

Chapter 5: INFRASTRUCTURE AND NATURAL RESOURCES

A. INTRODUCTION

The Downtown Neighborhoods are supported by an infrastructure network that is mostly complete and adequately serves the existing land uses. Many of these utility networks are aging and in need of upgrades to increase capacity or to ensure proper long-term function. As the City of Fresno moves toward a more sustainable and resource-efficient future, the infrastructure of the Downtown Neighborhoods will be critical to the area's future. The vision, goals, and policies contained herein describe the City's intention for the role of infrastructure within the context of the City of Fresno's resource portfolio, and how infrastructure can be used to promote conservation, efficiency, and natural resource protection. These goals can be achieved while still providing a valuable service to citizens and visitors.

DRAFT

B. CONTEXT

1. Water Resources. The primary source of water in the City of Fresno is groundwater. The groundwater levels are declining regionally and significantly in the downtown area. As these levels continue to decline, the cost and energy demand of extracting this water increases. The City has a Metropolitan Regional Water Management Plan (MRWMP) that includes measures to introduce more surface water resources into the City intended to alleviate this problem and ensure a long-term sustainable water source for the City. The implementation of this Plan and other measures are critical to the economic development of the City of Fresno.

a. Groundwater. Depending on groundwater conditions, the City operates 250-265 municipal supply wells that access groundwater from the Kings Sub-basin of the San Joaquin Valley Groundwater basin and a 30 million gallon per day (mgd) surface water treatment facility Northeast Surface Water Treatment (NESWTF). Three active wells—PS3A, PS21A, and PS22A—are located near or within the central Downtown Plan Area. These wells are prone to sanding, air entrainment, and general failure due to receding groundwater levels. Groundwater quality generally meets primary and secondary drinking water standards for municipal use, although chemical contaminant plumes containing DBCP, EDB, TCP, TCE, PCE, and nitrates pose a threat to the drinking water supply. A few City wells already use advanced treatment, such as granular activated carbon and other measures, to remove contaminants.

Groundwater levels have been declining since 1930, but the rate of decline has been accelerated over the last 20 years to an average of 1.5 feet per year since 1990. The City has operated an unbalanced groundwater program since 1990, pumping a cumulative 785,000 acre feet more than it has recharged over twenty years. In addition to groundwater level declines, this has resulted in a reduction in groundwater basin storage, potential groundwater quality degradation, and unnecessarily elevated operating costs due to energy consumption. Existing aquifers have high transmissivity and high surface infiltration potential. Natural recharge is currently at 37,000 acre-feet/year (AFY) currently expected to decrease to 27,000 AFY by 2025 (27 percent decrease) due to increased urbanization within the City's sphere of influence. In addition, there is approximately 27,000 AFY of inflow into the aquifer, primarily underground flow from the Sierra Nevada Mountains. Over the last 25 years, several agencies have worked to recharge the groundwater supply intentionally through a system of recharge basins. The City of Fresno has recharged an average of 44,200 AFY and intends to increase this number to account for increased draws on the groundwater supply.

Groundwater Basin	AF (acre/feet)
Projected Natural Recharge	27,000
Basin Inflow	27,000
Average City Recharge	44,200

b. Surface Water. Available surface water supplies are treated at the City's 30 mgd surface water treatment facility located in northeast Fresno (NESWTF). The City receives high quality surface water from the Fresno Irrigation District (FID) Kings River contract. In 2010, the amount of surface water available to the City exceeded 105,000 AFY. Although this will increase over the next 20 years as the City annexes additional lands, available surface water will ultimately be limited by the proposed densification of existing land within the current boundaries of the City to provide growth. The City receives 58,200 AFY of high quality surface water from the San Joaquin River via the Friant-Kern Canal under a contract with the U.S. Bureau of Reclamation (USBR), which represents 97 percent of the 60,000 AFY entitlement. This entitlement depends on water year conditions, with the City

receiving the full 60,000 AFY only in favorable water years. Through its Wastewater Recycle Exchange program, FID made available 13,800 AFY, assuming a 46 percent return on wastewater pumped into FID canals after being percolated into groundwater and withdrawn. In addition, 20 percent of the supply (12,000 AFY) is subject to the terms of the San Joaquin River Restoration Settlement. The City also has a commitment of 10,000 AFY of potential flood release water (Section 215 releases) from the Friant Dam, which is available whenever the Army Corps of Engineers needs to release water to provide storage behind the dam. This water supply is discounted below the price of normal delivery water and can be increased during wet years. Due to the extremely cool, wet years in both 2010 and 2011, the City was offered up to 100,000 AF in each year, but was unable to accept the water due to the lack of conveyance and storage capacity.

Surface water	AF (acre/feet)
FID Water Allocation (2010)	105,000
FID Wastewater Recycle Exchange	13,800
USBR Normal Year Allocation	58,200
Potential ACE Flood Release Water	10,000

c. Water Distribution. The City's potable water transmission and distribution system consists of:

