



**CEDAR PARK**

**FY  
17**

**LONG RANGE**

**WASTEWATER PLAN UPDATE**



## **1.1 INTRODUCTION**

The Fiscal Year 2014 Long Range Water and Wastewater Plan Update (“Plan Update”) was produced to evaluate the water and wastewater systems of the City of Cedar Park to develop capital improvement project recommendations to provide for system expansions to accommodate present and future demands. As part of the Plan Update, a hydraulic wastewater model of the primary wastewater interceptors was developed in Excel to predict flows within 112 wastewater basins. To verify wastewater model predictions, model accuracy, and predict future flows, a project was undertaken by City of Cedar Park Utility Engineering staff to update the model using current data. The goal of the effort was to provide additional data for future capital improvement projects to assist with system planning and capital improvement project budgeting. The following is a summary of that effort, analysis, and recommendations.

## **1.2 METHODOLOGY AND MODEL VERIFICATION**

The FY2014 Plan Update to the wastewater model included basin modeling that was based on two flow components, dry weather and wet weather flows. Wastewater collection basin delineation was performed based on common downstream points and topography to create a total of 112 basins. A wastewater interceptor model was developed that combined the dry weather and wet weather flow components, along with consumption data and population data to predict total basin flows.

The dry weather flow component includes a residential flow contribution and a non-residential flow contribution. The residential flow contribution is calculated from the number of parcels, the average occupants per parcel, and 65 gallons per capita per day (gpcd) of wastewater flow contribution. Non-residential flows were added to the model and calculated using total acreage within a basin times a unit load factor of 650 gallons per acre per day. A peaking factor is applied to the total dry weather flow for each basin, and dry and wet weather flows are summed to determine the peak wet weather flow.

Population values are based on City of Cedar Park estimates as predicted in the City of Cedar Park’s Utility Rate Model. Population, combined with historical wastewater flow data, yields a gpcd for previous years that can be used to calibrate the model. Model calibration consisted of adjusting the gpcd of prior years’ flow data until the flow data produced by the model matches historical data. Using this method, it was determined that the per capita per day value should be set to 62 gallons per capita per day. The contribution from non-residential flow was kept at 650 gpad (gallons per acre per day). This methodology is inherently conservative in that it tends to overestimate the total flow through the wastewater collection system. This is due to the design flows having to compensate for multiple unknowns, such as development patterns and population density. Temporal variations also have to be accounted for, as well as infiltration and inflow (I&I), resulting in a conservative flow value that overestimates the total amount of wastewater flow in the system. This overestimation by the model provides an inherent safety factor to ensure adequate capacity of the collection system during peak events. In addition, a basin is considered at-capacity if the predicted dry weather flows are 65% of available pipe volume, or wet weather flows are 85% of available pipe volume for pipes less than or equal to 15 inches in diameter or 80% for pipes greater than 15 inches in diameter.

To model future years, the persons per dwelling unit was adjusted in the model based on the population estimates in the City of Cedar Park's Utility Rate Model. Present day conditions, year 2020, 2025, 2030, and 2040 were modeled by varying the population data to simulate anticipated population growth and its impact on the collection system. The value of 62 gpcd was used for the modeling, though it is anticipated that this value will be reduced over time due to conservation efforts.

### **1.3 BASIN DELINATION AND ZONING CHANGES**

To determine if the model basins needed adjustments due to growth between the time the model was published and present day, the 2017 City of Cedar Park Zoning Map was overlaid with the previous zoning map that the modelers used to develop the original basin map and residential vs. non-residential acreage. The number of zoning changes over this short period was not deemed significant enough to change the overall ratio of residential to non-residential flows in any basin. Development patterns appear to be following planned zoning maps.

### **1.4 MODEL REFINEMENTS**

During the course of updating the model, several changes were made to the model to improve the overall flow estimates, including:

- There was an error in the model whereby not all the basins that are served by the Riviera Lift Station were accounted for in the flow calculations. The model was corrected to have basins 58A, 58B, 58C, 58, 49P, 18A, and 46P flow into the Riviera Lift Station.
- Added a new basin, CPE24A, from part of basin CPE15 and routed to CPE24 to model 17 acres that will be served by a 6" private wastewater main.
- Reduced the developable acreage in basin CPW3 to reflect terrain constraints. CPW3 has terrain that will constrain development due to extreme slopes. The developable percentage of this basin was reduced by 1/3 (33%).
- Various basins were not connected in the model; flow was not leaving those basins into the proper receiving basins.
- Label pointers were fixed on some column heading so that the vlookup function in Excel provided correct data.
- Support for 33" pipes was added to the model.

### **1.5 ANALYSIS**

Tables 1 through 5 detail the results of modeling with revised population data and gpcd values for years 2017, 2020, 2025, 2030 and 2040; the modeling also included the model improvements listed in section 1.4. Table 6 is an updated capital project summary of potential capital projects to update the 2014 capital project recommendations based on the updated modeling. Table 7 is an updated cost summary for the capital project recommendations.

The model predicts that there are 9 basins that are currently over capacity. Of those nine, four will be addressed with the Lone Star Drive Wastewater Improvements Project, which is currently under construction. The model shows basin CPW2 currently over its wet weather capacity; however, this is an artifact of the infiltration and inflow (I&I) component of the model from basin CPW3, which does not currently have sewer service that would contribute to flows into CPW2. If development occurs in CPW2 and CPW3, the basins should be broken down into smaller basins so that I&I can be more accurately modeled. Basins capacity issues in basins 331 and 421A were identified in the 2014 Plan Update as project candidates to increase capacity. Basin 18A is shown over capacity due to the predicted flow contribution from Basin 46A (the Shenandoah Basin). Basin 46A is a fully developed basin outside of City Limits that is currently served by septic systems. It is not anticipated that Basin 46A will be served by sanitary sewer during the planning period, and therefore, Basin 18A will not be over capacity and require a project to increase capacity.

Table 2, the predicted flow conditions in the year 2020, shows no changes that would require additional capacity projects beyond what has been previously identified in the 2017 model run.

Table 3, the predicted flow conditions in the year 2025, indicate that basins 58B and 307 will be slightly over capacity. The model predicts that in the year 2025, basin 58A will be at 90% full during wet weather flows and basin 307 will be at 91% of capacity during wet weather flows. It does not appear that there is a large amount of developable land remaining in basin 58A or 307 to necessitate increasing flow capacity in this basins, but the areas should be monitored for redevelopment and increasing development density.

Tables 4 and 5 (model years 2035 and 2040) indicate two additional basins will be over capacity, 307A and CPE24A. CPE24A is a large lot established subdivision, so there is a lower likelihood of increasing density of development that could drive a need to expand the collection system. Basin 307A is predicted to be just slightly over capacity at 70% of dry weather flow capacity, and 84% of wet weather flow capacity. Basin 307A has very little developable land remaining, with the majority of the acreage being comprised of existing single family development. Development in this area should be monitored, but it does not appear that a project to increase capacity is needed during the planning period.

Table 6: Table 6 lists the updated recommended Capital Projects based on the modeling through year 2040 and project construction status. Table 7 is a cost summary of the updated recommended Capital Projects and is an update to Table 4.8 in the 2014 Long Range Wastewater Plan Update. Updated project summary sheets are contained in Appendix A.

## **1.6 ADDITIONAL RECOMMENDATIONS**

While the model is calibrated on a total sum of flows basis based upon the flows to the wastewater treatment facilities, calibration has not been performed at a basin level. The use of temporary flow meters on interceptors and trunk lines would be helpful to further refine the model.

