County.
Stormwater Management	SW-1: Basin C Improvements SW-2: WRF Sites SW-4: Flood Protection Wall	Stormwater management in Basin C is a priority for the City. The stormwater management systems at the WRFs need to be replaced. The Northeast WRF would benefit in the future from an eco-flood protection wall to mitigate SLR.
Natural Resources	NR-1: Floating Wetland Islands	Floating wetland islands would improve water quality in select City lakes as demonstrated by the Crescent Lake community project.
Sustainable Options	SUS-1: Photovoltaic Systems at WRFs	It is recommended the City evaluate installing PV arrays at each WRF to increase alternative energy sources.

The following figures show how the infrastructure improvements from the recommended scenarios would fit on each WRF site. A schematic of the conceptual treatment wetland is presented in Figure ES-0-4.

Community Benefits

The STAR certification process was used for quantifying community benefits. The potential additional points offered by each scenario is presented in Table ES-0-10a. The criteria used for assigning points is explained in Section 2.

The following were the highest scoring scenarios.

- Scenario WT-8: Treatment Wetland Park (24 points)
- Scenario WC-3: Express Sewers (19.5 points)
- Scenario WT-3: WRF Capacity Upgrades (19.5 points)
- Scenario WC-1: Smart Sewer Technology (15 points)

In 2016, St. Petersburg received a 3-STAR community rating under the program by earning 381.7 points. To achieve a 4-STAR rating, the City would need to earn 18.3 more points (a total of 400 points). To achieve a 5-STAR rating, the City would need to earn 218.3 more points (a total of 600 points).

Table ES-0-10b provides a summary of the maximum possible STAR points the City could earn from implementing the recommended scenarios, which include P-2, P-4, WC-1, WC-3, WT-3, WT-5, WT-7B, WT-8, R-1, R-3, SW-1, SW-2, SW-4, and SUS-2.

Table ES-0-10b. Maximum Possible STAR Certification Points from Recommended Scenarios

Goal Area	Objectives	Maximum Additional Points
Built Environment (66%)	BE-1: Ambient Noise and Light	0.5
	BE-2: Community Water System	1.0
	BE-5: Infill & Redevelopment	1.0
Climate & Energy (47%)	CE-1: Climate Adaptation	5.0
	CE-2: Greenhouse Gas Mitigation	3.0
	CE-3: Greening the Energy Supply	2.0
	CE-6: Resource Efficient Public Infrastructure	1.0
Economy & Jobs (62%)	EJ-3: Local Economy	3.0
	EJ-6: Workforce Readiness	3.0
Equity & Empowerment (22%)	EE-3: Environmental Justice	3.0
Health & Safety (62%)	HS-1: Active Living	0.5
	HS-6: Natural & Human Hazards	1.0
Natural Systems (35%)	NS-1: Green Infrastructure	1.0
	NS-2: Invasive Species	2.0
	NS-3: Natural Resource Protection	5.0
	NS-5: Water in the Environment	3.0
Total Maximum STAR Points from Recommended Scenarios		**35.0**