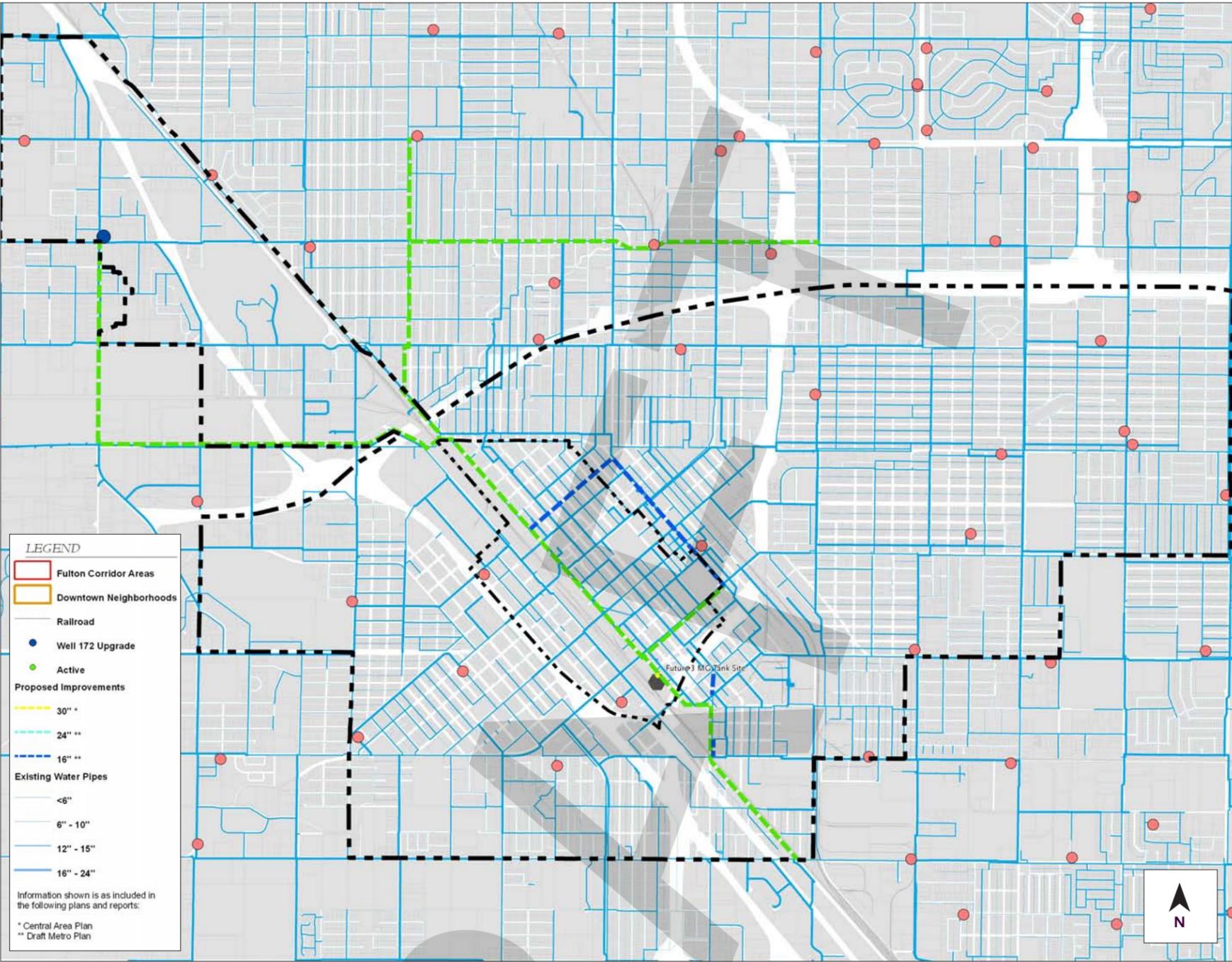
- **Distribution System.** A 1,740 mile pipe network ranging in size from 6 inches to 14 inches in diameter that serves individual customers.
- **Transmission Grid Main (TGM) System.** 16 inch diameter water mains that convey potable water to the distribution system.
- **Regional Transmission Main (RTM) System.** Pipes 24 inches in diameter or greater that convey water from the NESWTF to the TGM.

Water is supplied from up to 265 operational groundwater wells, a 30 mgd NESWTF, storage facilities, and booster pump facilities. A 60-inch raw water gravity main is also being constructed from the Friant-Kern Canal, one mile of which is already completed. There is over 40-feet of elevation difference between the outlet from the Friant-Kern Canal into the 60-inch raw water pipeline and the lower elevation outlet to the headworks of the NESWTF. Currently the Department of Public Utilities – Water Division is planning to construct a low-head hydropower generation plant on the low-end of the pipeline at the NESWTF to take advantage of the elevation difference and provide alternative energy electrical power directly for the operation of the NESWTF. The distribution system is divided into four quasi-pressure zones to help regulate minimum and maximum system pressures in the various topographic areas of the City.

The Central Area, which includes Fulton Corridor, relies on a large number of six-inch water mains over 50 years old that cannot provide appropriate fire flow according to current fire flow standards. In 2009, West Yost and Associates completed a Hydraulic Evaluation of the Central Area comparing current conditions and projected additional water supply needs based on incremental growth according to the 2025 General Plan. The evaluation included a water model and master planning of water supply and major water transmission infrastructure projects. The evaluation also studied maximum day demand including fire flow for 2009 conditions, and found that the Central Area retains an approximate supply deficit of 1,200 gallons per minute (gpm). For peak hour demand without fire flow requirements, the supply deficit is approximately 800 gpm.

In order for the entire Downtown Neighborhood area to meet the fire flow demands of existing and anticipated

FIGURE 5-1 - EXISTING WATER DISTRIBUTION AND PLANNED IMPROVEMENTS



Pervious paving and drought resistant native landscape reduce the need for water and stormwater conveyance.



Low Impact Development (LID) techniques, such as bioswales within street medians, treat stormwater while providing a beautiful landscape.