Monitoring of development in basins CPW2, CPW3, 58B, 307, 307A, CPE24A, and 18A is recommended. If these basins see significant development beyond what is predicted, more refined modeling should be performed to ensure adequate hydraulic capacity within the system.

**Table 1: 2017 Model - Over Capacity Basins**

| 2017 Model |          | Design For New Pipes |        |                  |        | Notes   |
|------------|----------|----------------------|--------|------------------|--------|---|
|            |          | Dry Weather Flow     |        | Wet Weather Flow |        |   |
| Basin      | Diameter | Capacity             | % Full | Capacity         | % Full |   |
| CPW2       | 12       | o.k.                 | 51%    | full             | 127%   | Artifact of model due to assumed I&I and non-residential contribution |
| 276P       | 8        | full                 | 74%    | full             | 88%    | To be addressed with Lone Star Drive Project                          |
| 278        | 12       | o.k.                 | 36%    | full             | 93%    | To be addressed with Lone Star Drive Project                          |
| 278        | 8        | full                 | 107%   | full             | 275%   | To be addressed with Lone Star Drive Project                          |
| 253        | 15       | o.k.                 | 55%    | full             | 110%   | To be addressed with Lone Star Drive Project                          |
| 331        | 8        | full                 | 127%   | full             | 165%   | Recommended replacement in 2014 Plan Update                           |
| 421A       | 12       | full                 | 103%   | full             | 159%   | Recommended replacement in 2014 Plan Update                           |
| 18A        | 12       | full                 | 80%    | full             | 114%   | Not applicable - Shenandoah Basin (46A) not served by sewer           |
| 253A       | 12       | full                 | 69%    | full             | 139%   | To be addressed with Lone Star Drive Project                          |

**Table 2: 2020 Model - Over Capacity Basins**

| 2020 Model |          | Design For New Pipes |        |                  |        | Notes   |
|------------|----------|----------------------|--------|------------------|--------|---|
|            |          | Dry Weather Flow     |        | Wet Weather Flow |        |   |
| Basin      | Diameter | Capacity             | % Full | Capacity         | % Full |   |
| CPW2       | 12       | o.k.                 | 51%    | full             | 127%   | Artifact of model due to assumed I&I and non-residential contribution |
| 331        | 8        | full                 | 127%   | full             | 165%   | Recommended replacement in 2014 Plan Update                           |
| 421A       | 12       | full                 | 103%   | full             | 159%   | Recommended replacement in 2014 Plan Update                           |
| 18A        | 12       | full                 | 80%    | full             | 114%   | Not applicable - Shenandoah Basin (46A) not served by sewer           |

**Table 3: 2025 Model - Over Capacity Basins**

| 2025 Model |          | Design For New Pipes |        |                  |        | Notes   |
|------------|----------|----------------------|--------|------------------|--------|---|
|            |          | Dry Weather Flow     |        | Wet Weather Flow |        |   |
| Basin      | Diameter | Capacity             | % Full | Capacity         | % Full |   |
| CPW2       | 12       | o.k.                 | 53%    | full             | 129%   | Artifact of model due to assumed I&I and non-residential contribution |
| 58B        | 8        | o.k.                 | 64%    | full             | 90%    | Monitor development in area   |
| 307        | 15       | full                 | 71%    | full             | 91%    | Monitor development in area   |
| 331        | 8        | full                 | 142%   | full             | 180%   | Recommended replacement in 2014 Plan Update                           |
| 421A       | 12       | full                 | 115%   | full             | 170%   | Recommended replacement in 2014 Plan Update                           |
| 18A        | 12       | full                 | 87%    | full             | 121%   | Not applicable - Shenandoah Basin (46A) not served by sewer           |

**Table 4: 2030 Model - Over Capacity Basins**

| 2030 Model |          | Design For New Pipes |        |                  |        | Notes   |
|------------|----------|----------------------|--------|------------------|--------|---|
|            |          | Dry Weather Flow     |        | Wet Weather Flow |        |   |
| Basin      | Diameter | Capacity             | % Full | Capacity         | % Full |   |
| CPW2       | 12       | o.k.                 | 55%    | full             | 132%   | Artifact of model due to assumed I&I and non-residential contribution |
| 58B        | 8        | o.k.                 | 66%    | full             | 92%    | Monitor development in area   |
| 307        | 15       | full                 | 74%    | full             | 94%    | Monitor development in area   |
| 307A       | 10       | full                 | 70%    | o.k.             | 84%    | Monitor development in area   |
| 331        | 8        | full                 | 150%   | full             | 188%   | Recommended replacement in 2014 Plan Update                           |
| 421A       | 12       | full                 | 121%   | full             | 177%   | Recommended replacement in 2014 Plan Update                           |
| 18A        | 12       | full                 | 90%    | full             | 125%   | Not applicable - Shenandoah Basin (46A) not served by sewer           |
| CPE24A     | 6        | full                 | 81%    | full             | 86%    | Large lot subdivision- low likelihood of high density development     |

**Table 5: 2040 Model - Over Capacity Basins**

| 2040 Model |          | Design For New Pipes |        |                  |        | Notes   |
|------------|----------|----------------------|--------|------------------|--------|---|
|            |          | Dry Weather Flow     |        | Wet Weather Flow |        |   |
| Basin      | Diameter | Capacity             | % Full | Capacity         | % Full |   |
| CPW2       | 12       | o.k.                 | 55%    | full             | 132%   | Artifact of model due to assumed I&I and non-residential contribution |
| 58B        | 8        | o.k.                 | 70%    | full             | 96%    | Monitor development in area   |
| 307        | 15       | full                 | 74%    | full             | 94%    | Monitor development in area   |
| 307A       | 10       | full                 | 74%    | o.k.             | 89%    | Monitor development in area   |
| 331        | 8        | full                 | 163%   | full             | 201%   | Recommended replacement in 2014 Plan Update                           |
| 421A       | 12       | full                 | 131%   | full             | 187%   | Recommended replacement in 2014 Plan Update                           |
| 18A        | 12       | full                 | 97%    | full             | 131%   | Not applicable - Shenandoah Basin (46A) not served by sewer           |
| CPE24A     | 6        | full                 | 88%    | full             | 94%    | Large lot subdivision- low likelihood of high density development     |

**Table 6: Wastewater Collection System Capital Project Summary**  
**FY 17 Long Range Wastewater Plan Update**  
**City of Cedar Park**

