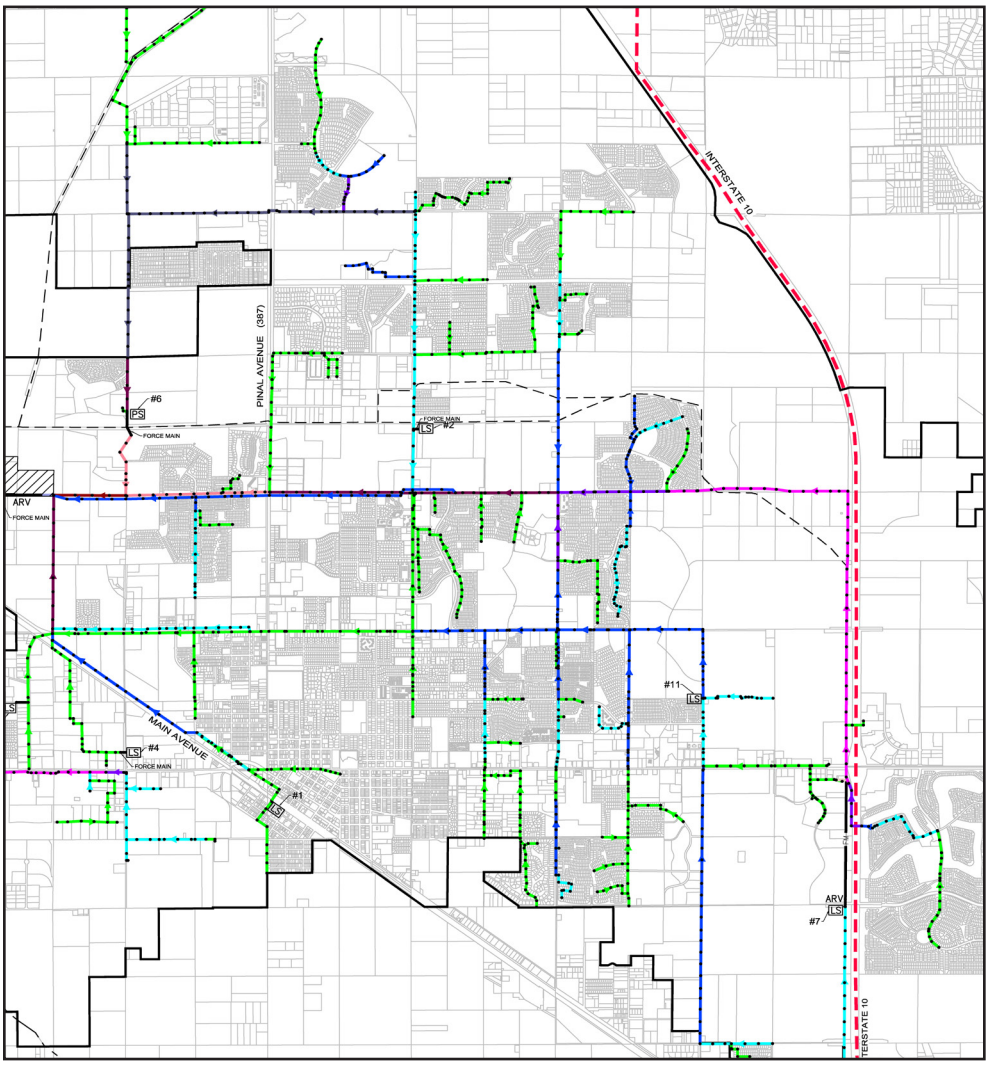

Wastewater Master Plan Update & Interceptor Sewer Modeling

Final Report - August 2014

City of Casa Grande

SUNRISE ENGINEERING

WASTEWATER MASTER PLAN UPDATE
& INTERCEPTOR SEWER MODELING

FOR

City of Casa Grande

AUGUST 2014

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1.0 INTRODUCTION

1.1 SCOPE OF WORK

The purpose of this Wastewater Master Plan Update is to provide the City of Casa Grande with an evaluation of the City's interceptor wastewater collection system. Currently there is a wastewater master plan being utilized by the City, however, allowances to deviate from that plan have been made to accommodate growth. As such, the modeling and analysis performed under this project reflect the sewer network as constructed, including the impact of these deviations. It is intended that this report will function as a planning tool to determine deficiencies with existing facilities, as well as sizing of projected facilities in both the "committed" and the future service area expansions of the City's sewer network.

The scope of work for the study consisted of 5 major tasks including:

- Data Collection & Supplemental Manhole Survey
- Sewer Interceptor Model Data Input
- Sewer Interceptor Modeling – 2014 Service Area
- Sewer Interceptor Modeling – Committed Service Area
- Sewer Interceptor Modeling – Future Service Area

This Wastewater Master Plan Update provided modeling and analysis of a substantial portion of the wastewater service area within the City boundary and the General Plan 2020. However, this report does not provide a comprehensive analysis of the entire planning or service areas. The City understands that further analysis and master-planning will be required for those areas not covered in this report.

1.2 PROJECT PLANNING AREA

The City of Casa Grande is located in Pinal County approximately 50 miles southeast of Phoenix. The City is adjacent to the City of Eloy to the southeast and the City of Coolidge to the east. The project planning area is within a portion of the City of Casa Grande 2020 planning boundary as shown on the map in **Figure 1.2.1 – Project Planning Boundary**. The boundary was established by the City to accommodate projected short and long term planning needs.

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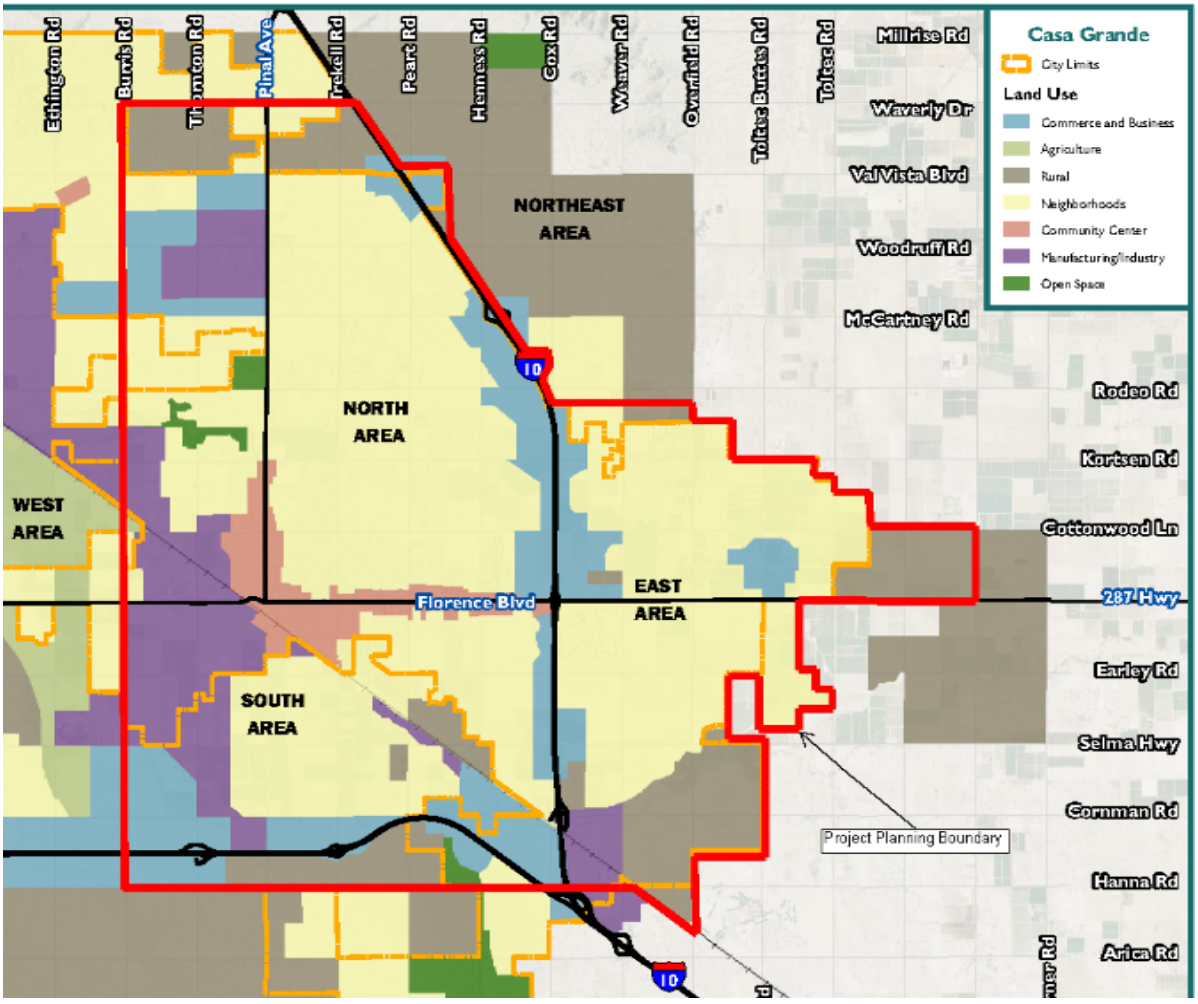
The area within the City planning boundary, north of Rodeo Road and east of the I-10 is known as the Northeast Area. While flows from the Northeast Area have been accounted for in the future service area modeling scenario, detailed modeling and a proposed interceptor sizing layout within this area were not included as part of the study. In addition to the Northeast Area, the West Area, everything west of Burris Road, is also not included. Eventually the City plans to expand modeling efforts to the West Area, extending to Montgomery Road to the west, and the 2020 Planning Boundary to the north and south. Montgomery Road is the dividing line between the City's Service Area & Global Water Resources' Service Area.

Figure 1.2.1



1.3 BACKGROUND INFORMATION

Over the years multiple sewer interceptor models, analyses and master plans have been developed to service the planning areas defined by the City. Differences between these plans are slight in some instances and highly variable in others. Growth and development in Casa Grande has necessitated the expansion of the City's interceptor system. Most of the sizing and routing for these expansions has been based on the *Wastewater Master Plan Phase I Conceptual Plan*, August 2006, by Carollo Engineers. Some of the interceptor routing shown in the 2006 Wastewater Master Plan has changed. In addition, the City's General Plan has changed, which has a direct impact on the flow loading of the City's interceptor system.

There are two main reasons for a Wastewater Master Plan Update. The first reason is to provide an analysis of City's interceptor sewer system based on the latest General Plan and the changes that have occurred over the past eight years since the Carollo report was written. The second

purpose is to provide a modeling tool for the City to easily perform additional analyses for future development and service area expansions.

It should be noted that the interceptor layout in the East Area model was heavily influenced by the City's decision to utilize the previous sewer models and master plans. As a result, some of the routing in the East Areas closely mimics that of the Carollo report; however, sizes have changed due to updated land use, topography, and flow loading. Utilizing the previous wastewater master plans, and making adjustments, as necessary, produced a comprehensive and efficient layout for serving the East Area.

1.4 OUTFALL CAPACITIES

The topography of the City generally slopes in a southwesterly direction at approximately 0.5% North of Rodeo Road and in a northwesterly direction at approximately 0.25% South of Kortsen Road. The North Branch of the Santa Cruz Wash flows from east to west in between the Kortsen and Rodeo Road alignments. As expected from the topography, all of the City's interceptors feed into the Kortsen interceptors which eventually convey flow to the ultimate outfall at the Casa Grande Water Reclamation Facility (CGWRF). The CGWRF is owned and operated by the City of City of Casa Grande and has a current capacity of 12 MGD. The City of Casa Grande will likely expand this facility beyond the currently planned capacity to meet future demand.

Figure 1.4.1 – CGWRF shows the aerial view of the Casa Grande Water Reclamation Facility located at the northeast corner of Burris Road and Kortsen Road.

Figure 1.4.1

1.5 PREVIOUS STUDIES

The analysis shown in this report primarily used background data from two previous wastewater collection system reports prepared for the City and the latest General Plan, which are as follows:

Wastewater Master Plan Phase I Conceptual Plan, August 2006, *Carollo*: This study provided an analysis of the City's existing sewer system and provided a basis for future sewer interceptor construction throughout the City. This study includes the modeling and master planning of the "Option 4" service area.

Sewer Model Report – Rodeo Road Interceptor Sewer, February 2009, *Olsson Associates:* An additional analysis utilizing the Carollo model and focusing on the interceptor in Kortsen Road from the CGWRF to the I-10. This study also looked at the potential need for a major east-west interceptor along the Rodeo Road alignment to handle future development. It analyzed development east of I-10 and how to potentially convey flow to the Kortsen Road interceptor. The report includes a significant amount of new survey data for the interceptor sewer mains within the Cottonwood Lane and Kortsen Road corridors.

City of Casa Grande General Plan 2020, July 2009, *City of Casa Grande:* This study provides a comprehensive reference for guiding future growth and development within the City limits and planning boundary.

1.6 MODELING SOFTWARE

The modeling software employed in this analysis was H_2OMAP Sewer Pro Suite version 10.5, by *Innovyze*. H_2OMAP Sewer is a powerful, stand-alone GIS-based computer program for use in the planning, design, analysis, and expansion of sanitary, storm and combined sewer collection systems. The program can be effectively used to model both dry-weather and wet-weather flows and determine the most cost-effective and reliable method of wastewater collection. The software allows the user to seamlessly view, manipulate, and exchange GIS data sets with relative ease. This feature is particularly beneficial because all hydraulic and geometric data sets generated from the project modeling can be fully integrated into the City's GIS database. The City utilizes the GIS based InfoSewer, also by *Innovyze*, which runs within ArcGIS.

In addition, H_2OMAP Sewer and InfoSewer allow various shapefiles and images to be brought into the modeling environment for reference purposes or data storage. For example, parcel shapefiles can be utilized to store a specified allocation manhole. In other words, every parcel in the City could store the unique manhole ID to which it contributes flow. This same file could later be used, along with an overlaid land use shapefile, by H_2OMAP Sewer's Load Allocator module, to allocate sewer flow and population loads to a specific manhole. This is a powerful tool for the City staff to utilize when land usage and/or load factors change and thereby keep the interceptor model up to date with changing conditions.

2.0 DATA COLLECTION

Every attempt was made to ensure that model input data was current and representative of the actual physical system. This included analyzing GIS data provided by City and comparing it against supplemental survey data, as well as sewer record drawings and available technical reports.

2.1 CITY DATA COLLECTION

The first project task involved coordination with the City's GIS department to retrieve any pertinent sewer data for inclusion in the model. This data consisted of digital shapefiles, which can easily be imported with H_2OMAP Sewer, and other appurtenant files which supported the completion of the collection system mapping and model setup. The files collected included the following:

- Aerial Imagery
- Sewer As-built Record Drawings
- Previous Interceptor Models
- Parcel Information (City and County)
- GIS Existing Sewer Interceptor Network
  - Manholes (shapefile)
  - Gravity Pipes (shapefile)
  - Force Mains (shapefile)
- Pinal County Topography (contours)
- Land Use Data
  - City Zoning Map (shapefile)
  - General Plan 2020 Map (shapefile)
- Sewer Flow Data
  - Existing and Proposed SIUs
  - Proposed Major Developments
  - Metered Flows

In general, the data provided appeared to be consistent with the horizontal datum AZ83CIF (Arizona State Plan Coordinates, NAD83, Central Zone, International Feet), and the vertical datum NAVD88, US Feet. The major exceptions to this were record sewer as-built drawings, which were on different datum than the GIS data. However, the relative change in elevation from manhole to manhole (invert to invert) appeared to be the same between the as-builts and GIS.

The as-built data and reports were utilized to verify or update invert data whenever inconsistent or questionable data was observed. Considerable time was also taken to ensure that elevations were accurate at major flow split locations. As part of that effort, field-survey data was obtained (See **Section 2.2**) to verify or correct elevations at various points in the network.

2.2 INTERCEPTOR MANHOLE SURVEY

The City requested that critical locations in the system, including major flow splits, be verified in order to refine the model input data. Therefore a field survey of approximately 30 sewer interceptor manholes was conducted as part of the data collection effort. Surveyors collected the following data for each manhole: horizontal location (northing & easting), rim elevation, depth to pipe inverts, and compass direction of inverts. The existing rim and invert data from the field survey was then input into the model.

Manhole rim elevations at non-critical locations were verified using the latest aerial topography from Pinal County. This review indicated general consistency between the aerial topography and the GIS data. A combination of field survey data, as-built maps, and technical reports were used to verify the GIS rim and invert elevations. The approximate location of flow splits and other critical manholes are shown in Table 2.2.1.

Table 2.2.1

Manhole ID	Location	Manhole ID	Location
1024	Cottonwood & French St	2673	Florence Blvd (GBH) & 1st St
1143	Kortsen & Thornton	2836	Kortsen & Pinal
1145	Kortsen & Thornton	2837	Kortsen & Pinal
1368	9th St & Peart Rd	2915*	Cottonwood & Trekell Rd
1925	Kortsen & Schultz St	5869*	Cottonwood & Trekell Rd
1931	Kortsen & Raintree Dr	3027*	Kortsen & Peart Rd
2092	Kortsen & Vista Ln	3033*	Cottonwood & Peart
2094	East of Kortsen & Trekell Rd	3343*	Cottonwood & Peart
2095	Kortsen & Trekell Rd	3292	Kortsen & Colorado St
2096	Kortsen & Trekell Rd	4801	Cottonwood & Schultz St
3017	Kortsen & Trekell Rd	7299	Cottonwood & Schultz St
2098	West of Kortsen & Trekell Rd	1019	Cottonwood & Schultz St
2099	West of Kortsen & Trekell Rd	4814	Kortsen & Cox
2935	West of Kortsen & Trekell Rd	7290	Kortsen & Maria Ave
2298	Kortsen & Friar Rd	7319	Kortsen Road & CGWRF Outfall
2627	Kortsen & Arizola Rd	8208	Kortsen Road & CGWRF Outfall
2672	Florence Blvd (GBH) & 1st St	7320	East of Kortsen & Pueblo

*Obtained from As-Built Maps or Reports.

2.3 CITY OF CASA GRANDE LAND USE

Two sources were used to define land use for the Interceptor Sewer Model; the current City of Casa Grande Zoning Map and the General Plan 2020 Map (See Appendix C).

For developed parcels within the existing city limits, land use was primarily based on the City's Zoning Map. However, in some residential areas, the density (DU/Acre) within existing subdivisions was found to be different than the density defined by the current zoning. In those areas, the modeling was adjusted to account for the actual density (See Appendix D, 2014 Flow Calibration).

Undeveloped parcels within the existing city limits were defined by both the current Zoning Map and the General Plan 2020 Map. In general, variations in land use between the two maps were minimal and the current zoning densities are consistent with the range of densities described in the General Plan 2020 Report. Undeveloped parcels outside of the existing city limits but within the planning boundary were solely defined by the General Plan 2020 Map.

Defining land usage within the study boundary was a critical component in developing the loading factors for the model. Loading factors allow you to apply a sewer flow rate per unit area, usually gallons per day per acre (GPD/Acre) or cubic feet per second per acre (CFS/Acre). For residential areas the load factor can be derived from a known density (DU/Acre) for a given land use, a known occupancy (persons/DU), and a known capita flow rate (GPD/person).

2.4 VACANT AND OCCUPIED LAND PARCELS

In order to make a clear distinction between occupied parcels and vacant land, the 2014 Connections Map was developed (See **Exhibit 2.4.1**). The occupied land parcels have been divided into three groups; Existing, Existing–Heavy Industrial, & Septic. The Existing group includes developed parcels that are currently connected to the City's sewer infrastructure network. The Existing – Heavy Industrial group consists of those parcels being served by the City which have been categorized as a Significant Industrial User (SIU) or a Categorical Industrial User (CIU). The Septic group was determined to be those parcels where a dwelling unit was present but adjacent sewer facilities were not. The vacant land parcels have been divided into two groups; Committed and Vacant. Vacant parcels include undeveloped land that will eventually connect to the City's sanitary network but no infrastructure is currently constructed. Committed parcels include undeveloped land that the City either already has infrastructure in place to serve or plans to develop infrastructure to serve in the near future.

While most parcels could easily be delineated into their respective group based on physical observations (e.g. existing buildings), the Committed parcels required extra effort and coordination with the City staff. The City chose to define the Committed group as parcels that fall within one of the following categories:

1. Subdivisions that have a recorded plat with City (these are lots that the City is legally obligated to serve)
2. Developments that have filed a Notice of Intent to Discharge (Sewage Collection System) with the Arizona Department of Environmental Quality (ADEQ) or the City. These developments typically include:
    a. Planned Area Developments (PADs).
    b. Non-platted parcels which have received will-serve letters from the City.

Multiple files were provided from the GIS database including shapefiles of both platted and non-platted parcels to be included in the Committed group. Each of the parcels was also listed in a spreadsheet that had projected average daily sewer flow (ADF) with a population and a peaking factor or simply a peaked flow rate (each corresponding to a parcel shapefile). The GIS specific loads (platted and non-platted) were used in lieu of the allocated loads for these parcels in the model. Design flows were generally greater than flows defined by the land-use, i.e. more conservative estimates of future flows. Also, where shapefiles were unavailable, other resources were used to determine location and flow loading of the Committed development, like the City's online PAD library. Wherever flows seemed uncharacteristically high or low, even those parcels with flow data recorded in the GIS database were checked against the flows recorded in the PAD. In some cases, the PAD flow loading (or allocated loading) was used in place of incomplete or inaccurate GIS data.