B. CONTEXT (Continued)

future development, additional 12- and 10-inch diameter pipelines will need to be constructed. A vulnerability analysis revealed the need for additional supply to increase reliability under existing conditions. This additional supply would be achieved by a plan to upgrade Well 172 to full capacity, construct transmission mains from Well 172 to Downtown, and provide additional water storage downtown. The planned distribution system improvements associated with this Plan would include approximately 5,270 feet of 16-inch diameter pipeline south along Hughes Avenue and approximately 9,050 feet of 24-inch diameter pipeline along Nielsen Avenue to convey the additional capacity of 1,500 gpm from Well 172 to Fulton Corridor. A 3 million gallon tank has also been planned for the central area of the City, which falls in the Fulton Corridor Specific Plan Area. This tank is intended to supplement the main distribution system in order to provide for peak demands and required fire flow.

Recent analysis has identified Well 172 as an operationally critical system component; while the new tank and main provide some safeguard in the event Well 172 fails, the pumps solely in the downtown would be unable to meet demands with fire flow included for the downtown area. These planned improvements to Well 172 and the associated main and storage improvements are a temporary solution, as the city intends to construct a southeast surface water treatment facility (SESWTF) as recommended in the MRWMP in order to provide increased supply throughout the City to meet projected demands independent of the development associated with this Community Plan.

The existing water system and proposed improvements are shown in **Figure 5-1** - Existing Water Distribution and Planned Improvements.

- d. Water Demand.** Current City-wide water consumption trends are straining the City's available water resources, indicating the need for increased conservation measures and the development of alternative water resources. The Urban Water Management Plan is able to provide water for the Central Area to 2025 build-out, however any increased densification beyond what was accounted for in the 2025 General Plan will require additional supply.

The existing average water use for the City of Fresno is 300 gallons per capita per day (gpcd). This is higher than in neighboring municipalities, demonstrating an opportunity for increased water conservation. Total water demand for all sectors (industrial, public landscape irrigation, commercial/institutional, multi-family residential, single-family residential) in 2007 was 165,798 AFY, and is projected by the 2008 Urban Water Management Plan to reach 233,400 AFY by the year 2025. This projection includes conservation savings that will be achieved by the year 2025. In 2007, single-family and multi-family residential users accounted for over 65 percent of the City's total water demand, at 85,285 AFY, and 23,529 AFY respectively. Since the majority of the City's residential customers are currently unmetered (single-family will be metered by 2013; all multi-family is currently metered), these statistics are estimated based on assumptions about average leakage losses and unaccounted-for water uses, such as flushing and fire flows.

- e. Existing Water Conservation Measures.** The City has an active and successful history of water conservation, beginning as early as 1917 and gaining particular momentum following the 1976-77 drought. However, given the City's per capita water use compared to similar California cities, there is room for improvement. Despite extensive community outreach efforts, monitoring, and complimentary audits, customers have not been incentivized to conserve without being offered more tangible economic incentives. For example, the City's meter pilot program identified 70 percent of the cus-

tomers in the program as having leaks with almost no one fixing the leaks. With a flat rate in place there is no monetary incentive to spend money on maintenance.

The City's current Water Conservation Plan was completed in 2005 and includes:

- Voluntary Water Survey Program for single-family and multi-family residential customers.
- Voluntary Residential Plumbing Retrofits provide low flow shower heads and faucet aerators to City customers upon request and at public outreach events.
- System Water Audits, Leak Detection and Repair performed in 1998, 2004 and 2013.
- Mandatory Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections, require meters to be installed by 2013 and residential billing to will be completed by the end of 2012, with no commodity rates currently implemented.
- Large Landscape Conservation Programs and Incentives offer landscape surveys, in state permits for large landscapes that require excessive watering, and added landscape conservation requirements to the Municipal Code.
- High Efficiency Washing Machine Rebate Programs in place.
- Public Information Programs in place.
- School Education Programs for K-12 and college.
- Conservation Programs for Commercial, Industrial, and Institutional Accounts that provide voluntary surveys and require water conserving devices.
- Conservation Pricing to be implemented in 2013 when meters are in place; no specific tiered billing structure in place.
- Water Conservation Program Coordinator designated as a full-time position.
- Water Waste Prohibitions incorporated into City Municipal Code.
- Residential Ultra-Low-Flush Toilet Replacement Programs in place since 2006.

- 2. Sewer Resources.** The City of Fresno is the Regional Sewer Agency for the Fresno-Clovis Metropolitan Area (FCMA), and owns and maintains the wastewater collection system that serves the City and the following agencies: a small portion of the County of Fresno, City of Clovis, Pinedale Public Utility District, and Pinedale County Water District. The City's wastewater collection system consists of over 23,000 manholes, 15 lift stations, nearly 2 miles of force mains, 54 junction structures, and approximately 1,498 miles of gravity sewer pipes ranging from 6" to 84" in diameter. The City also owns and operates the Fresno/Clovis Regional Wastewater Reclamation Facility (RWRF). The RWRF provides secondary wastewater treatment via primary settling and biological secondary processes.

According to the 2025 General Plan, the City's population will increase from about 482,000 in 2000 to 790,000 in 2025. The growth will occur through population densification as well as new developments. The collection system must be expanded to handle the resulting increased flow within the City's current collection system and to provide service to new developments. These improvements would supplement the City's on-going program to address the age and existing challenges in the collection system, notably the corrosion of existing concrete sewers due to high sulfide levels.