| Project # | Project  | Collection Basin | Existing Diameter | Pipe Slope in Model (ft/ft) | Required Slope for Existing Pipe to Meet Capacity Requirement (ft/ft) | Recommended Diameter (in) <sup>(1)</sup> | Estimated Length (ft) | Considerations/Trigger  |
|-----------|--|------------------|-------------------|-----------------------------|---|--|-----------------------|---|
| WW-1      | Woodall Drive Wastewater Improvements Project    | CPW-2            | 12                | 0.003                       | 0.0106  | 18                                       | 4,065                 | Needed if development occurs in Basins CPW3, CPW4 and CPW5.                                     |
| WW-2      | Basin 278 Improvements                           | 278              | 12                | 0.0059                      | 0.011   | 15                                       | 500                   | Needed if development occurs in Basins CPW3, CPW4 and CPW5.                                     |
| WW-3      | Lone Star Wastewater Improvements                | 278              | 8                 | 0.0059                      | 0.096   | 15                                       | 321                   | Pipe into the FM1431 Lift Station, existing capacity is limited.                                |
| WW-4      | Lone Star Wastewater Improvements                | 253A             | 12                | 0.0062                      | 0.022   | 18                                       | 5,937                 | Existing capacity is limited.   |
| WW-5      | Lone Star Wastewater Improvements <sup>(2)</sup> | 253              | 15                | 0.004                       | 0.0085  | 18                                       | 2,238                 | Existing capacity is limited.   |
| WW-6      | Rambling Trail Wastewater Improvements           | 331              | 8                 | 0.0034                      | 0.0144  | 12                                       | 1,060                 | Existing capacity is limited.   |
| WW-7      | Cypress Creek Wastewater Improvements            | 421A             | 12                | 0.004                       | 0.0161  | 15                                       | 1,000                 | Existing capacity is limited.   |
| WW-8      | Spanish Oaks Wastewater Interceptor              | CPE4             | n/a               | n/a                         | n/a   | 8 and 12                                 | 4,000                 | Spanish Oaks Wastewater Interceptor Phase II.   |
| WW-9      | Cottonwood Creek Wastewater Interceptor Phase C  | CPE3, CPE9S      | n/a               | n/a                         | n/a   | 33                                       | 4,200                 | Final phase to take Cottonwood lift station out of service.                                     |
| WW-10     | Lobo Lift Station Relief Tunnel                  | 216,217A, L58    | n/a               | n/a                         | 0.0003  | 42                                       | 8,000                 | Required to avoid sanitary sewer overflows.   |
| WW-11     | BCRWWS rerate and expansion                      | n/a              | n/a               | n/a                         | n/a   | n/a                                      | n/a                   | Required to increase BCRWWS capacity.   |
| WW-12     | 183 Wastewater Improvements Project              | 226              | 15                | 0.0005                      | 0.0008  | 24                                       | 300                   | Reverse grade in one section. Needed only if development occurs in basins CPW3, CPW4, and CPW5. |

Note:

(1) Assumes the same pipe slope as existing sewer

(2) Majority of this project will be completed with Lone Star Project. Remaining project named WW-12

Under design or construction

Complete

**Table 7: Cost Summary - Wastewater Improvements\***  
**FY 17 Long Range Wastewater Plan Update**  
**City of Cedar Park**

| Project #        | Project                                       | Units | Quantity | Unit Cost - Construction | Construction Cost | Unit Cost - Project | Project Estimate |
|------------------|---|-------|----------|--------------------------|-------------------|---------------------|------------------|
| WW-1             | Woodall Drive Wastewater Improvements Project | LF    | 4,065    | \$192                    | \$780,480         | \$250               | \$1,016,250      |
| WW-2             | Basin 278 Improvements                        | LF    | 500      | \$174                    | \$87,000          | \$225               | \$112,500        |
| WW-6             | Rambling Trail Wastewater Improvements        | LF    | 1,060    | \$155                    | \$164,300         | \$202               | \$214,120        |
| WW-7             | Cypress Creek Wastewater Improvements         | LF    | 1,000    | \$174                    | \$174,000         | \$225               | \$225,000        |
| WW-10            | Lobo Lift Station Relief Tunnel               | LF    | 8,000    | \$865                    | \$6,920,000       | \$1,124             | \$8,992,000      |
| WW-12            | 183 Wastewater Improvements Project           | LF    | 350      | \$900                    | \$315,000         | \$1,180             | \$413,000        |
| <b>Project #</b> | <b>Description</b>                            |       |          | <b>Cost</b>              |                   |                     |                  |
| WW-11            | BCRWWS Rerate and Expansion                   |       |          | \$1,290,000              |                   |                     |                  |

\*This is an updated version of Table 4.8 in the FY2014 Long Range Wastewater Plan Update

## **Appendix A: Updated Project Sheets**

**Project Number:** CIP -WW-1



# CEDAR PARK

**Planning Period:** 2040

**Description:** New 18 in. wastewater line in collection basin CPW2 to replace 12 in. sewer, along Woodall Dr from Whitestone Blvd to SW of Power Ln.

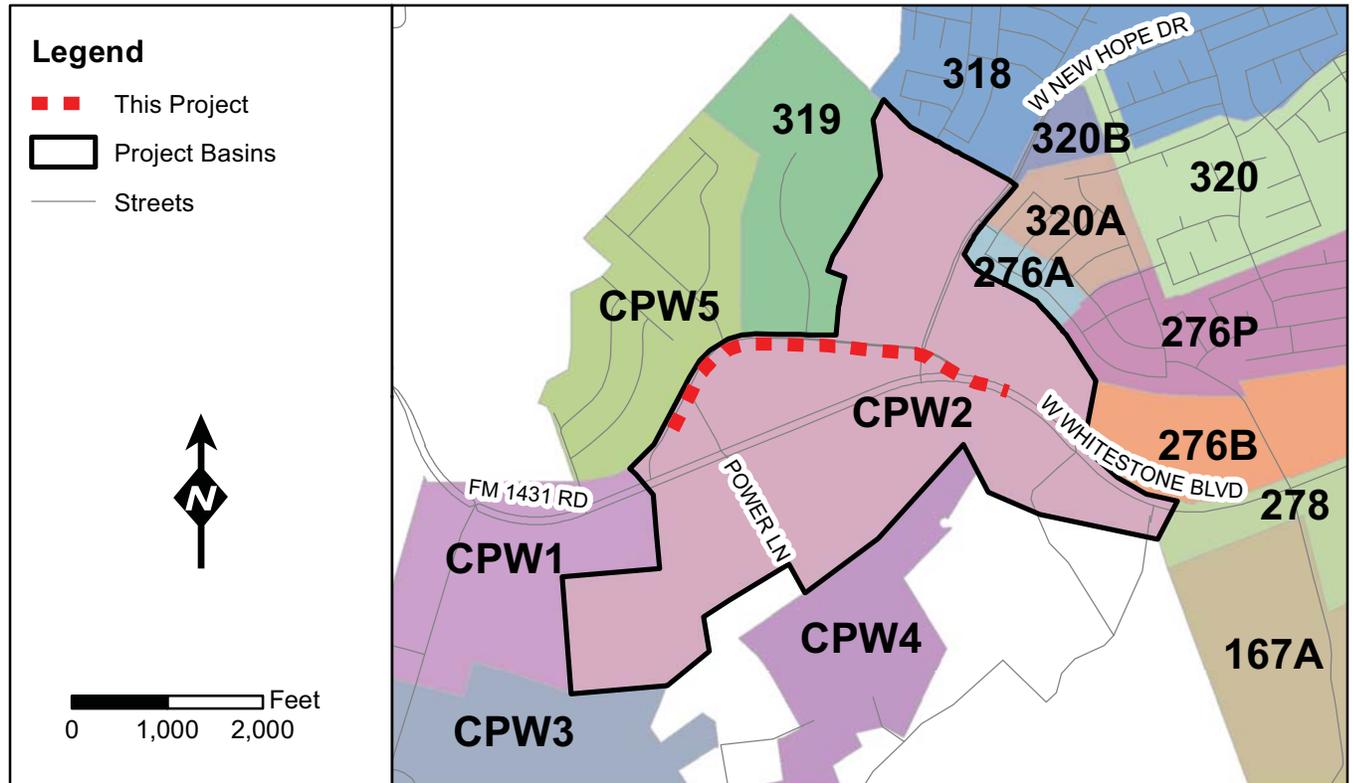
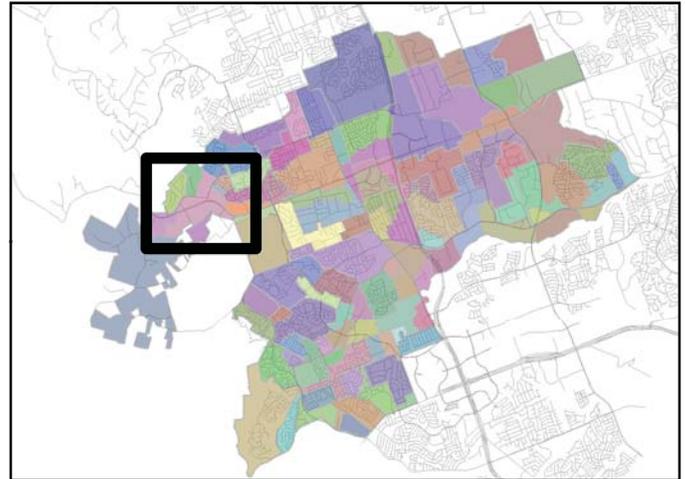
**2017 Planning Level Cost:**

| Project # | Diameter (in): | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|----------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW - 1    | 18             | 4065         | \$192                     | \$780,480         | \$250                     | \$1,016,250   |

\*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

**Justification:**

This project will provide additional capacity for future needs.