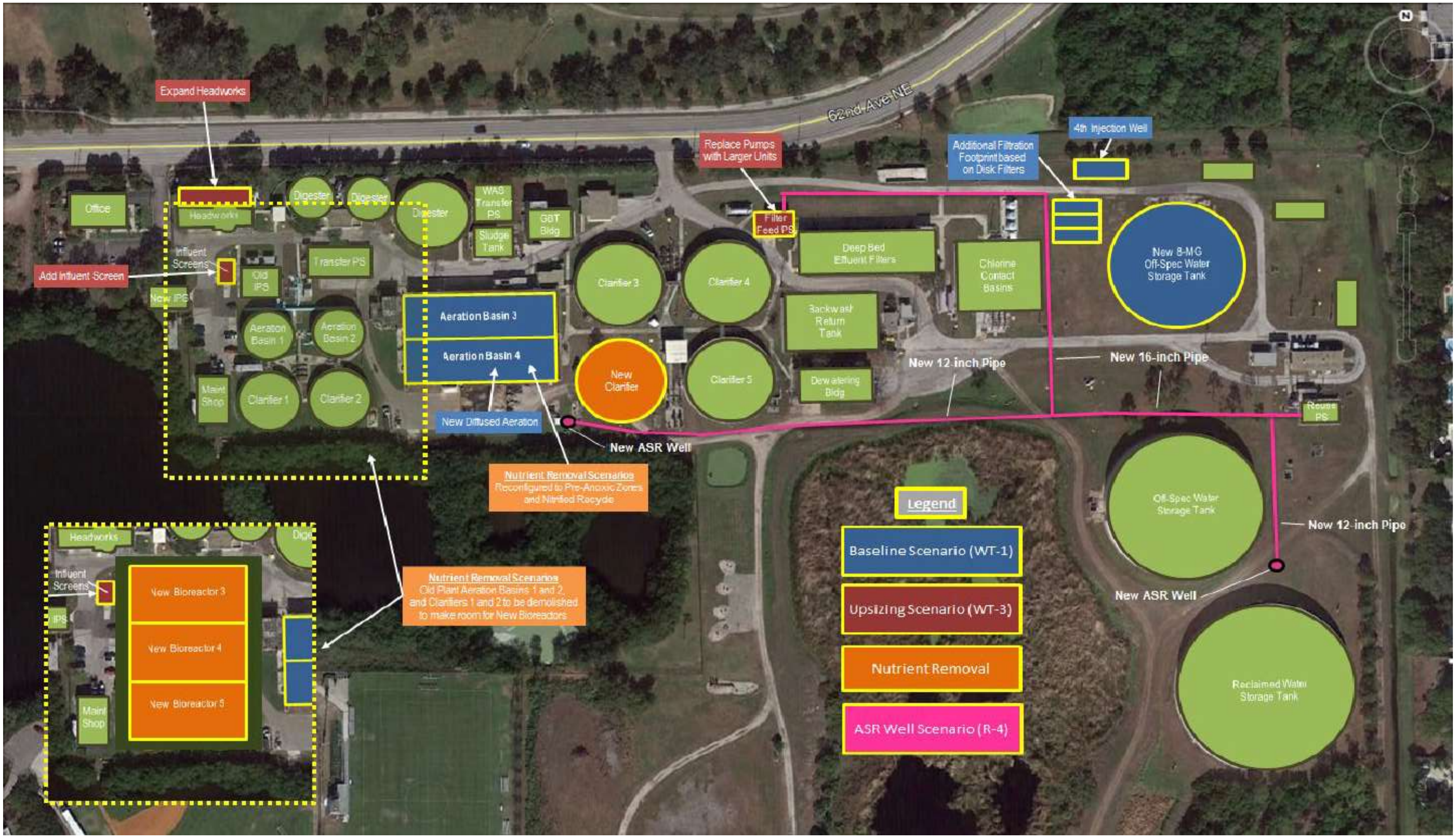

Figure ES-0-1. Site Layout Plan for the Northeast WRF

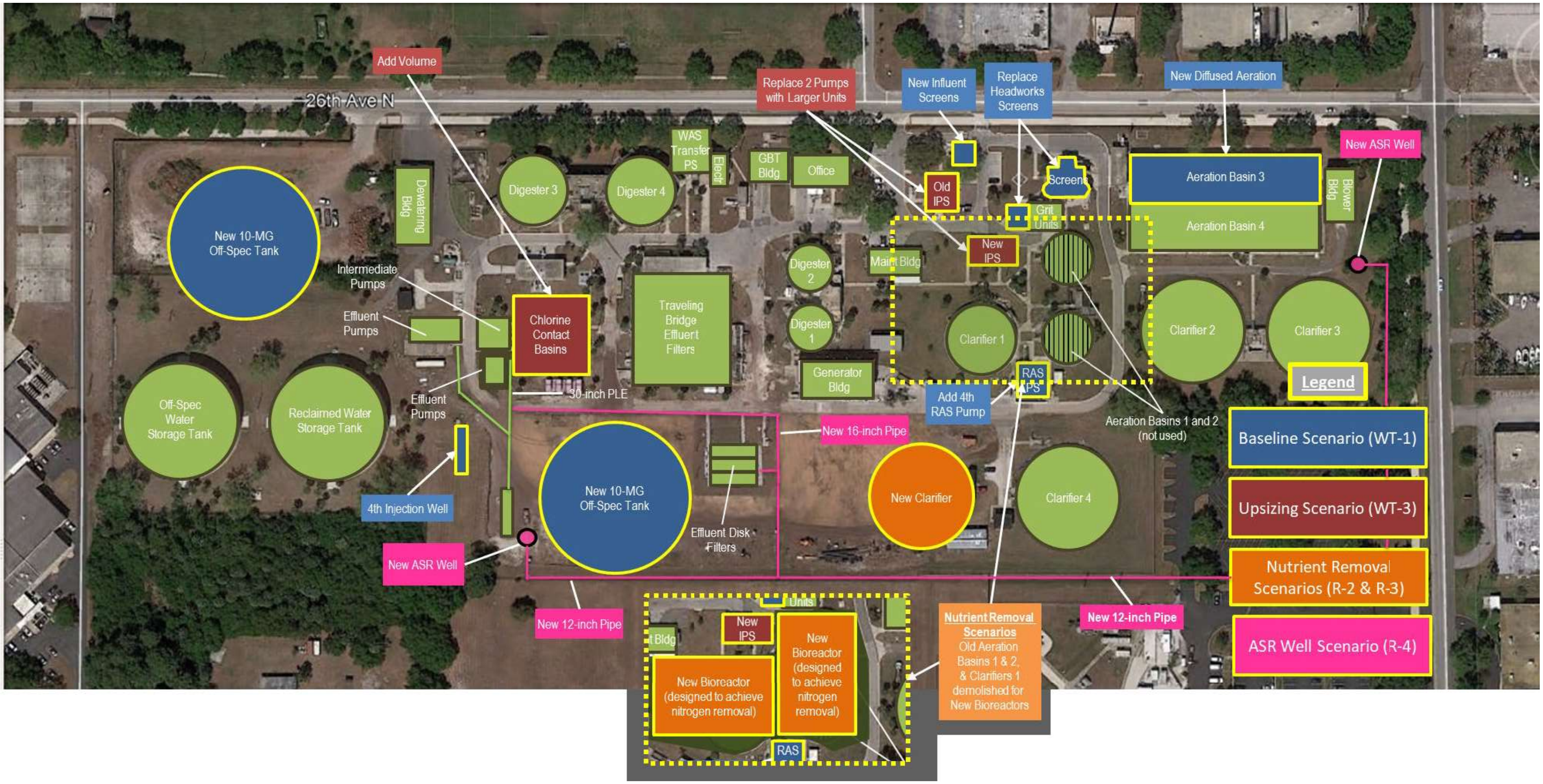

Figure ES-0-2. Site Layout Plan for the Northwest WRF

Figure ES-0-3. Site Layout Plan for the Southwest WRF

Figure ES-0-4. Schematic of Conceptual Treatment Wetland for Northeast WRF

Table ES-0-10a. Summary of Potential STAR Certification Points by Scenario

Goal Area	Objective	Points Missed in 2016	WT 1 Baseline WRF	WT 2 Equalization Storage	WT 3 WRF Capacity Upgrade	WT 4 Coastal WRF	WT 5 Nutrient Removal 2 WRFs	WT 6 Nutrient Removal 3 WRFs	WT 7 AWT at Albert Whitted	WT 8 Treatment Wetland	WC 1 Smart Sewer Technology	WC 2 Collection Storage	WC 3 Express Sewers	WC 4 Flow to Pinellas County	WC 5 Low Pressure Force Main	P 1 Cosme Baseline	P 2 Sell Cosme to TBW	P 3 Cosme Upgrade Technology	P 4 New WTP at Repump	P 5 New WTP at Lake Maggiore	P 6 New Desalination WTP	R 1 Expand Reclaimed System	R 2 Reclaimed ASR Wells	R 3 Interconnected with County	R 4 Wholesale Reclaimed	R 5 Salinity Barrier Reclaimed	R 6 Reclaimed to Pasco Co.	SW 1 Basin C Improvements	SW 2 WRF Stormwater	SW 3 Seawall Northeast WRF	SW 4 Stormwater ASR Wells	SW 5 Stormwater Policy	SUS 1 Floating Wetlands	SUS 2 Solar Power Systems
Built Environment	BE-1: Ambient Noise and Light	3.8	-	-	-	-	-	-	-	½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
	BE-2: Community Water System	1.1	-	1	1	½	1	1	½	½	-	½	½	-	-	-	-	½	1	½	½	1	-	½	-	-	-	-	-	-	-	-	-	-
	BE-5: Infill & Redevelopment	3.3	-	-	1	1	1	1	1	1	-	-	-	-	-	-	-	-	1	1	1	-	-	1	-	-	-	1	-	-	-	-	-	-
Climate & Energy	CE-1: Climate Adaptation	11.8	2	2	2	2	2	2	2	2	5	5	5	2	1	1	1	1	1	1	1	2	2	2	2	1	2	2	-	1	1	1	-	-