Figure 5-2 - Existing Sewer System and Planned Improvements shows the existing wastewater collection network and improvements planned by the City based on its 2006 Wastewater

FIGURE 5-2 - EXISTING SEWER SYSTEM AND PLANNED IMPROVEMENTS

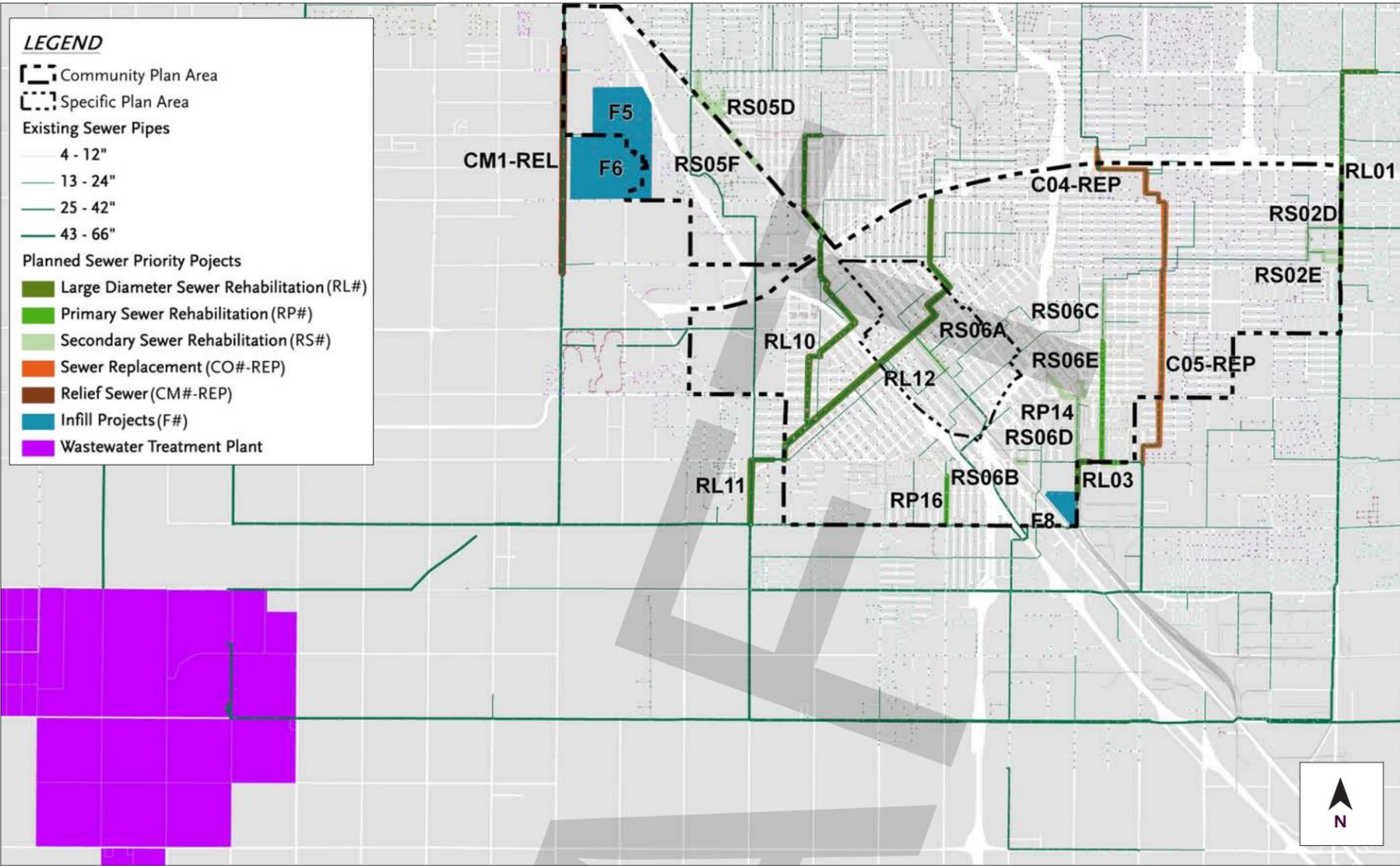
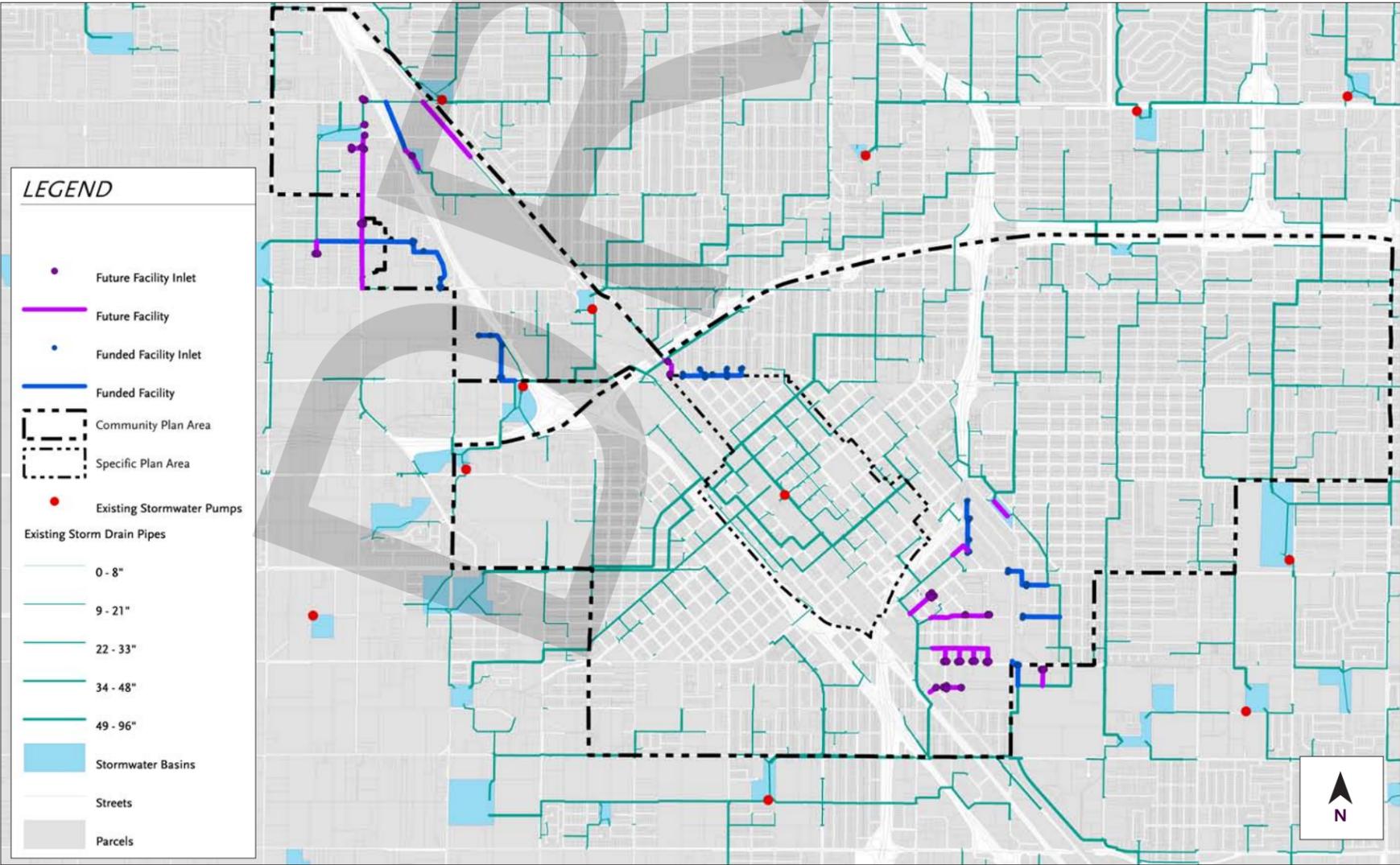