**Project Number:** CIP -WW-2



**Planning Period:** 2040

**Description:** New 15 in. wastewater line in collection basin 278 to replace 12 in. sewer along Whitestone Blvd near Anderson Mill Rd to N Lakeline Blvd.

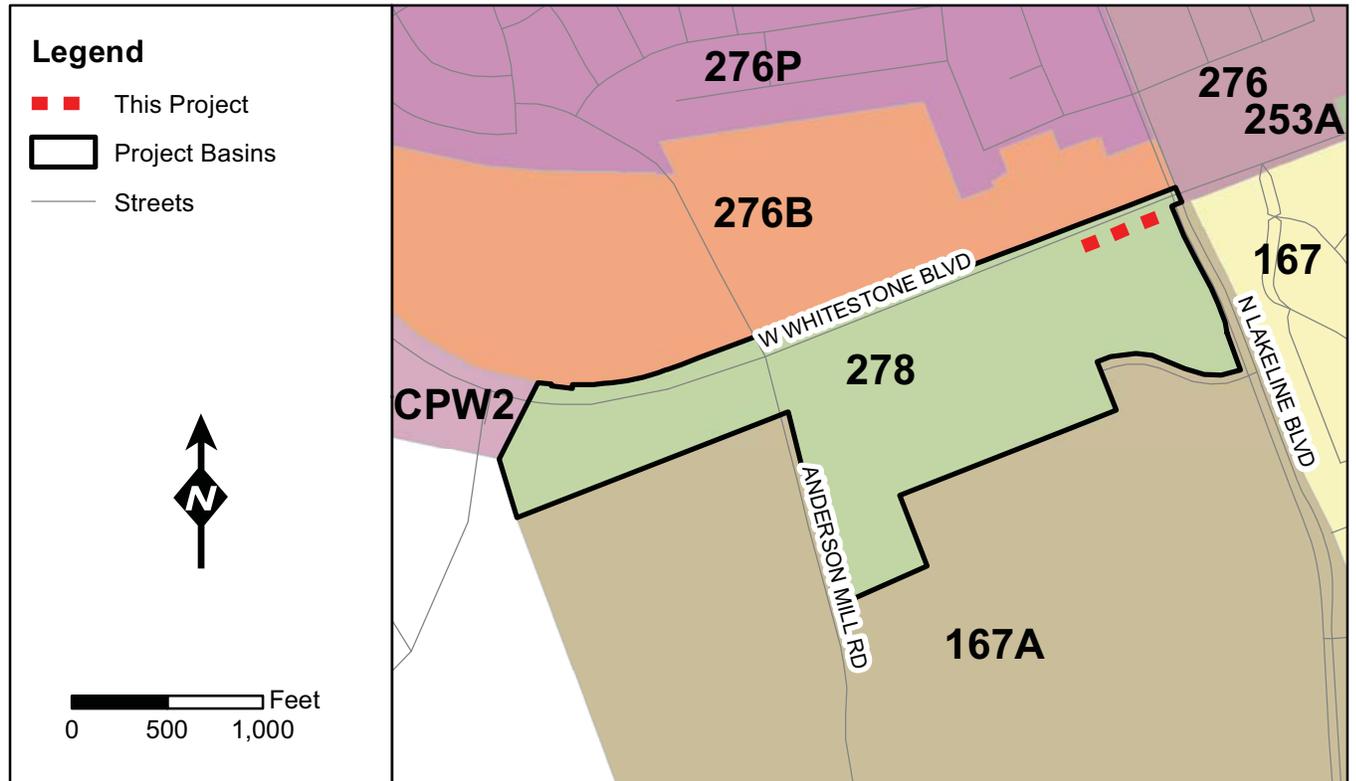
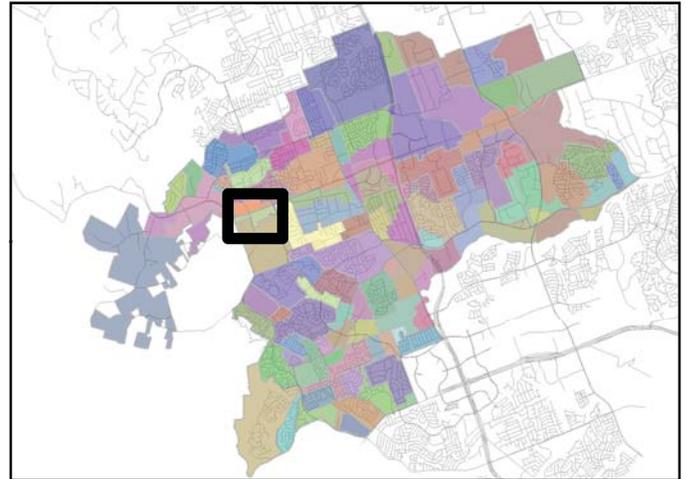
**Planning 2017 Level Cost:**

| Project # | Diameter (in): | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|----------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW - 2    | 15             | 500          | \$174                     | \$87,000          | \$225                     | \$112,500     |

\*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

**Justification:**

This project will provide additional capacity for future needs.



**Project Number:** CIP -WW-6



# CEDAR PARK

**Planning Period:** 2013 - 2018

**Description:** New 12 in. wastewater line in collection basin 331 to replace 8 in. sewer along Rambling Trail between Woodhollow Ln and Cluck Creek Trl.