Developing the Connections Map and defining the land-use groups was also necessary for defining the three main model scenarios for the project:

1. 2014 Scenario – Includes Existing and Existing-Heavy Industrial parcels.
2. Committed Scenario – Includes everything in the 2014 Scenario and Committed parcels.
3. Future Scenario – Includes everything in the Committed Scenario, Vacant, and Septic parcels, i.e. all areas within the project service area limits.

These model scenarios will allow City staff to determine what improvements need to be made to service current customers and determine what infrastructure must precede development on undeveloped parcels to be served. This will allow the City to designate CIP projects and funds for appropriate solutions.

Note: There are a few large parcels that have a single dwelling unit (DU) on them, with the majority of the parcel being used for agricultural purposes. Consequently there are a few parcels that are shown as Existing on the Connections map, but a majority of the parcel is not contributing sewage flows. This has been taken into consideration when modeling the 2014 Scenario.

2.5 HISTORIC SEWAGE FLOWS

Existing and projected flow rates within the sewer model have a direct correlation to the land use definitions for the service area. Once the land use for all parcels within both the current City boundary and the City's planning boundary were identified, a loading chart was developed for each of these land uses. This chart shows the land usage type and ultimately the unit load (GPD/Acre) that was used for each parcel type and acreage within the model. The development of load factors is more thoroughly discussed in **Section 3.0 Design Criteria**. As may be surmised, loading factors vary widely between the different residential, commercial, and industrial land uses. Load factors for the same land use type may also vary depending on whether they are being applied to an existing conditions model scenario or a proposed conditions model scenario. That is, proposed loading charts are typically more conservative, i.e. larger load factors, and conform to ADEQ requirements for design flows.

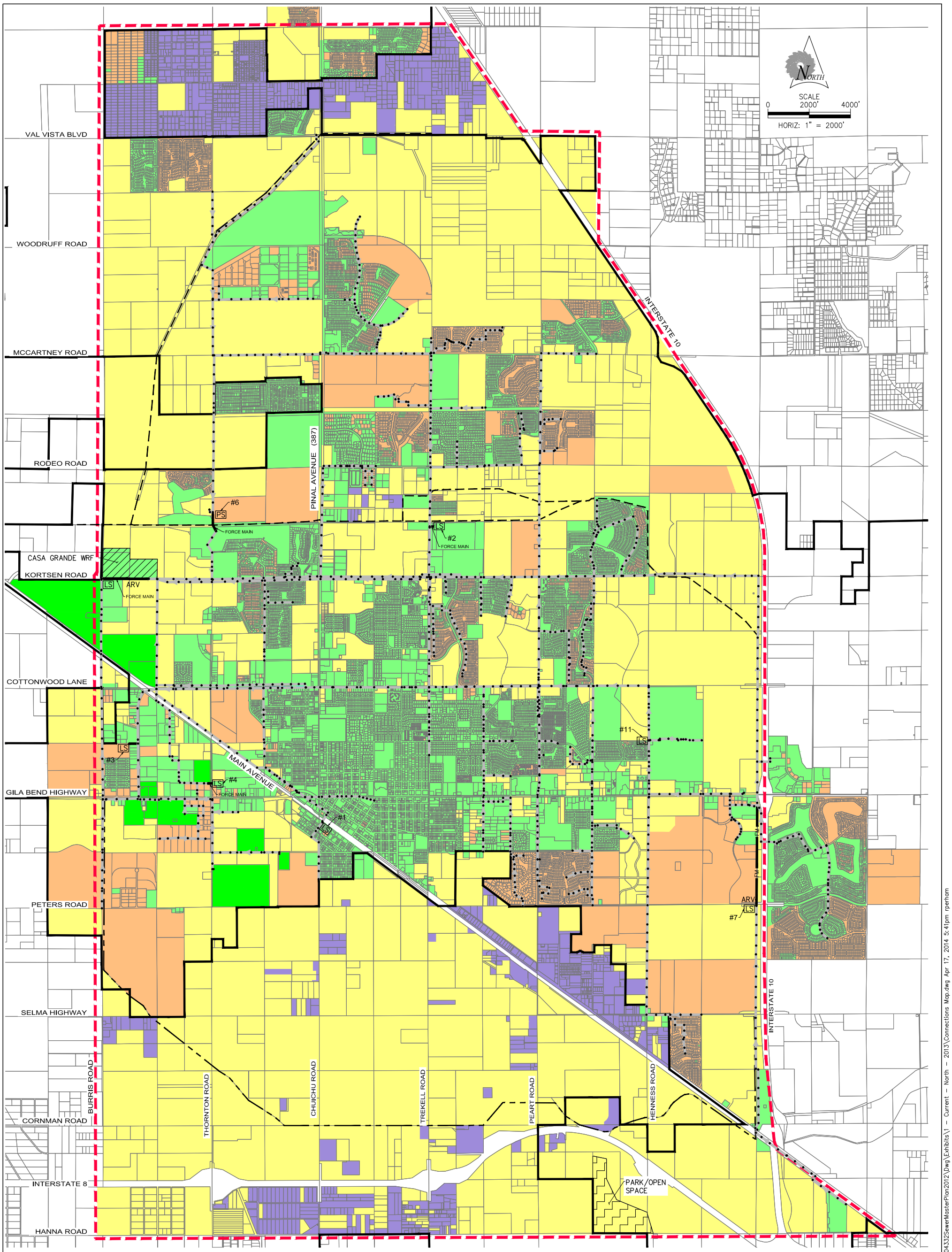
The module which runs within the H_2OMAP Sewer software and utilizes load factors and parcel acreage to develop sewer flows (and contributing populations) is known as the Load Allocator. Consequently, all sewer loads developed in the model using this tool are known as Allocated Loads. This was the primary method used to develop sewage flows for each of the three model scenarios. There were also loads that were entered manually for each of the scenarios which are referred to as Known Loads. The Known Loads for the 2014 Scenario consisted of known, permitted, or metered flow rates from the industrial users. In the Committed Scenario and Future Scenario, known loading was entered for PADs, subdivisions, and parcels that had a calculated design flow. These design flows were taken from available technical reports that were prepared by consulting engineers for the development.

After initial model loading (Allocated and Known), flow monitoring results were used to calibrate the Existing Scenario to more accurately represent the field measurements observed. This was a critical step in the modeling process as the existing conditions provide the base for which all other scenarios are built upon. The City provided historic sewage flow at various monitoring locations throughout the City. This included metered flows from the CGWRF and other critical locations, for a total of 15 monitoring sites (See **Exhibit 2.5.1** Flow Monitoring Map). On average, one to two weeks of continuous monitoring time was provided for each site. However, monthly flow totals were provided at the active outfall location, as well as, a peak day flow of 6.5 million gallons for the entire system. Flow monitoring results were used to iterate different load variations. While loading was not adjusted to match the monitoring data exactly, adjustments were made to the load chart in order to make the model as representative of the existing system, as possible. This was accomplished by calibrating the load factor input data: daily flow per capita (gallons/capita/day), occupancy (people/DU), and density (DU/Acre).

As a result of the flow monitoring, it was revealed that the zoning density (DU/Acre) was not accurate for several land uses, especially R-1, R-3, and PAD. The density was adjusted (based on actual parcel counts) to more accurately reflect densities of these land uses in the existing system. After calibration, modeled flows in the existing conditions model remain slightly more conservative than provided monitoring data. This was expected as some of the flow monitoring data wasn't current and/or was collected during non-peak months. It should also be noted that some of the flow monitoring data was collected prior to the construction of the Gila Bend Highway Sewer Interceptor. Therefore, monitoring results in this area aren't necessarily a true reflection of existing conditions.

Further calibration of the model should be conducted when the City has in place a more extensive monitoring program. Adding more flow monitoring sites could improve the accuracy of the modeling and monitoring flows throughout the year would allow the City to capture flow variations in population and wet weather conditions. Most of the monitoring data doesn't take into account "seasonal flow" increases from the approximate 10,000 to 15,000 capita change during the high season. The substantial population increase that occurs between the months of October and April can cause significant increases (as much as 20%) in the system. Interceptors that will see the greatest fluctuation in flow are those adjacent to high density retirement communities or any residential developments with concentrated groups of seasonal visitors. As part of the expanded monitoring program, the City should be able to start tracking and quantifying these changes. For this study, all parcels with existing homes were loaded into the model, therefore seasonal visitors were accounted for in the existing service area.

SECTION 2
FIGURES & EXHIBITS



CONNECTIONS AREA LEGEND

- EXISTING CONNECTIONS
- EXISTING CONNECTIONS – HEAVY INDUSTRIAL
- COMMITTED CONNECTIONS
- SEPTIC
- VACANT LAND (FUTURE CONNECTIONS)

LEGEND

- STUDY LIMITS
- CITY LIMITS
- SEWER 2014
- FM FORCE MAIN
- LS LIFT STATION
- MANHOLE
- EXISTING CANAL
- EXISTING WASH
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 2.4.1

2014 CONNECTIONS MAP

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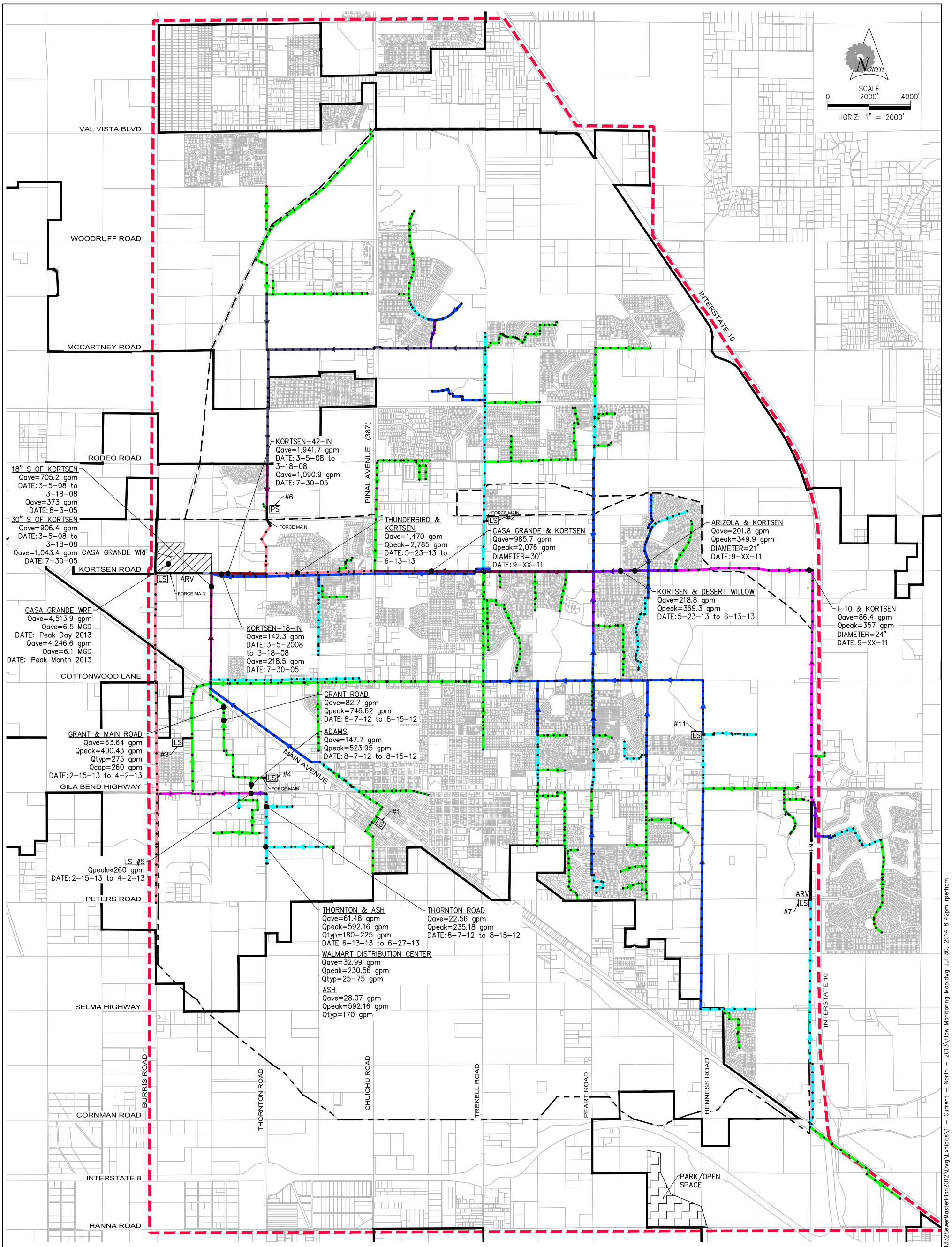

LEGEND

- STUDY LIMITS
- CITY LIMITS
- 10" SEWER
- 12" SEWER
- 15" SEWER
- 18" SEWER
- 21" SEWER
- 24" SEWER
- 27" SEWER
- 30" SEWER
- 36" SEWER
- 42" SEWER
- 48" SEWER
- FM FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- MANHOLE
- ARV AIR RELEASE VALVE
- LS LIFT STATION
- PS PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 2.5.1

FLOW MONITORING MAP

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3.0 DESIGN CRITERIA

3.1 ADEQ REQUIREMENTS

This report utilized the Arizona Department of Environmental Quality (ADEQ) minimum sewer collection system design guidelines in the Arizona Administrative Code (AAC) Title 18, Chapter 9, Article 3, Part E. Type 4 General Permits (Last amended on Nov. 12, 2005) as the basis for the design criteria. See **Appendix A - ADEQ Minimum Standards** for AAC codes and minimum sewer system design constraints relating to sewer collection systems including Table 1, Unit Design Flows.

Per ADEQ standards (R18-9-E301.4.01), all proposed sewer interceptors were designed and all existing interceptors were checked against the following criteria:

- Slopes that ensure a minimum velocity of 2 feet per second (ft/s) and a maximum velocity of 10 ft/s when flowing full, using a Manning's roughness coefficient of 0.013.
- Base design flow shall be 80 gal/capita/day.
- Maximum manhole spacing is dependent on interceptor sizing and shall not exceed that which is prescribed by ADEQ for a given pipe diameter.
- Maintain minimum cover of 3 feet over all proposed sewer pipes.
- Ratio of flow depth to the pipe diameter (d/D) shall not exceed 0.75 in peak dry weather conditions
- Population-based Peaking Factors (applied to cumulative loading for all pipes)

3.2 CITY OF CASA GRANDE REQUIREMENTS

In addition to ADEQ requirements, this report uses current sewer design standards established by the City of Casa Grande. Some of these requirements are from City Code, while others were directly outlined by the City Engineer for this project. The design criteria that governed the analysis, modeling and master planning for the project are as follows:

1. For the purposes of this project, modeling shall only be conducted for sewer interceptors ("trunk lines"). An interceptor is defined as any sanitary sewer pipe, within the City's system, 12 inches in diameter or greater. Some 12-inch diameter pipes were excluded from the analysis because they were later determined to be a minor lateral sewer pipe that fed into a true interceptor.

2. The City believes, based on the observed flows and the proliferation of water-saving technologies, 80 gal/capita/day is sufficient for planning purposes. This design flow was used for sizing proposed interceptors in all residential areas within the City's planning area and for determining equivalent populations for commercial and industrial flows.

3. Although a detailed analysis of the Northeast Area is not included in the scope of this report, the City requested that the flows generated from this area be accounted for in the Future Scenario of the interceptor model. Originally, it was suggested to bring the Northeast flows south to combine with the East Area flows and cross the Interstate 10 Freeway (I-10) in one large diameter pipe at Kortsen Road. Later it was decided that returning to two smaller diameter pipe crossings would better fit the City's needs given the current development trends. McCartney and Kortsen Road were selected for the crossing locations represented in this report.

4. There is an existing sewer manhole located at the intersection of Cox Road and Kortsen Road. The City requested that the proposed pipe network for the East Area match the existing invert elevation within this manhole. Matching inverts at this location allows the City to accommodate flows generated east of the I-10 within the existing system on an interim basis. A future continuation of this sewer will be required to provide adequate capacity westerly from this point.

5. The City Engineer directed that the minimum loading rate (gallons/day/acre) for parcels that are zoned commercial/business be not less than the loading rate for R-1 residential zoning. This will give the City more flexibility when commercial parcels request a land use amendment to convert to residential.

6. The City directed that the minimum loading rate for parcels that are zoned industrial be not less than 1500 gallons/day/acre. This is based on the observed flows of the current industrial users being served by the City.

7. All proposed interceptor sewers will be located within or adjacent to arterial street rights-of-way.

8. A 0.2 foot drop from invert to invert will be included in manholes where the main flow changes in direction 90 degrees.

9. All rim elevations for proposed manholes shall match the most current topography provided by the City.

10. Maintain minimum cover of 6 feet or greater over all proposed sewer pipes.

11. The master planning shall conform to the current City Design Standards for sewer systems unless otherwise directed by the City Engineer.

12. Irrigation canal crossings should be avoided wherever possible.

13. Parallel interceptors should be avoided wherever possible. System maintenance becomes more difficult and less efficient where parallel lines exist.

14. The master plan should not include interim sizing. All sizing should be based on future flow conditions to avoid the costs of replacing a newly constructed line or necessitating a parallel line. However, the development of a flushing plan may be required in the interim between construction of the interceptor and build out of the sewer shed.

3.3 RESIDENTIAL FLOW RATES

A majority of connections within the existing system (and the future system) fall under a residential land use. Under the City's current zoning there are a range of different residential uses including:

- R-1 (Single Family Housing, Low Density)
- R-1a (Single Family Housing, Moderate Density)
- R-2 (Multiple Family Housing, Medium Density, Duplex-Fourplex)
- R-3 (Multiple Family Housing, High Density, Apartments)
- R-4 (Mobile Home Subdivision, Medium Density)
- RR (Rural Ranch, Low Density, Single Family with Agricultural Use)
- UR (Urban Ranch, Low Density, Single Family with Agricultural Use)
- PAD (Planned Area Development, Varied Density, Mixed Residential and Commercial Use)
- PAD-RV (Recreational Vehicle Park Overlay Zoning District, High Density with Open Space)

For each of the residential uses described, a unique loading factor (cfs/acre) was developed in order to calculate the anticipated flow rates for parcels that fell within that land use. Beyond the City limits, land use is solely defined by the General Plan 2020. The General Plan residential uses encompass a much broader range of densities and uses within each category. Unique loading factors were developed for these, as well.

Load factors were initially established using the sanitary sewer design standards requirements from the City Code: Title 16 SUBDIVISIONS / Chapter 16.16 DESIGN STANDARDS / 16.16.390 Public Land Reservation Requirements – Table 4 – Design Factors (Appendix B – City of Casa Grande Standards). Table 4 gives very conservative values for determining sewer flows for residential land uses. It was determined early on in project that the load factors developed from this table needed to be adjusted based on more current data and the flow monitoring results.

According to ADEQ requirements, collection system design flows must be calculated based on 80 gal/capita/day (excluding peaking factors), but allows for "lower unit flow values in the served area due to significant use of low-flow fixtures, hydrographs of actual flows, or other factors." A comparison of the historical sewage flow rates with the design flow rate required by ADEQ was investigated to determine if a "lower unit flow value" was justified. According to the Infrastructure Improvements Plan (IIP) – Wastewater Demand Factors developed in 2009, estimated average sewer flows contributed per person was actually 70 gallons/day.

Given recent flow monitoring data provided by the City, design standards, and recent reports, the 2014 Scenario load factors were based on a lower unit flow value of 70 gal/capita/day. Load factors for the Committed and Future Scenarios used the ADEQ minimum standard of 80 gal/capita/day. Based on water saving technology that will likely result in lower flows per capita in the future, using a loading factor of 80 gal/day/person is reasonable.

For the analysis of existing facilities and the design of new facilities, 3.11 people per dwelling unit was used based on the estimated occupancy for residents of Casa Grande connected to the sewer system from the IIP. However, for the 2014 Scenario, the model was showing higher total flows than the measured flows at the CGWRF. It was suggested that the occupancy value be lowered for the analysis of existing facilities. According to U.S. Census Bureau information, the average household size in Casa Grande is 2.79 people per household (2008-2012). Therefore, the loading factors were adjusted accordingly to be consistent with the most current census data and flow monitoring results.

While developing load factors to be used in the model, reducing the density of R-1 and R-1a to 3.5 DU/Acre was considered. R-1 and R-1a zoning would fall underneath the "Neighborhood" designation which has a citywide net target density of 4 DU/Acre (See pg. 72, General Plan 2020 Report). However, 4.5 DU/Acre is permitted if certain criteria are met. For planning purposes it was recommend keeping 4.5 DU/Acre for R-1 and R-1a density to be more conservative, with the exception of the Existing Scenario.

The Loading Tables for the three model scenarios can be found in Appendix D – 2014 Flow Data, Appendix E – Committed Flow Data, and Appendix F – Future Flow Data. These load factors were entered into the model to develop the Allocated Loads for both existing and future residential development. Known Loads from residential land uses were manually entered into the model for the Committed and Future Scenarios. Known Loads consisted of design flow rates that had been calculated for planned developments.

3.4 COMMERCIAL FLOW RATES

Commercial load factors in this report are based upon those utilized by comparable municipal entities in the region, in particular those of the Town of Gilbert and the Town of Queen Creek. Initially the unit loads used to estimate sewage flows from commercial developments were established using the Infrastructure Improvements Plan (i.e. 1,000 gallons per day per acre). These flows were not representative of the existing conditions. The Town of Gilbert presented commercial flow rates in their Wastewater Master Plan that are more representative of the City of Casa Grande's existing development. **Figure 3.4.1 - Commercial Flow Rate Comparison** correlates City of Casa Grande General Plan land uses and unit loads to Town of Gilbert and the Town of Queen Creek land uses and flows.

