City of Merced
Wastewater Collection System
Master Plan

Prepared for:
City of Merced

Prepared by:
Stantec Consulting Services Inc.

December 15, 2017

Executive Summary

The City of Merced (City) Vision 2030 General Plan (2030 General Plan) discusses City growth that may occur by the year 2030. Much of that growth requires construction of new infrastructure that is to be funded by the proponents of growth needing public services which the City provides. Key infrastructure needs relevant to this Wastewater Collection System Master Plan (WCS Master Plan) include the wastewater collection system, itself; wastewater treatment, disposal, and reuse facilities; and various potable and non-potable water needs for the growing areas of the City. This WCS Master Plan is focused on wastewater collection system (aka, sewer system) needs and planning. However, wastewater collection system planning is driven by 1) where the wastewater is generated (i.e., collected from), and 2) where it is conveyed to receive treatment, and then subsequent disposal or reuse of the treated wastewater, which is termed "effluent". The siting of wastewater treatment facilities is driven by many factors including land use/zoning, how/where the treated wastewater is to be disposed/reused, and overall life cycle costs. The City is in the process of updating its master plan for wastewater treatment needs and recently updated a draft of its water master plan (AECOM, 2015 draft). This WCS Master Plan is believed to integrate the intent and objectives expressed by City staff relevant to these related infrastructure planning efforts. The most important concept coming out of these concurrent planning efforts is that the City is not planning to implement extensive effluent reuse (i.e. the City is not planning to install a "purple pipe" distribution system) in the North Merced area. This WCS Master Plan considers the collection system needs of the existing City as well as future needs of the Specific Urban Development Plan (SUDP) identified in the 2030 General Plan, see **Figure ES-1**.

Because wastewater collection systems are designed to have an effective service life of over 50 years and can be expected to be in service up to 75 or 100 years, such systems are designed and constructed based on best professional judgement of wastewater collection system needs under "reasonable build-out" conditions, not just City growth envisioned in the 2030 General Plan (which has a mandated 20-year planning horizon). The City's collection system is to be designed and constructed to serve "reasonable build-out" of the General Plan SUDP depicted in **Figure ES-1**. "Reasonable build-out" conditions (hereinafter, simply "build-out", or "build-out conditions") are City growth and wastewater flow estimates based on development density assumptions outlined in Section 5.0 of this WCS Master Plan. Application of maximum densities on all properties within the 2030 General Plan SUDP could result in higher flow estimates than presented herein. Planning for maximum densities is unrealistic for a city like Merced (versus "land-locked" cities like San Francisco). Consequently, this WCS Master Plan is based on reasonable build-out of the City utilizing current development trends and judgment of City staff. Prior to actual design and construction of infrastructure improvements, developers should be given the opportunity to fund maximum density sewer capacity, if that is their desire.

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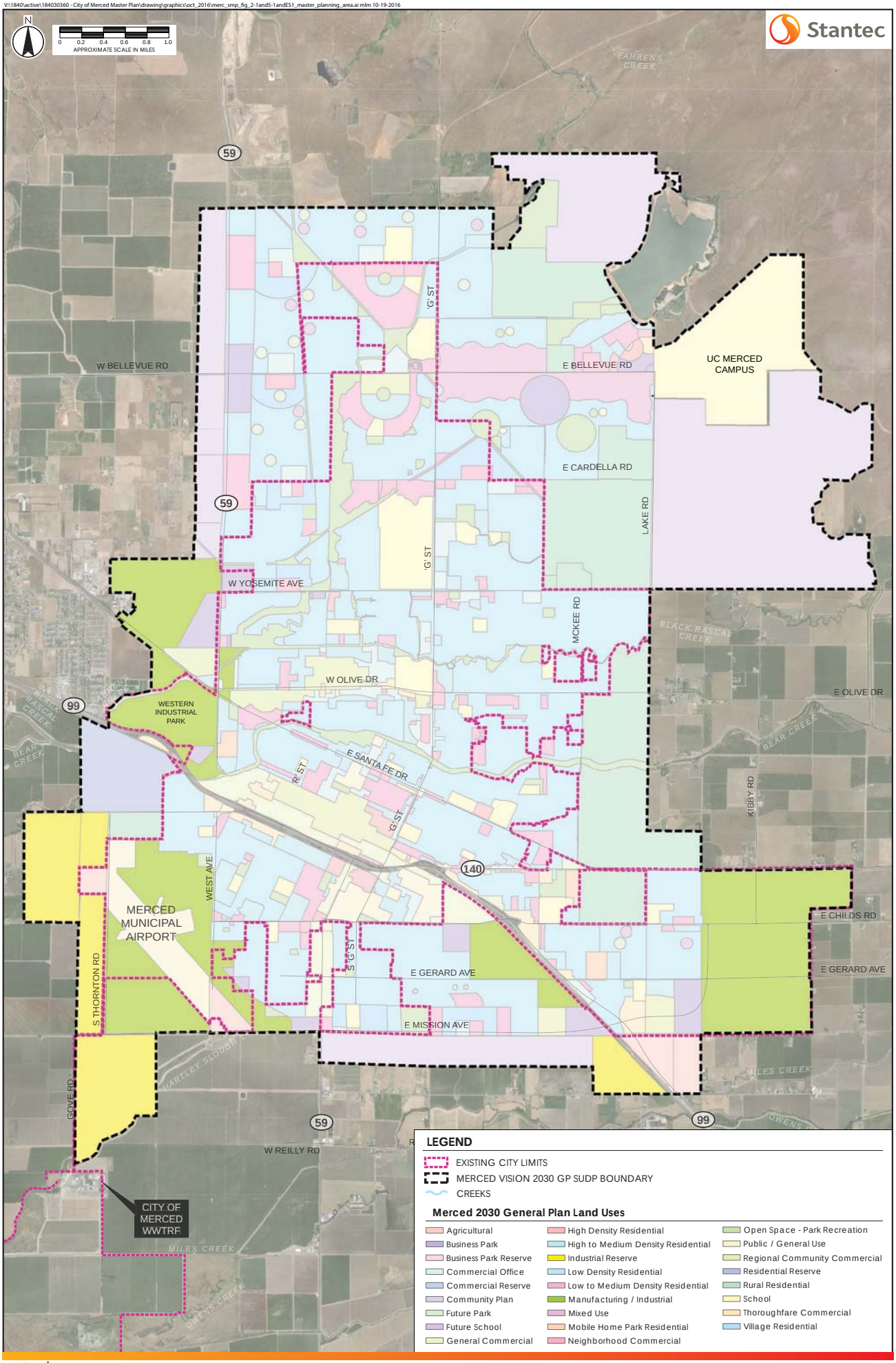