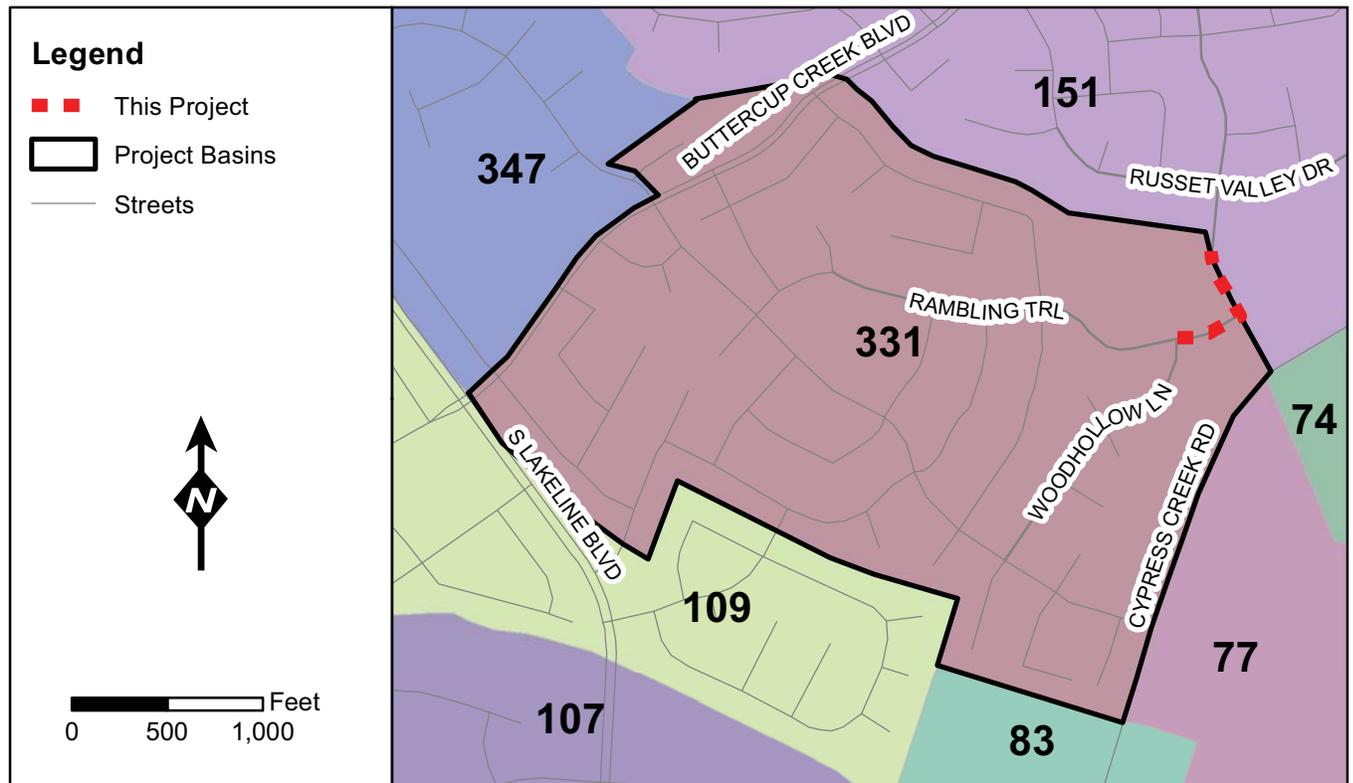
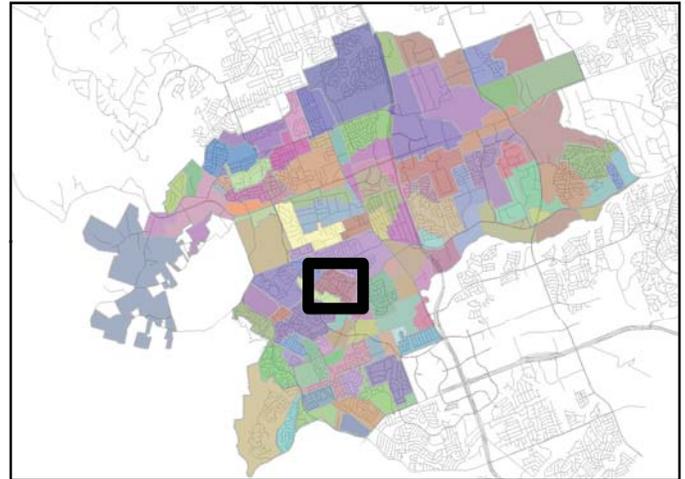
**Planning Level Cost:**

| Project # | Diameter (in): | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|----------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW - 6    | 12             | 1060         | \$155                     | \$164,700         | \$202                     | \$214,120     |

\*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

**Justification:**

This project will provide additional capacity for current/future needs.



**Project Number:** CIP -WW-7

**Planning Period:** 2013 - 2018

**Description:** New 15 in. wastewater line in collection basin 421A to replace 12 in. sewer along Cypress Creek Rd between Timberwolf Trl and Anderson Mill Dr.



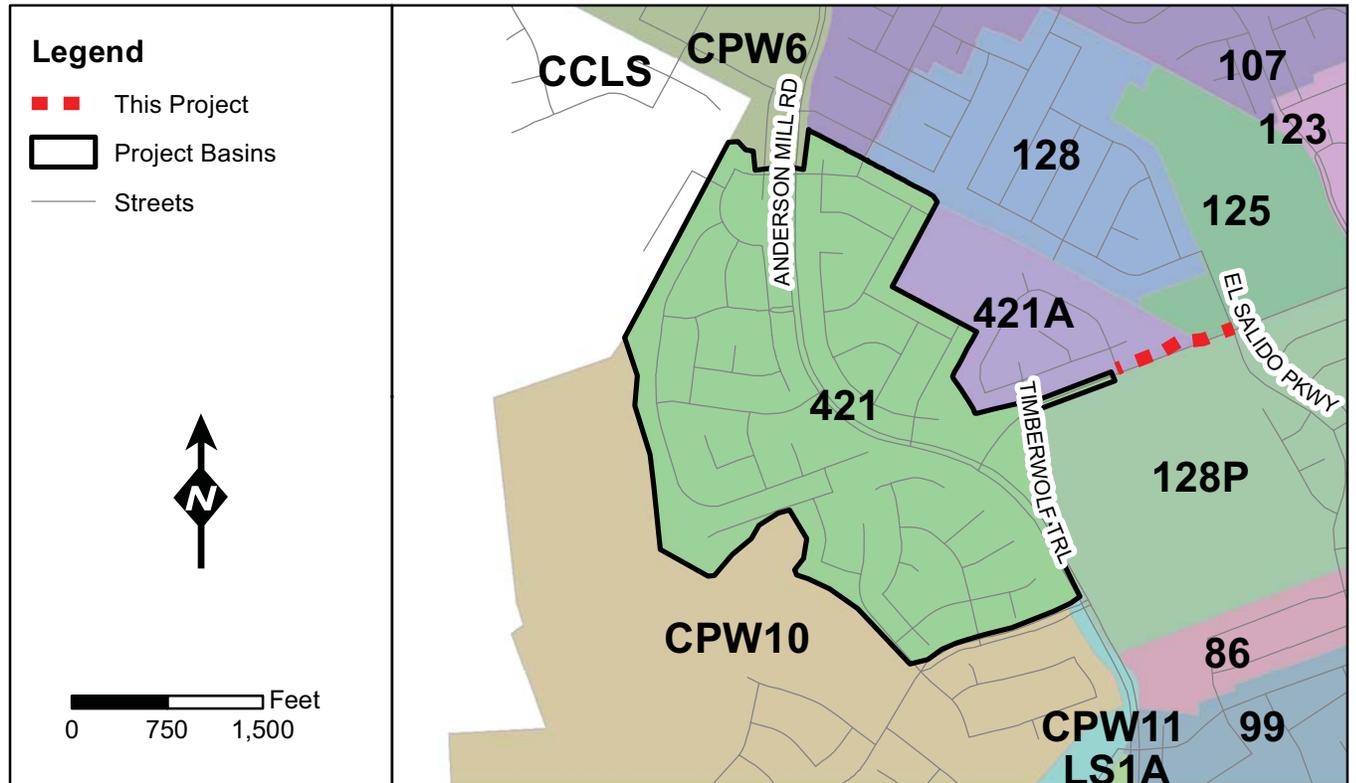
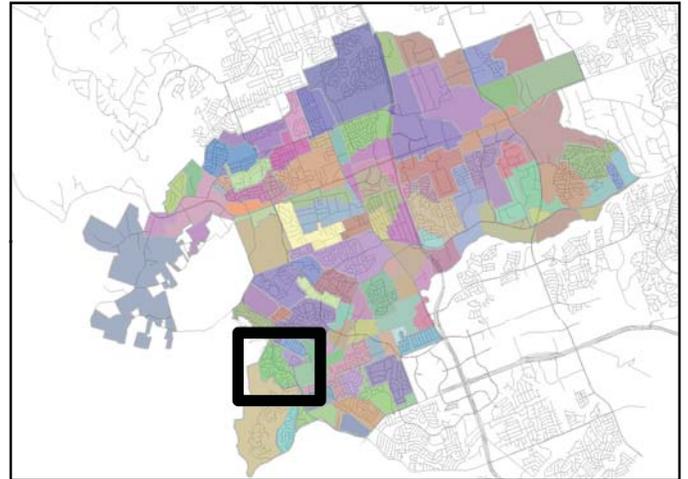
**Planning Level Cost:**

| Project # | Diameter (in): | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|----------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW -7     | 15             | 990          | \$174                     | \$164,800         | \$225                     | \$225,000     |

\*Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

**Justification:**

This project will provide additional capacity for current/future needs.