Load factors applied to the interceptor model for the various commercial zones are shown in the Loading Tables (Appendix D, E, & F). The City's commercial zones include:

- B-1 (Neighborhood Business Zone)
- B-2 (General Business Zone)
- B-3 (Central Business Zone)
- B-4 (Community Service Zone)
- CO (Commercial Office Zone)

The two commercial uses defined by the General Plan include Commerce and Business and Community Center. While the Existing Scenario used load factors from Gilbert, commercial/business loading for the Committed and Future Scenarios were set to the R-1 load factor. It was established that all future commercial/business loadings shall be, at a minimum, equal to R-1 residential loading to allow for potential zoning conversions from commercial to residential in the future. Known Loads from commercial land uses were also manually entered into the model for the Committed and Future Scenarios.

3.5 INDUSTRIAL FLOW RATES

After residential users, industrial land use areas are the second biggest contributor of sewer flows within the system. Industrial flows account for approximately 38% of City's wastewater. There are two different industrial uses under the City's current zoning including I-1 (Garden and Light Industrial) and I-2 (General Industrial Zone). As with other land uses described, a unique loading factor (GPD/Acre)) was developed in order to calculate the anticipated flow rates for parcels within that land use. The General Plan industrial uses fall under the Manufacturing/Industrial category. Loading factors developed for the General Plan areas mirrored those defined by the current zoning.

Load factors were initially established using the sanitary sewer design standards from the Infrastructure Improvements Plan, i.e. all non-residential (Industrial/Commercial) unit loads shall be based on 1,000 gallons per day per acre. However, the loading tables reflect a higher load value because the standard was not a realistic estimate of the existing industrial users. For this analysis, 1,500 gallons per day per acre was used to accommodate potential "heavy users" or SIUs in the existing conditions model and for future expansions to the system. The City's engineering department advised using the higher unit load based on the type of industrial users that have been attracted to the area.

In addition to the load factors developed for Allocated Loads, metered flow rates from industrial connections, provided by the City, were manually entered into the model. Known Loads from industrial users were primarily used in the Existing Scenario and include flows from the following:

- Abbott Nutrition/Laboratories
- Casa Grande Regional Medical Center (CGRMC)
- Daisy Brand
- Ehrmann Arizona Dairy
- Franklin Foods West
- Frito Lay, Inc.

- Hexcel Corporation
- Metal Solutions, LLC
- Monsanto Company
- Price Industries, Inc.
- Wal-Mart HVDC #7013
- National Vitamin

Given peaking factors from these users varied widely. Comparisons with the monitoring data at various manholes throughout the City did not show the large peaks that were anticipated from the provided industrial data. In fact, using large peaking factors disrupted the calibration of the rest of the model. Eventually, the average base flow from the industrial users was entered into the model and peaked according to an equivalent population. This method more closely matched the flow monitoring results. Note that all flow loading for SIUs was based on the flow monitoring results provided by the City for the respective users and not the permitted capacities. In most cases, the measured discharge was less than the permitted capacities. Known Loads were also manually entered in the Committed and Future Scenarios for anticipated flow increases from existing industrial users and new SIUs. Again, the increased loads were based on planned expansions and not the current permitted capacity.

The Flow Data appendices for each scenario (Appendix D, E, & F) give the estimated industrial user flow rates based on land usage and all known industrial flows. They represent all industrial flows applied to the hydraulic model of the City's sewer interceptor system.

3.6 PEAKING FACTORS

Dry Weather Peaking Factors were applied to all flows within the model based upon the total population upstream of the calculation point. ADEQ recommended peaking factors per R18-9-E301 (See **Appendix A - ADEQ Minimum Standards**, Dry Weather Peaking Factor Table) were entered into the model via a table showing peaking factor versus population. For populations greater than 1,000 the peaking factor must be calculated based upon given equations. These equations were also entered into the model.

The H_2OMAP Sewer Pro model applies peaking factors to flows by first adding the population of the upstream manholes. Next it applies the appropriate peaking factor from the loaded table based on the cumulative population total. This allows the model to develop a unique peaking factor based on the upstream population at each manhole node. The peaking factor is applied to the total non-peaked flow to that point.

Population calculations were used for calculation of peaking factors only. Actual City population projections were not estimated for this project. Where applicable, residential peaking factor populations were calculated using a value of 2.79 people per dwelling unit for existing conditions and 3.11 people per dwelling unit for future conditions. For commercial and industrial land uses, peaking factors were developed from equivalent populations, which were simulated by taking the flow rate of the land area and dividing by the City's historic water usage rate of 70 gal/capita/day (80 gal/capita/day for the future conditions).

Proposed pipes in the system are then designed such that d/D (ratio of flow depth in the pipe to the diameter of the pipe) does not exceed 0.75 when the peaked dry weather flow is applied. Existing pipes in the system are also checked to see if they exceed 0.75 d/D.

3.7 INFLOW AND INFILTRATION

R18-9-C305.2.05 General Permit: Capacity, Management, Operation and Maintenance of a Sewage Collection System requires that the City demonstrate "how to maintain sufficient capacity to convey the base flows and peak wet weather flow of a 10-year, 24-hour storm event for all parts of the collection system owned or managed by the permittee (City) or under the permittee's operational control"

While determination of inflow and infiltration (I&I) flows was beyond the scope of work for this study, in order to comply with R18-9-C305.2.05, the City plans to prepare a comprehensive I&I study to determine the magnitude and location of the wet weather surcharging on the existing sewer network. This study will include recommendations for mitigation efforts by the City to reduce I&I throughout the system. Unfortunately, the study and results were not yet available for the development of this report. Instead all future pipes were designed to adhere to 0.75 d/D during peak dry weather flow and to alleviate flows to the existing system wherever possible. It is recommend that the City increase flow monitoring efforts at multiple locations prior to and during the rainy season to track increased flows due to I&I. Significant events could potentially cause adverse surcharging in pipes that are currently flowing at full flow capacity in the peak dry weather condition. While results likely vary throughout the system, in the past the City has observed significant flow increases at the WRF during heavy rainfall events.

The historic inflow and infiltration rate during a 10-yr, 24 hr event, estimated from the City's I&I study (and future studies), should be incorporated into the model as a surcharge load in order to demonstrate the collection system's capacity to convey this flow. According to ADEQ standards (R18-9-E301.4.01), peak wet weather flow may be determined by adding to the peak dry weather flow "a wet weather infiltration and inflow rate based on either a percentage of peak dry weather flow or a gallons per acre rate of flow." The results of the study should show an average percent (%) increase in flow during the 10yr, 24hr storm event due to infiltration and inflow. In the model, the average flow increase may be added to the dry weather peak flows**,** by applying a global multiplier to peak dry weather flows.

As previously stated, all proposed sewer pipes have been designed to convey the peak dry weather flow at a depth to diameter ratio (d/D) no greater than 0.75. Newly constructed sewer is typically less prone to I&I flow, therefore it is unlikely that any of the recommended sizing in this report will need to be modified once peak wet weather flow is determined. Depending on the findings of the I&I study, recommendations for upsizing existing facilities may need to be expanded.

SECTION 3
FIGURES & EXHIBITS

Figure 3.4.1 - Industrial & Commercial Load Comparison

Usage Type	Category	Land Use Descriptions (Casa Grande)	Unit Load (Casa Grande, GPD/AC)	Land Use Descriptions (Town of Queen Creek)	Unit Load (Town of Queen Creek, GPD/AC)	Land Use Descriptions (Gilbert)	Unit Load (Gilbert, GPD/AC)
B-1	Commercial	Neighborhood Business Zone	1,000.00	Neighborhood Commercial	600.00	Commercial	600.00
B-2	Commercial	General Business Zone	1,000.00	Commercial Services	600.00	Commercial	600.00
B-3	Commercial	Central Business Zone	1,000.00	Regional Commercial Center	800.00	Regional Commercial	800.00
B-4	Commercial	Community Service Zone	1,000.00	Mixed Use/Town Center	1,300.00	Vertical Development	1,300.00
CO	Commercial	Commercial Office Zone	1,000.00	Office/Services	600.00	Commercial	600.00
I-1	Industrial	Garden & Light Industrial Zone	1,500.00 *	Employment Type A&B	400.00	Industrial	400.00
I-2	Industrial	General Industrial Zone	1,500.00 *	Employment Type A&B	400.00	Industrial	400.00

*Industrial standard is actually 1,000 GPD/AC, however, 1,500 GPD/AC is more representative of actual flows per City of Casa Grande Engineering Staff

4.0 2014 INTERCEPTOR MODELING

The goal of the 2014 interceptor modeling is to create a hydraulic simulation of the City's wastewater collection system as it currently exists. This model was created using information provided by the City (GIS data, mapping, record drawings, unit flows, etc.), field survey of interceptor manholes, and wastewater flow measurement. The results of this modeling are intended to show how the current (2014) interceptor system performs under current loading conditions.

4.1 PHYSICAL MODEL

In order to develop the interceptor model the first step is to create the physical elements. The input data for the model mathematically simulates the physical characteristics of the interceptor system. The input data used for the simulation is as follows:

- **Manhole Information**
  Location (Northing & Easting)
  Rim Elevation
  Invert Elevation
  Pipe Connectivity
- **Pipe Information**
  Pipe Size (Diameter)
  Pipe Length
  Pipe Slope (From Inverts & Pipe Length)
  Pipe Roughness (Manning's n=0.013)

As previously stated, the input data was gathered through meetings and coordination with the City, record drawings, and field survey of manholes within the interceptor system. The results of this physical model are best depicted in a map of the existing system which is shown in **Exhibit 4.1.1 - 2014 System Map**

The current model includes the latest improvements to the network including the Gila Bend Highway Sewer Interceptor. Installation of this this 24 inch sewer pipe was completed in November 2013 and was sized for build-out of the contributing area (i.e. existing and future industrial flows).

There are a number of flow splits at various locations throughout the City's system. H_2OMAP Sewer is capable of splitting the sewer flows automatically based on invert elevations and downstream pipe slope. However, in some cases it becomes necessary to input a flow split criteria at a given manhole structure, e.g. when pipes switch from open-channel (free surface) and switch to pressurized flow. The manual flow split can be based on a simple percentage of incoming flow (other methods are also available). For the 2014 Scenario, there is only one manual flow split (Trekell and Cottonwood).

4.2 SEWERSHED DEFINITIONS

After the physical model was created, sewersheds were defined for areas that contribute to each interceptor from the existing service area. This was completed using the latest available topography, aerial photography, as-builts and other GIS data. The City and Pinal County aerial photographs were used to determine if homes were built within the platted subdivisions, or commercial and industrial developments in non-residential areas. Empty parcels within partially developed subdivisions were not considered to contribute flow to the system. Subdivisions that were platted but construction had not begun were not considered to contribute flow to the system. Developed areas that are not connected to the sewer system (i.e. lots with septic systems) were not shown as contributing. A map of the defined sewer sheds within the system is shown in **Exhibit 4.2.1 - 2014 Sewershed Map**.

Sewersheds include all land within a given area of the project planning boundary that ultimately outfalls at a certain location on the sewer network. The **2014 Sewershed Map** only highlights those areas within the "ultimate sewer shed" that are currently contributing. In other words, the boundary of an existing sewer shed may expand in future model scenario if the contributing area is not built out.

A separate (reference only) model was also created which incorporated every sewer pipe in the collection system (not just interceptors) to determine the exact sewer shed delineations. As such, results of this model are not included as part of this report.

4.3 SEWER CONNECTIONS & FLOW CALCULATIONS

The number of sewer connections in each sewershed was calculated using parcel shapefiles and aerial imagery from the City's GIS department. Each parcel within a sewershed is assigned an existing downstream manhole on the interceptor network where it ultimately contributes sewer flow. Sewersheds were further broken down into sub-basins made up of all the parcels that contribute flow to a specific manhole. All the flows from individual sub-basins make up the total sewer shed outfall flow. The sub-basins are not shown on **Exhibit 4.2.1**; however, they may be viewed in the H_2OMAP Sewer interceptor model. The software allows you to store the outfall manhole data associated with each parcel within the parcel shapefile itself. Total number of parcels and acreage per sewer shed is found in the **Exhibit 4.2.1 - 2014 Sewer Shed Map** legend.

The sewer flow calculations are the portion of the modeling that simulates the current (2014) flows within the interceptor system. Each manhole in the system was allocated specific parcels that are associated with a land use defined by the Zoning or the General Plan 2020. In order to simulate flows, each manhole was "loaded" with a flow rate using the Load Allocator. Loads were calculated by multiplying the allocated parcels acreage by the unit load (cfs/acre) for the parcel's land use. This simulated the average daily flow (ADF) from each developed parcel within the system. Later, peaking factors were applied in according with **Section 3.6**, to obtain the ultimate peak flow (design flow). Known Loads from SIUs were also entered into the model manually but were stored separately from the Allocated Loads in the model database. The

respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) are as follows:

- LOAD 1 – Allocated Loads based on the existing 2014 system
- LOAD 2 – Known Loads based on given flow rates from SIUs

Table 4.3.1 – 2014 Load Data

Model Load Data	ADF (MGD)
LOAD 1	5.52
LOAD 2	1.27

All land within the project planning boundary was divided into five main categories (**Section 2.4**), Existing, Existing Heavy-Industrial, Committed, Septic and Vacant. Septic. Vacant and Committed parcel areas are not considered to be contributing to the system within the 2014 Scenario model. Septic parcels, i.e. existing lots that are currently being serviced by individual on-site treatment systems, will eventually be connected to the City's sewer system but are not simulated until the Future Scenario.

The total flow output per land use type (Allocated Loads) and metered flow data from SIUs (Known Loads) applied to the model is shown in **Appendix D - 2014 Flow Data**.

4.4 MODEL CALIBRATION

Creating the existing conditions scenario was a critical step in the modeling process, as all other scenarios (Committed and Future) build upon the 2014 Scenario. As such, great care was taken to calibrate the model and ensure that modeled flows were as representative of actual flows as possible. Calibration efforts included:

1. Comparison of modeled flow rates (ADF and peak flows) against flow monitoring results.
2. Conducting parcel counts to determine actual subdivision densities within the existing system and to verify zoning density. If actual density was consistent with zoned density, the loading stayed the same. If the density was significantly different, the loading was adjusted to represent the actual density.
3. Other load factor adjustments were made based on more current occupancy data (person per dwelling unit) and capita flow rates (gallons per person per day). For instance, daily flow per capita was reduced to 70 gallons/capita/day and occupancy for an equivalent residential unit (ERU) was reduced to 2.79 people/DU. These values were consistent with those in the Infrastructure Improvements Plan.
4. Peaking ADF industrial flows from an equivalent population was more accurate compared with flow monitoring results than entering in the peaked industrial flow (**Section 3.5**).
5. As-builts from the City were used to decipher how the flow was being split at the Cottonwood and Trekell intersection.

6. Inverts along the 18 inch Kortsen Road line were updated using a combination of survey and as-built data.

4.5 INTERCEPTOR MODELING RESULTS

Once the physical model described in **Section 4.1** was loaded with the sewer flows described in **Section 4.3** to create a completed interceptor sewer model, simulations were run with peaking factors (**Section 3.5)** for the 2014 Scenario.

In general, the 2014 interceptor modeling showed that the existing interceptor system is adequate to convey the existing Average Daily Flow, and Dry Weather Peaked Flow. However, there is one major concern at this time for the interceptor system. The Dry Weather Peaked Flows cause significant surcharging over full flow capacity for both the 12 inch Trekell Road interceptor from Cottonwood Road to Kortsen Road and portions of the 12 inch Cottonwood Road interceptor from Trekell Road to the flow split at French Street.

The model also revealed sections of pipe that exceed 0.75 d/D and some minor surcharging under peaked conditions at various locations through the system. The locations of these sections are clearly shown in red on **Exhibit 4.5.1 – 2014 d/D Map**.

The total flow at the CGWRF outfall from the model is compared with the actual total outfall flow recorded by the City in **Table 4.5.1 – 2014 Outfall Flows**.

Table 4.5.1 – 2014 Outfall Flows

Location/Source	ADF, MGD	Peak, MGD
CGWRF/Sewer Model	6.79	10.58
CGWRF/Flow Monitoring	6.50	Not Measured

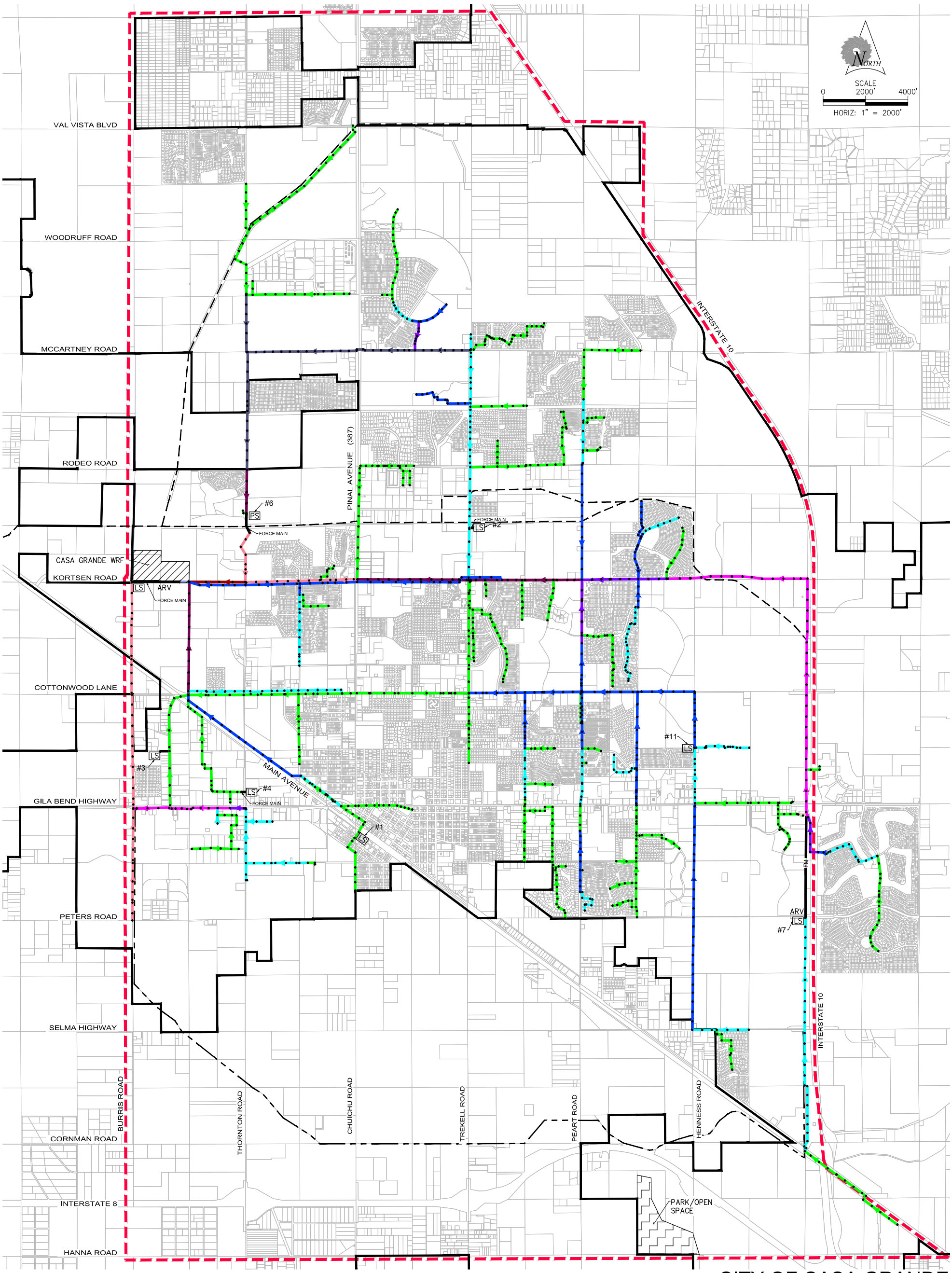
4.6 2014 RECOMMENDATIONS

The 2014 interceptor modeling showed that most of the existing interceptor system is adequate to convey the existing flows experienced by the system for Average Daily Flow and Dry Weather Peaked Flow. Only one critical improvement is recommended at this time for the interceptor system.

To relieve the surcharging on the Trekell and Cottonwood Road interceptors, the 12 inch Trekell Road interceptor should be upsized to a 21 inch pipe (Project 1). The majority of flows in the Trekell Road interceptor, south of Cottonwood, were originally designed to flow north to Kortsen Road. However, the existing 12 inch Trekell interceptor fills up with flows from the east Cottonwood Road interceptor, raising the hydraulic grade line and pushing flows into the 12 inch Cottonwood Road interceptor west of Trekell. Therefore, upsizing the Trekell Road interceptor between Cottonwood Road and Kortsen Road relieves both overtaxed lines. Flows from the south Trekell interceptor would be able to flow north unimpeded into the new 21 inch line along with all flows from the east. Sizing has been made to accommodate flows from the Future Scenario, along with flows from the Existing and Committed Scenarios.

Other improvements are not recommended for the minor surcharging seen at other locations in the system. Instead, these locations should be monitored during wet weather conditions to determine the magnitude from storm surge on a case by case basis. **Exhibit 4.6.1 - 2014 Recommendations Map** shows the pipes that will require replacement due to lack of capacity. **Figure 4.6.1 - 2014 Recommendations Cost Estimate** shows the cost estimates of the removal and replacement of the recommended improvements. Pipe segment lengths shown on the estimate are approximate, true lengths will be determined in final design.