Because wastewater collection systems flow to wastewater treatment plant sites and related effluent disposal/reuse facilities, these plant sites and effluent facilities must also be evaluated conceptually for function/viability under "build-out" flow conditions. The importance of this concept of planning infrastructure for build-out conditions becomes evident from the forecasts of current (2017), 2030 General Plan, and build-out design wastewater flows presented in **Table ES-1**.

Table ES-1 Design Wastewater ADWFs for the City of Merced [a]

Time Frame	Entire City	North Merced [b]	Rest of City [c]
	ADWF, Mgal/d	ADWF, Mgal/d	ADWF, Mgal/d
Current (2017) [d]	~ 8	--	--
2030 General Plan	~ 16 to 17	~ 4 to 5	~ 12
Build-out	~ 34 to 35	~ 14 to 15	~ 20

(a) Design flow= expected flow for design purposes, not actual flow which can vary materially from year-to-year. ADWF = average dry weather flow.

(b) Represents new flow from the North Merced service area requiring new trunk sewers and additional wastewater treatment and effluent disposal/reuse capacity.

(c) Represents flow to the existing trunk sewer system, including some flow (about 4 Mgal/d) from proposed projects entitled to connect to the existing trunk sewer system.

(d) Current flows include a mix of wastewater from both North Merced (including UC Merced) and the rest of the existing City.