FIGURE 5-3 - EXISTING STORM DRAIN SYSTEM



B. CONTEXT (Continued)

Collection System Master Plan. These improvement projects fall into several different categories, as described below. As development occurs, similar improvements would likely need to occur to account for increased system flows.

- a. **Infill Projects** are generally planned for developed areas in which no sanitary sewer service is currently available, where existing infrastructure has been abandoned or where residents rely on septic systems for wastewater treatment and disposal. Infill projects also include areas served by existing sewer trunks and mains. These projects are required by City ordinance to protect groundwater from nitrate contamination. Growth infill projects are for partially developed areas where the City expects additional growth to occur.
- b. **Sewer Replacement Projects** provide the necessary sewer capacity by the removal of deficient sewer facilities and the construction of replacement sewer facilities providing the additional capacity.
- c. **Rehabilitation Projects** consist of sewer improvements planned for existing sewers to halt and remedy the effects of sulfide-related pipe corrosion via the installation of cured-in-place pipe (CIPP) liner. In general, the existing pipe materials consist of reinforced concrete pipe (RCP), non-reinforced or standard concrete pipe (NRCP or SCP), and asbestos-cement pipe (ACP), all of which are susceptible to sulfide-related corrosion processes. These projects are further differentiated as “Primary”, “Secondary”, or “Large Diameter”. The City commissioned an evaluation that was completed in 2001 of its then-existing concrete sewers ranging from 12 to 27 inches in diameter. Primary sewer rehabilitation recommendations were made for approximately 14.5 miles of these sewers, generally those found to be in “severe” condition, with a total estimated rehabilitation cost of \$11.1 million. The primary sewer rehabilitation recommendations included 16 separate projects, presented in order of priority. Since the time of the 2001 evaluation, the City has implemented Primary Rehabilitation Priorities No. 1 through No. 11. The remaining projects, Primary Rehabilitation Priorities No. 12 through No. 16, are planned for implementation as part of the Capital Improvement Program. Secondary sewer rehabilitation recommendations were made for approximately 18.4 miles of the evaluation sewers, generally those found to be in “moderate” condition, with a total estimated rehabilitation cost of \$11.0 million.
- d. **Relief Sewer Projects** provide supplemental sewer capacity by the construction of parallel sewer facilities that function in combination with the existing sewer facilities.

