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## CHAPTER 6 - PUBLIC FACILITIES

### EXISTING CONDITIONS

The availability and capacity of water and sanitary sewer facilities have a direct impact on the intensity and timing of development. Both systems should be able to accept additional capacity in order to accommodate future growth. The City of De Soto has prepared a 10-year Capital Improvements Plan to address some of the immediate needs of these systems. Coordination with neighboring facilities is needed to facilitate the long range expansions of these systems. The city has recently implemented systems development charges to be imposed on new developments to aid with the future funding of water and sewer system improvements. Projects for capital improvements are budgeted within the framework of the Capital Improvements Program, which is reviewed on a yearly basis. However, it is assumed that any major system expansions will be funded within the framework of user fees, benefit districts, rate increases, or other alternative funding mechanisms.

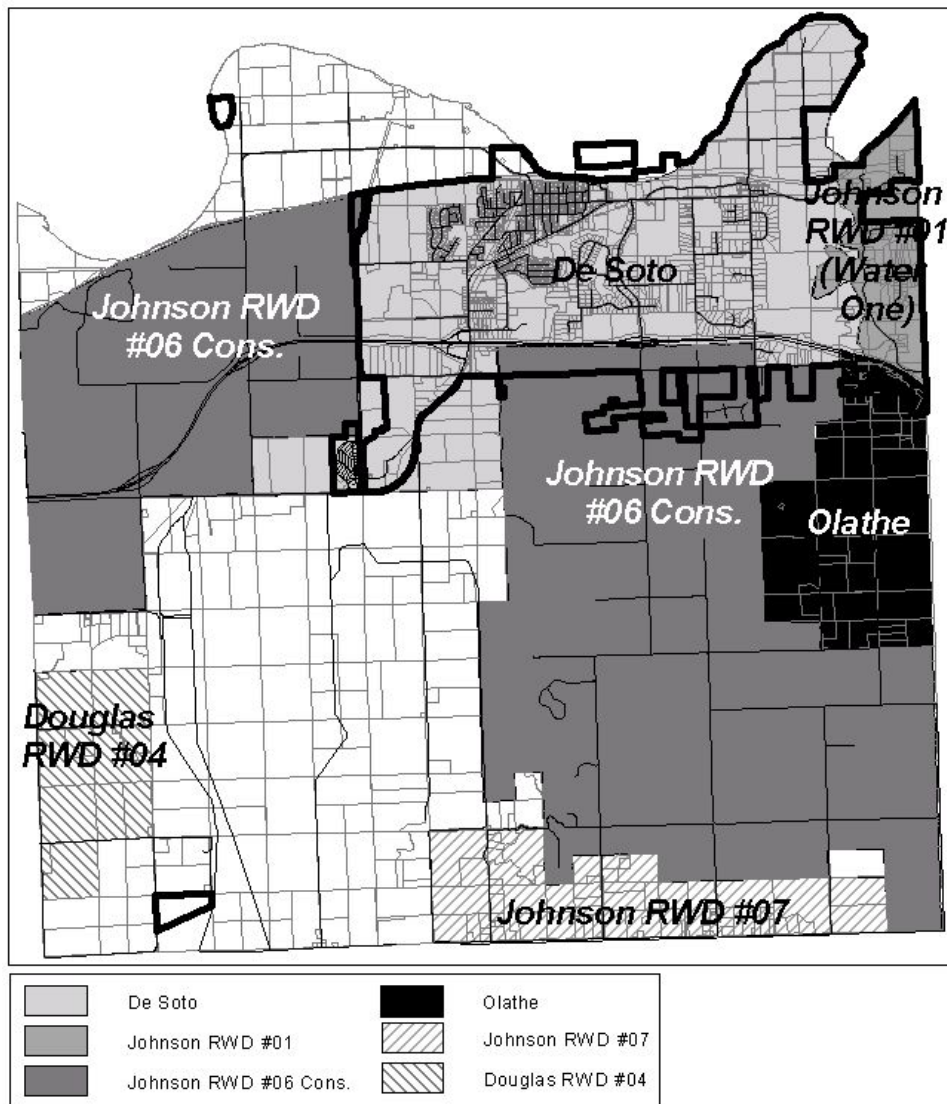
### WATER SYSTEM

Within the existing corporate limits of De Soto, water service is provided by the City of De Soto, Johnson County Water District Number 1 (Water One), and Johnson County Rural Water District Number 6 (RWD #6). The service areas for these three suppliers are as shown on **Figure 6.1**. The portion of the City east of Cedar Creek is served by Water One, while the portions south of 95th Street and west of Sunflower are served by RWD #6. There are an estimated 200 water patrons within the City that are served by either Water One or RWD #6. The possibility of future expansion of the City's service area to the east is limited. To the south and west there is a potential for expansions to the City's service area, however any expansion into the RWD #6 service area will have to be negotiated with RWD #6.