	CE-2: Greenhouse Gas Mitigation	13	2	-	2	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	3
	CE-3: Greening the Energy Supply	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
	CE-6 : Resource Efficient Public Infrastructure	1.6	½	½	½	½	½	½	½	½	1	1	1	-	-	-	1	-	½	½	½	0. 5	-	1	1	1	-	-	-	-	-	-	-	-
Economy and Jobs	EJ-3: Local Economy	7.1	2	2	2	2	2	2	2	3	-	2	2	-	2	2	-	2	2	2	2	2	-	-	-	-	2	2	-	-	-	-	-	-
	EJ-6: Workforce Readiness	8.2	2	2	2	2	2	2	2	3	-	2	2	-	2	2	-	2	2	2	2	2	-	-	-	-	2	2	-	-	-	-	-	-
Equity and Empowerment	EE-3: Environmental Justice	15	-	3	3	-	-	-	-	3	3	3	3	-	-	-	-	2	2	2	2	-	-	-	-	-	-	3	-	-	-	-	-	-
Health & Safety	HS-1: Active Living	4.8	-	-	-	-	-	-	-	½	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	HS-6: Natural & Human Hazards	3.4	1	1	1	1	-	-	1	-	1	1	1	-	½	-	-	-	-	-	-	-	-	-	-	½	-	1	-	½	1	1	-	-
Natural Systems	NS-1: Green Infrastructure	18.9	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	NS-2: Invasive Species	5.8	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	NS-3: Natural Resource Protection	16.8	2	2	2	2	-	-	2	5	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	1	-
	NS-5: Water in the Environment	9.4	3	3	3	3	2	2	3	2	3	3	3	-	-	-	-	-	-	1	2	2	1	-	-	1	-	-	-	-	1	-	2	-
Total Potential Additional STAR Certification Points		**133.1**	14.5	16.5	19.5	14	12.5	12.5	14	24	15	19.5	19.5	2	5.5	5	2	7.5	9.5	10	11	11.5	3	4.5	3	4.5	6	12	0	2.5	3	2	5	5

20-Year CIP

Translating the scenarios into defined capital projects is necessary to develop a draft 20-year CIP. The exercise is solely intended for financial planning purposes and to streamline and prioritize infrastructure improvements in a manner that supports forward looking needs and criteria.