3. **Recycled Water.** Currently, wastewater flows from the Copper River Ranch and the area immediately to the south of Copper Avenue flow to the North Fresno Water Reclamation Facility (NFWRF) for treatment and are used to irrigate the nearby golf course. Except for incidental and evaporative losses, the total wastewater volume treated at the RWRF is currently used to either to irrigate farmland directly or sent to incidental percolation basins. After this water percolates into the groundwater basin, a portion of this water is then pumped and discharged into the FID canal system as part of the Wastewater Recycle Exchange Agreement with FID. The City plans to expand its recycled water use to include landscape irrigation and non-potable applications, which would require the construction of additional tertiary treatment facilities. The expansion of the recycled water system is described in the City’s Recycled Water Master Plan (RWMP) and would enable the City to offset potable water use, enhance the sustainability of the water supply, and reduce current dependency on percolation ponds to handle effluent discharge. As part of the RWMP, the City intends to adopt a Recycled Water Ordinance to further support recycled water development by encouraging, or in some instances, requiring recycled water use. An example that demonstrates the potential success and benefit of increased recycled water reuse is the newly completed water reclamation facility (WRF) in northern Fresno. This WRF provides disinfected tertiary treatment for wastewater that will be used to irrigate the Copper River Ranch development and golf course, thereby decreasing current dependency on FID water.
4. **Stormwater and Drainage.** The Fresno Metropolitan Flood Control District (FMFCD) is responsible for managing urban stormwater runoff in the Fresno metropolitan area.
 - a. **Flood Hazard.** Large areas of the Downtown Neighborhoods are split between areas outside the floodplain or within the 500 year flood zone. However, there are several areas that are within the 100 year flood zone: an approximately 100 acre area located at the southern end of the Downtown Neighborhoods along State Route 99; a smaller area to the northeast of the railroad line and south of California Avenue; along the southwestern edge of the Fulton Corridor Specific Plan Area. These areas are designated by the Federal Emergency Management Agency (FEMA) as a Special Flood Hazard Area (SFHA). Property owners located in a SFHA with federally backed mortgages are required to purchase flood insurance in accordance with the Federal Insurance Rate Map (FIRM).
 - b. **Flood Control.** FMFCD’s flood control program consists of eight major flood control facilities and related streams and



The use of pervious paving, which is lighter in color than asphalt, in parking lots helps significantly reduce stormwater runoff during the rainy season and surface temperatures during the hot summer months.



Landscape bulb-outs with stormwater inlets provide localized treatment, while irrigating landscape during the rainy season.

channel features that control the flows from several low-elevation streams collectively referred to as the Fresno County Stream Group.

- c. Storm Water Quality Management.** In compliance with the federal Clean Water Act and storm water permit regulations, FMFCD and four other local public agencies (County of Fresno, City of Fresno, City of Clovis, and CSU Fresno) developed a storm water quality management program to be implemented in the Fresno-Clovis metropolitan area as a part of the National Pollutant Discharge Elimination System (NPDES) municipal storm water permit process. The current NPDES permit was recently renewed in 2008.
- d. Stormwater Facilities.** The District's local storm water drainage system provides control and disposal of storm water runoff generated by local land uses. The City of Fresno Street Maintenance Division and the County of Fresno Road Maintenance Division manages storm water runoff on streets, sidewalks, and the City's gutter system. The runoff is then collected in drop inlets and conveyed to the FMFCD pipe networks, pump stations, and infiltration basins that recharge storm water to the groundwater aquifer. Unlike metro areas in Los Angeles and the San Francisco Bay Area, the City doesn't have major lined channels, or pipelines that outfall to the ocean. The City is also unique in that it retains much of its stormwater in drainage basins within the City sphere throughout the metro area. Excess water is conveyed to other District facilities, irrigation canals, creeks, and the San Joaquin River.

Portions of the Downtown area have experienced localized flooding as evidenced by water damage in streets. To mitigate these flood hazards, storm drain improvements—such as replacing or supplementing existing pipes, adding inlets, or updating pump stations—are needed to facilitate conveyance and detention in these areas. Neighborhoods with deficient storm drain systems are subject to increased local flooding, lower property values, and higher insurance costs for homeowners and businesses. These areas have not historically generated sufficient tax revenue to fund the construction of modern drainage facilities.

Figure 5-3 - Existing Storm Drain System shows where new underground pipelines are planned to be built. The completed systems will route stormwater directly to existing flood control ponding basins.

- 4. Information Services.** The Information Services Department has developed the City's Fiber Master Plan in conjunction with

the Fresno Intelligent Transportation Systems Master Plan (PW 625), a fiberoptic plan for the entire City. The development of the Downtown Neighborhoods Community Plan will provide lower cost opportunities to install fiber as part of major road and sidewalk construction. Installation of the fiber will increase access to technology such as video policing, wireless access and web cams to promote events in the area. The Information Services Department will work closely with the plan to take full advantage of all opportunities to install the fiber.

C. KEY DEFICITS

- **Aging Infrastructure.** About 30 percent of the utility networks in the downtown area are over 50 years old; roughly 5 percent are over 100 years old. These networks are either nearing or past their intended design life and are subject to capacity, reliability, and potential failure issues.
- **Water Consumption.** The City of Fresno as a whole (particularly in areas developed more recently than the Plan Area) has some of the highest water use per capita in the state in conjunction with the lowest water rates of any major city, which overburdens the City's water supply portfolio. The above water resource issue will only intensify if more stringent water conservation measures are not implemented and water rates are not raised to fund much needed infrastructure improvements.
- **Utilization of Recycled Water.** The City has an emerging and progressive recycled water program that is subject to the availability of City resources to implement the Recycled Water Master Plan.
- **Lack of Incentives for Reducing Consumption.** Resource consumption trends continue to strain and overwhelm the City's infrastructure systems. Allowances and incentives currently provided by the City do not effectively encourage residents and businesses to use natural resources available on-site to their fullest potential. Additional incentives are needed in order to promote a healthy and regenerative City.
- **Localized Flooding.** Due to the age and design of the stormwater system, the Downtown Neighborhoods experience localized flooding during periods of heavy rains. Along with mediating and ensuring collaboration between the City, the FMFCD, and the public and private realm to establish the best mix of BMPs, solutions such as Low Impact Development (LID) in the public realm and at individual building sites can help to address issues related to flooding that include water quality issues, deteriorating community amenities, and receding aquifer levels.



On-site stormwater capture and treatment can reduce the need for potable water service for irrigation.



Wastewater can be treated and recycled for irrigation and other non-potable uses.