All of the City's raw water is obtained from wells located within the alluvium along the Kansas River. De Soto is currently operating two water treatment facilities; the city-owned water treatment plant located at 8180 Shawnee Street, and the groundwater treatment facility at the Sunflower Army Ammunition Plant. The City has been operating the Sunflower Treatment Plant under a facility use agreement with the U.S. Army since 1998. The general operating characteristics and abilities of each water plant, along with the distribution system is outlined in the following sections. **Map 8** also shows the layout of the City's existing water system.



Figure 6.1: Water District Service Areas



### City Water Treatment Plant

The City's water treatment facility consists of four wells located in the area of 79th and Ottawa Streets. Combined, these wells have the capability of producing 600 gallons per minute (864,000 per day). The treatment of the water is achieved by an intermediate lime softening process, with aeration, gravity sand filtration, and chlorination. The plant's production capacity is limited by its sand filter beds at a rate of 0.69 million gallons per day (mgd). The City withdraws water from these wells pursuant to withdrawal permits granted by the Kansas Division of Water Resources. The total water allocation provided by these permits is 752 acre feet per year (245 million gallons per year, or 670,000 gallons per day on average). The plant has been operated as high as 0.85 mgd to meet the City's peak water demands. Operation at this rate reduces the efficiency of the treatment process and also reduces the safety factor built into the treatment design.



### **Sunflower Army Ammunition Water Treatment Facility**

The treatment facility on the Sunflower Army Ammunition Plant was constructed in 1942, with a major renovation in the mid 1970's. In 1995, the U.S Army declared the entire Sunflower Ammunition facility as excess property and began the process of disposal of the site. In 1998, the City began operating the water treatment facility under a one-year facility use agreement with the U.S. Army. Also in 1998, the City gained approval from the Kansas Department of Health and Human Services for the public benefit transfer of the water plant, storage facilities, and diversion wells. In 1999, the City commissioned a study of this facility to determine the feasibility of its renovation and production of water for the then proposed OZ development. The study's findings were positive toward the possibility of renovating the plant. Since then, the OZ development failed to gain the necessary approvals for its implementation, and the property remains with the U.S. Army. Two separate law suits have been filed relating to the Army's disposal of the property which have blocked the City from obtaining ownership of the facility. As a result, much needed renovations have been delayed.

The Sunflower water facility gets its raw water from a well field along the Kansas River. Originally, there were a total of 12 wells, six on the north side of the river, and six on the south. Two of these wells have been completely abandon, and four others are not currently operable. The remaining six operating wells are in varying states of repair, but all are currently capable of producing water. The raw water is pumped via two 16-inch mains from the well field approximately 4 miles south to the head works of the treatment facility. In total, the well field and transmission lines have a current capacity of approximately 1,250 gallons per minute, or 1.80 mgd. This capacity could easily be increased by the renovation of wells. The treatment process includes lime softening, gravity filtration, and chlorination. The original hydraulic capacity of the treatment plant was 10 mgd. However, one of the two circular clarifiers is currently inoperable, reducing the hydraulic capacity of the plant to 5 mgd. The limiting factor for the treatment of raw water is currently the well field, with approximately 1.80 mgd of pumping capacity.

The diversion of water to the Sunflower plant is done under a water right owned by the U.S. Army. The amount of this water right is 10 mgd. If the plant were to become the City's property, this water right could not be transferred to the City. Therefore, the City applied for and was granted a new appropriation for water diversions. The amount of the new diversion right is approximately 1.5 mgd.

The repairs needed to bring the Sunflower water treatment facility up to current operating standards are significant. The City's Capital Improvement Plan has addressed this need and identified the tasks and investment required for the ultimate upgrade of this facility (see **Appendix C**). Currently, the upgrade of this facility appears to be a viable means of securing a long-term source of treated water for the City. Additionally, the upgrade of this facility could offer the possibility of revenues from future wholesale of water to other public water supply systems.