SECTION 4
FIGURES & EXHIBITS



LEGEND

- STUDY LIMITS
- CITY LIMITS
- 12" SEWER
- 15" SEWER
- 18" SEWER
- 21" SEWER
- 24" SEWER
- 27" SEWER
- 30" SEWER
- 36" SEWER
- 42" SEWER
- 48" SEWER
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- MANHOLE
- ARV • AIR RELEASE VALVE
- LS LIFT STATION
- PS PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 4.1.1

2014 SYSTEM MAP

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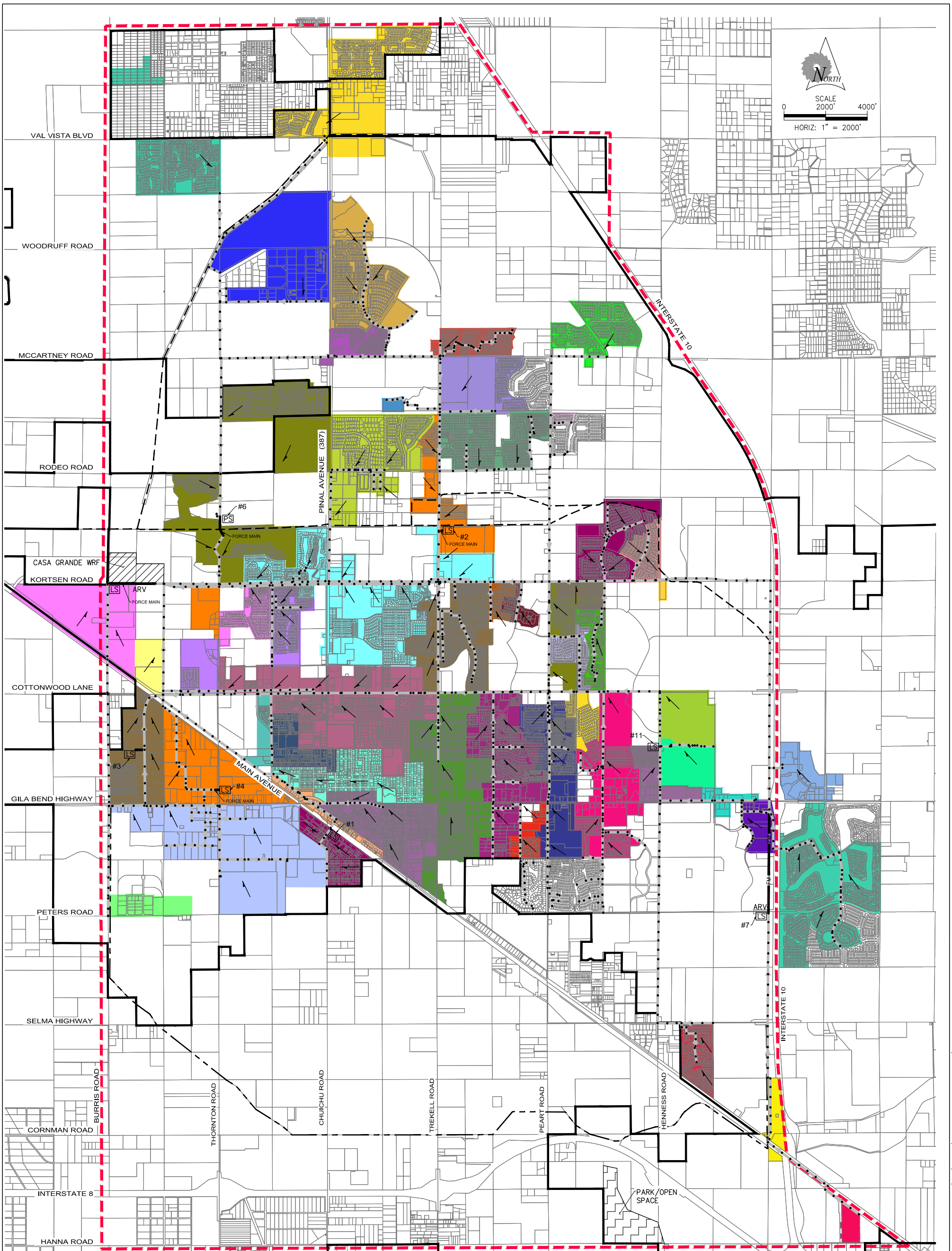

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 4.2.1

2014 SEWER SHED MAP

LEGEND

- STUDY LIMITS
- CITY LIMITS
- SEWER 2014
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- LS — LIFT STATION
- MANHOLE
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

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SEWER SHED LEGEND - 2014

STREET NAME	AC	PARCEL COUNT
ABBOTT LINE	76	2
ARIZOLA ROAD 1	242	667
ARIZOLA ROAD 2	404	630
BROWN AVENUE	13	1
BURRIS 1	85	21
BURRIS 2	350	6
BURRIS 3	N/A	N/A
CAM MERCADO	72	15
CAMINO GRANDE AVENUE	229	211
CASA VISTA	110	368
CENTENNIAL BOULEVARD	485	99
CHUICHU ROAD	N/A	N/A
CLAYTON	109	91
COTTONWOOD LANE 1	60	65
COTTONWOOD LANE 2	686	1158
COTTONWOOD LANE 3	68	205
COTTONWOOD LANE 4	N/A	N/A
COTTONWOOD LANE 5	152	1
COX ROAD	58	6
DESERT WILLOW STREET	83	325
EAST AREA	N/A	N/A
FIRST STREET	53	93
FRIAR ROAD	78	264
GILA BEND HIGHWAY 1	311	729
GILA BEND HIGHWAY 2	39	21
GILA BEND HIGHWAY 3	737	72
GUARDIA	268	211
HANNA STREET	N/A	N/A

STREET NAME	AC	PARCEL COUNT
HENNESS ROAD 1	96	140
HENNESS ROAD 2	N/A	N/A
HENNESS ROAD 3	N/A	N/A
HESTER TRAIL	79	261
JEFFERSON	351	77
JIMMIE KERR BLVD	33	1
KORTSEN ROAD 1	69	9
KORTSEN ROAD 2	711	1317
KORTSEN ROAD 3	103	362
KORTSEN ROAD 4	N/A	N/A
KORTSEN ROAD 5	6	1
KORTSEN ROAD 6	47	156
KORTSEN ROAD 7	N/A	N/A
LAKESIDE PARKWAY	369	806
MAIN	N/A	N/A
MARIA AVENUE 1	44	167
MARIA AVENUE 2	423	977
MCCARTNEY ROAD 1	88	204
MCCARTNEY ROAD 2	173	536
MISSION ROYALE	568	1,536
INTERCHANGE	N/A	N/A
NORTH AIRPORT	486	867
PEART ROAD 1	13	47
PEART ROAD 2	101	255
PEART ROAD 3	309	740
PEART ROAD 4	N/A	N/A
POTTEBAUM AVENUE 1	32	68
POTTEBAUM AVENUE 2	55	77

STREET NAME	AC	PARCEL COUNT
PROMENADE	125	27
PUTTER PLACE	124	2
RODEO DRIVE 1	267	971
RODEO DRIVE 2	395	618
SACATON	129	353
SCHULTZ STREET 1	131	492
SCHULTZ STREET 2	117	313
SCHULTZ STREET 3	262	657
SCOTT DRIVE	282	807
SELMA HIGHWAY	N/A	N/A
THORNTON ROAD	675	1056
THORNTON ROAD 2	N/A	N/A
TREKELL ROAD 1	110	315
TREKELL ROAD 2	206	211
TREKELL ROAD 3	305	937
TREKELL ROAD 4	505	1,287
TREKELL ROAD 5	N/A	N/A
VERBENA ROAD	N/A	N/A
WEST ONE ROAD	N/A	N/A

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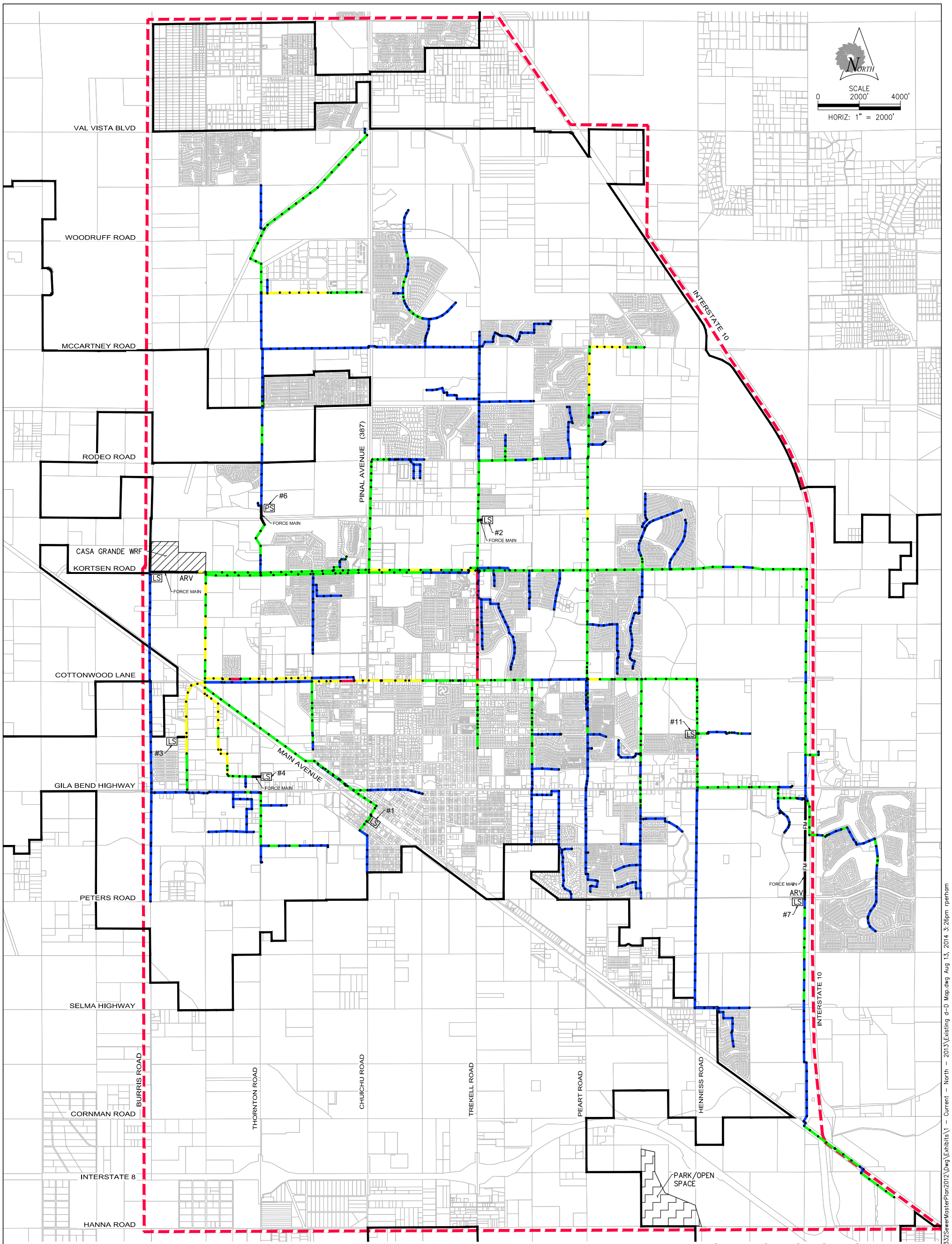

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 4.5.1

2014 d/D MAP

LEGEND

- STUDY LIMITS
- CITY LIMITS
- 0.00 TO 0.25 d/D
- 0.25 TO 0.50 d/D
- 0.50 TO 0.75 d/D
- 0.75 TO 1.00 d/D
- FM — FORCE MAIN
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- MANHOLE
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

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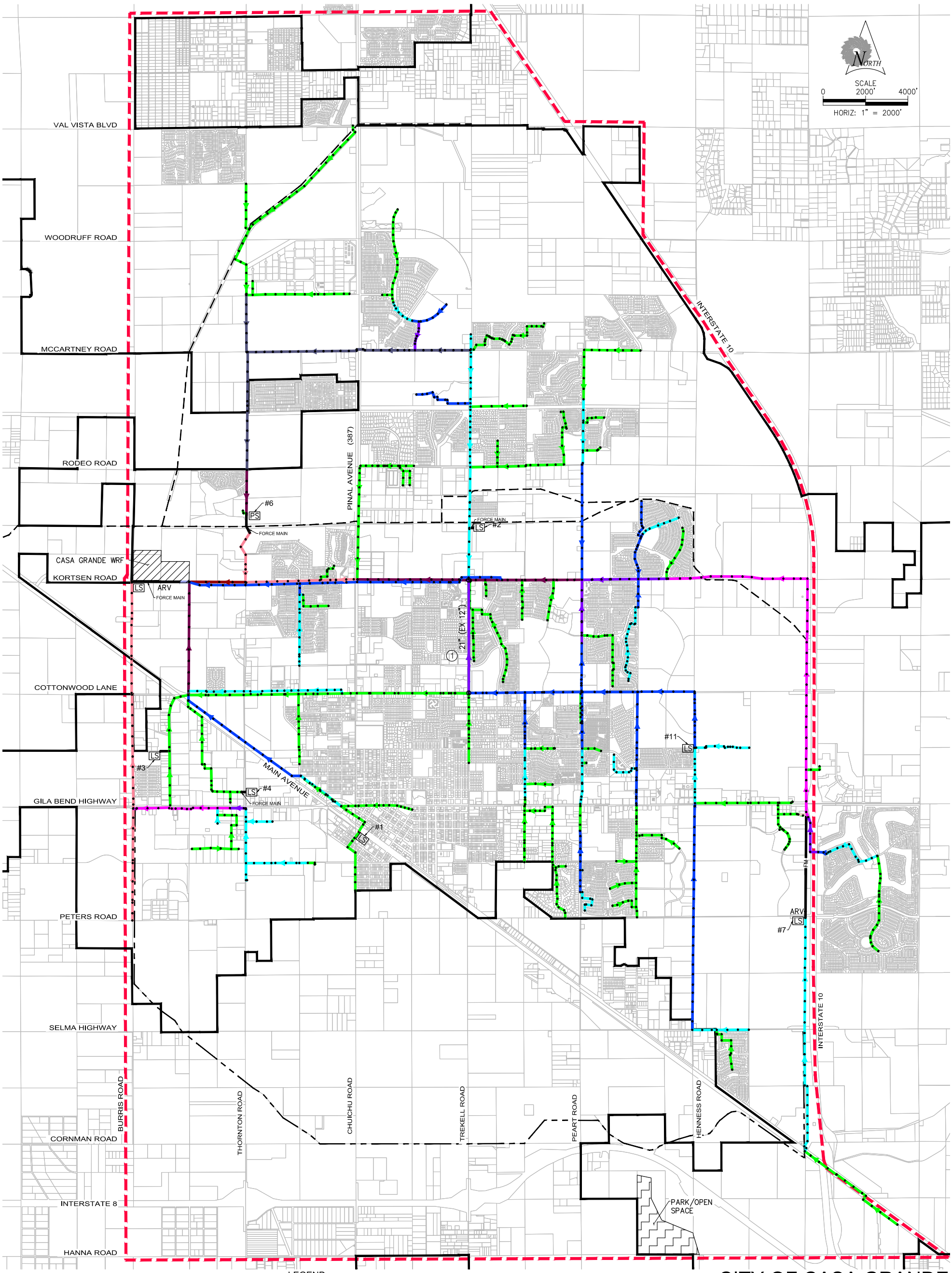

LEGEND

2014 EXISTING	UPSIZE EXISTING	PROPOSED	
			12" SEWER
			15" SEWER
			18" SEWER
			21" SEWER
			24" SEWER
			27" SEWER
			30" SEWER
			36" SEWER
			42" SEWER
			48" SEWER
			54" SEWER

- STUDY LIMITS
- CITY LIMITS
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- (X) PROJECT NUMBER

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE
INTERCEPTOR SEWER MODELING
EXHIBIT 4.6.1
2014 RECOMMENDATIONS MAP

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2014 Projects

City of Casa Grande

SUNRISE ENGINEERING
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Mesa, Arizona 85210
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Figure 4.6.1 - 2014 Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,318	LF	$155.00	$824,262
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$98,630
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	5,318	LF	$20.00	$106,356
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	10	EA	$2,500.00	$24,658
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$52,695.33	$52,695
30	Traffic Control	10%	LS	$105,390.66	$105,391
31	Engineering & Administration	10%	LS	$105,390.66	$105,391
32	Staking and Construction Management	10%	LS	$105,390.66	$105,391
				Sub-Total	**$1,422,774**
				20% Contingency	$284,555
				PROJECT TOTAL	**$1,707,000**

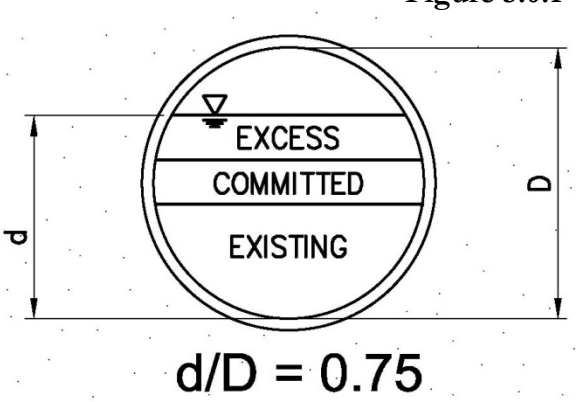
*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

5.0 COMMITTED SERVICE AREA MODELING

The goal of the Committed Service Area interceptor modeling was to create a hydraulic simulation of the City's wastewater collection system if all committed parcels (see definition in Section 2.5) were to be built-out within the project planning boundary. This model was created using information from the 2014 interceptor model plus projected flows from the committed development areas not currently serviced by the City. The results of this modeling are intended to show how the City's interceptor system performs under committed loading conditions and determine what improvements are necessary to serve the additional demands.

The Committed Scenario originally developed from analysis of the East Area, in an effort to appropriately size the infrastructure required to serve proposed developments. The City believed it was in the best interest of the public to size the East Area interceptors not only to accommodate current development but also any future flows that would eventually outfall into that line (thereby avoiding installation of parallel sewers). During this analysis it became apparent that, in order to consider flows from the East Area, the City needed to determine the excess capacity in the Kortsen Road interceptors. In order to determine available capacity in the Kortsen interceptors, an analysis not only of the existing flows but all flows that the City had committed to take on in the immediate future, was necessary (See **Figure 5.0.1**). Thus an analysis to determine the excess capacity in Kortsen developed into a total system analysis which included all existing and committed sewer flows.

Figure 5.0.1



The City required a solution that included recommendations for serving all committed parcels, including those in the East Area, as well as a solution to free up capacity in the Kortsen and Cottonwood interceptors. Interceptors would be extended or upsized as necessary to serve all committed connections. The dedicated pipe sized to alleviate flows along Cottonwood and Kortsen Road would be called the Cottonwood-Kortsen Relief Line. East Area proposed inverts shall be established such that all future upstream lines shall gravity flow to the connection point at the intersection of Cox and Kortsen Road. The recommended solutions would allow the City to appropriately allocate CIP funding and develop an appropriate cost sharing strategy for providing service to proposed developments.

5.1 PHYSICAL MODEL

The Committed Scenario model expands upon the 2014 physical model, extending the City's interceptor sewers, adding new interceptors to areas not currently serviced by the system, and upsizing and replacing some existing interceptors. Model input included the proposed pipe sizes, manhole rim elevations, pipe lengths and inverts. The new pipes and manholes were schematically located (horizontally and vertically) using existing mapping and topographic information. Topography from Pinal County (2012) was provided by the City to allow the model to be built with the most current surface data available. Pipe slopes are based on invert input information and ADEQ minimum slopes required to maintain a cleaning velocity of two feet per second when flowing full.

As previously discussed, alignments of proposed interceptors in the East were determined in collaboration with City staff. Alignments selected were primarily along section-line roads, as there may be a claim that right-of-way exists on these alignments. As with the 2014 Scenario modeling, there is only one manual flow split (Trekell and Cottonwood). The rest of the splits are automatically calculated based on the pipe invert elevations.

Exhibit 5.1.1 - Committed System Map shows the proposed pipe extensions, additions, and upsizing for the Committed Scenario model.

5.2 SEWERSHED DEFINITIONS

Sewershed areas were expanded to include all land within the project planning boundary identified as having a "committed" flow associated with it. The contributing areas for the interceptor extensions added in **Section 5.1** were defined using the latest available topography, aerial photography, as-builts and other GIS data. **Exhibit 5.2.1 – Committed Sewer Shed Map** shows a map of the defined sewer sheds within the Committed Scenario system.

5.3 SEWER CONNECTIONS & FLOW CALCULATIONS

The number of sewer connections in each sewer shed was calculated using the parcel shapefiles and other City GIS data. The designated land use for each parcel was defined by the Zoning or General Plan 2020 Map for all committed land within the project planning boundary. The land use was then used to estimate the number of connections. Total number of parcels and acreage per sewer shed is found in the **Exhibit 5.2.1 - Committed Sewer Shed Map** legend.