It is not reasonable for a 20-Year plan to remain unchanged as the utility environment is dynamic and priority continuously changes. The IWRMP provides documentation for a fully funded CIP that addresses the City's needs, mandates, goals, and LOS. It is envisioned that City staff will update the IWRMP every 3 to 5 years. A summary of the long-term CIP for each asset class is presented herein.

Potable Water System

The Cosme WTP has served the City well for more than 100 years. The location of the WTP with respect to the City requires a long travel time for potable water and requires repumping and flushing of the water distribution system to maintain proper water quality for the City's customers. The IWRMP recommendation is to construct 20 mgd of membrane water treatment capacity within the City limits (at either the Oberly or Washington Terrace Water Repump Station) to be blended with 20 mgd of water from TBW.

This scenario provides the City with the greatest benefit at a reasonable capital cost. The large capital investment will position the City for providing reliable high quality potable water for its customers. The efforts of City staff have ensured the investment made for the Cosme WTP established long-term regional benefit.

- **Regional Benefit**: TBW has expressed an interest in potentially using the Cosme WTP as part of its regional water supply program. The City could sell the Cosme WTP to TBW and use the proceeds toward construction of new membrane softening WTP(s) in the City. The ultimate WTP location and technology will be a cooperative effort between the City and TBW.

- **Improved Technology**: Membrane technology provides more assurances that future regulations regarding more stringent potable water quality standard will be satisfied.

- **Located Near End-Users**: Sufficient space is available at the City's Water Repump Stations. Locating the WTP(s) in the City eliminates the potential for issues associated with water age.

- **40 mgd Capacity**: Although the City could construct the new WTP in 10 mgd increments and phase the capital needs over time, staff would prefer to construct the full capacity plant to minimize concerns related to different water quality produced by the Cosme WTP and the new membrane WTP. The longevity of the Cosme WTP assets remains a concern in that most were well past the industry standard useful life

A summary of the recommended potable water system 20-year CIP is presented in Table ES-0-11.

Table ES-0-11. 20-Year CIP Potable Water System Recommendations

Driver	Description	20 Year CIP
Water Treatment Plant	Cosme WTP Improvements	$15,500,000
	Scenario P-4C New Membrane WTP in City Limits	$120,000,000
	P-4C Future Asset Management	$6,000,000
	Sub-Total	**$141,500,000**
Water Mains Asset Management	Backflow Prevention / Meter Replace	$39,000,000
	Main / Valve Replacement / Aqueous Crossings	$90,000,000
	Main Relocation	$2,000,000
	Downtown Main Replacement	$113,000,000
	Galvanized and Unlined Pipe Elimination[a]	$260,000,000
	Annual Condition Assessment	$10,000,000
	High Corrosivity Soils Pipe Replacement	$191,000,000
	Automated Meter Reading Installation Program[b]	$35,000,000
	Redundant Pipeline Installation Project	$19,000,000
	Sub-Total	**$759,000,000**
Water Repump Stations Asset Management	Oberly Water Repump Station	$10,295,000
	Washington Terrace Water Repump Station	$7,809,500
	Gulf-to-Bay Water Repump Station	$5,278,500
	McMullen Booth Water Repump Station	$630,000
	Crescent Lake Storage Tank	$2,668,000
	Sub-Total	**$26,680,800**
Capacity Improvements	Gandy Blvd Water Main Improvements	$9,200,000
	Southwest Blvd North Water Main Improvements	$4,500,000
	55th Avenue North Water Main Improvements	$7,500,000
	71st Street North & 74th Street North WM	$4,700,000
	Duke Energy Bartow Plant WM Improvements	$2,200,000
	Future Development	$10,000,000
	Sub-Total	**$38,100,000**
Construction Coordination	New Water Main Extensions	$1,000,000
	Service Taps, Meters & Backflows	$16,000,000
	Annual Bridge Replacement	$10,000,000
	Annual Roadway Coordination	$2,000,000
	Sub-Total	**$29,000,000**
	20 Year CIP for Potable Water System	**$994,281,000**

[a] Cost to replace 256 miles of remaining galvanized water mains
[b]Cost estimate provided by City contractor.

Wastewater Collection System

The IWRMP recommends scenarios WT-1 Smart Sewer Technology and WT-3 Express Sewers for the 20-Year CIP. The Smart Sewer Technology will equip the City with the ability to know how flows are occurring within the collection system. In the event wet weather is peaking in one area of the City, flow could be diverted from surcharged sewers to sewers having available capacity. The Express Sewers scenario offers the City the added benefit of being able to take one WRF off-line for a short period of time while significantly reducing the likelihood for unauthorized discharges or off-spec water production. The primary reasons for recommending these scenarios are as follows.

- **Fewer Unauthorized Discharges**: In addition to the system improvements noted in the Kriseman Plan, the City has expressed a desire to be able to effectively manage wet weather flows associated with the 7-inch storm event (similar to Tropical Storm Hermine). Having the conveyance capacity in the collection system will prevent authorized discharges under many circumstances. Sizing the capacity for the Tropical Storm event, will afford ample routine capacity throughout the system. The improvements noted for the CAPP will address this level of service.