D. VISION FOR CHANGE

The Downtown Neighborhoods and Downtown Fresno are serviced by a network of utilities that protect and provide for the community. The physical and economic development of these neighborhoods is dependent on this network and the availability of adequate resources to allow the City to grow in a sustainable manner. Fresno and the Central Valley's culture are closely linked to the availability of water and other abundant natural resources. As both the City and the Region continue to grow, the City's focus will be on providing the same level of service with fewer resources. This will be manifested through the development and implementation of sustainable infrastructure at all scales.

E. GOALS AND POLICIES

5.1 Work within the existing water resources portfolio

Intent: Develop policies that enable the downtown area to thrive without having to increase the delivery of outside water resources beyond quantities outlined in the MRWMP timeline. Intensive water conservation is the first step in enhancing existing water supplies, followed by alternative methods such as water exchanges or through the prioritization of water deliveries by demand type.

- ▶ **5.1.1** Work within the existing water resources portfolio and accommodate the water use for all new development through offsets from water conservation measures.
- ▶ **5.1.2** Minimize the use of potable water for outside irrigation through drought tolerant native planting and other landscape that requires less water, water use reduction incentives, and regulations.
- ▶ **5.1.3** Require that new projects produce a Water Balance that demonstrates through calculation an anticipated reduction in water use by proposed utilization of water conservation measures including efficient, low-demand irrigation and landscaping designs in conformance to the MRWMP.
- ▶ **5.1.4** Voluntarily implement tiered conservation rate structures to accelerate full implementation of the MRWMP and meter installation.
- ▶ **5.1.5** Ensure the continued provision of an adequate supply of potable water to serve all urban development within the planned urban area. (RCP 4-3)
- ▶ **5.1.6** Ensure that conditions of project approval are implemented with each urban development proposal, to assure that the necessary potable water production and supply facilities are in place prior to issuance of a building permit. (RCP 4-3.3)

- ▶ **5.1.5** Implement water conservation programs that will result in decreased per capita water consumption. (RCP 4-3.6)
- ▶ **5.1.8** Assure that adequate water supplies and hydrants are available for fire suppression. (RCP 4-5.3)
- ▶ **5.1.9** Review all development proposals with the Fire Department in order to ensure the inclusion of adequate on-site fire protection provisions. (RCP 4-5.5)
- ▶ **5.1.10** Promote water conservation through the use of low-flow and water efficient shower heads, toilets, washing machines, tankless water heaters, etc.

5.2 Promote recycled water programs and use in order to reduce loads on sewer system.

Intent: To bolster the City's burgeoning recycled water program and supplement its alternative water resources.

- ▶ **5.2.1** Enhance the water resource portfolio with alternative water resources such as recycled and reclaimed water.
- ▶ **5.2.2** Install reclaimed water lines whenever large street improvements occur.
- ▶ **5.2.3** Develop additional financing mechanisms for an expanded recycled water distribution network.
- ▶ **5.2.4** Allow rainwater harvesting for interior use.
- ▶ **5.2.5** Meter landscape water usage separate from potable demands or install smart water meters as the City's new metering system is implemented.
- ▶ **5.2.6** Allow modifications to the development code to encourage the use of recycled water for indoor uses.

5.3 Implement Low Impact Development (LID) stormwater design guidelines that integrate into complete streets, open space, and high density development.

Intent: To enhance the existing infrastructure network of the FMFCD and to reduce localized flooding, improve water quality, provide community amenities and enhance aquifer recharge throughout the City.

- ▶ **5.3.1** Require new development projects or major renovations to provide on-site stormwater detention/retention and treatment for the first 1/2 inch of rainfall.



Roof gardens capture rainwater for landscape and increase insulation of the building.



Use of drought resistant native landscaping and ground cover reduces the need for water.

- ▶ **5.3.2** Require that post-development runoff from a site is not greater than the pre-development runoff condition.
- 5.3.3** Promote the development and implementation of reproducible and low cost pilot projects.
- ▶ **5.3.4** Ensure the provision of adequate storm drainage facilities to protect residents and property within the Plan Area from flooding caused by storm water runoff. (RCP 4-4)
- 5.3.5** In order to minimize conflicts between aircraft and wildlife, limit the construction of new retention/recharge basins within 10,000 feet of the Fresno Chandler Downtown Airport runways and/or introduce mitigation measures that discourage wildlife from congregating around or inhabiting retention/recharge basins within 10,000 feet of the Fresno Chandler Downtown Airport runways.

5.4 Promote energy savings and local renewable power generation.

Intent: To develop a more energy independent community that uses passive solar design (collecting, storing, and distributing heat during winter and rejecting heat during summer without the use of mechanical or electrical devices) and renewable energy derived from natural resources including sunlight, wind, rain, and geothermal to reduce the carbon footprint of the Downtown Neighborhoods.

- ▶ **5.4.1** Encourage, and where possible protect, solar access for all new development and major renovations.
- 5.4.2** Develop allowances for solar and wind energy generation within architectural design standards.
- ▶ **5.4.3** Develop defined development incentives for local power generation at multiple scales.
- ▶ **5.4.4** Use financial incentives, solar access easements, and property tax abatements to help fund and promote renewable power generation at various scales.
- ▶ **5.4.5** Continue to offer and expand defined development incentives for energy efficient building measures.
- 5.4.6** Develop allowances for passive solar building design strategies through window placement and glazing type, thermal insulation, thermal mass, and shading within architectural and landscape design standards.