The sewer flow calculations are the portion of the modeling that simulates the projected flows that will be experienced within the interceptor system once the committed land is developed according to the designated land use. Each manhole in the system was allocated specific parcels that are associated with a land use defined by the Zoning or the General Plan 2020. Flows were simulated similar to the previous scenario; each manhole was "loaded" with a flow rate using the Load Allocator based on the assigned parcels. This simulated the average daily flow (ADF) from existing and committed parcels within the system. Later, peaking factors were applied in accordance with **Section 3.6** to obtain the ultimate peak flow (design flow). As in the 2014

Scenario, the outfall manhole data associated with each parcel was stored within a separate committed parcel shapefile (cparcels.shp).

Known Loads from committed developments were also entered into the model manually for individual developments contributing significant flows to the system. One of the largest developments contributing a Known Load is Phoenix Mart, a proposed 585-acre master planned development located between Cottonwood Lane and Florence Blvd. near Toltec Buttes Rd Loading from this development made a significant impact on sizing of infrastructure in East Area, as well as the overall system recommendations for Committed Scenario. These flows were stored separately from the Allocated Loads in the model database. Other areas determined to be committed were loaded using the Allocator.

The respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) are as follows:

- LOAD 1 – Allocated Loads based on the existing 2014 system
- LOAD 2 – Known Loads based on given flow rates from SIUs
- LOAD 3 – Not used
- LOAD 4 – Not used
- LOAD 5 – Known Loads based on given flow rates for Committed Developments
- LOAD 6 – Allocated Loads based on the Committed system

Table 5.3.1 – Committed Load Data

Model Load Data	ADF (MGD)
LOAD 1	5.52
LOAD 2	1.27
LOAD 3	-
LOAD 4	-
LOAD 5	9.67
LOAD 6	2.14

The Committed Scenario includes all land within the project planning boundary designated as Existing, Existing – Heavy Industrial, and Committed. The Septic and Vacant parcel areas are not considered to be contributing to the system within the Committed Scenario model.

The total flow output per land use type (Allocated Loads) and given flow data from Committed Developments (Known Loads) applied to the model is shown in **Appendix E - Committed Flow Data**. The flows entered in the 2014 modeling for the Committed Service Area remains unchanged, the committed flows were added as additional flow to the model.

5.4 INTERCEPTOR MODELING RESULTS

Once the physical model described in **Section 5.1** was loaded with the sewer flows described in **Section 5.3** to create a completed interceptor sewer model, simulations were run with peaking factors (**Section 3.5)** for the Committed Scenario.

The committed interceptor modeling indicates that the existing interceptor system is not adequate to convey the committed Average Daily Flow, nor Dry Weather Peaked Flow. Multiple locations in the existing interceptor system are under-capacity and therefore unable to handle the projected flows. The model also revealed sections of pipe that exceed 0.75 d/D and some minor surcharging under peaked conditions, i.e. the hydraulic grade lines of the pipes flowing full are right at the top of pipe or just above it (less than 2'). The locations of these sections are clearly shown in red on **Exhibit 5.4.1 – Committed d/D Map with No Improvements** and **Exhibit 5.4.2 - Committed d/D Map with Improvements**. The later of the two exhibits gives the d/D for the system after the major interceptor extensions and improvements were added to the model, including the Cottonwood-Kortsen Relief Line. Both maps do not include the upsizing of existing facilities so that the problem areas can be easily visualized

The Dry Weather Peaked Flows cause significant surcharging over full flow capacity for the following:

- 12 inch Pinal Avenue interceptor north of Kortsen Road (MH 7263 to MH 8118).
- 12 inch Gila Bend Highway interceptor east of Henness Road (MH 2722 to MH 2710).
- 15 inch & 18 inch Henness Road interceptor north of Gila Bend Highway (MH 2710 to MH 2542).
- 12 inch Arizola Road interceptor north of Peters Road (MH 7085 to MH 7278)
- 12 inch Trekell Road interceptor between Cottonwood Lane and Kortsen Road (MH 2915 to MH 3017) – Solution proposed in Section 4.6 – 2014 Recommendations
- 12 inch Cottonwood Road interceptor west of Trekell Road (MH 1024 to MH 5869) – Solution proposed in Section 4.6 – 2014 Recommendations
- Various locations along Cottonwood Road and Kortsen Road interceptors prior to the addition or the Cottonwood-Kortsen Relief Line

The total flow at the CGWRF outfall from the Committed Scenario model is shown in **Table 5.4.1 –** Committed Outfall Flows, which includes flow contributions from the Committed Scenario (Known and Allocated) and flows from the 2014 Scenario.

Table 5.4.1 – Committed Outfall Flows

Location/Source	Scenario	ADF, MGD	ADF, Cumulative	Peak, MGD	Peak, Cumulative
CGWRF/Sewer Model	2014	6.79	6.79	10.58	10.58
CGWRF/Sewer Model	Committed	11.82	18.61	17.31	27.89

5.5 COMMITTED RECOMMENDATIONS

The modeling results were used to determine the recommended master planned pipe sizes and locations for committed flow conditions within the existing system and expanded Committed Service Area. Four major expansions to the interceptor system have been proposed to serve committed development (Projects 6, 7, 8, & 9E). All interceptors were sized to accommodate future peaked dry weather flow at 0.75 d/D. Future flows are discussed in **Section 6.3**.

North & South Area

The expansions for the North & South Area include a 36 inch interceptor along Peters Road between Thornton Road and Burris Road (Project 8), a 27 inch interceptor along Henness Road between Cottonwood Lane and Kortsen Road (Project 7), and the Cottonwood-Kortsen Relief Line - 36 & 48 inch interceptors (Project 6).

A preliminary analysis on the Cottonwood-Kortsen Relief Line determined that the Kortsen Road corridor itself would be the most economical alignment to serve the existing system and committed users. There were three alignment alternatives considered for the relief line.

- Santa Cruz Wash Alignment – The ½ mile alignment between Kortsen and Rodeo
- Rodeo Road Alignment – New interceptor within the Rodeo Road right-of-way (R/W)
- Kortsen Road Alignment - Another parallel line within the Kortsen Road R/W

A decision matrix was developed to address the critical concerns expressed by the City in determining the appropriate alignment. Each alignment was ranked 1-3 (3 being the most preferred) for the various criteria.

Table 5.5.1 – Alignment Decision Matrix

Project Criteria	Kortsen Road	Santa Cruz Wash	Rodeo Road
City Owned R/W	3	1	2
Total Material Costs	3	2	1
Ease of Construction	2	3	2
Potential Obstacles	1	2	3
Total	9	8	8

The committed interceptor modeling showed that portions of the existing interceptor system were not adequate to convey the committed Average Daily Flow and Dry Weather Peaked Flow. There are four critical improvements recommended where existing pipes may be undersized for the committed conditions.

- To relieve the surcharging on the Pinal Avenue interceptor north of Kortsen Road, the 12 inch interceptor should be upsized to a 15 inch pipe (Project 2).
- The 15 inch & 18 inch Henness Road interceptors north of Gila Bend Highway should be upsized to 27 inch and 30 inch pipes as appropriate (Project 3).
- The 12 inch Gila Bend Highway interceptor east of Henness Road should be upsized to an 18 inch pipe (Project 4).

- Lastly, the 12 inch Arizola Road interceptor north of Peters Road should be upsized to a 15 inch and 18 pipe (Project 5).

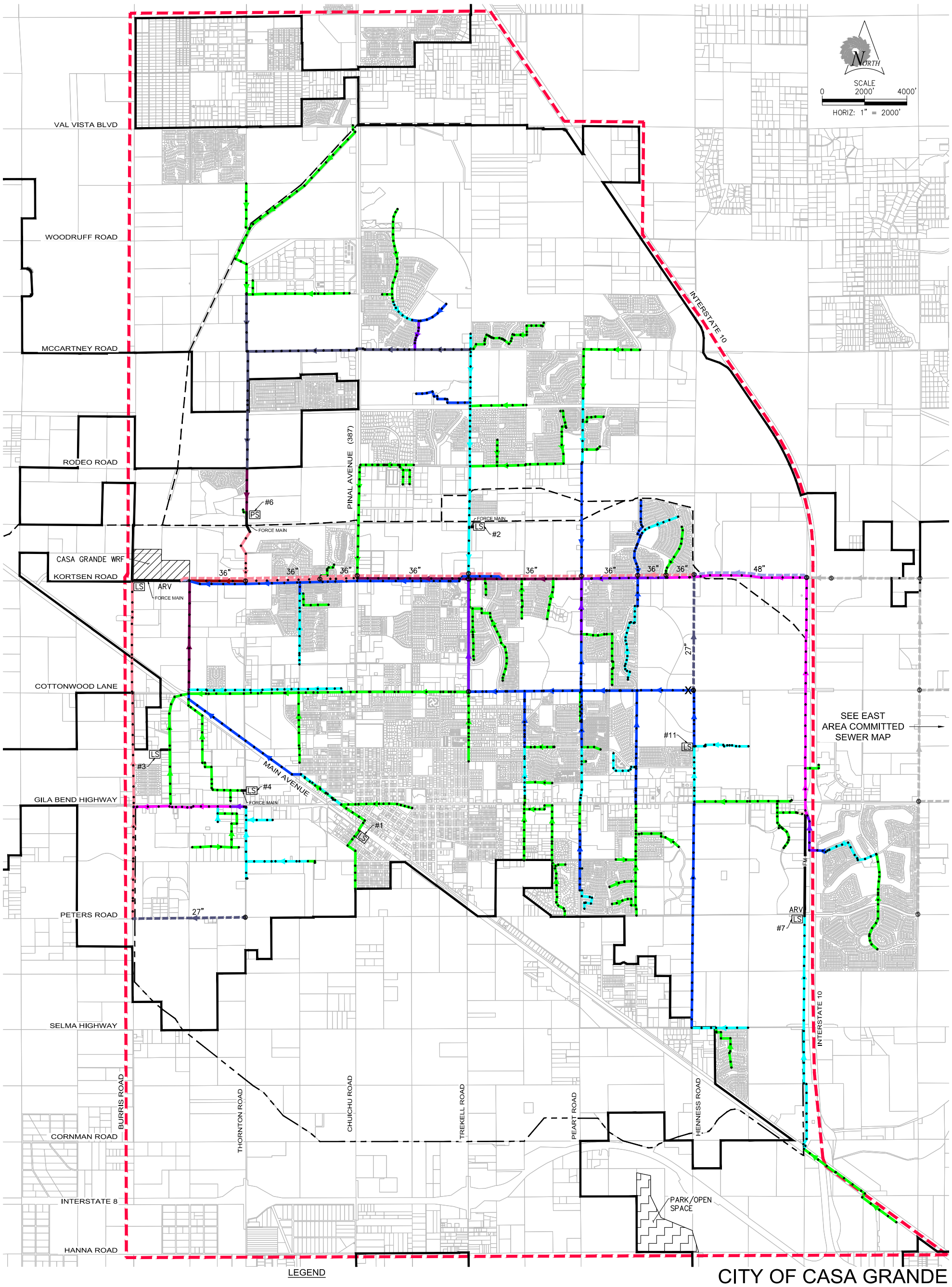
Sizing has been made to accommodate flows from the Future Scenario, along with flows from the Existing and Committed Scenarios. A map showing the committed system deficiencies and potential solutions to fix these deficiencies is shown in **Exhibit 5.5.1 – Committed Recommendations Map**. Other improvements are not recommended to provide relief of the minor surcharging observed in the system model. Instead, these locations should be monitored during wet weather conditions, to determine the magnitude of the storm surge on the interceptor, on a case by case basis

Figure 5.6.1 – Committed Recommendations Cost Estimate shows the cost of the proposed master planned improvements including removal and replacement costs. Pipe lengths shown on the estimate are approximate, true lengths will be determined in final design. Individual cost estimates for each project may be found in **Appendix G**.

East Area

The expansions to serve the East Area include multiple interceptors of various sizes (see **Exhibit 5.5.2 – Committed Recommendations Map – East Area**). All of the East Area improvements fall under Project 9E. The estimate for the East Area is included in the total estimate for the Committed Recommendations. The individual cost estimate for Project 9E may be found in **Appendix G**.

SECTION 5
FIGURES & EXHIBITS



LEGEND

2014 EXISTING	UPSIZE EXISTING	PROPOSED	
			12" SEWER
			15" SEWER
			18" SEWER
			21" SEWER
			24" SEWER
			27" SEWER
			30" SEWER
			36" SEWER
			42" SEWER
			48" SEWER
			54" SEWER

STUDY LIMITS
CITY LIMITS
FM FORCE MAIN
EXISTING CANAL
EXISTING WASH
PROPOSED MANHOLE
ARV AIR RELEASE VALVE
LS LIFT STATION
PS PUMP STATION
WATER RECLAMATION FACILITY (WRF)

PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE
INTERCEPTOR SEWER MODELING
EXHIBIT 5.1.1
COMMITTED SYSTEM MAP

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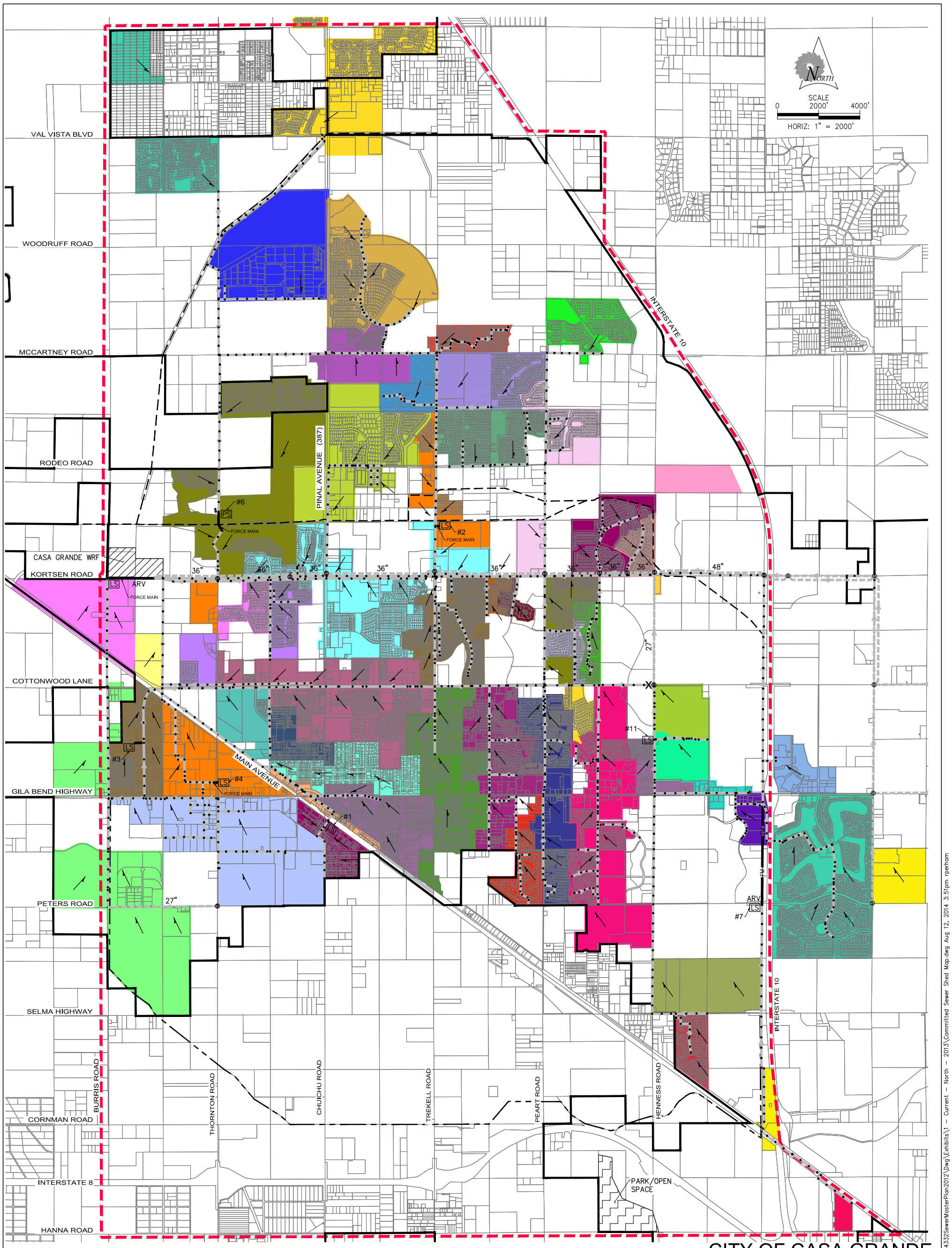

LEGEND

- STUDY LIMITS
- CITY LIMITS
- SEWER 2014
- PROPOSED SEWER
- EXISTING CANAL
- EXISTING WASH
- LIFT STATION
- FORCE MAIN
- MANHOLE
- PROPOSED MANHOLE
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 5.2.1

COMMITTED SEWER SHED MAP

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SEWER SHED LEGEND - COMMITTED

STREET NAME	AC	PARCEL COUNT
ABBOTT LINE	76	2
ARIZOLA ROAD 1	242	667
ARIZOLA ROAD 2	727	925
BROWN AVENUE	126	4
BURRIS 1	951	53
BURRIS 2	350	11
BURRIS 3	N/A	N/A
CAM MERCADO	72	15
CAMINO GRANDE AVENUE	309	435
CASA VISTA	110	368
CENTENNIAL BOULEVARD	570	129
CHUICHU ROAD	N/A	N/A
CLAYTON	109	92
COTTONWOOD LANE 1	172	69
COTTONWOOD LANE 2	686	1158
COTTONWOOD LANE 3	68	205
COTTONWOOD LANE 4	N/A	N/A
COTTONWOOD LANE 5	152	1
COX ROAD	58	6
DESERT WILLOW STREET	83	325
EAST AREA	156	3
FIRST STREET	53	93
FRIAR ROAD	78	264
GILA BEND HIGHWAY 1	311	729
GILA BEND HIGHWAY 2	39	21
GILA BEND HIGHWAY 3	796	74
GUARDIA	268	217
HANNA STREET	N/A	N/A

STREET NAME	AC	PARCEL COUNT
HENNESS ROAD 1	96	140
HENNESS ROAD 2	322	4
HENNESS ROAD 3	120	1
HESTER TRAIL	79	261
JEFFERSON	351	77
JIMMIE KERR BLVD	33	1
KORTSEN ROAD 1	69	9
KORTSEN ROAD 2	711	1,315
KORTSEN ROAD 3	103	362
KORTSEN ROAD 4	N/A	N/A
KORTSEN ROAD 5	6	1
KORTSEN ROAD 6	47	156
KORTSEN ROAD 7	N/A	N/A
LAKESIDE PARKWAY	526	810
MAIN	N/A	N/A
MARIA AVENUE 1	44	162
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MCCARTNEY ROAD 1	231	212
MCCARTNEY ROAD 2	209	537
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INTERCHANGE	N/A	N/A
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POTTEBAUM AVENUE 1	32	68
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STREET NAME	AC	PARCEL COUNT
PROMENADE	134	30
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RODEO DRIVE 1	288	971
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SACATON	129	353
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TREKELL ROAD 2	206	211
TREKELL ROAD 3	305	937
TREKELL ROAD 4	505	1,287
TREKELL ROAD 5	N/A	N/A
VERBENA ROAD	N/A	N/A
WEST ONE ROAD	N/A	N/A

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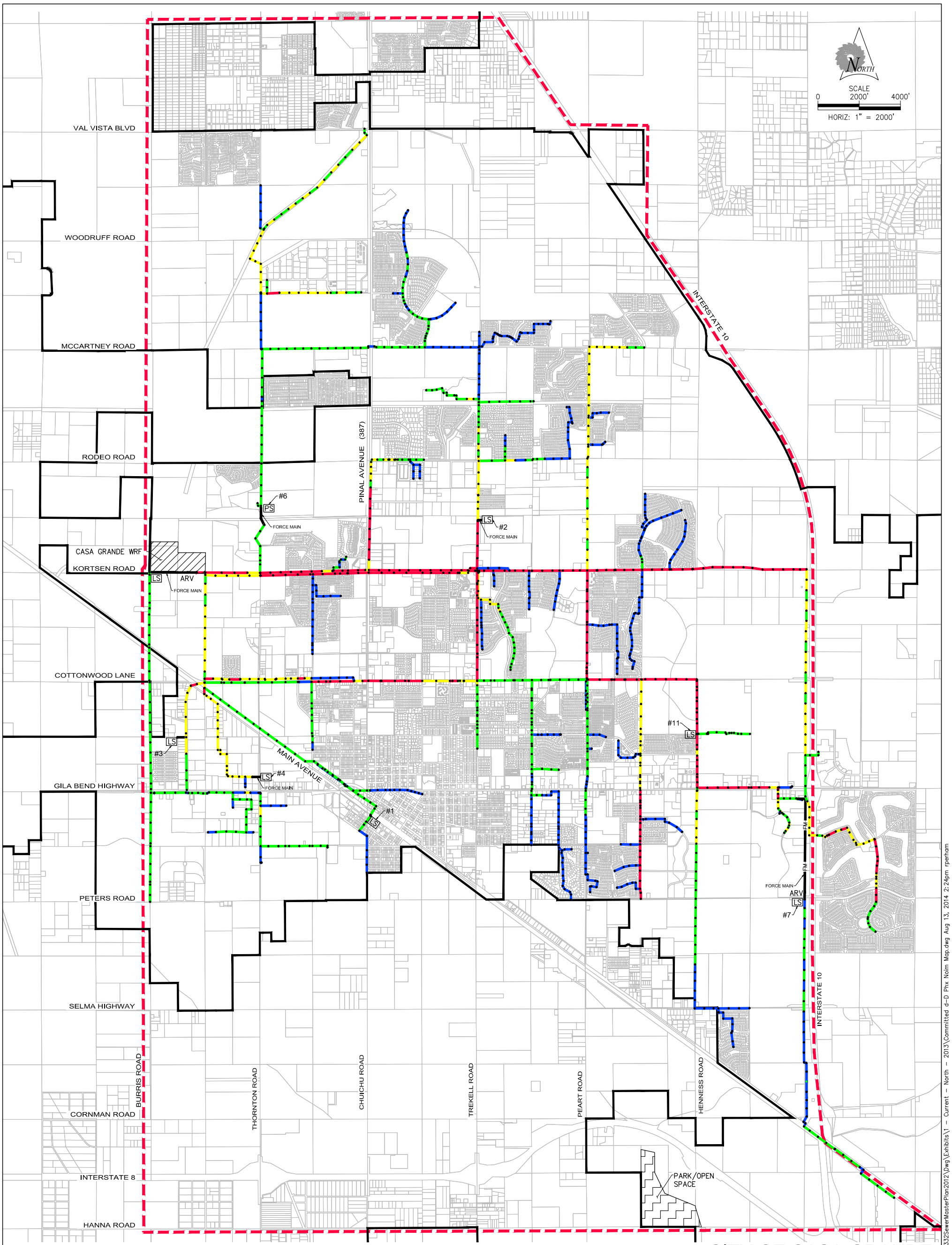