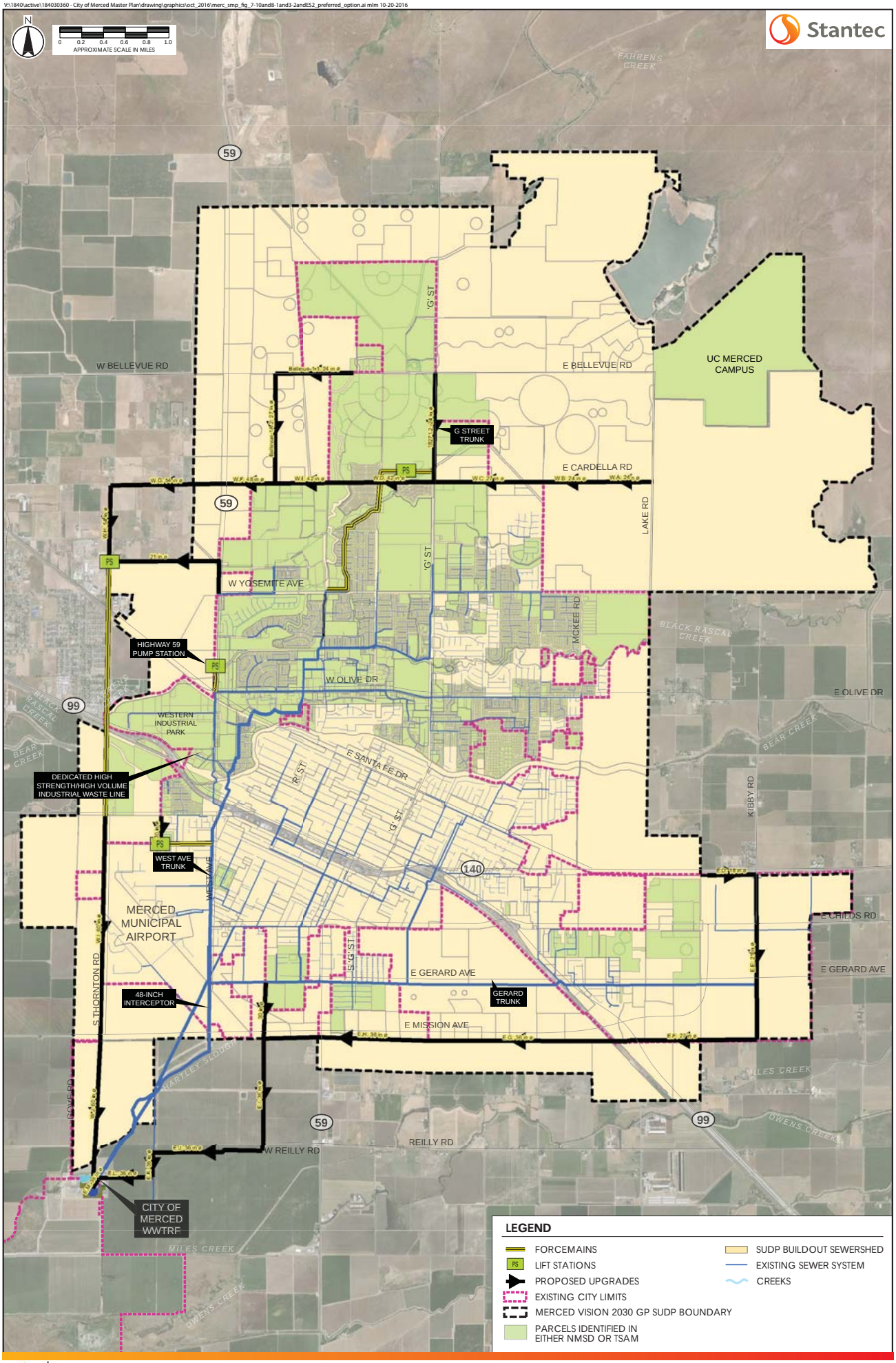
Like collection systems, wastewater treatment plants are master planned to serve "reasonable build-out", but construction of these facilities can be more cost effectively phased. Collection system sewer lines, particularly large trunk sewers, are often located within roadways. This WCS Master Plan has identified locations for trunk sewers which are consistent with the Vision 2030 General Plan Circulation Plan. Trunk sewers require deep excavations and are most cost effectively installed prior to, or concurrent with construction of major roadway and other surface improvements. Replacing sewers or putting in parallel sewers after the fact is disruptive to the public and very expensive.

Treatment plants, when properly sited have generous buffers to limit exposure of commercial and residential land uses to objectionable odors, noise and visual impacts associated with them. Thus, construction activities occurring on treatment plant sites do not involve significant traffic disruptions like trunk sewers and typically result in less exposure of the general public to noise and other potential impacts. So, although treatment plants must be planned for "reasonable build-out" to ensure these generous buffers are in place, they allow for construction of capacity expansions to be phased to keep pace with population growth and take advantage of advances in treatment process technology and consideration of regulatory requirements.

This WCS Master Plan, after consideration of many alternatives, describes two basic plans for building the wastewater collection system infrastructure needed to serve 2030 General Plan growth projections and City forecasts of reasonable "build-out" conditions. All flow capacities referred to in the following bullets are design, ADWF (Average Dry Weather Flow) capacities.