**Project Number:** CIP -WW-10

**Planning Period:** 2013 - 2018

**Description:** The Lobo Tunnel is an 8,000 foot 42" diameter tunnel to eliminate the 6000 GPM Lobo lift station.



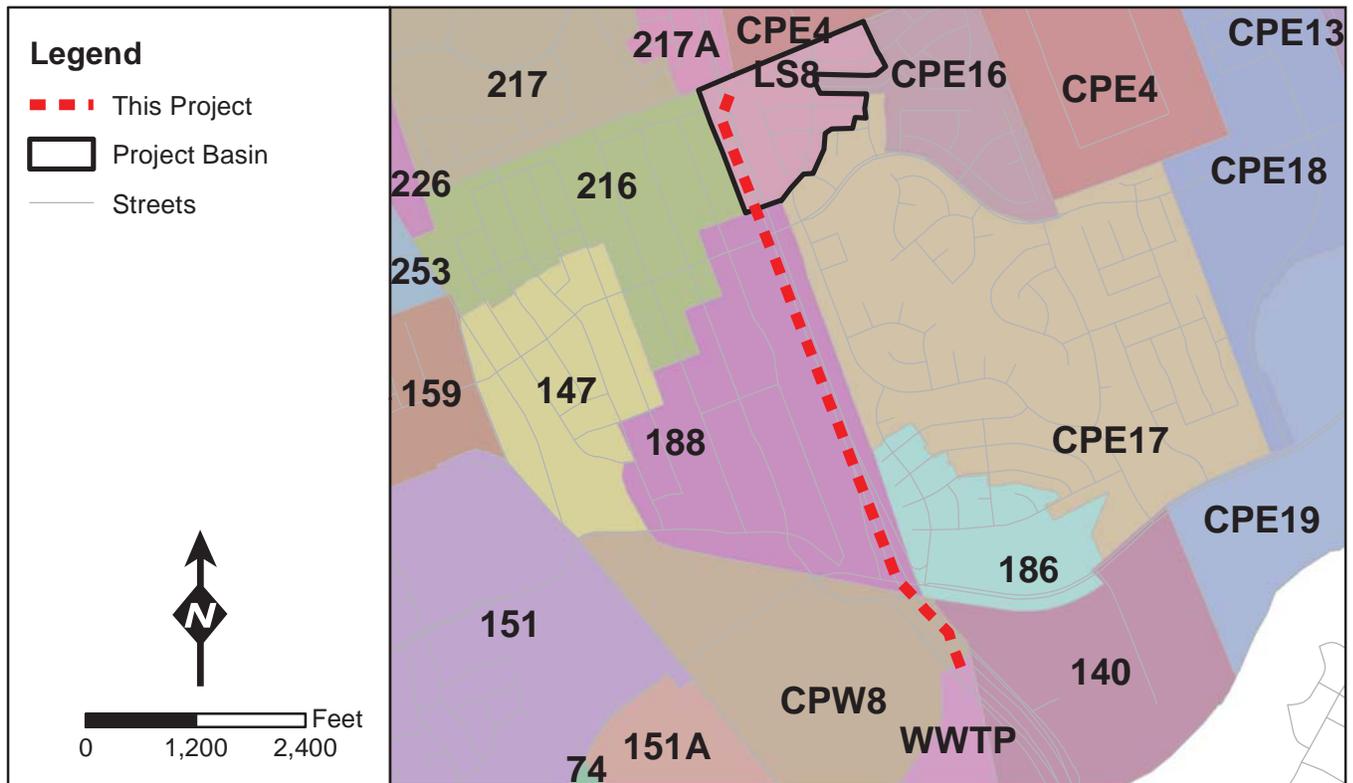
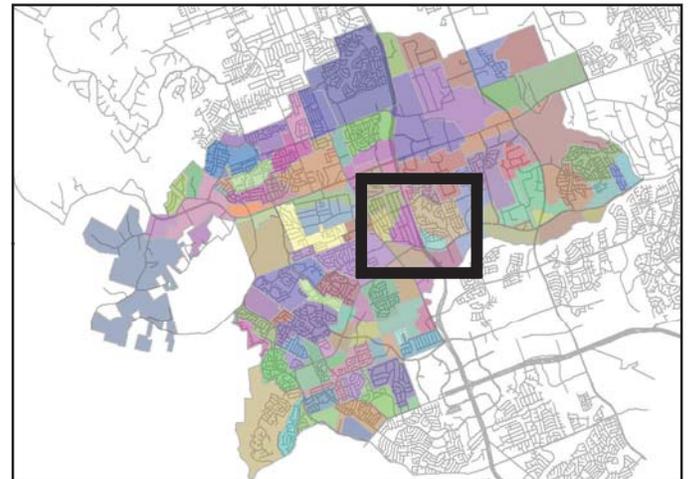
**Planning Level Cost:**

| Project # | Diameter, in | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|--------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW-10     | 42           | 8,000        | \$111                     | \$860,000         | \$107                     | \$8,992,000   |

\* Note: Project Costs equal Construction Costs plus an additional 30% for Engineering, Construction Management, and Administration costs.

**Justification:**

This project reduces maintenance and operation costs, and overflow liability by taking the Lobo lift station off line. The primary purpose of this project is to reduce potential sanitary sewer overflows (SSOs) at the existing Lobo lift station.



**Project Number:** CIP -WW-12

**Planning Period:** 2040

**Description:** New 24 in. wastewater line in collection basin 226 to replace 15 in. sewer under N. Bell Blvd. to the railroad tracks. Consists of bore under N. Bell Blvd.