5.5 Minimize natural resource consumption.

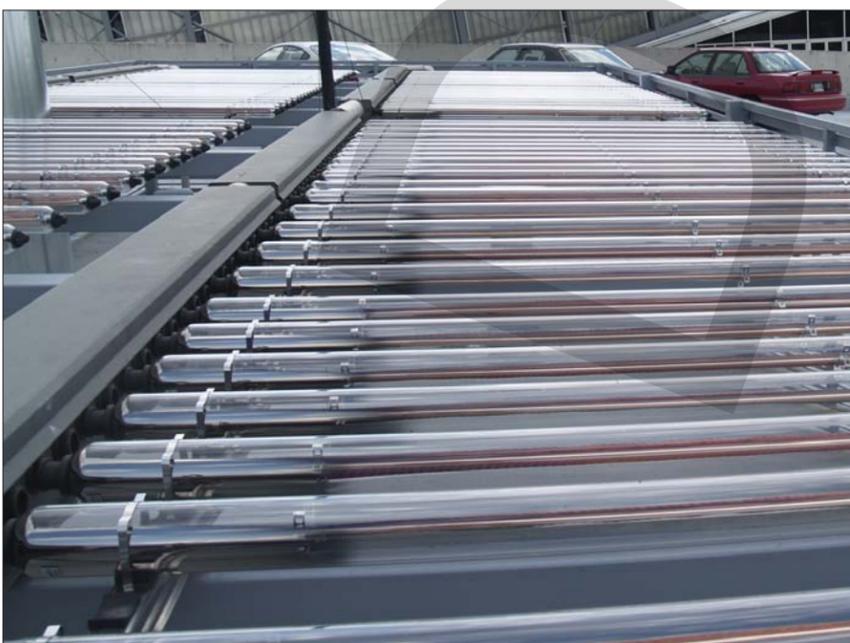
Intent: To minimize resource consumption by all new structures, renovated buildings, and infrastructure facilities in order to protect the environment and support the local economy. To limit the consumption of natural resources through green building, resources conservation, and resource recovery.

- 5.5.1** Promote regionally appropriate green building within the Downtown Neighborhoods that implement the goals and strategies of Fresno Green.
- ▶ **5.5.2** Require solid waste separation at the source for all land uses (compost, recycle, landfill) in order to reduce the volume and toxicity of solid wastes that must be sent to landfill facilities.
- 5.5.3** Require high albedo materials for roofs and hardscape in order to reduce heat absorption and radiation.
- ▶ **5.5.4** Develop utility design guidelines that cluster and locate penetration and layout to minimize impacts to lot frontages for stormwater management or other sustainable features.
- ▶ **5.5.5** Provide green building design resources and material sourcing options to local builders.

5.6 Ensure collaboration between City of Fresno and outside utility agencies such as P.G.&E. and the Fresno Metropolitan Flood Control District (FMFCD).

Intent: To promote frequent and organized communication between agencies and utility providers that share the public realm in order to ensure that planning efforts and utility capacity studies are aligned. Synergies, cost savings and facility sharing can be realized through shared construction efforts and easements.

- ▶ **5.6.1** Coordinate with utility providers for new development projects and infrastructure projects during the schematic design phase of each Capital Improvement Project.
- ▶ **5.6.2** Organize regular meetings between capital improvement departments of FMFCD, the City of Fresno Public Works and Public Utilities Department.
- ▶ **5.6.3** Appoint a liaison within the City to coordinate meetings between various agencies and utility providers.



Solar evacuated tube collectors generate green power.



The Robert E. Coyle United States Courthouse implements energy efficient building measures to reduce its impact on the environment and resources while providing a comfortable environment for its occupants.

E. GOALS AND POLICIES (Continued)

5.7 Maintain utilities to protect health, safety and welfare and to support the vision of the Downtown Neighborhoods.

Intent: To plan and fund appropriate infrastructure improvements.

- ▶ **5.7.1** Require as a condition of approval new development located adjacent to above-ground utilities to place above-ground utilities underground (and/or in alleys) and require new utilities to be placed underground (and/or in alleys) in order to improve the visual appearance of Downtown Neighborhood streets.
- ▶ **5.7.2** Provide comprehensive mechanisms for funding and timely construction of needed public facilities including, but not limited to, streets, sidewalks, drainage facilities (including curbs and gutters), sewer and water utilities. (West CP W-2)
- ▶ **5.7.3** Support implementation of the FCSP that designs infrastructure based on planned development intensity, which will determine appropriate sizing criteria for public facilities based on population and land use designations with sufficient additional reserve capacity to provide a reasonable margin of safety for potential variations in population growth and intensity of use. (West CP W-2-a)

5.8 Maintain a sustainable, safe and effective wastewater treatment system.

Intent: To ensure that the wastewater treatment system in the Downtown Neighborhoods provides a high level of wastewater treatment for residents and businesses while also meeting high standards for environmental quality.

- ▶ **5.8.1** Monitor and improve the operation of the wastewater treatment plant to minimize or eliminate any negative impact on the Downtown Neighborhood's air or water quality. (Edison p. 52)
- ▶ **5.8.2** Assure the provision of adequate sewage treatment and disposal by utilizing the City of Fresno's regional wastewater treatment plant for all existing and new development within the Plan Area. (RCP 4-1)
- ▶ **5.8.3** Provide increased wastewater treatment plant capacity in a timely manner to facilitate planned development. (RCP 4-1.1)
- ▶ **5.8.4** Implement cost effective and environmentally beneficial operational and management measures to maximize the efficiency of the regional wastewater treatment facility. (RCP 4-1.2)



Wastewater can be treated through a system of ecological solutions, most notably called the Living Machine. The clean, treated water can be used for irrigation, toilet flushing, waterfalls, or simply returned directly to the environment.