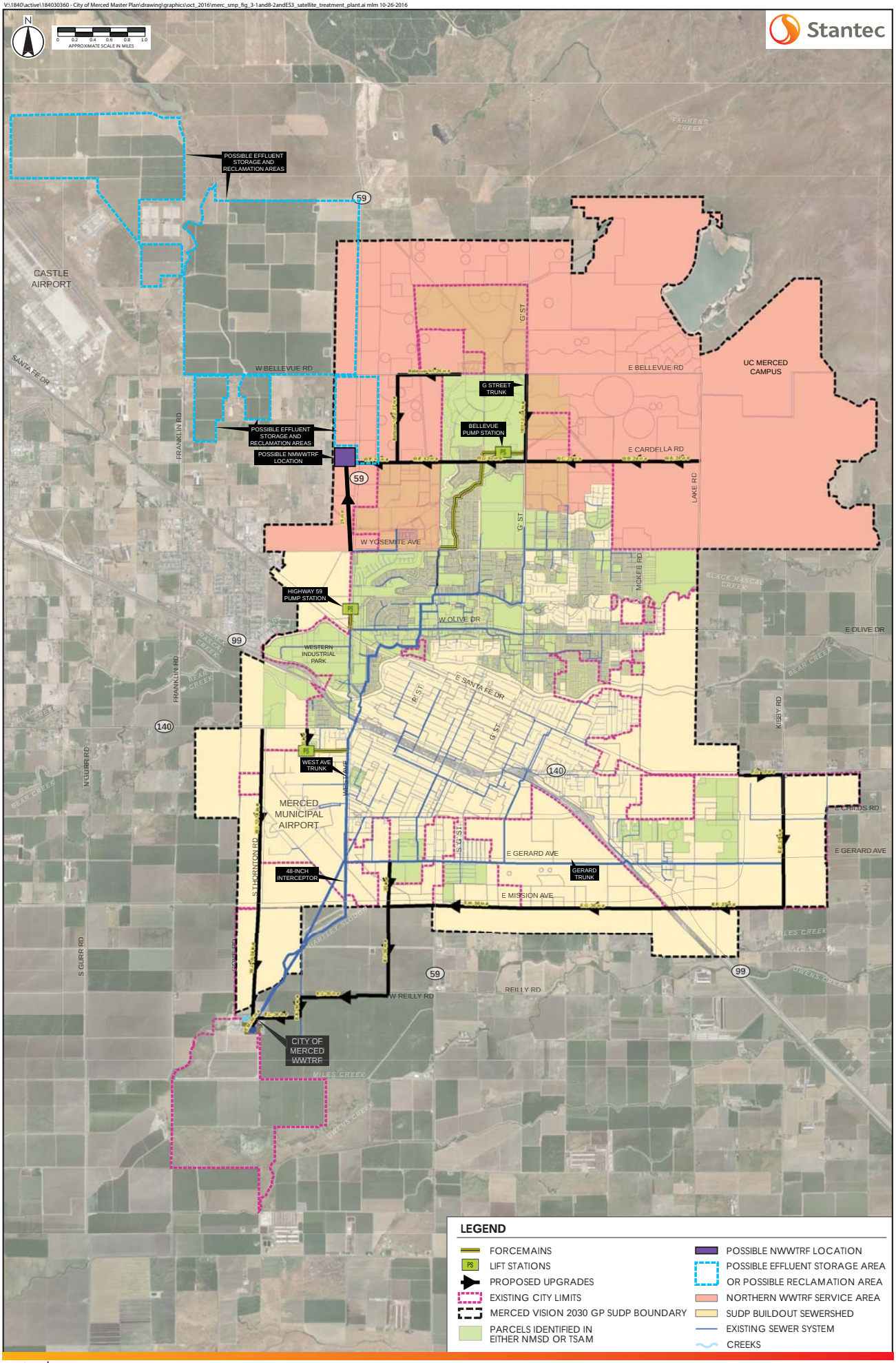
- Plan A: Under Plan A, the collection system takes all municipal wastewater to the City's existing 12 Mgal/d capacity wastewater treatment and reclamation facility (WWTRF) located southwest of the City, as shown in **Figure ES-2**. The existing WWTRF would be expanded, as needed, to handle 2030 General Plan flows. The effluent disposal and reuse facilities needed by the planned expansions largely exist; however, developers still need to buy their fair shares of all existing City facilities they use, including the land on which that infrastructure is located. The existing WWTRF site is believed to have sufficient land and disposal potential to serve "reasonable build-out" design flow estimates of 34 to 35 Mgal/d, if/when needed.

- Plan B: Under Plan B, the collection system takes most municipal wastewater generated by growth in North Merced to a new North Merced WWTRF (NMWWTRF) located on industrially zoned land west of the intersection of W. Yosemite Avenue and Highway 59 (aka, Snelling Highway), see **Figure ES-3**. The NMWWTRF site would be planned for 2030 General Plan and build-out capacities of approximately 4 to 5 Mgal/d, and 14 to 15 Mgal/d, respectively. The existing WWTRF would serve the remainder of the City and its growth, and would have approximate planned capacities for 2030 General Plan, and build-out conditions of 12 Mgal/d and 20 Mgal/d, respectively. Both the new NMWWTRF and existing WWTRF would be built and expanded in stages, or phases, as needed. The NMWWTRF would also need new effluent disposal and reuse facilities master planned for its 2030 General Plan and build-out flow conditions. This is because there are no existing effluent facilities or related effluent discharge permits for the NMWWTRF site, at this time, whereas they do exist at the WWTRF site.