## **Distribution System**

At the City-owned water treatment plant, finished water is stored in a 200,000 gallon clearwell located south of the treatment plant building. Two high service pumps (each 600 gpm) pump water from the clear well to other storage facilities in the City. In addition to the 200,000 gallon clearwell, other storage facilities include a 100,000 gallon elevated water storage tank (Waverly and 91st), a 50,000 gallon elevated water storage tank (in Downtown) and 480,000 gallon above-ground storage vessel (at the water treatment plant).

At the Sunflower water plant, finished water is stored on a 1.2 million gallon clearwell located below the filter building. From there, it is pumped by two high service pumps to the four elevated storage towers on the Sunflower property. The Sunflower system also includes a ground level storage facility with a capacity of 12 million gallons that is not currently in use. The Sunflower distribution system consists of miles of 48" and 36" diameter water mains with smaller mains throughout approximately 4,000 acres of the site. Most of the existing water mains are now abandon.

The City's water distribution system consists of approximately 43 miles of water pipe and other water distribution appurtenances (pressure control valves, sectionalizing valves, fire hydrants, blow off valves, etc.). The system also consists of approximately twelve miles of service lines ranging in size from 3/4" to 4 inches that are owned and maintained by the City and other valves, curb stops, metering equipment, meter pits, curb boxes, and other devices associated with customer service lines.

The original distribution system in old town De Soto (Planning Area 1) was constructed in the early 1950's. The first major extension of the system came with the development of Oak Country Subdivision in the late 1970's and early 1980's. Extensions serving De Meadows, the High School and K10 Industrial Park occurred in the mid 1980's and early 1990's. Most recent extensions have been made in the newer residential developments along 87th Street, and connecting the City's distribution system with the Sunflower water treatment facility. Approximately 22 miles of distribution system piping and appurtenances are 40 years old or older; approximately 4 miles of the systems 10-15 years old; approximately 7 miles is 7-10 years old, and approximately 10 miles is newer than 7 years.

Until 2000, the City distribution system was not connected to the distribution system at the Sunflower Army Ammunition Plant. In the summer of that year, a booster pump and 8-inch water main were installed to enable the City to supplement its water production capabilities with water from the Sunflower plant. The booster pump is located at the intersection of 103rd Street and Sunflower Road. The pump has the ability of supplying approximately 400 gpm (0.576 mgd) of water from the elevated storage towers at Sunflower to the city's elevated tower on Waverly Road. In addition, a 12-inch water main was constructed in the spring of 2001 that connected the western portions of the City's distribution system to the elevated storage towers on the Sunflower Property. These connections have made it possible for the entire city to be fed water from the Sunflower treatment plant.

## **Usage and Diversion Trends**

The City's historical water usage and diversion trends are presented on **Tables 6.1, Table 6.2** and **Figure 6.2** on the following pages. Since the city only started operating the Sunflower water plant in 1998, no



further historical records for it are available. However, historical records for the Sunflower property would be of little value, since the past industrial use of the property has been discontinued.

**Table 6.1: Water Diversion**

Year	De Soto Shawnee Plant			Sunflower			Combined Plants		
	Peak Monthly Sold (gal)	Yearly Sold (gal)	De Soto Average Daily Sold (gal)	Peak Monthly Sold (gal)	Yearly Sold (gal)	Sunflower Average Daily Sold (gal)	Peak Monthly Sold (gal)	Yearly Sold (gal)	Combined Average Daily Sold (gal)
1987	11,516,000	103,889,000	284,267	No Records	No Records	No Records	11,516,000	103,889,000	284,627
1988	13,263,000	113,798,000	311,775	↓	↓	↓	13,263,000	113,798,000	311,775
1989	11,452,000	116,151,000	318,222				11,452,000	116,151,000	318,222
1990	10,800,000	111,792,000	306,279				10,800,000	111,792,000	306,279
1991	12,368,000	111,665,000	305,932				12,368,000	111,665,000	305,932
1992	12,212,000	110,735,000	303,384				12,212,000	110,735,000	303,384
1993	11,691,000	109,553,000	300,145				11,691,000	109,553,000	300,145
1994	13,918,000	115,079,000	315,285				13,918,000	115,079,000	315,285
1995	14,148,667	122,277,833	335,008				14,148,667	122,277,833	335,008
1996	14,379,333	129,476,667	354,731				14,379,333	129,476,667	354,731
1997	14,610,000	136,675,500	374,453				14,610,000	136,675,500	374,453
1998	14,840,667	143,874,333	394,176				14,840,667	143,874,333	394,176
1999	15,071,333	151,073,167	433,622	20,718,000	123,427,000	338,156	35,789,333	274,500,167	771,778
2000	15,302,000	158,272,000	433,622	18,725,000	140,231,000	384,195	34,027,000	298,503,000	817,816
2001	19,662,000	168,369,000	461,285	31,667,000	151,922,000	416,225	51,329,000	320,291,000	877,510