- **System Optimization**: With a relatively minimal investment, the City can convert its wastewater collection system into a smart sewer system. This technology provides operations staff working in the collection system, lift stations, and WRFs to have a clear understanding of where flow is entering the system and the estimated travel time to key infrastructure. This advanced knowledge will enable staff to redirect flow to areas having available capacity during wet weather conditions. The technology will also assist routine system bypassing and diversion associated with operations, maintenance, or line breaks.

- **Operational Flexibility**: Scenario WC-3 Express Sewers will provide the City with operational flexibility to divert wastewater flows to other basins. This is one of the goal areas of the Kriseman Infrastructure Plan. The concept would allow one of the three existing WRFs to be taken off-line for a few weeks, assuming the other two facilities have sufficient systems operational to accept the additional flow. This added system protection should be considered toward the end of the 20-Year Program outlined in the IWRMP. The CAPP projects, Consent Decree projects, and Smart Sewer System will provide a greater benefit and should be constructed first.

- **Replace/Rehab Aging Assets**: It is important for the City to continue is sewer and manhole renewal programs. These programs are critical components of the EPA's CMOM requirements. The asset management recommendation for the sewers includes continued use of the annual allowances to replace aging assets before they fail. Typical industry standard is to replace 1 percent to 2 percent of the collection system per year. This approach allows the City to maximize the life of existing assets while proactively addressing infrastructure needs before they become problematic for the community.

A summary of the 20-year wastewater collection CIP recommendations is presented in Table ES-0-12.

The line item shown under peak flow wet weather management for private laterals represents a placeholder in the event the City decides to develop a comprehensive program. This decision will be made in the future pending the results of the ongoing Private Laterals Pilot Study.

Table ES-0-12. 20-Year CIP Wastewater Collection System Recommendations

Driver	Description	20 Year CIP
Asset Management	Manhole Ring and Cover Replacements	$3,000,000
	Flow Control 2, LS 12	$1,200,000
	Annual I/I Removal	$10,000,000
	CMOM Annual Pipe R&R	$80,000,000
	CMOM Annual Manhole Rehabilitation Program	$17,000,000
	Annual Flow Monitoring Devices	$1,000,000
	Sub-Total Sewers	**$112,200,000**
	Lift Station Asset Management	$159,050,000
	Lift Station Resiliency Improvements	$8,620,000
	Lift Station SCADA Improvements	$500,000
	Sub-Total Lift Stations	**$168,170,000**
CAPP & Level of Service	Private Laterals Replacement Program	$10,000,000
	Lift Stations CAPP	$53,600,000
	Sewers CAPP	$251,100,000
	Sub-Total	**$314,700,000**
Regulatory Compliance	LS 87 Childs Park Force Main and LS	$8,200,000
	CMOM Annual Pipe CIPP Lining Program	$48,000,000
	Sub-Total	**$56,200,000**
Construction Coordination	Potential Septic Tank Eliminations	$3,031,000
	Annual Gravity Sewer Extensions	$1,000,000
	Annual New Sewer Connections	$1,000,000
	Annual Aqueous Crossing Rehabilitation	$1,000,000
	Annual Roadway Coordination	$2,000,000
	Annual Bridge Replacements	$10,000,000
	Sub-Total	**$18,031,000**
System Optimization	Scenario WC-1 Smart Sewer Technology	$12,750,000
	Scenario WC-3 Express Sewers	$127,850,000
	Sub-Total	**$140,600,000**
20 Year CIP for Wastewater Collection System		**$809,901,000**

Water Reclamation Facilities

The IWRMP recommendation is to construct Scenario WT-1 Baseline WRF Needs; Scenario WT-3 Upsizing WRFs for Peak Flows; Scenario WT-5 Nutrient Reduction at Northeast and Northwest WRFs; Scenario WT-7b Wet Weather Storage Facility at the Albert Whitted WRF; and Scenario 8 Treatment Wetland for Northeast WRF.

The WRF recommended strategy combines multiple scenarios at each WRF site. The scenarios work in tandem to optimize replacement of aging assets with new technology as well as replacing aging assets with upsized units to accommodate peak wet weather flow.

This scenario provides the City with a strategy for improving the resiliency and sustainability of the existing WRF infrastructure while also improving the quality of reclaimed water produced and indirectly improving the quality of local surface waters. This strategy accomplishes multiple complementary goals and benefits for the City. The primary basis for making this recommendation includes the following.

- **Address Aging Assets**: The three WRFs require routine repair, replacement, or rehabilitation of its assets. An industry-standard asset management program is recommended to budget for and address asset needs in a proactive manner before they reach the end of their useful life. This approach will result with improved reliability and fewer asset failures.

- **Water Quality**: Producing a higher quality of reclaimed water reduces the concentration of nitrogen running off to local waterways from reuse irrigation systems. It also reduces the concentration of nitrogen pumped below into the injection wells resulting with improved groundwater chemistry.

- **Regional Benefit**: Anytime the City can utilize reclaimed water instead of disposing it via injection wells, the regional water resources benefit. When applied for irrigation, the reclaimed water fill voids in dry soils; promotes positive ecology; and reduces reliance on potable water for irrigation.

- **Future Regulations**: Constructing nutrient reduction facilities at the Northeast and Northwest WRF will position the City to comply timely if FDEP requires utilities to operate and maintain high-level treatment or advanced wastewater treatment throughout the State of Florida.