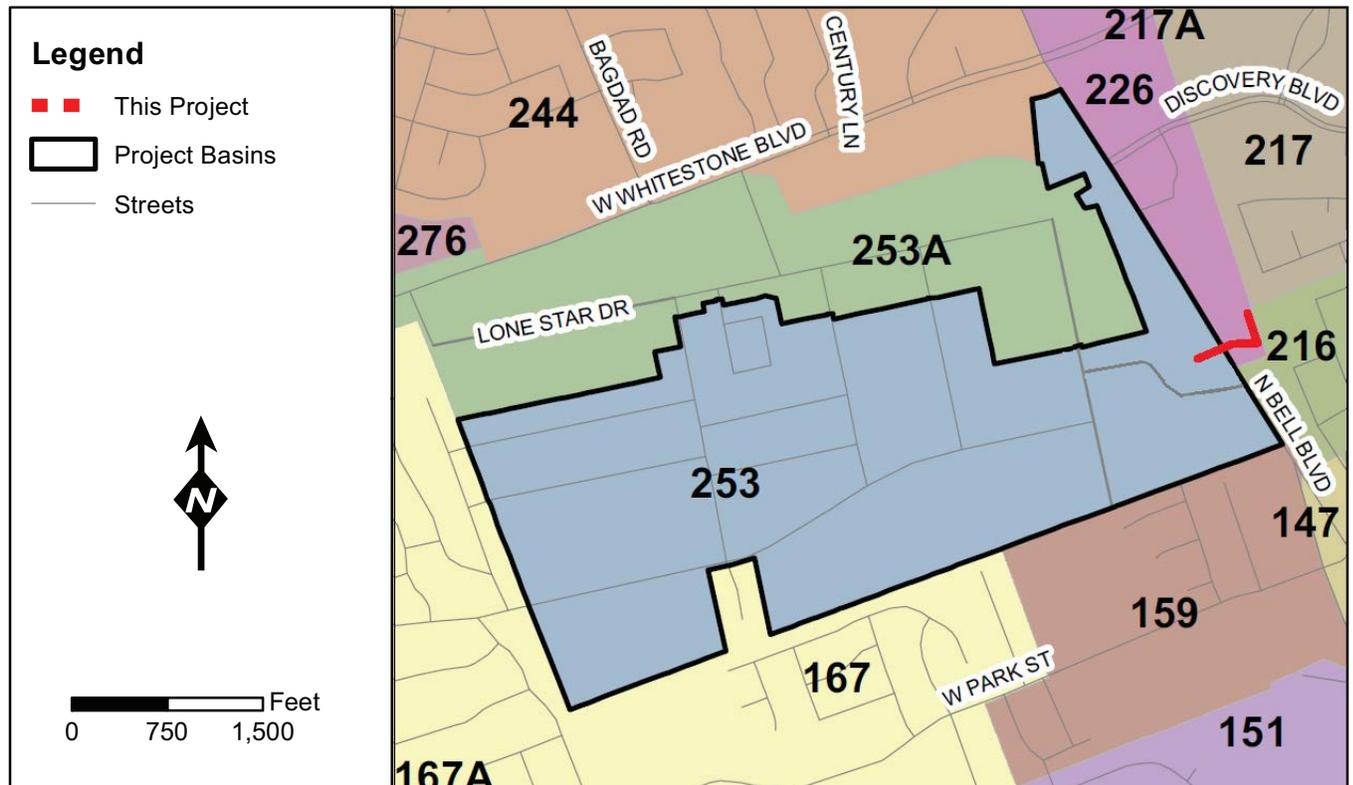
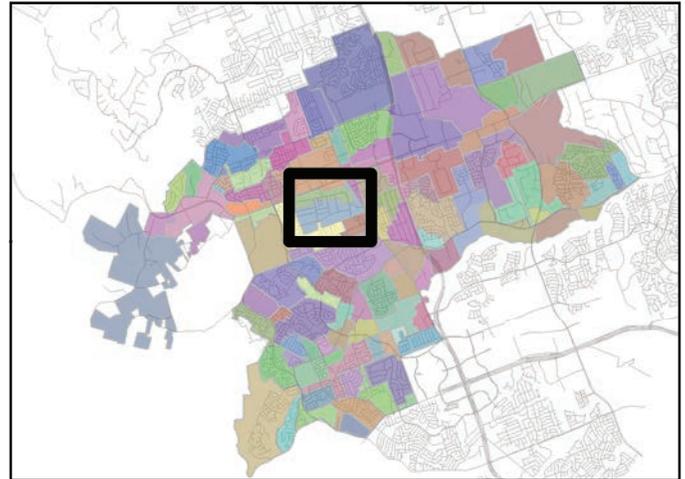
**2017 Planning Level Cost:**

| Project # | Diameter (in): | Quantity, LF | Unit Price - Construction | Construction Cost | Unit Price - Project Cost | Project Cost* |
|-----------|----------------|--------------|---------------------------|-------------------|---------------------------|---------------|
| WW- 12    | 24             | 350          | \$900                     | \$315,000         | \$1,180                   | \$413,000     |

\*Note: Project Costs equal Construction Costs plus an additional 40% for Engineering, Construction Management, Permitting, and Administration costs.

**Justification:**

This project will provide additional capacity for future needs.

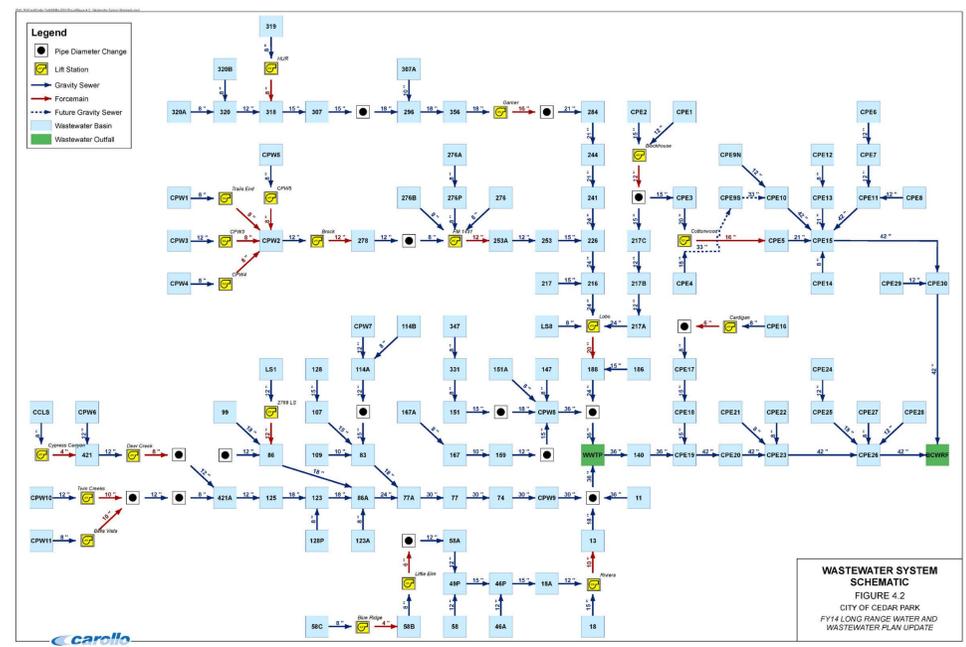
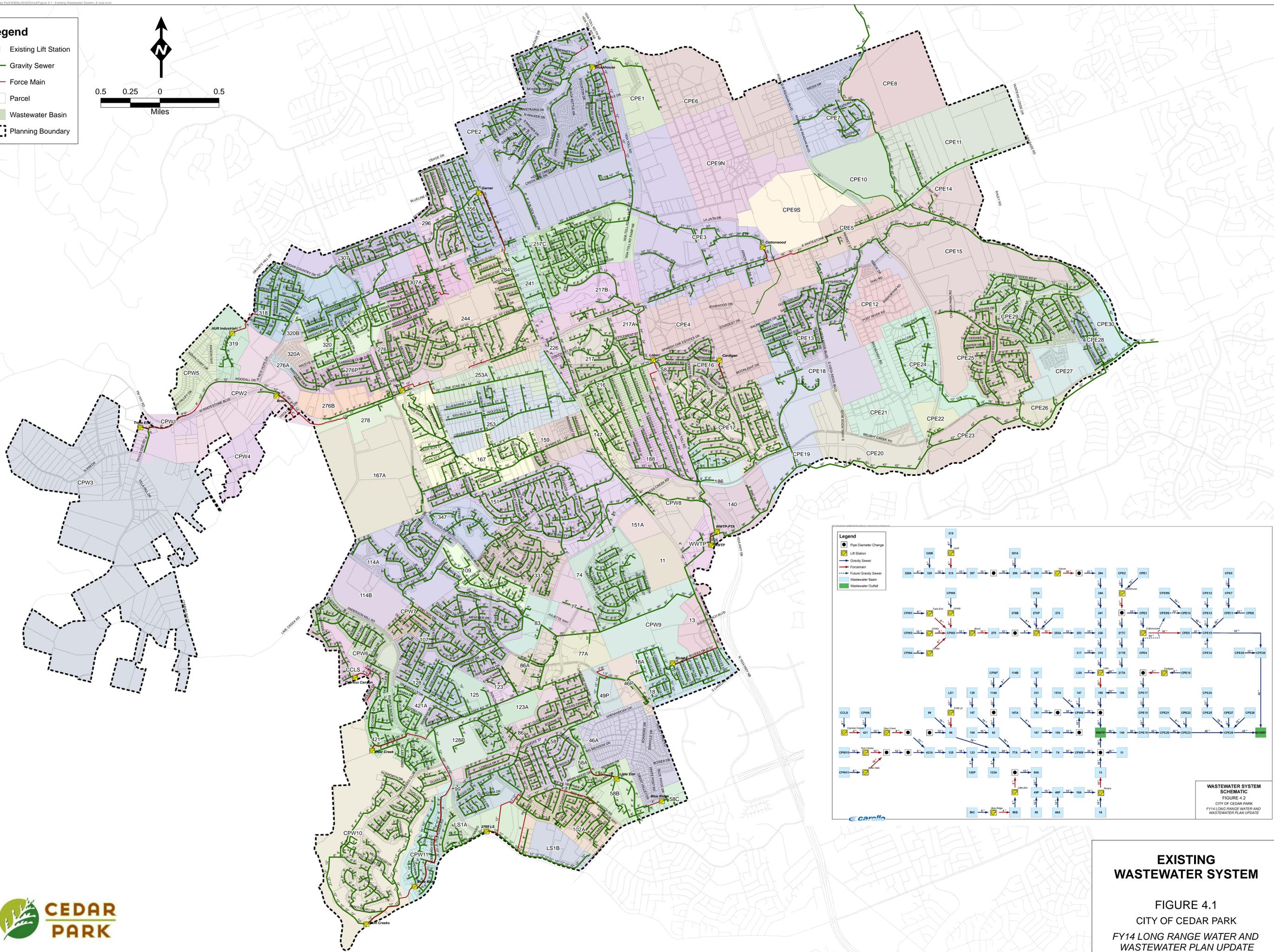
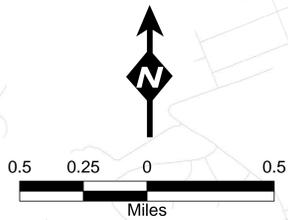