City of Merced
Wastewater Collection System Master Plan

Figure ES-2
WCS Plan A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N
0 0.2 0.4 0.6 0.8 1.0
APPROXIMATE SCALE IN MILES
Stantec
POSSIBLE EFFLUENT STORAGE AND RECLAMATION AREAS
CASTLE AIRPORT
SANTA FE DR
W BELLEVUE RD
E BELLEVUE RD
UC MERCED CAMPUS
G STREET TRUNK
BELLEVUE PUMP STATION
POSSIBLE EFFLUENT STORAGE AND RECLAMATION AREAS
POSSIBLE NMWWTRF LOCATION
FRANKLIN RD
E CARDELLA RD
LAKE RD
G ST
W YOSEMITE AVE
MCKEE RD
HIGHWAY 59 PUMP STATION
W OLIVE DR
E OLIVE DR
WESTERN INDUSTRIAL PARK
E SANTA FE DR
R ST
KIBBY RD
WEST AVE TRUNK
MERCED MUNICIPAL AIRPORT
N GURR RD
S GURR RD
S PARSONS RD
E CHILDS RD
E GERARD AVE
48-INCH INTERCEPTOR
GERARD TRUNK
E MISSION AVE
W REILLY RD
REILLY RD
CITY OF MERCED WWTRF
MILES CREEK
OWENS CREEK
BEAR CREEK
BLACK RASCAL CREEK
FAHRENS CREEK
99
59
140
LEGEND
FORCEMAINS
LIFT STATIONS
PROPOSED UPGRADES
EXISTING CITY LIMITS
MERCED VISION 2030 GP SUDP BOUNDARY
PARCELS IDENTIFIED IN EITHER NMSD OR TSAM
POSSIBLE NWWTRF LOCATION
POSSIBLE EFFLUENT STORAGE AREA
OR POSSIBLE RECLAMATION AREA
NORTHERN WWTRF SERVICE AREA
SUDP BUILDOUT SEWERSHED
EXISTING SEWER SYSTEM
CREEKS

When comparing wastewater collection system needs under Plan A (**Figure ES-2**) to the wastewater collection system needs under Plan B (**Figure ES-3**), it becomes evident that there is one major similarity and four major differences between these two plans, as summarized below.

Similarities:

S-1. The wastewater collection systems servicing North Merced and the rest of the City are the same under both plans except that under Plan A the North Merced sewer system leads to a pump station conveying the wastewater to the existing WWTRF, whereas under Plan B, the North Merced sewer system leads to a pump station (in essentially the same location as Plan A) lifting the wastewater into the new NMWWTRF.

Differences:

D-1. Plan A builds a pipeline between the North Merced pump station (see S-1, above) and the existing WWTRF, whereas Plan B does not.

D-2. Plan A expands the existing WWTRF, whereas Plan B builds a new NMWWTRF on industrially zoned land adjacent to the North Merced pump station (see S-1, above).

D-3. Plan A expands effluent disposal capacity at the existing WWTRF, whereas Plan B builds a new effluent disposal facility in the greater North Merced area. The new effluent disposal/reuse area could occupy up to approximately 3,800 acres of land under build-out conditions. Effluent reuse is envisioned to entail irrigation of agricultural crops in this WCS Master Plan in the absence of there being any other plan for NMWWTRF effluent, at this time.

D-4. Plan B facilitates effluent reuse in the North Merced area, and therefore has the potential to reduce agricultural use of groundwater in the area, which has been over-utilized historically.

Because actual wastewater collection system needs under Plan A and Plan B are very similar, a comparison of Plan A and Plan B is presented in **Table ES-2** to help avoid confusion as to the major and material differences between these two plans.

Because the wastewater collection system improvements needed under Plans A and B are virtually identical except as noted under "D-1" of Table ES-2, the City Council's decision regarding which wastewater collection system plan to implement will be based more on wastewater treatment and disposal/reuse issues (and associated costs) than on wastewater collection issues (and associated costs). Besides these differences and their costs, the City Council's decision will also be based on many other considerations including recommendations from City staff, City consultants, the general public, and various special interest groups; water resource planning considerations; economics; political considerations; specific service area needs/objectives; etc.

Table ES-2 Differences Between Plan A and Plan B

Major Differences	Plan A	Plan B
D-1. Raw sewage pipeline from North Merced to existing WWTRF	Approximately 2.5 miles of dual 24 and 36-inch forcemains and approximately 3 miles of 60-inch diameter gravity sewer	Not required.
D-2. WWTRF Needs	Expand existing WWTRF to approximately 34 Mgal/d, as needed.	Build new approximately 14 Mgal/d NMWWTRF, and expand existing WWTRF to approximately 20 Mgal/d, both as needed.
D-3. Effluent disposal needs a. Land b. Storage c. Conveyance pipe	 a. None b. None c. None	 a. Up to ~3,800 acres b. Up to ~750 acres c. Approximately 2 miles to ag land north of Bellevue Road and west of Highway 59
D-4. Effluent reuse potential	Indirect via MID (Merced Irrigation District)	Indirect via MID and direct from NMWWTRF to ag land in/near North Merced area

An important consideration in the City Council's final decision regarding Plan A and Plan B is cost and cost differences between A and B. As will be discussed, the costs and cost differences between Plan A and Plan B are dependent on many factors, including whether the City plans to implement extensive effluent reuse via agricultural irrigation in the North Merced area to reduce agricultural use of the North Merced groundwater resource. This groundwater resource serving the City, agriculture, and other uses in the greater Merced area is currently heavily utilized. Extensive agricultural reuse of effluent in the North Merced area could potentially reduce agricultural use of the groundwater resource, and possibly play a role in helping sustain the City's potable water supply.