Source: City of De Soto, 2003

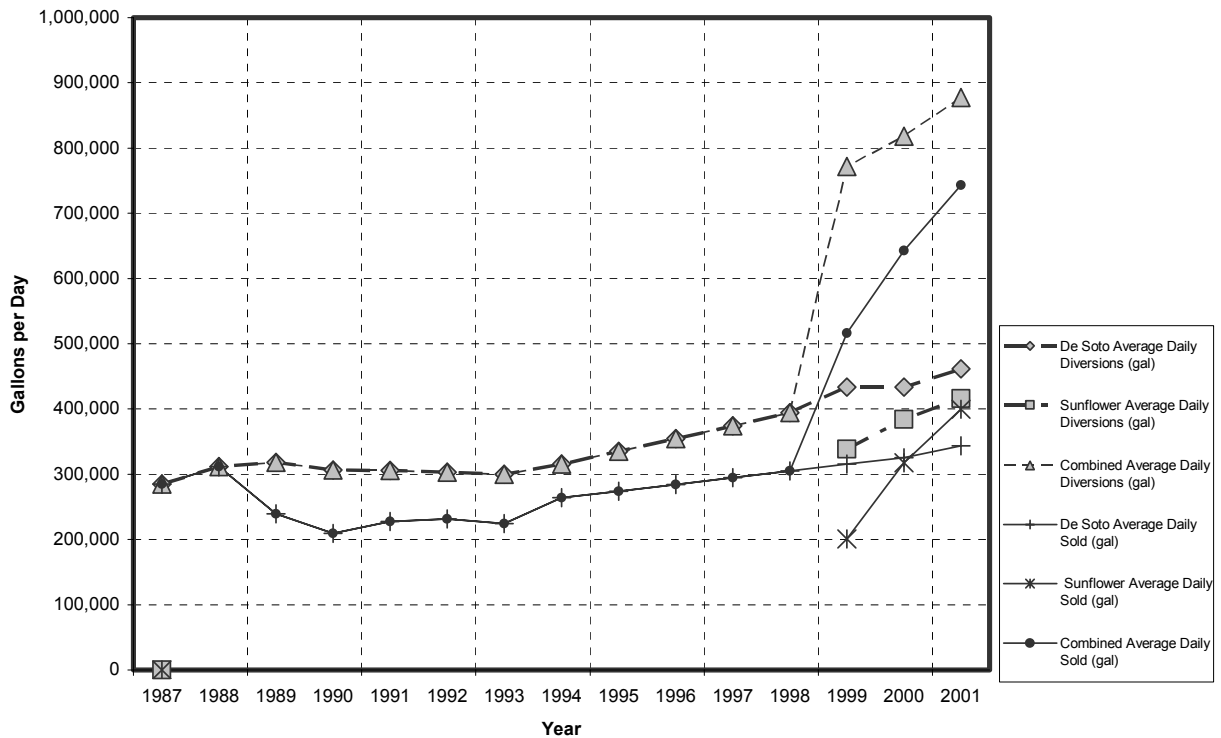
**Table 6.2: Water Consumption**

Year	De Soto Shawnee Plant			Sunflower			Combined Plants		
	Peak Monthly Sold (gal)	Yearly Sold (gal)	De Soto Average Daily Sold (gal)	Peak Monthly Sold (gal)	Yearly Sold (gal)	Sunflower Average Daily Sold (gal)	Peak Monthly Sold (gal)	Yearly Sold (gal)	Combined Average Daily Sold (gal)
1987	11,508,000	103,889,000	284,627	No Records	No Records	No Records	11,508,000	103,889,000	284,627
1988	13,263,000	113,851,000	311,921	↓	↓	↓	13,263,000	113,851,000	311,921
1989	8,382,000	87,386,000	239,414				8,382,000	87,386,000	239,414
1990	7,039,000	76,397,000	209,307				7,039,000	76,397,000	209,307
1991	8,487,000	82,948,000	227,255				8,487,000	82,948,000	227,255
1992	8,359,000	84,580,000	231,726				8,359,000	84,580,000	231,726
1993	6,931,000	81,904,000	224,395				6,931,000	81,904,000	224,395
1994	10,875,000	96,254,000	263,710				10,875,000	96,254,000	263,710
1995	11,061,833	100,013,167	274,009				11,061,833	100,013,167	274,009
1996	11,248,667	103,772,333	284,308				11,248,667	103,772,333	284,308
1997	11,435,500	107,531,500	294,607				11,435,500	107,531,500	294,607
1998	11,622,333	111,290,667	304,906				11,622,333	111,290,667	304,906
1999	11,809,167	115,049,833	315,205	18,069,000	18,069,000	200,877	29,878,167	188,369,833	516,082
2000	11,061,833	118,809,000	325,504	16,375,000	16,375,000	317,529	28,371,000	234,707,000	643,033
2001	12,849,000	125,334,000	343,381	30,608,000	30,608,000	399,759	43,457,000	271,246,000	743,140

Source: City of De Soto, 2003



**Figure 6.2: City of De Soto and Sunflower Water Treatment Plants  
Average Daily Water Diversions and Consumption**



Source: City of De Soto, 2003

### Water Accessibility

As with any utility, proximity to the water distribution system is a good indicator of growth potential. **Map 9** shows the areas that are in close proximity to larger looped water mains currently serving the City. Areas within 1/4 mile of the City existing water mains are assumed to have the highest near-term development potential and lower additional development costs for expansion water system. Areas within 1/2 mile of the existing water mains are considered to have a moderate to high development potential with increased development costs for expansion of the existing system. While this information helps indicate areas where near-term development pressures are anticipated to be higher, it is not intended to indicate plans or support for expansion of the water system. Rather the water system expansions will be planned as a result of comprehensive water systems studies and as part of City's ongoing Capital Improvement Plan process.

### WASTE WATER UTILITIES

The city sanitary sewer system has limited remaining capacity to serve future residences, business and industry. Wastewater is treated by the City of De Soto at a treatment facility north of the City. The plant has an approximate hydraulic capacity of 480,000 gpd or a population equivalent of approximately 4,800 residents. The average operating flows to the plant are currently approximately 280,000 gpd with peak flows in excess of the design capacity. These peaks occur during periods of wet weather when inflow and