- **Increased Reclaimed Water Utilization**: Having a high quality of reclaimed water facilitates more uses for the water in lieu of sending it to injection wells for disposal. With the nitrogen concentration reduced, the City will be able to expand its reclaimed water distribution system and/or pursue wholesale customers. More information regarding these options is presented in Section 7.

- **Community Enhancement**: A treatment wetland integrates well into the City's urban green space culture. The wetland facility would serve as an educational center, treatment facility, protected habit for native wildlife, and passive recreation facility for residents and tourists. By locating the wetland on a portion of the City's existing golf course, green space is not lost, rather it is further enhanced for a greater public benefit.

A summary of the 20-year water reclamation facility CIP recommendations is presented in Table ES-0-13.

Table ES-0-13. 20-Year CIP WRF Recommendations

Driver	Description	Northeast WRF	Northwest WRF	Southwest WRF
Asset Management	Remaining Kriseman Plan			
	Asset Management Program	$101,500,000	$97,500,000	$124,700,000
	WT-1 Future Asset Mgmt	$800,000	$300,000	$0
	WT-3 Future Asset Mgmt	$600,000	$700,000	$2,100,000
	WT-5 Future Asset Mgmt	$2,000,000	$1,700,000	$0
	WT-7B Future Asset Mgmt	$0	$0	$1,250,000
	WT-8 Future Asset Mgmt	$800,000	$0	$0
	Sub-Total	**$105,700,000**	**$100,200,000**	**$128,050,000**
Regulatory Compliance	Off-Spec Storage Capacity	$8,100,000	$19,400,000	$5,400,000
	WT-1 Reliability	$16,000,000	$6,900,000	$0
	Sub-Total	**$24,100,000**	**$26,300,000**	**$5,400,000**
Capacity and Wet Weather Peak Flow	WT-3 Upgrades	$12,400,000	$14,600,000	$43,400,000
	WT-7B Albert Whitted Storage	$0	$0	$25,000,000
	Sub-Total	**$12,400,000**	**$14,600,000**	**$68,400,000**
Nutrient Removal	WT-5 Nutrient Reduction	$39,300,000	$34,700,000	$0
	WT-8 Treatment Wetland	$15,900,000	$0	$0
	Sub-Total	**$55,200,000**	**$34,700,000**	**$0**
Alternative Energy	SUS-2 Photovoltaic Systems	$3,549,000	$2,282,000	$2,704,000
	Sub-Total	**$3,549,000**	**$2,282,000**	**$2,704,000**
	20 Year CIP by WRF	**$200,949,000**	**$178,082,000**	**$204,554,000**
	Total 20-Year CIP for WRFs		**$583,585,000**	

Reclaimed Water Distribution System

The IWRMP recommendation is to construct Scenario R-1 Expand Reclaimed Water Distribution System and Scenario R-3 Construct Reclaimed Water Interconnect with Pinellas County. The scenarios recommended for the reclaimed water distribution system provide the City with the ability to utilize more reclaimed water and reduce the amount of water disposed via the injection wells. The primary reasons for recommending these scenarios are as follows.

- **Reduce Reliance on Injection Wells**: The more reclaimed water that can be reused, the less disposal into the injection wells. This approach is favorable because we are maximizing utilization of resources.

- **Increased Revenue from More Users**: Adding residential customers as noted under Scenario R-1 will result with more revenue for the Water Resources Department. Revenues are also anticipated to increase with an interconnect with the County's reclaimed water system. The City is well positioned to provide reclaimed water to some unserved neighborhoods in Pinellas County's Utility service area.

- **Improved Water Quality**: Any increase in reclaimed water utilization requires a higher quality of water to be produced by the WRFs to reduce nitrogen concentrations. This approach improves local groundwater chemistry, reduces scaling in distribution pipes and appurtenances, and minimized eutrophication of local surface waters.

The overall 20-year CIP for the reclaimed water distribution system is presented in Table ES-0-14.

Table ES-0-14. 20-Year CIP for Reclaimed Water Distribution System

Driver	Description	20 Year CIP
Asset Management	Main/Valve/Tap Replacements	$22,000,000
	Northeast PCCP RWS Replacement	$11,400,000
	Northwest PCCP RWS Replacement	$16,410,000
	Shore Acres RWS Replacement	$6,000,000
	Snell Isle RWS Replacement	$2,000,000
	Yacht Club Estates RWS Replacement	$2,100,000
	Isla Del Sol RWS Replacement	$1,300,000
	Automated Meter Installation Program	$7,000,000
	Future Corrosion Replacement Program	$20,000,000
Construction Coordination	Annual Roadway Coordination	$2,000,000
	Annual Bridge Replacements	$1,000,000
	Service Taps & Backflows	$1,500,000
Recommended Scenarios	R-1 RWS Distribution Expansion	$15,500,000
	R-3 Pinellas County Interconnect	$12,743,000
	Total	**$120,953,000**

Note: Recommended scenarios do not include costs for nutrient reduction at the WRFs. These costs are included in the WRF 20-Year CIP table.