LEGEND

- STUDY LIMITS
- CITY LIMITS
- 0.00 TO 0.25 d/D
- 0.25 TO 0.50 d/D
- 0.50 TO 0.75 d/D
- 0.75 TO 1.00 d/D
- FM — FORCE MAIN
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- MANHOLE
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING
EXHIBIT 5.4.1
COMMITTED d/D MAP
WITH NO IMPROVEMENTS

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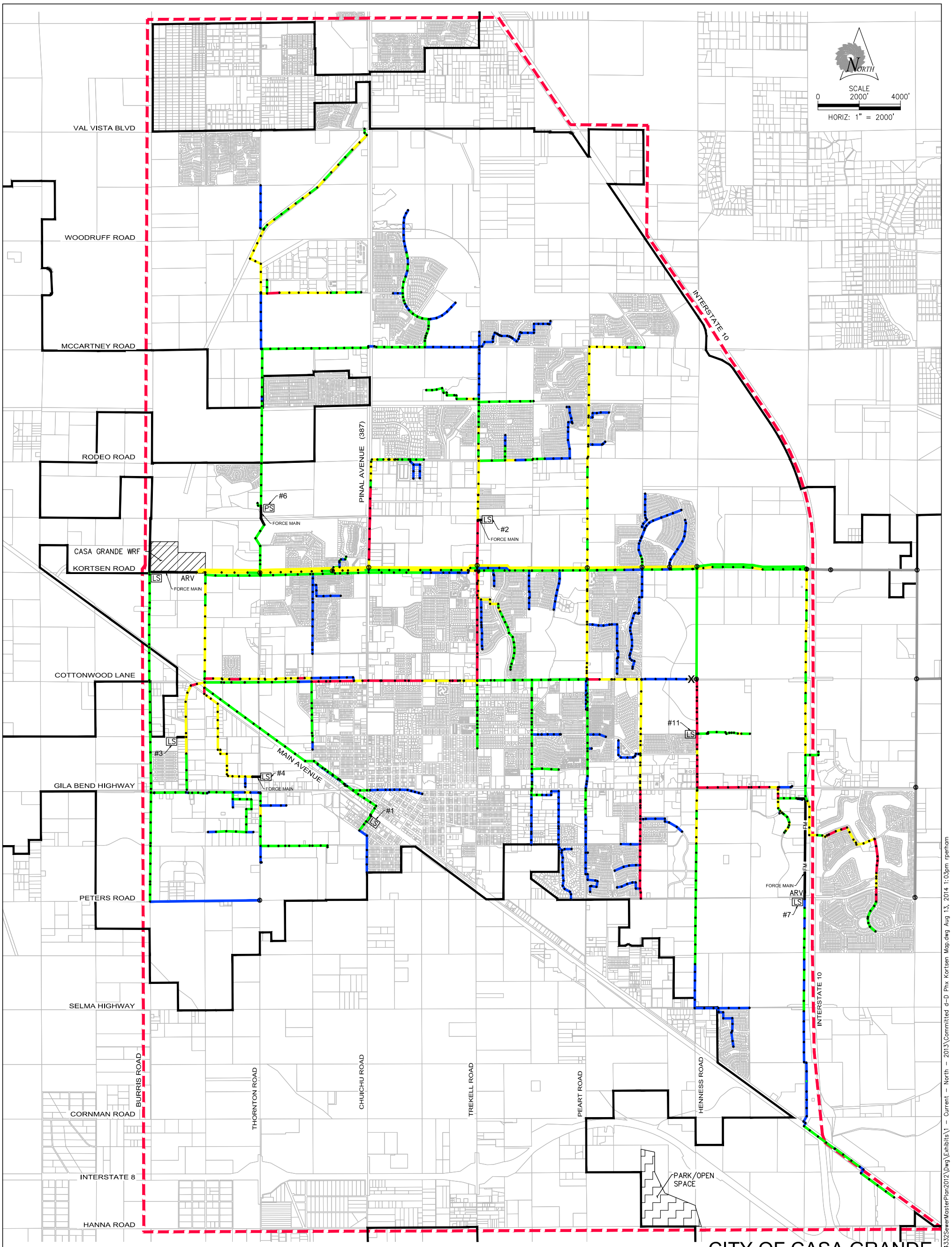

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 5.4.2

COMMITTED d/D MAP WITH IMPROVEMENTS

LEGEND

- STUDY LIMITS
- CITY LIMITS
- 0.00 TO 0.25 d/D
- 0.25 TO 0.50 d/D
- 0.50 TO 0.75 d/D
- 0.75 TO 1.00 d/D
- FM — FORCE MAIN
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- MANHOLE
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
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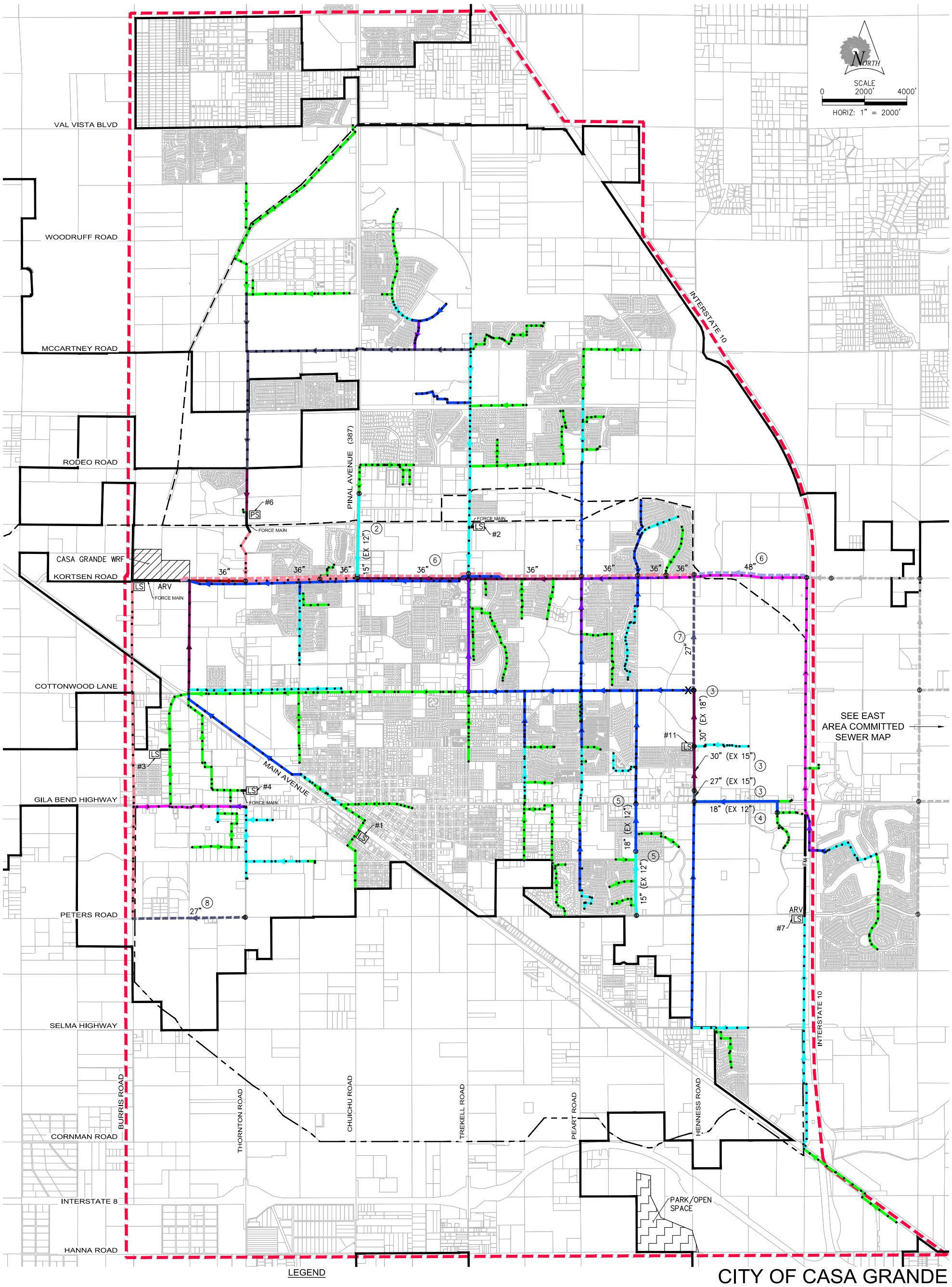

LEGEND

2014 EXISTING	UPSIZE EXISTING	PROPOSED	
			12" SEWER
			15" SEWER
			18" SEWER
			21" SEWER
			24" SEWER
			27" SEWER
			30" SEWER
			36" SEWER
			42" SEWER
			48" SEWER
			54" SEWER

- STUDY LIMITS
- CITY LIMITS
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- (X) PROJECT NUMBER

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE
INTERCEPTOR SEWER MODELING
EXHIBIT 5.5.1
COMMITTED RECOMMENDATIONS MAP

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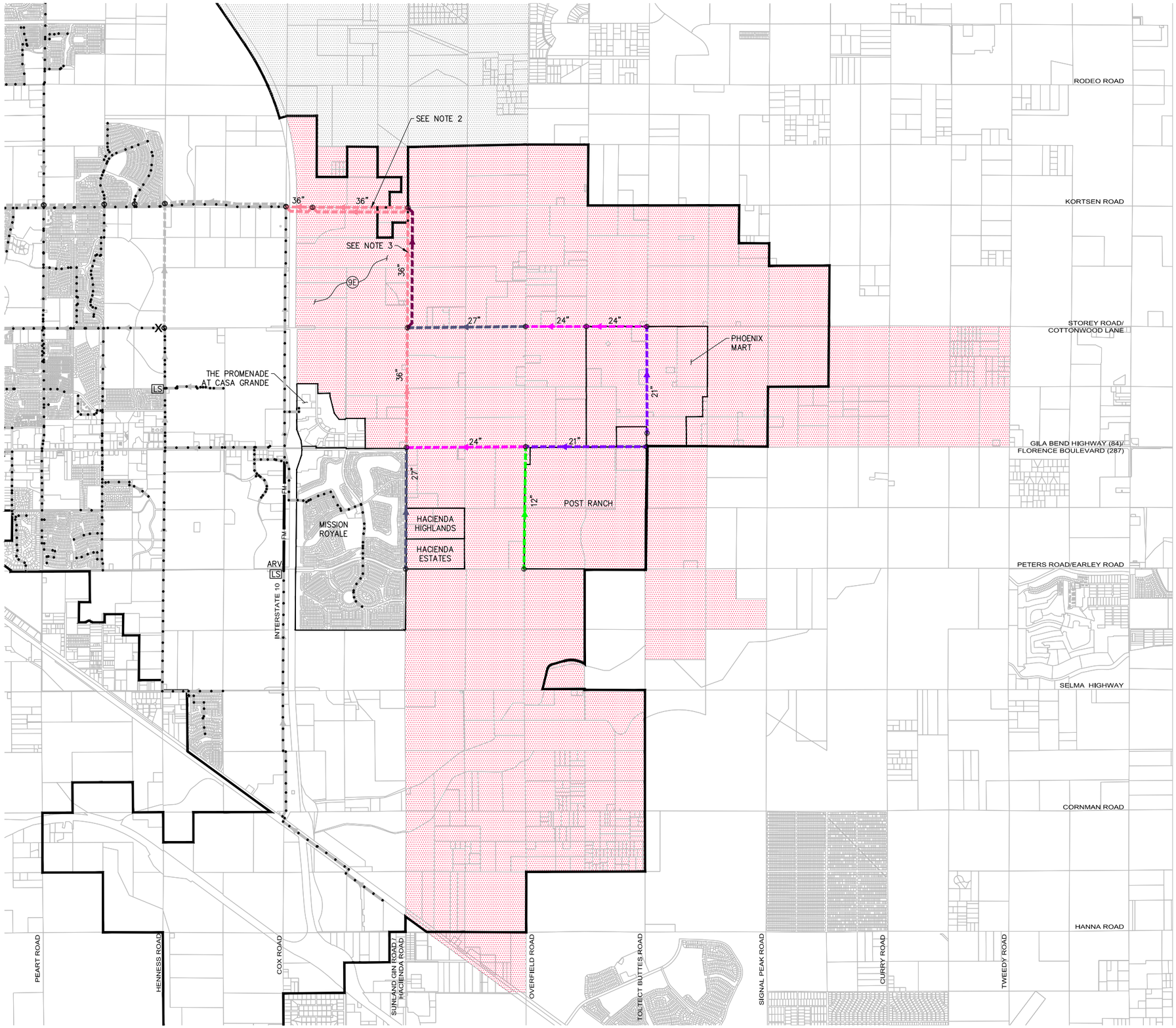

NORTH

SCALE
0 2000' 4000'
HORIZ: 1" = 2000'

NOTES

1. ALL SIZING SHALL BE USED AS A GUIDE FOR PLANNING PURPOSES ONLY. SIZING IS SUBJECT TO CHANGE DURING FINAL DESIGN.
2. BUILDOUT OF THE EAST PLANNING AREA WILL NECESSITATE AN ADDITIONAL 36 INCH PARALLEL LINE ADJACENT TO THE 36 INCH KORTSEN ROAD INTERCEPTOR. ALTERNATIVELY, A SINGLE 48 INCH INTERCEPTOR MAY BE INSTALLED.
3. BUILDOUT OF THE EAST PLANNING AREA WILL NECESSITATE AN ADDITIONAL 30 INCH PARALLEL LINE ADJACENT TO THE 36 INCH HACIENDA ROAD INTERCEPTOR. ALTERNATIVELY, A SINGLE 42 INCH INTERCEPTOR MAY BE INSTALLED.

LEGEND

- CITY LIMITS
- SEWER (NON-EAST AREA)
- 12" PROPOSED SEWER
- 15" PROPOSED SEWER
- 18" PROPOSED SEWER
- 21" PROPOSED SEWER
- 24" PROPOSED SEWER
- 27" PROPOSED SEWER
- 30" PROPOSED SEWER
- 36" PROPOSED SEWER
- 42" PROPOSED SEWER
- 48" PROPOSED SEWER
- PROPOSED MANHOLE
- LIFT STATION
- FORCE MAIN
- EAST PLANNING AREA
- NORTHEAST PLANNING AREA
- PROJECT NUMBER

CITY OF CASA GRANDE
INTERCEPTOR SEWER MODELING
EXHIBIT 5.5.2
EAST AREA COMMITTED SEWER MAP

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Committed Projects

City of Casa Grande

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Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Figure 5.5.1 - Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,372	LF	$144.00	$773,516
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	7,036	LF	$148.00	$1,041,380
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	6,690	LF	$152.00	$1,016,937
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	9,978	LF	$155.00	$1,546,629
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,228	LF	$175.00	$914,909
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	27,143	LF	$200.00	$5,428,569
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	4,732	LF	$215.00	$1,017,478
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	40,121	LF	$225.00	$9,027,164
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,318	LF	$335.00	$1,781,629
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	181	EA	$10,000.00	$1,814,648
16	Jack & Bore Major Canal Crossing	2	LF	$165,000.00	$330,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	9,280	LF	$20.00	$185,592
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	519	LF	$22.00	$11,422
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	9,180	LF	$22.00	$201,951
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	40	EA	$2,500.00	$100,515
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$1,259,616.95	$1,259,617
30	Traffic Control	10%	LS	$2,519,233.89	$2,519,234
31	Engineering & Administration	10%	LS	$2,519,233.89	$2,519,234
32	Staking and Construction Management	10%	LS	$2,519,233.89	$2,519,234
				Sub-Total	**$34,009,658**
				20% Contingency	$6,801,932
				PROJECT TOTAL	**$40,812,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

6.0 FUTURE SERVICE AREA MODELING

The goal of the Future Service Area interceptor modeling is to create a hydraulic simulation of the City's wastewater collection system assuming all development within the study area is completed. The results of the modeling are intended to show how the City's interceptor system (current and projected) performs and provide a planning tool for future loading conditions. This model was created using information from the previous model scenarios, plus available GIS data and topography in future development areas.

6.1 PHYSICAL MODEL

The Future Scenario model expands upon the Committed Scenario physical model, extending the City's interceptor sewers, adding new interceptors to areas not currently serviced by the system, and upsizing and replacing some existing interceptors. These new pipes and manholes were schematically located (horizontally and vertically) using existing mapping and topographic information (Pinal County). Model input included the proposed pipe sizes, manhole rim elevations, pipe lengths and inverts. Pipe slopes are based on invert input information and ADEQ minimum slopes required to maintain a cleaning velocity of two feet per second. Initial input data was modified, as necessary, during the iterative modeling process to determine appropriate sizing and slopes of proposed interceptors.

In the Future Scenario model, all upsizing of existing facilities and recommendations for new interceptors (from all scenarios) was incorporated into the physical model input. As a result, the manual flow split created at the Trekell and Cottonwood intersection was no longer necessary because of the 21 inch upsize in Trekell Road. However, four additional manual flow splits were created to maximize the capacity of the system. Two flow splits were created near the Henness and Kortsen intersection to push flow north into the new 54" interceptor along Henness Road. One flow split was created at McCartney and Trekell Road to intercept flows that were originally heading south on Trekell and push them west into the underutilized McCartney Road interceptor. The last split was created at the Cox and Kortsen intersection to push flows into the new 48 inch interceptor in Kortsen Road. The rest of the splits are automatically calculated based on the pipe invert elevations.

See **Exhibit 6.1.1 - Future System Map** for the Future Scenario proposed pipe extensions and additions.

6.2 SEWERSHED DEFINITIONS

Sewershed areas were expanded to include all land within the project planning boundary. The contributing areas for the interceptor extensions added in **Section 6.1** were defined using the latest available topography, aerial photography, as-builts and other GIS data. **Exhibit 6.2.1 – Future Sewershed Map** shows a map of the defined sewer sheds within the Future Scenario system.

Note: In this scenario, the sewershed for a portion of the network was redefined to represent the City's plan to decommission the lift station on McMurray Blvd between VIP Blvd and Burris Road. This project proposes the installation of a 12-inch sewer from VIP to Burris within McMurray Blvd. This line is intended to convey flows to the existing 36-inch sewer in Burris Road from the area south of McMurray bounded by VIP Blvd and Burris Road.

6.3 SEWER CONNECTIONS & FLOW CALCULATIONS

The number of sewer connections in each sewer shed was calculated using the parcel shapefiles and other City GIS data. The designated land use for each parcel was defined by the Zoning or General Plan 2020 Map for all future land within the project planning boundary. The land use was then used to estimate the number of connections. **Exhibit 6.2.1 - Future Sewershed Map** shows the future areas contributing flow to the system. Total number of parcels and acreage per sewershed is found in the **Exhibit 6.2.1 - Future Sewershed Map** legend.

The sewer flow calculations are the portion of the modeling that simulates the projected flows that are anticipated within the interceptor system once the future land is fully developed according to the designated land use. In addition to the loadings for the existing and committed scenarios, each manhole in the system was allocated specific parcels, not yet represented in previous scenarios, associated with a land use defined by the Zoning or the General Plan 2020. Flows were simulated in a manner similar to the previous scenarios; each manhole was allocated future parcels and "loaded" with a flow rate using the Load Allocator. This simulated the average daily flow (ADF) from existing, committed, and future parcels within the system. Later, peaking factors were applied in according with **Section 3.6**, to obtain the ultimate peak flow (design flow). As in the 2014 Scenario and Committed Scenario, the outfall manhole data associated with each parcel was stored within a separate future parcel shapefile (fparcels.shp). The East Area outfall manhole data was also stored in a separate parcel shapefile (eparcels.shp).

Known Loads from future developments were also entered into the model manually for individual developments projected to contribute significant flows to the system. These flows were stored separately from the Allocated Loads in the model database.