When put in those terms, without benefit of a more complete understanding of City water resource planning, it may seem irresponsible to not implement Plan B and associated effluent reuse in North Merced. However, the City has engaged in extensive water resource planning to help achieve the goal of making the City's potable water supply more sustainable and reliable. The most significant planning relative to this WCS Master Plan is between the City and Merced Irrigation District (MID) to swap effluent water from the existing WWTRF for Merced River water to be used to 1) recharge the area's groundwater resource, and 2) irrigate parks and other City landscaping (in place of using groundwater).

In summary, not implementing effluent reuse in the North Merced area does not mean the City is ignoring groundwater resource issues. It means the City is attempting to address the issue via different means involving use of lower salinity and lower nitrogen content Merced River water

rather than tertiary-treated effluent. This is important because the two most common contaminants of concern in groundwater resources are salinity and nitrogen. With this insight, one may ask, "Why even consider effluent reuse in North Merced when better quality water is available?" The answer is reliability. The City has greater control over an effluent reuse program than over a water swap program involving MID and parties impacted by changes in Merced River flows and/or diversions. This is why the City continues to consider effluent reuse in the North Merced area and throughout the City.

In so far as Plan A and Plan B both include effluent reclamation and groundwater resource considerations, the choice between Plan A and Plan B is primarily a matter of economics from an engineering perspective. Specifically, is the overall life cycle cost of Plan A more or less than the overall life cycle cost of Plan B? Life cycle costs cover the upfront cost of building the infrastructure (the primary concern of developers, who typically pay this bill when assessment districts are not involved), and the present worth of the on-going annual costs necessary to operate, maintain, and ultimately rebuild the infrastructure (the primary concern of businesses and residents, who pay these bills after occupying the developers' projects). The desires for low, up-front construction costs versus low, long-term annual costs are generally competing interests. The City's objective is to act as the fair deal broker between these two special interest groups, who are both essential to City growth.

Stantec's reconnaissance opinion of probable total project costs to plan, design and construct Plan A and Plan B (to serve "reasonablel build-out", or ~34 Mgal/d, ADWF) reflects a difference of approximately 15 to 20 percent, with Plan B having the higher expected cost. Detailed breakdowns of the estimated costs for Plan A and Plan B are presented in Section 8.0 of this WCS Master Plan, along with discussion of the anticipated process and facility components associated with each. Major uncertainties (known to exist, at this time) associated with each plan are presented in **Table ES-3**. Schematics of the relative locations of infrastructure needs for Plan A and Plan B are shown in **Figure ES-2** and **Figure ES-3**, respectively.

Table ES-3 Major Uncertainties Associated with Plan A and Plan B

	Uncertainties
Plan A	• Will water swap with MID occur and be a long-term proposition?
Plan B	• Does the City wish to devote 35 acres of industrially zoned land for the new NMWWTRF? Will the presence of a major WWTRF in the industrial park discourage other industries from locating there, particularly food processing industries? • Which agricultural lands in the greater North Merced area will become part of the NMWWTRF effluent reclamation system, and how/when will those lands be secured for City use under build-out conditions? • Will CEQA analyses and/or Regional Water Board permitting present any roadblocks to implementing Plan B either near-term or long term? • Will Plan B help or hinder maintenance of the quantity and/or quality of the City's groundwater potable water supply?

Under Plan A, wastewater treatment, disposal, and reuse are expansions in-kind of existing facilities and permits. Much of the effluent is planned to be swapped for Merced River water, as described previously. Under Plan B, effluent disposal from the new NMWWTRF is envisioned to entail dry season effluent irrigation of agricultural land under City ownership (effluent disposal facilities should be as permanent [i.e., secure] as the developments they serve), wet season storage of effluent for subsequent use during the following dry season, and possibly wet season effluent discharges to Fahrens Creek under very wet conditions when Fahrens Creek is both below flood stage, and has adequate flow to dilute effluent discharged to it (if realistic under CEQA and permitted by the Regional Water Board). As to whether effluent produced by the NMWWTRF under Plan B could be swapped for MID surface water (as is proposed under Plan A) is unknown at this time. Plan B should reduce use of North Merced area groundwater for agricultural purposes, but this is not an established fact at this time because the agricultural lands that would be used for effluent reclamation have not been identified by the City, let alone acquired by the City. Because the actual types, locations, and feasibilities of the new NMWWTRF effluent facilities have not been developed by the City, subjected to CEQA analyses, permitted by the Regional Water Board, etc., the estimated higher total project costs for Plan B NMWWTRF effluent facilities are based solely on Stantec's judgement and experience with somewhat similar facilities in the Central Valley.

Plan A is believed to have a total project cost and fewer uncertainties than Plan B. Plan A's effluent is proposed to be swapped by the City for MID surface water; Plan B's effluent may not have this potential benefit. Plan A is well precedented by similar sized cities throughout the Central Valley, and is in concert with Regional Water Board policy to regionalize WWTRFs to the extent feasible rather than have multiple WWTRFs servicing geographically contiguous areas. Based on available information, Stantec's recommendation is to implement Plan A, primarily for cost and water resource planning reasons. In other words, Stantec's preliminary recommendation is to pipe all municipal wastewater to the existing WWTRF for treatment, disposal, reuse, and water swapping.