Stormwater Management System

The City is currently working with the SWFWMD to update its Stormwater Management Master Plan. This effort is scheduled to be complete in 2022. The IWRMP coordinated the evaluations performed for the Basin C drainage area to identify early action projects. The recommended projects will address challenges facing one of the most flood-prone areas of the City

The IWRMP recommendation is to construct Scenario SW-1 Early Action Basin C Projects, Scenario SW-2 Replace Stormwater Management Systems at the WRFs, and SW-3 Construct Seawall at the Northeast WRF. The scenarios recommended for the stormwater system provide the City with the ability to better manage stormwater. The primary reasons for recommending these scenarios are as follows.

- **Improve Drainage**: The Basin C projects address stormwater management, flood protection, and I/I to a limited extent in the area of the City that has historically experienced frequency issues. The projects also consider future variability in climate conditions and potential sea level rise.

- **Optimize Facilities**: The WRF stormwater system improvements will ensure proper drainage, cleanout silt from the existing stormwater system including drain pipes, inlets, and pumps for all sumps and equipment in curbed areas exposed to rainfall. These projects will improve internal access to treatment units for City staff during wet weather.

- **Climate Adaption**: The seawall at the Northeast WRF will protect the facility from future SLR. This long-term strategy will mitigate extreme tides, surge events, and impacts associated with future SLR.

The overall 20-year CIP for the stormwater system is presented in Table ES-0-15.

Table ES-0-15. Recommended 20-Year Stormwater CIP

Driver	Description	20 Year CIP
Asset Management	SW-2 Northeast WRF Stormwater System	$1,000,000
	SW-2 Northwest WRF Stormwater System	$1,000,000
	SW-2 Southwest WRF Stormwater System	$1,000,000
	Annual Storm Sewer Repair & Replacement [b.]	$20,000,000
	Annual Drainage Improvements [b.]	$50,000,000
	Complete Streets Program [b.]	$50,000,000
	Sub-Total	**$123,000,000**
Construction Coordination	Annual Roadway Coordination [b.]	$2,000,000
	Annual Bridge Replacements [b.]	$1,000,000
	Sub-Total	**$3,000,000**
Enhanced Stormwater Management	SW-1 Basin C – Salt Creek Outfall [b.]	$30,417,000
	SW-1 Basin C – Salt Creek Channel Widening [b.]	$11,892,000
	SW-1 Basin C – Lake Maggiore Secondary Outfall [b.]	$10,866,000
	SW-4 Northeast WRF Flood Protection Wall	$5,630,000
	Floating Wetland Islands [c]	$25,450,000
	Annual Water Quality Improvements [b.]	$24,550,000
	Sub-Total	**$108,805,000**
Future Projects	Future Stormwater Projects from Master Plan	$400,000,000
	Sub-Total	**$400,000,000**
	20 Year CIP for Stormwater [a]	**$634,805,000**

[a] The full listing of capital needs will be updated by the City after the Stormwater Management Master Plan has been completed.

[b.] Part of Stormwater Department CIP – not Water Resources

[c] Includes Scenario described in Section 9 related to surface water lakes.

Summary of 20-Year CIP

The totals for all 20-Year CIP forecasts are presented in Table ES-0-16 and Figure ES-0-5. To complete all improvements across all utility asset classes the City would need to budget approximately $157 million per year for a total of approximately $3.1 billion.

Table ES-0-16. Overview of 20-Year CIP by Asset Class

Asset Type	20 Year CIP ($)	20 Year CIP (%)
Potable Water Treatment	$141,500,000	5%
Water Distribution	$852,781,000	27%
Wastewater Collection	$809,901,000	26%
Water Reclamation Facilities	$583,585,000	19%
Reclaimed Water Distribution	$120,953,000	4%
Stormwater Management[a]	$634,805,000	20%
Total	**$3,143,525,000**	**100%**