## **Appendix B: Reference Figures**



**Legend**

-  Existing Lift Station
-  Gravity Sewer
-  Force Main
-  Parcel
-  Wastewater Basin
-  Planning Boundary



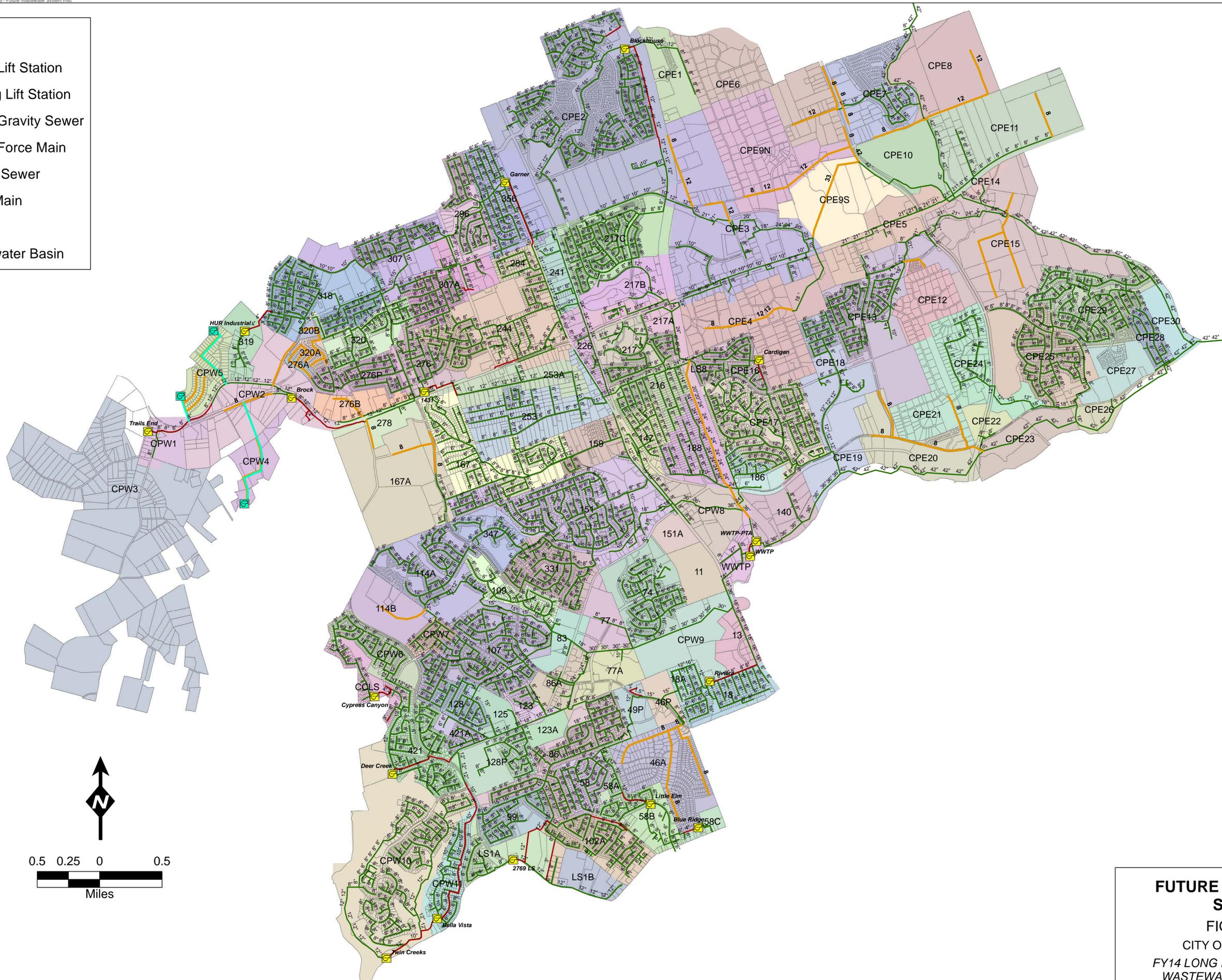
**EXISTING  
WASTEWATER SYSTEM**

FIGURE 4.1  
CITY OF CEDAR PARK  
FY14 LONG RANGE WATER AND  
WASTEWATER PLAN UPDATE



### Legend

-  Future Lift Station
-  Existing Lift Station
-  Future Gravity Sewer
-  Future Force Main
-  Gravity Sewer
-  Force Main
-  Parcel
-  100A Wastewater Basin



**FUTURE WASTEWATER SYSTEM**  
**FIGURE 4.5**  
CITY OF CEDAR PARK  
FY14 LONG RANGE WATER AND WASTEWATER PLAN UPDATE