In making that preliminary recommendation, Stantec believes both Plan A and Plan B are viable. Merced-sized cities with two WWTRFs are relatively rare in the Central Valley, but do exist. A good example of such a city is Roseville, California. Roseville elected to build a second WWTRF (the Pleasant Grove Creek facility: ADWF= 18 Mgal/d) just under 5 miles northwest from its existing Dry Creek facility (ADWF= 12 Mgal/d) to serve new growth that was occurring primarily in this northwesterly area. The two Cities (Roseville and Merced) face different circumstances relative to land use planning. The driving force behind Roseville's decision to bifurcate treatment and disposal was the reality that development had encroached upon the Dry Creek facility, surrounding it and making expansion in that location impractical. The City of Merced, in contrast, has large agricultural and industrial land use buffers surrounding its existing WWTRF making such conflicts far less likely in the future.

When considering the contents of this WCS Master Plan, likely questions are "Why not recommend this approach…or that approach?" A very brief discussion of some collection system options raised by special interests that have not been carried forward in this WCS Master Plan as being feasible for the City on a long-term, permanent basis are presented below.

1. *Why not install wastewater flow equalization basins in the collection system to utilize the existing sewers more efficiently, and more cost effectively?*

   Such basins are possible, but storing raw sewage for flow equalization purposes, in practice, is almost entirely limited to WWTRF sites. Such basins are rare in developed areas because they are ugly, are a potential nuisance, and are maintenance headaches. Such basins have aeration equipment (to minimize smells), have automatic wash-down systems (to scour "solids" from the basin when not in use), and may need a cover or other visual screening, noise attenuation, and/or odor scrubbing equipment (depending on situation-specific factors). Raw sewage equalization basins should not be a planned permanent component of a wastewater collection system (except in rare situations not applicable to Merced); however, such basins may be considered on a temporary basis (with specific closure criteria and financial guarantees) in specific situations authorized by the City Council. The entire cost of such a basin, if approved by the City Council, should be borne and bonded by the basin proponent, and in no way reduces proponent's fees for building the permanent wastewater collection system, which will be exactly the same regardless of whether the City Council permits temporary use of such a basin to expedite a specific development that otherwise would be on hold until sewer system capacity is built to meet the development's needs.

2. *Why not allow larger, planned community developments to build their own wastewater collection, treatment, and effluent reuse systems? We could save the cost of those big trunk sewers, implement effluent reuse, and expedite development all at the same time*

   This approach to implementing wastewater infrastructure reduces upfront construction costs (paid by developers) and increases long-term annual costs (paid by residents and businesses) because of loss of economy of scale on at least operations and maintenance, if not also construction when total construction costs are considered. As an example of total construction costs, such systems need places to store effluent within the planned communities through 100-year rainfall seasons. In this example, each planned community may plan to build an ornamental lake for seasonal tertiary effluent storage, but problems with such lakes are manifold. The lake's water level must be able to rise and fall seasonally because the only lake volume that counts as 100-year effluent storage is the volume of the lake that is empty each autumn. Algae that naturally grow in tertiary effluent lakes can be chronically problematic. The lake may need aeration, circulation, and chemical controls. Following construction and filling of ornamental lakes, midge populations can explode to nuisance levels until the natural ecology of the lake has time to develop (typically in a year or two). Such small, project-specific wastewater

systems are difficult to permit with the Regional Water Board because they run contrary to Board policy, which was developed because the long-term track record of multiple small systems has been relatively poor. If/when such systems fail, the City will be responsible for correcting the failure. This is because the development is within the City, and the City permitted it to occur. Because the wastewater collection system was not planned for these "self-sufficient" planned community developments, the City will either reconstruct the wastewater collection system, or continue to rebuild and operate the small systems to prevent the planned community development from being condemned for health and safety reasons. However, as with the raw sewage equalization basins, temporary small wastewater systems (with specific closure criteria and financial guarantees) could be authorized by the City Council in specific situations to address specific development needs. The entire cost of the temporary system should be borne and bonded by the system proponent. The proponent still pays upfront for proponent's share of the permanent wastewater collection system and treatment facilities. The proponent still designs the development's collection system to tie into the permanent City trunk sewer by gravity flow when that trunk sewer reaches the development. Because the City has General Plan Policy UE-1.2 to maintain development in a compact urban form, any proposal for a temporary, development-specific wastewater treatment and reuse system should be located on the perimeter of existing City-served developments with the only hindrance to connecting to the City system being lack of capacity in the existing City wastewater collection system at the time the development desires to move forward.