[a] includes WRD and Stormwater CIP budgets

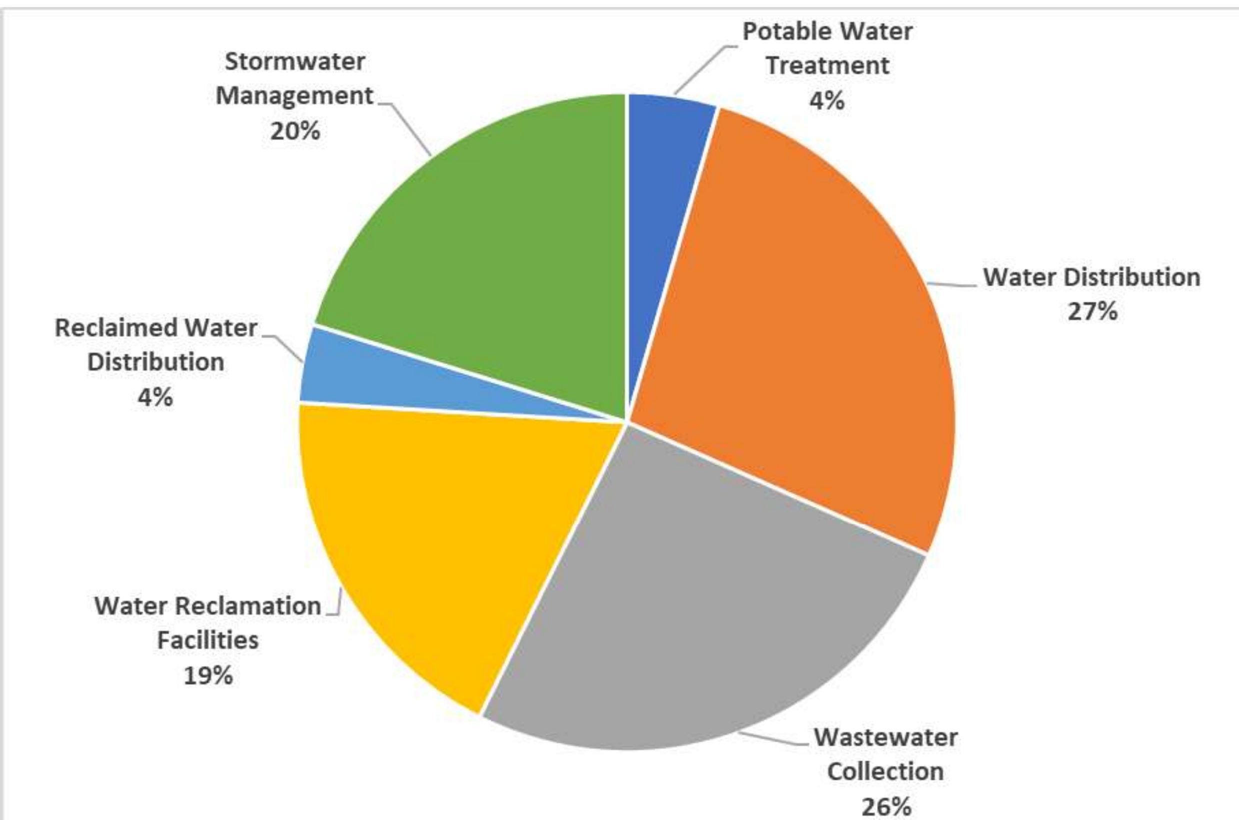

Figure ES-0-5. Summary of 20-Year CIP by Asset Class

Next Steps for Implementation of the IWRMP

The following action items represent next steps the City is advised to consider regarding an approach for implementing the IWRMP recommendations noted in this report.

- **Scenario P-4 Pilot Testing**: Field testing is needed to analyze the appropriate blend of raw water supplied by TBW with NF membranes. This ratio will affect the sizing of the membrane trains as well as the overall capital cost. The testing should also evaluate the level of treatment appropriate for the raw water bypass as well as if pretreatment for the NF membranes is needed to increase the life of the treatment membranes.
- **Scenario P-5 Pilot Testing**: Although this scenario was not recommended for advancement, if the City decides to pursue constructing an indirect potable reuse system, then additional pilot testing is required to analyze the appropriate blends and treatment strategies for the reclaimed water to augment Lake Maggiore; water pretreatment needs prior to directly flow to the ASR wellfield; and pretreatment requirements for the surface water treatment plant.
- **Scenario WC-1 SCADA Master Plan**: The Smart Sewer Technology system will be more easily implemented if the City develops a master plan for the collection system SCADA components. The SCADA Master Plan can expand to WRF and WTP uses of SCADA technology.
- **Scenario WT-3 Clarifier Testing**: Full scale testing is recommended for the Southwest WRF Secondary Clarifiers to determine if the proposed peak loading is within the capability of the existing clarifiers.
- **Scenario SW-2 WRF Stormwater Systems**: It is recommended the City develop Stormwater Management Master Plans for each WRF location. This approach will streamline replacement of the silted up systems; update the Asset Management system of appropriate system maintenance for the new systems; and determine the most suitable construction sequencing strategy to minimize impact to plant operations during construction of the new stormwater systems.
- **Confirm Long-Term Planning Preferences**: The IWRMP includes recommendations for improving all utility infrastructure. The City needs to obtain internal concurrence with the strategies recommended herein in order to develop a high-level 20-year CIP implementation Plan. The Implementation Plan will identify phasing, priorities, regulatory deadlines, and sequencing for the work recommended in the IWRMP>
- **Prioritize 5-Year CIP**: Jacobs worked with City staff to develop a prioritization strategy and excel-based tool that can be used each year to assign priority scoring to the CIP projects. The prioritization criteria that each CIP project will be compared across all asset classes include: public health and water quality; level of service; historical performance; criticality to operations; safety and security; aesthetics; sustainability; system coordination; and alignment with City initiatives. A CIP Prioritization Standard Operating Procedure should be developed to outline the steps staff agree to follow each year to develop and recommend a CIP to City Leadership for review and City Council for approval.
- **Develop Resource Allocation Plan**: The City will need to determine the appropriate staffing levels and skills sets needed to implement the IWRMP over the next 20 years. Effective workflows for tasks shared between Engineering, Water Resources, Stormwater, and other City Departments should be finalized based upon the draft documents created while the IWRMP was being developed. The City will need to fill vacancies and fund additional positions within both Engineering and Water Resources. Jacobs worked with City Human Resources and Water Resources staff to develop an outline for drafting a Succession Plan. The City is advised to work more aggressively toward Succession Planning particularly in light that several key staff are likely to retire within the next three to five years. A vast amount of institutional knowledge is going to leave the City and the next generation of leaders needs to be groomed and mentored.