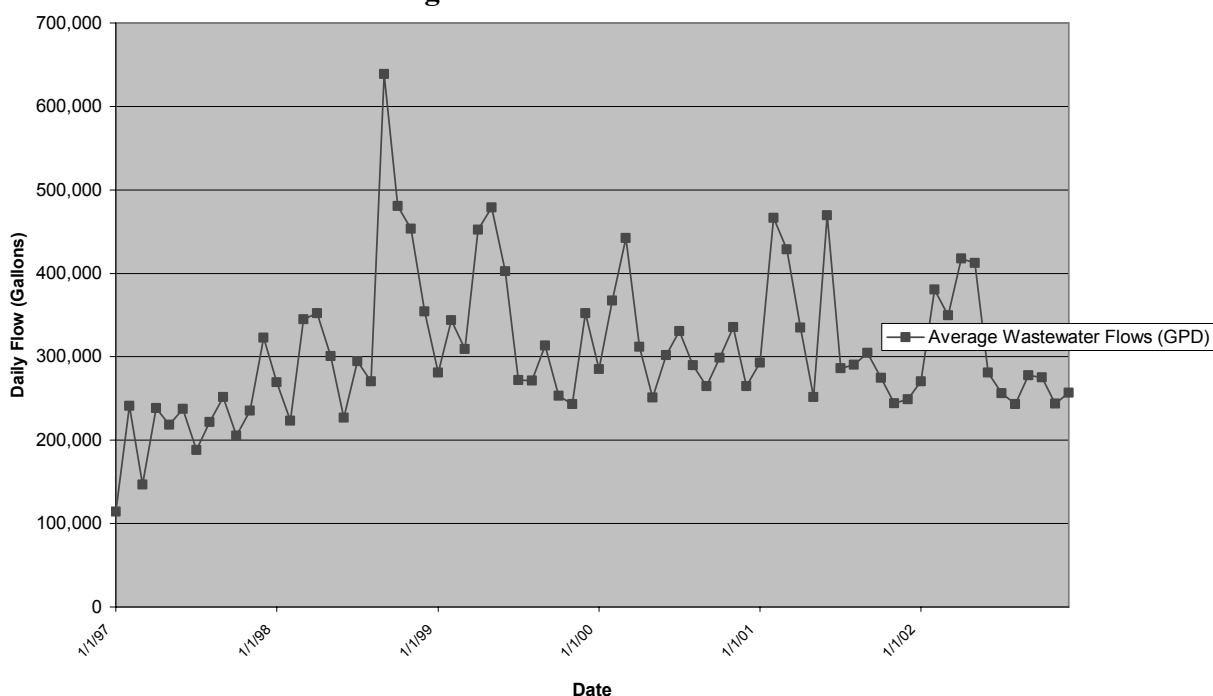


infiltration increased flows to the plant. When floods occurred in 1993, flows reached as high as 700,000 gpd. **Figure 6.3** on the following page shows the monthly average flows at the sewer treatment plant.

The City system is a secondary-oxidation ditch waste water treatment plant. The collection system is comprised of force mains and gravity flow mains. The City’s waste water utility consists of a network of service lines that transport sewage from its sources through collector and trunk sewers and force mains to lift stations to the City’s waste water treatment plant for treatment and discharge to the Kill Creek tributary to the Kansas River. **Map 10** shows the current wastewater collection system, with the drainage basins identified.

The corporate limits of the City of De Soto encompass approximately twelve square miles of land area, or nearly 8,000 acres. Approximately one half of land area is currently undeveloped or underdeveloped. Only about 1,150 acres of the land area in the community has ready access to the City’s sanitary sewer system. This area is not currently built out. Upon ultimate build out of the area currently served by the sewer collection system, the remaining treatment capacity of the sewer plant will be exceeded. Thus, if the sewer area is to expand, the existing treatment facility will need to be upgraded, or a new facility will have to be constructed.

**Figure 6.3: Wastewater Flows**



Source: City of De Soto, 2003

### Wastewater Collection System

In the area served by the sanitary sewer system, the City owns, operates, and maintains approximately 17 miles of sanitary sewer collectors. The system also includes forced mains, manholes and cleanouts, ejector stations and lift stations necessary to provide adequate service.



A large portion of the system that serves old town De Soto was constructed early to mid 1940's. The brick construction of manholes in this area and the design of the Imhoff tank (the first sewer treatment plant in De Soto) date this portion of the collection system. Since that time the system has been expanded but there have been few major improvements made to the existing system. In 1990, approximately 90% of the brick manholes in the old area of De Soto were lined to cure problems of ground water infiltration into the sewer system. Over the past ten years, various sections of the system have been televised and inspected. Much of the system is vitrified clay pipe (VCP) with a "bell" at one end.

As a result of these improvements, groundwater inflow and infiltration into the sewer system has been greatly reduced. The result is a reduction in the average daily flows at the treatment plant, as shown in the **Figure 6.2**. The continuance of a program for identifying and eliminating sources of inflow and infiltration will preserve the capacity of the sewer system and prevent hydraulic overloading of the plant which could cause, environmental damage and could violate parameters established in the City's NPDES discharge permit.

### **Wastewater Accessibility**

As with the water system, proximity to the wastewater distribution system is a good indicator of growth potential and development demand. However, wastewater service accessibility is impacted by more than proximity to the existing system. The relationship to area sub-basins must also be considered. To this extent, areas of the City where development pressures are anticipated based on the near-term feasibility of sewer extensions have been identified. **Map 11** shows these potential sewer extension areas, along with the sewer main extensions necessary to serve them. These areas have been identified due to their proximity to existing collection systems and their position within the drainage basins currently served by sewer. In most cases, the potential sewer extension areas could be served by a simple extension of gravity flow sewer mains.

Again this information helps indicate areas where near-term development pressures are anticipated to be higher, but is not intended to indicate plans or support for expansion of the wastewater system. Rather wastewater system expansions will be planned as a result of comprehensive wastewater systems studies and as part of City's ongoing Capital Improvement Plan process. To that extent, the City is currently planning to conduct a sewer facilities master plan aimed at identifying the best location for the new treatment facility and the most efficient means of serving the City's expected growth corridors.