The Regional Water Board is not expected to approve any small systems unless they are operated by the City, and are temporary (with specific and enforceable closure criteria and financial guarantees). Because of the poor economy of scale of operating and maintaining small WWTRFs, the annual costs (as reflected by monthly sewer use fees) for users of these small systems will be higher than normal City wastewater fees. As a matter of policy, the City Council (when approving any such temporary system) will need to decide whether the businesses and residents served by the temporary system pay higher monthly sewer use fees, or whether they pay the City's normal use fee with the system proponent covering the cost difference until the businesses and residents connect to the permanent City system.

Raw sewage equalization basins and development-specific WWTRFs are suggestions put forth by developers to reduce their infrastructure costs and/or to facilitate implementation of their developments that are on-hold because of the need for City wastewater infrastructure. Neither suggestion is recommended as a permanent facility; therefore, neither suggestion impacts the design or cost of Plan A, or Plan B. However, the City Council may wish to consider allowing developer use of temporary raw sewage equalization basins and/or development-specific WWTRFs on a project-specific basis for situation-specific reasons, e.g., to facilitate development critically needed by the community. If the City Council desires to consider temporary means to facilitate critically needed development, then Stantec recommends that the City develop an Implementation Plan describing use of and design criteria for temporary facilities.

Finally, this Executive Summary concludes with a list (see **Table ES-5**) of recommended trunk sewer projects:

- Improvements to existing trunk sewers (common to Plans A and B).
- New trunk sewers to serve new growth in SUDP (common to Plans A and B).
- New pump station, forcemain, and gravity sewer connecting North Merced area trunk sewers to the existing WWTRF (unique to Plan A).

Table ES-4 includes reconnaissance opinions of probable capital costs for each trunk sewer project.

Table ES-4 Recommended Trunk Sewer Improvements & Opinions of Probable Cost [(a)]

Service Area	Construction Cost [(a)]	Engineering, CM, Admin (20%)	Contingency (30%)	Total Project Costs (rounded)
Address Existing Deficiencies	$3,417,000	$683,000	$1,230,000	$5,330,000
North Merced SUDP (Plan A)	$67,139,000	$13,428,000	$24,171,000	$104,738,000
South Merced SUDP	$14,620,000	$2,924,000	$5,264,000	$22,808,000

(a) ENR CCI = 10703, June 2017. Costs presented do not include acquisition of additional right-of-way, environmental or permitting costs.

The improvement projects to address existing deficiencies identified in **Table ES-4** do not include repair and replacement (R&R) of City facilities. A robust R&R program is a key element of any properly managed public infrastructure system. The City's R&R program for the sewer utility includes an annual expenditure for the replacement of older, aging infrastructure. To replace all the facilities in the City's sewer enterprise would require a significant sum of money. An annual R&R allocation is recommended to reduce the impact of repairing and replacing critical portions of the City's sewer collection system by stretching them out over time.

Implementation of Plan A and the necessary improvements to convey wastewater to the existing City WWTRF site would require the construction of additional treatment capacity as needed. The City, as described previously and in more detail in Section 8.0 of this WCS Master Plan, intends to expand those facilities either in one 8 Mgal/d, ADWF phase, or in two 4 Mgal/d phases up to 20 Mgal/d. This would be sufficient to provide treatment and disposal capacity for the projected flows anticipated in 2030 (~16 to 17 Mgal/d, ADWF) as summarized in **Table ES-1**. **Table ES-5** summarizes the expected cost of those WWTRF improvements.

Table ES-5 An Estimate of Improvements Needed to Provide Capacity at Existing WWTRF to Serve 2030 Population Projections [a]

WWTRF Improvements	Opinion of Capital Costs to Expand Existing WWTRF to 20 Mgal/d [b]
Headworks and Primary Treatment Facilities	$2,474,000
Secondary Treatment	$21,901,000
Tertiary Treatment	$3,065,000
Disinfection System	$0
Effluent Disposal Facilities	$0
Solids Handling Facilities	$21,835,000
Miscellaneous Structures	$677,000
Subtotal 1	**$49,952,000**
Mobilization, Bonds, Insurance, Startup, Misc.	$6,808,000
Sitework	$6,152,000
Site Piping	$4,922,000
Electrical and Instrumentation	$10,663,000
Subtotal 2	**$78,497,000**
Contingencies @ 30%	$23,549,000
Subtotal 3	**$102,046,000**
Engineering and Administration @ 20%	$20,409,000
Total Project Cost	**$122,455,000**

a) 20 Mgal/d, ADWF is estimated to be sufficient to serve the 2030 population projected in the City's General Plan.

b) Based on ENR-CCI (20 Cities Index) = 10703, June 2017.

At this time, the City is planning to budget $600,000 to $800,000 annually for repair and replacement of collection system assets. Prioritization of R&R projects will be done within the typical five-year CIP timeframe, updated accordingly, but the City also recognizes that unforeseen incidents may require adjustments in the specific projects identified in any particular year. Further discussion of the City's R&R program is provided in Sections 7.0 and 8.0 of this WCS Master Plan.