The respective flow loads within the Manhole Hydraulic Model Data Table (within the model database) are as follows:

- LOAD 1 – Allocated Loads based on the existing 2104 system
- LOAD 2 – Known Loads based on given flow rates from SIUs
- LOAD 3 – Not used
- LOAD 4 – Not used
- LOAD 5 – Known Loads based on given flow rates for Committed Developments
- LOAD 6 – Allocated Loads based on the Committed system
- LOAD 7 – Allocated loads based on the Future system
- LOAD 8 – Known loads based on given flow rates for Future Developments

Table 6.3.1 – Future Load Data

Model Load Data	ADF (MGD)
LOAD 1	5.52
LOAD 2	1.27
LOAD 3	-
LOAD 4	-
LOAD 5	9.67
LOAD 6	2.14
LOAD 7	47.61
LOAD 8	4.61

The Future Scenario includes all land within the project boundary designated as Existing, Existing – Heavy Industrial, Committed, Septic and Vacant. The assumption is that septic areas will ultimately connect to the centralized sewer network once individual septic systems near the end of their design life.

The total flow output per land use type (Allocated Loads) and given flow data from Future Developments (Known Loads) applied to the model is shown in **Appendix F - Future Flow Data**. The flows entered in the 2014 and Committed modeling for the Future Service Area remains unchanged, the future flows were added as additional flow to the model. The generated flows were added throughout the model based on anticipated location of connection to the future interceptor system.

6.4 INTERCEPTOR MODELING RESULTS

Once the physical model described in **Section 6.1** was loaded with the sewer flows described in **Section 6.3** to create a completed interceptor sewer model, simulations were run with peaking factors (**Section 3.5)** for this Future Scenario.

The future interceptor modeling showed that the existing interceptor system is not adequate to convey the future Average Daily Flow, nor Dry Weather Peaked Flow. Multiple locations in the interceptor system are under capacity and therefore unable to handle the projected flows The model also revealed sections of pipe that exceed 0.75 d/D and some minor surcharging under peaked conditions, i.e. the hydraulic grade lines of the pipes flowing full are right at the top of pipe or just above it (less than 2'). The locations of these sections are clearly shown in red on **Exhibit 6.4.1 – Future d/D Map**. The exhibit gives the d/D for the system after the major interceptor extensions were added to the model. The Future d/D Map is different than the d/D Maps from previous scenarios because it incorporates all recommended upsizing of existing facilities for Existing, Committed, and Future Scenarios. In other words, the problem areas on the Future d/D Map consist only of minor surcharging issues.

Note: The future interceptor along Rodeo Road provided relief to some of the overtaxed lines, i.e. the upsize recommendation of the 12 inch Pinal Avenue interceptor north of Kortsen Road in the Committed Scenario was no longer necessary.

The Dry Weather Peaked Flows cause significant surcharging over full flow capacity for the following:

- 12 inch Gila Bend Highway interceptor east of Henness Road (MH 2722 to MH 2710) – Solution proposed in Section 5.5 – Committed Recommendations
- 15 inch & 18 inch Henness Road interceptor north of Gila Bend Highway (MH 2710 to MH 2542) – Solution proposed in Section 5.5 – Committed Recommendations
- 18 inch Henness Road interceptor south of Gila Bend Highway
- 12 inch Arizola Road interceptor north of Peters Road (MH 7085 to MH 7278) – Solution proposed in Section 5.5 – Committed Recommendations
- 12 inch Trekell Road interceptor between Cottonwood Lane and Kortsen Road (MH 2915 to MH 3017) – Solution proposed in Section 4.6 – 2014 Recommendations
- 12 inch Cottonwood Road interceptor west of Trekell Road (MH 1024 to MH 5869) – Solution proposed in Section 4.6 – 2014 Recommendations
- Various locations along Cottonwood Road and Kortsen Road interceptors – Solution provided by the Cottonwood-Kortsen Relief Line
- 12 inch interceptor north of the Casa Grande Municipal Airport (MH 2575 to MH 8195)

The total flow at the CGWRF outfall from the Future Scenario model is shown in **Table 6.4.1 – Future Outfall Flows**, which includes flow contributions from the Future Scenario (Known and Allocated), as well as, flows from the 2014 Scenario and Committed Scenario.

Table 6.4.1 – Future Outfall Flows

Location/Source	Scenario	ADF, MGD	ADF, Cumulative	Peak, MGD	Peak, Cumulative
CGWRF/Sewer Model	2014	6.79	6.79	10.58	10.58
CGWRF/Sewer Model	Committed	11.82	18.61	17.31	27.89
CGWRF/Sewer Model	Future	52.22	70.83	74.42	102.31

The total outfall flows from the interceptor modeling for the Future Scenario are higher than outfall flows projected in previous sewer master plan reports and modeling. This was expected due to a number of conditions that have changed since the last model update. The first reason for the difference in flow is related to the completion of the General Plan 2020 Report and the resulting changes in land use. The second reason is increased loading factors for industrial, commercial and some residential land uses. And lastly, known flow rates provided from potential development within the planning boundary have been incorporated into the model.

6.5 FUTURE RECOMMENDATIONS

The modeling results were used to determine the master-planned pipe sizes and locations for future flow conditions within the existing system and expanded Future Service Area. Multiple expansions to the interceptor system have been proposed to serve future development in these areas. All interceptors were sized to accommodate future peaked dry weather flow at 0.75 d/D. The expansions include extensions to existing and committed interceptors (Projects 16-20), as well as, construction of new major interceptors.

North & South Area

The new lines include the following:

- The largest interceptor in the Future scenario is the 54 inch Rodeo Road Interceptor (Project 12). Construction of this interceptor will pick up flows from the North and a majority of the flows from East Area, thereby acting as another relief line for the Kortsen Road interceptors. This will free up capacity in the Kortsen interceptors allowing them to take on more flows from the parcels to the south, as well as convey flows from the north.
- 18 inch interceptor along McCartney Road between Thornton Road and Peart Road (Project 13)
- 18, 21, and 27 inch interceptor along Thornton Road between Martin Road and Rodeo Road (Project 14)
- 12, 15, and 21 inch interceptor along Burris Road between Martin Road and Kortsen (Project 15)
- 36 inch interceptor along Burris Road between Kortsen Road and Peters Road (Project 21)
- Multiple interceptors in the South Area (Projects 22 and 23).
- 18 inch interceptor adjacent to the Interstate-10 and Mission Royale (Project 24)

New interceptors were sized using the latest available development plans for parcels classified as Future. For instance, the proposed flow data from the Preliminary Land Use Plan for Copper Mountain Ranch was considered when sizing the new Thornton Road interceptor. New interceptors in the southeast area, near the I-8 & 1-10 interchange were sized to accommodate potential flows from the Regional Gateway Commerce Park, and flows from the Northeast Area were considered for sizing the proposed interceptor in McCartney Road.

In addition to the new interceptor lines, the future conditions model necessitates the construction of a new wetwell, lift station and headworks located on the southeast corner of the existing CGWRF property. This would establish a new outfall elevation at 1332.13, allowing the Thornton Interceptor to gravity flow through the Dave White Municipal Golf Course and eventually tie into the WRF. There is not a gravity flow solution through the golf course, which maintains minimum cover requirements, that outfalls at the existing influent structure elevation. The construction of this facility would add one more lift station to the City's network, however, it eliminates the need for the existing lift station on Thornton Road north of the golf course and the lift station near the intersection of Burris and Kortsen Road. The drawbacks to this solution are significant construction depths along portions of Kortsen Road and through the golf course. An alternative to this recommendation is discussed in **Section 7.0 Summary and Conclusions**.

As expected, future interceptor modeling showed that portions of the existing interceptor system were inadequate to convey the future Average Daily Flow and Dry Weather Peaked Flow. There are two critical improvements recommended where existing pipes may be undersized for the future conditions.

- To relieve the surcharging on the Henness Road interceptor south of Gila Bend Highway, the 18 inch interceptor should be upsized to a 24 inch pipe and a 27 inch pipe (Project 10).

- The 12 inch interceptor north of the Casa Grande Municipal Airport should be upsized to a 15 inch and 18 pipe (Project 11).

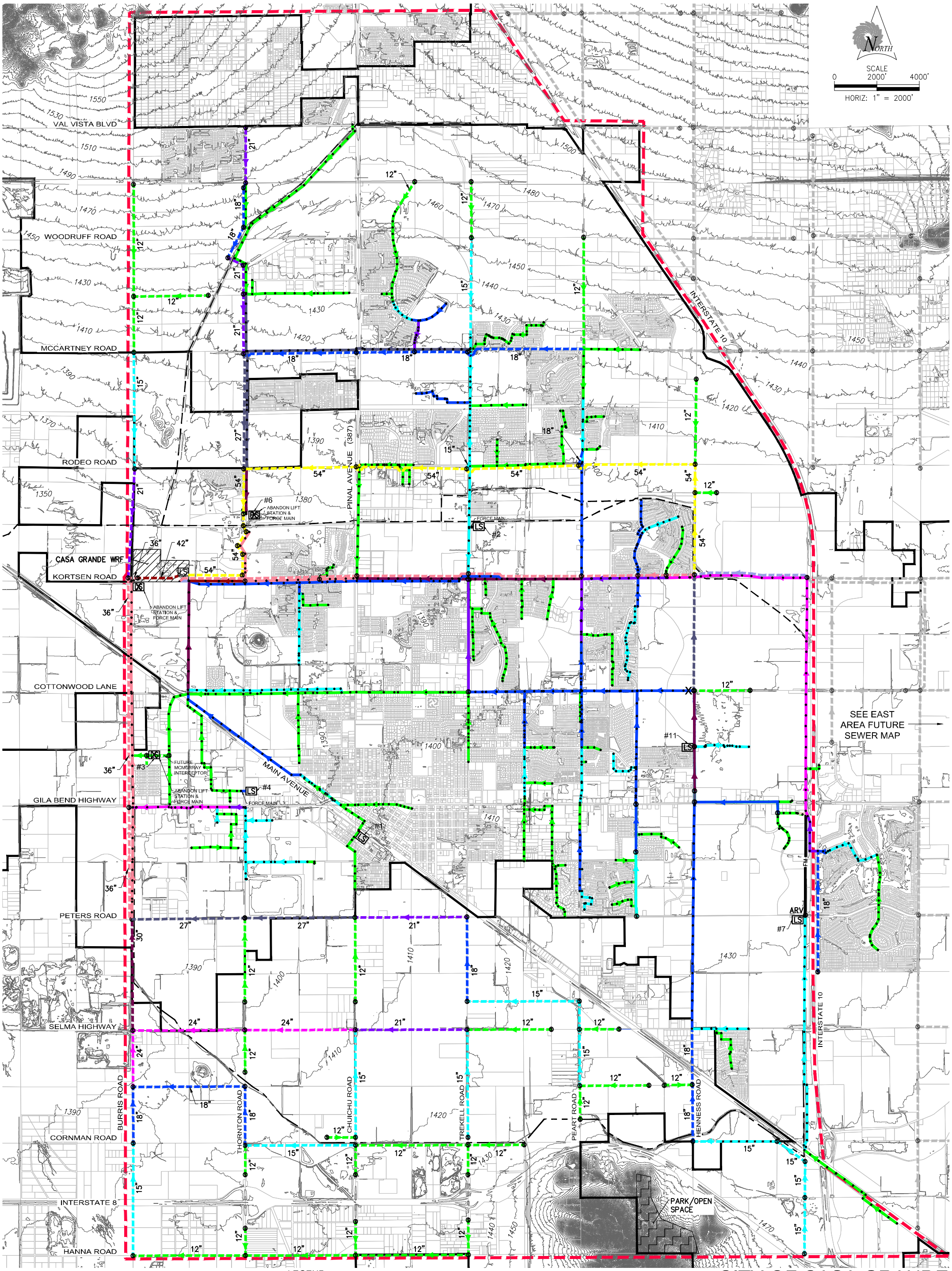
Sizing has been made to accommodate flows from the Future Scenario, along with flows from the Existing and Committed Scenarios. A map showing the proposed pipes and future system deficiencies with recommended solutions is shown in **Exhibit 6.5.1 – Committed Recommendations Map**.

Other improvements are not recommended for minor surcharging, i.e. when the hydraulic grade line is less than 2 feet above the top of pipe and the interceptors are sufficiently deep. Instead, these locations should be monitored during wet weather conditions, to determine the magnitude of the storm surge on the interceptor, on a case by case basis. In some cases, the wet weather conditions (I&I) could potentially surcharge the pipes to the point where an upsize is needed.

Figure 6.5.1 – Future Recommendations Cost Estimate shows the cost of the proposed master planned improvements including removal and replacement costs. Pipe lengths shown on the estimate are approximate, true lengths will be determined in final design. Individual cost estimates for each project may be found in **Appendix G**.

<u>East Area</u>
The expansions to serve the East Area include multiple interceptors of various sizes (see **Exhibit 6.5.2 – Future Recommendations Map – East Area**). All of the East Area improvements fall under Project 25E. The estimate for the East Area is included in the total estimate for the Future Recommendations. The individual cost estimate for Project 25E may be found in **Appendix G**.

SECTION 6
FIGURES & EXHIBITS



LEGEND

2014 EXISTING	UPSIZE EXISTING	PROPOSED	
			12" SEWER
			15" SEWER
			18" SEWER
			21" SEWER
			24" SEWER
			27" SEWER
			30" SEWER
			36" SEWER
			42" SEWER
			48" SEWER
			54" SEWER

- STUDY LIMITS
- CITY LIMITS
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
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- MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING
EXHIBIT 6.1.1
FUTURE SYSTEM MAP

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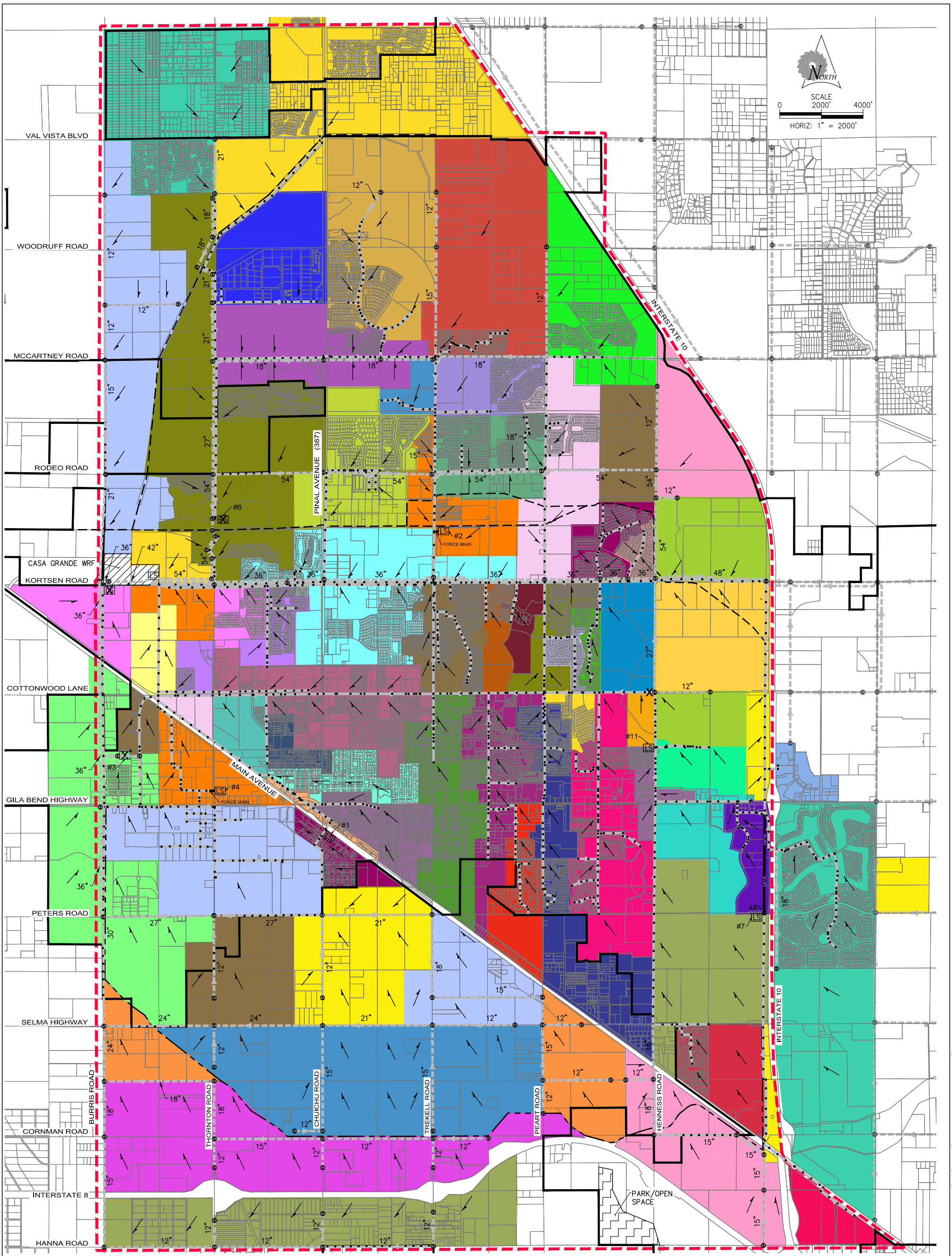

LEGEND

- STUDY LIMITS
- CITY LIMITS
- SEWER 2014
- PROPOSED SEWER
- EXISTING CANAL
- EXISTING WASH
- LIFT STATION
- FORCE MAIN
- MANHOLE
- PROPOSED MANHOLE
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE

NOTE
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CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING
EXHIBIT 6.2.1
FUTURE SEWER SHED MAP

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SEWER SHED LEGEND FUTURE

STREET NAME	AC	PARCEL COUNT
ABBOTT LINE	198	6
ARIZOLA ROAD 1	242	667
ARIZOLA ROAD 2	890	954
BROWN AVENUE	126	4
BURRIS 1	1,606	256
BURRIS 2	312	7
BURRIS 3	303	25
CAM MERCADO	193	25
CAMINO GRANDE AVENUE	309	435
CASA VISTA	406	376
CENTENNIAL BOULEVARD	563	129
CHUICHU ROAD	870	35
CLAYTON	109	92
COTTONWOOD LANE 1	188	71
COTTONWOOD LANE 2	753	1,166
COTTONWOOD LANE 3	91	208
COTTONWOOD LANE 4	82	2
COTTONWOOD LANE 5	269	4
COX ROAD	196	10
DESERT WILLOW STREET	83	325
EAST AREA	156	3
FIRST STREET	53	93
FRIAR ROAD	78	264
GILA BEND HIGHWAY 1	313	729
GILA BEND HIGHWAY 2	342	27
GILA BEND HIGHWAY 3	1,063	79
GUARDIA	115	39
HANNA STREET	1,107	255

STREET NAME	AC	PARCEL COUNT
HENNESS ROAD 1	126	142
HENNESS ROAD 2	894	30
HENNESS ROAD 3	510	3
HESTER TRAIL	79	261
JEFFERSON	351	78
JIMMIE KERR BLVD	197	7
KORTSEN ROAD 1	171	13
KORTSEN ROAD 2	1,125	1,338
KORTSEN ROAD 3	165	366
KORTSEN ROAD 4	322	10
KORTSEN ROAD 5	665	14
KORTSEN ROAD 6	47	156
KORTSEN ROAD 7	487	8
LAKESIDE PARKWAY	1,131	827
MAIN	78	4
MARIA AVENUE 1	146	184
MARIA AVENUE 2	525	993
MCCARTNEY ROAD 1	731	217
MCCARTNEY ROAD 2	780	567
MISSION ROYALE	1,985	2,377
INTERCHANGE	833	18
NORTH AIRPORT	1,768	1,236
PEART ROAD 1	692	440
PEART ROAD 2	189	269
PEART ROAD 3	862	1,275
PEART ROAD 4	492	10
POTTEBAUM AVENUE 1	133	72
POTTEBAUM AVENUE 2	347	296

STREET NAME	AC	PARCEL COUNT
PROMENADE	134	30
PUTTER PLACE	216	3
RODEO DRIVE 1	484	990
RODEO DRIVE 2	689	646
SACATON	169	370
SCHULTZ STREET 1	172	493
SCHULTZ STREET 2	117	313
SCHULTZ STREET 3	262	657
SCOTT DRIVE	1,202	1,712
SELMA HIGHWAY	1,838	42
THORNTON ROAD	1842	1077
THORNTON ROAD 2	592	12
TREKELL ROAD 1	1,305	360
TREKELL ROAD 2	382	225
TREKELL ROAD 3	384	948
TREKELL ROAD 4	621	1,305
TREKELL ROAD 5	536	32
VERBENA ROAD	1,598	55
WEST ONE ROAD	169	7

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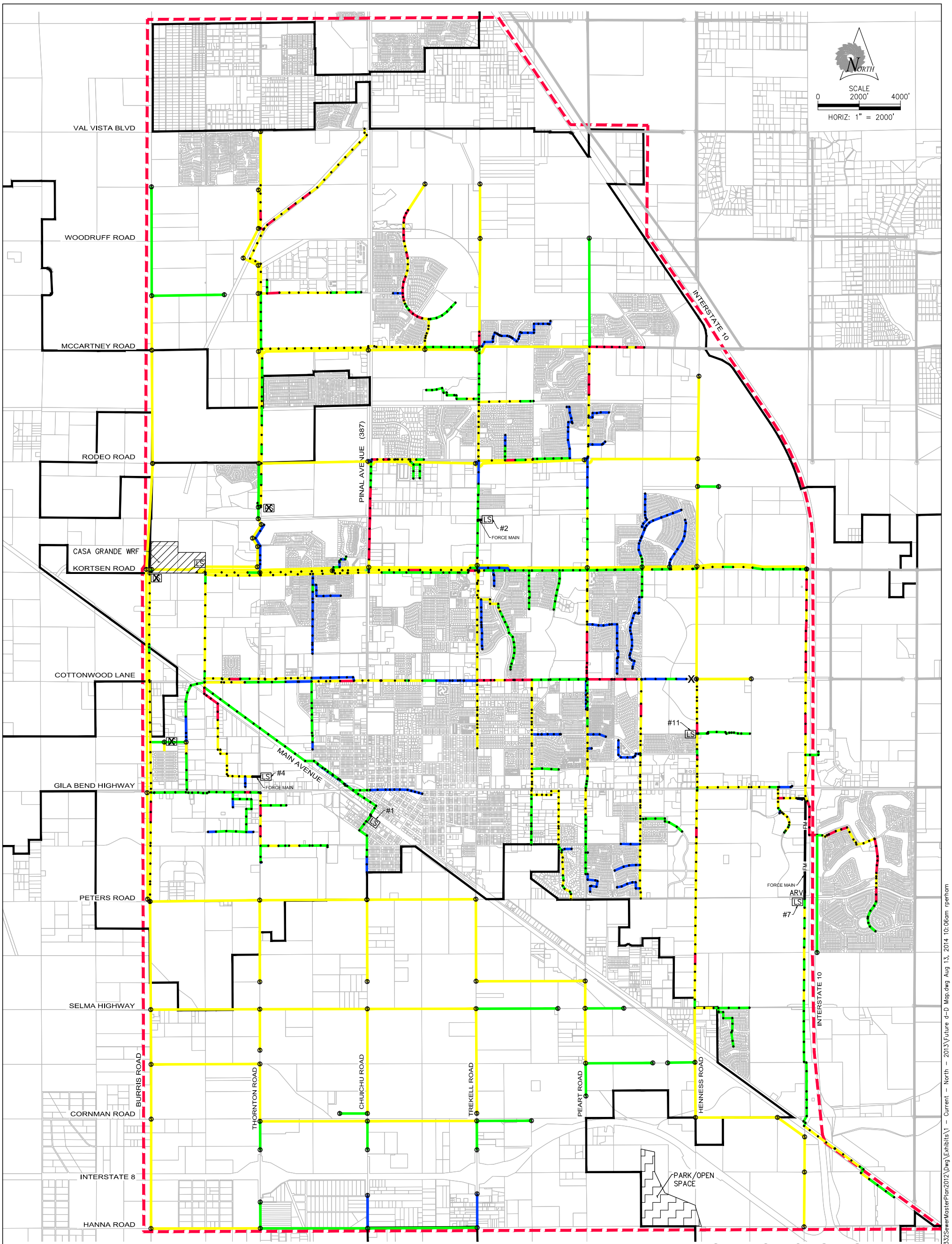

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 6.4.1

FUTURE d/D MAP

LEGEND

- STUDY LIMITS
- CITY LIMITS
- 0.00 TO 0.25 d/D
- 0.25 TO 0.50 d/D
- 0.50 TO 0.75 d/D
- 0.75 TO 1.00 d/D
- FM — FORCE MAIN
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- MANHOLE
- PROPOSED MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

THE FUTURE d/D MAP ASSUMES ALL RECOMMENDED IMPROVEMENTS FROM THE EXISTING, COMMITTED AND FUTURE SCENARIOS HAVE BEEN IMPLEMENTED.

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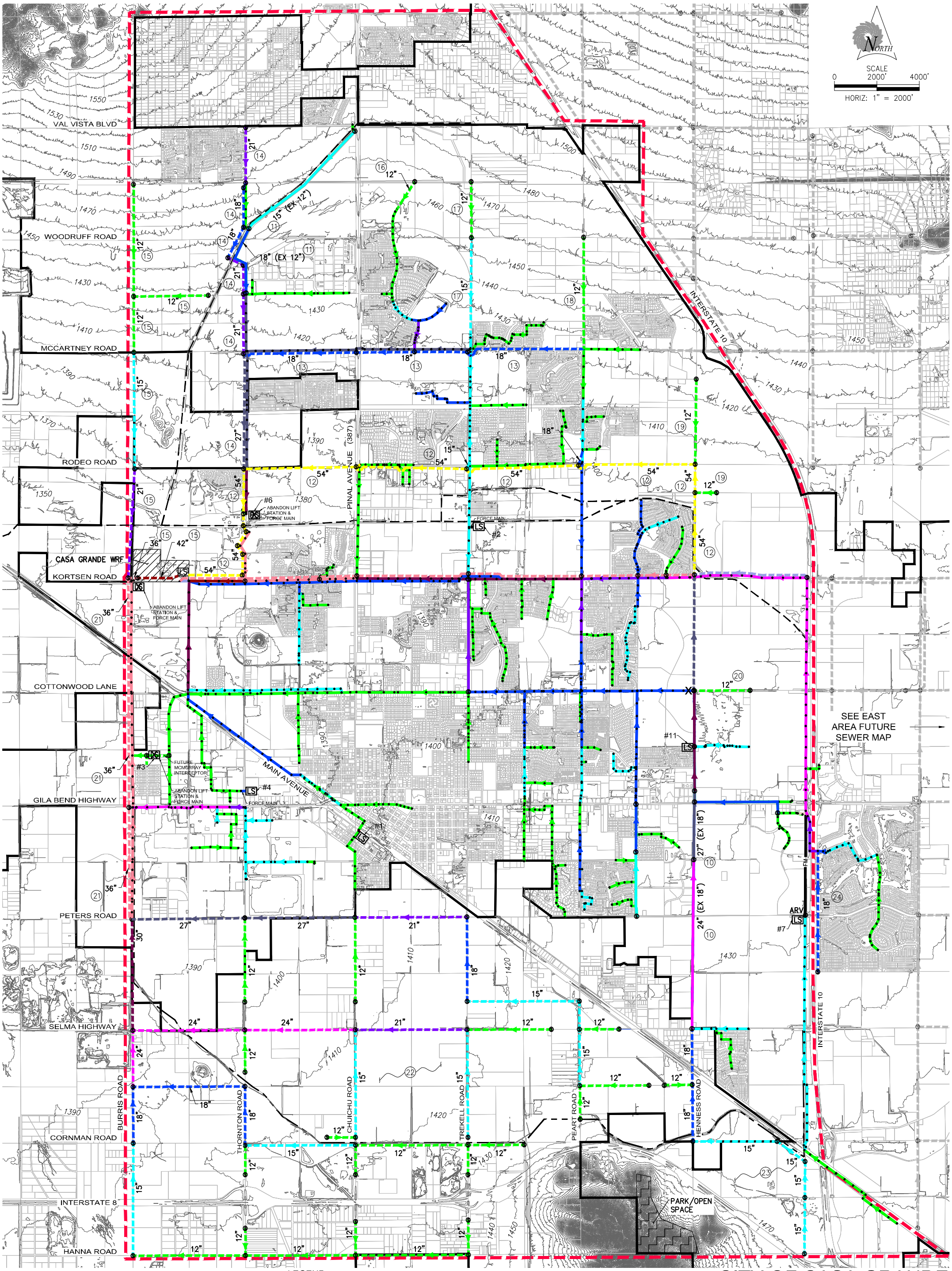

LEGEND

2014 EXISTING	UPSIZE EXISTING	PROPOSED	
			12" SEWER
			15" SEWER
			18" SEWER
			21" SEWER
			24" SEWER
			27" SEWER
			30" SEWER
			36" SEWER
			42" SEWER
			48" SEWER
			54" SEWER

- STUDY LIMITS
- CITY LIMITS
- FM — FORCE MAIN
- EXISTING CANAL
- EXISTING WASH
- PROPOSED MANHOLE
- MANHOLE
- ARV — AIR RELEASE VALVE
- LS — LIFT STATION
- PS — PUMP STATION
- WATER RECLAMATION FACILITY (WRF)
- PARK/OPEN SPACE
- (X) PROJECT NUMBER

NOTE
SPACING BETWEEN PARALLEL INTERCEPTORS HAS BEEN EXAGGERATED FOR CLARITY.

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING
EXHIBIT 6.5.1
FUTURE RECOMMENDATIONS MAP

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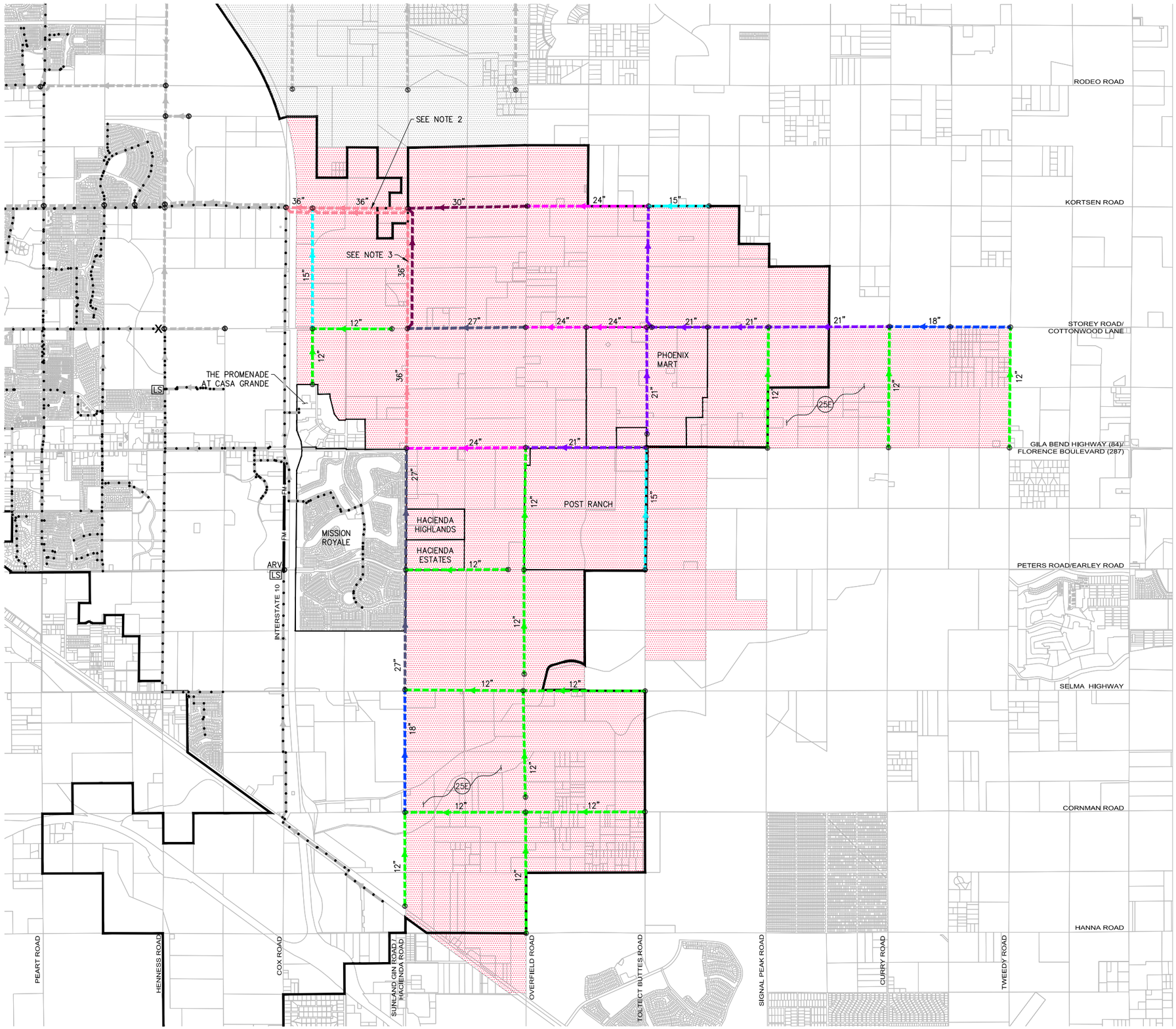

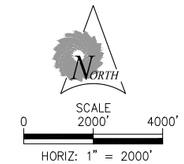

NOTES

1. ALL SIZING SHALL BE USED AS A GUIDE FOR PLANNING PURPOSES ONLY. SIZING IS SUBJECT TO CHANGE DURING FINAL DESIGN.
2. BUILDOUT OF THE EAST PLANNING AREA WILL NECESSITATE AN ADDITIONAL 36 INCH PARALLEL LINE ADJACENT TO THE 36 INCH KORTSEN ROAD INTERCEPTOR. ALTERNATIVELY, A SINGLE 48 INCH INTERCEPTOR MAY BE INSTALLED.
3. BUILDOUT OF THE EAST PLANNING AREA WILL NECESSITATE AN ADDITIONAL 30 INCH PARALLEL LINE ADJACENT TO THE 36 INCH HACIENDA ROAD INTERCEPTOR. ALTERNATIVELY, A SINGLE 42 INCH INTERCEPTOR MAY BE INSTALLED.

LEGEND

- CITY LIMITS
- SEWER (NON-EAST AREA)
- 12" PROPOSED SEWER
- 15" PROPOSED SEWER
- 18" PROPOSED SEWER
- 21" PROPOSED SEWER
- 24" PROPOSED SEWER
- 27" PROPOSED SEWER
- 30" PROPOSED SEWER
- 36" PROPOSED SEWER
- 42" PROPOSED SEWER
- 48" PROPOSED SEWER
- PROPOSED MANHOLE
- LIFT STATION
- FORCE MAIN
- EAST PLANNING AREA
- NORTHEAST PLANNING AREA
- PROJECT NUMBER

CITY OF CASA GRANDE

INTERCEPTOR SEWER MODELING

EXHIBIT 6.5.2

EAST AREA FUTURE SEWER MAP

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Future Projects

City of Casa Grande

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Figure 6.5.1 - Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	154,356	LF	$144.00	$22,227,309
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	70,020	LF	$148.00	$10,362,997
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	59,386	LF	$152.00	$9,026,628
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	39,096	LF	$155.00	$6,059,803
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	26,450	LF	$175.00	$4,628,677
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	23,920	LF	$200.00	$4,784,072
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	10,467	LF	$215.00	$2,250,474
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	16,419	LF	$225.00	$3,694,264
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	1,918	LF	$280.00	$537,163
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	34,374	LF	$390.00	$13,405,692
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	804	EA	$10,000.00	$8,039,613
16	Jack & Bore Major Canal Crossing	3	LF	$165,000.00	$495,000
17	Lift Station	1	EA	$250,000.00	$250,000
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	10,345	LF	$20.00	$206,891
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	10,692	LF	$22.00	$235,213
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	41	EA	$2,500.00	$101,271
28	Remove or Salvage Existing Lift Station	2	EA	$8,000.00	$16,000
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$4,316,053.24	$4,316,053
30	Traffic Control	10%	LS	$8,632,106.49	$8,632,106
31	Engineering & Administration	10%	LS	$8,632,106.49	$8,632,106
32	Staking and Construction Management	10%	LS	$8,632,106.49	$8,632,106
				Sub-Total	**$116,533,438**
				20% Contingency	$23,306,688
				PROJECT TOTAL	**$139,840,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

7.0 SUMMARY & CONCLUSIONS

In summary, the interceptor system model and master planning provide the City of Casa Grande with a tool to better manage their wastewater system and prepare for future development. The model also provides the City with additional collection system analysis and management capabilities. A summary of some relevant capabilities are as follows:

- Future Pipe Sizing
- Flow Depths
- Travel Time Analysis
- Flow Capacity Evaluations
- Alternative Pipe Routings
- CMOM Program Planning
- Dynamic Profiling
- Real Time Simulations
- Odor Control Analysis
- Source Tracing

For a full listing of modeling capabilities now available to the City please visit http://www.innovyze.com/products/infosewer/.

Recommendations: The proposed improvements in each scenario are intended to be cumulative. That is, each successive scenario is modeled such that the recommended improvements from the prior scenario are assumed to be complete. The following is a summary of all master plan recommendations with their associated scenario:

- Project 1 – Existing – Remove and Replace (R&R) – Trekell Rd. (12-inch to 21-inch)
- Project 2 – Committed – R&R- Pinal Ave. (12-inch to 15-inch)
- Project 3 – Committed – R&R – Henness Rd. (15 & 18-inch to 27 and 30-inch)
- Project 4 – Committed – R&R – Gila Bend Hwy. (12-inch to 18-inch)
- Project 5 – Committed – R&R – Arizola Rd. (12-inch to 15 and 18-inch)
- Project 6 – Committed – New Interceptor – Kortsen Rd. Relief Line (36 & 48-inch)
- Project 7 – Committed – New Interceptor – Henness Rd. (27-inch)
- Project 8 – Committed – New Interceptor – Peters Rd. (36-inch)
- Project 9E – Committed – New Interceptor – East Area (Multiple - See Exhibit 5.5.2)
- Project 10 – Future – R&R – Henness Rd. (18-inch to 24 & 27-inch)
- Project 11 – Future – R&R – North of the Municipal Airport (12-inch to 15 & 18-inch)
- Project 12 – Future – New Interceptor - Rodeo Rd. (54-inch)
- Project 13 – Future – New Interceptor – McCartney Rd. (18-inch)
- Project 14 – Future – New Interceptor – Thornton Rd. (18, 21, & 27 inch)
- Project 15 – Future – New Interceptor – Burris Rd. (12, 15, & 21 inch)
- Project 16 – Future – Extension – Lakeside Pkwy. (12-inch)
- Project 17 – Future – Extension – Trekell Rd. north of McCartney Rd. (12-inch)
- Project 18 – Future – Extension – Peart Rd. north of McCartney Rd. (12-inch)
- Project 19 – Future – Extension – Henness Rd. north of Rodeo Rd. (12-inch)
- Project 20 – Future – Extension – Cottonwood Ln. east of Henness Rd. (12-inch)
- Project 21 – Future – New Interceptor - Burris Road (36-inch)
- Project 22 – Future – New Interceptor – South Area (Multiple – See Exhibit 6.5.1)

- Project 23 – Future – New Interceptor – South Area (Multiple – See Exhibit 6.5.1)
- Project 24 – Future – New Interceptor – Interstate-10 and Mission Royale (18-inch)
- Project 25E – Future – New Interceptor – East Area (Multiple – See Exhibit 6.5.2)

In addition to the recommendations already covered, the following should be taken into consideration by the City:

Modeling Updates: This report recommends that the City perform regular updates to the model as development occurs and the collection/interceptor system is expanded. An up-to-date model of the system will provide the City with the best analysis and management tool. As the model changes the Master Plan can easily be updated to reflect those changes. The goal is that the Master Plan, and more so the models developed, will function as a living document that is updated or modified as conditions change.

Interim Sizing: Interim sizing for interceptors should be avoided wherever possible. However, due to budgetary constraints the City may choose to install a smaller diameter pipe than what is recommended in this report. The City should understand that any interim sized interceptor will likely be replaced in the future conditions or necessitate an additional parallel line along that corridor. It is highly recommended that any such alterations to the proposed pipe network be input under a new scenario, and such modifications be thoroughly analyzed and evaluated to determine the ramifications prior to implementation.

Committed Interceptor Alignment DCR: Although the Kortsen Road corridor was selected in this report as the recommended alignment for the 36" Cottonwood-Kortsen Relief Line, a thorough investigation of all potential obstacles, risk factors and associated costs was not conducted. It is recommended that an Alignment Study be prepared to further analyze the Kortsen Road corridor, as well as, the potential Santa Cruz Wash and Rodeo Road corridors prior to moving forward with the final alignment and construction documents.

Alternative to the Future Outfall: It must be noted that the future conditions model assumes the construction of a new wetwell, lift station and headworks located on the southeast corner of the existing CGWRF property. In order for the Thornton Interceptor to tie into this facility, significant portions of the Dave White Municipal Golf Course would be disturbed. An alternative to this solution would be to establish a new outfall elevation and lift station near the existing Thornton Road Lift Station and pump future flows via force main through the Dave White Municipal Golf Course. This could potentially reduce the impact on existing facilities. In this alternative, once beyond the golf course, a gravity line would convey flows along Kortsen Road to the new headworks for the CGWRF. This alternative would also not require a lift station at the new headworks.

Plan for Projects in the City's CIP: The City should use the information shown in each of the scenarios and evaluate those projects identified which should be included in the City's Capital Improvement Program, and when they should be programmed for design and construction. Many of these projects for the Committed and Future service areas will be dependent on the pace at which development occurs in the un-serviced areas of the City. All proposed developments will impact the downstream capacity in the City's network to varying extents.

Plan for Flows to WRF: Currently, the City uses only a portion of their 12 MGD capacity in the CGWRF. However, this report demonstrates that as the City grows and develops, in the future, additional capacity will be required. Planning for this will be necessary to accommodate both committed and future condition service areas. It is recommended that the City begin the process of expanding the current treatment capacity, in accordance with AAC R18-9-A305, in anticipation of increased flows from committed users likely to develop in the near future.

Plan for Flows to Lift Stations: The intent of this study was to avoid the need for new lift stations within the City's network. However, it was determined that improvements to existing lift stations may be required at the following locations as development occurs: Thornton Road Lift Station and the Burris Road Lift Station. Analysis and design of lift station facilities (pump sizing, etc.) was beyond the scope of this project.

Scour Depth Analysis: While this report attempted to establish depths of proposed interceptors sufficiently below washes and other drainage or irrigation facilities, consideration of requirements to prevent or mitigate scour were not considered..

Downstream Connections: It is recommended that users outside (downstream) of an established sewer shed who want to connect to a major interceptor meet the following criteria: the proposed development must be within 330' of an upstream line and no downstream line is available within a half mile, and the developer must pay a penalty (a portion of which will go towards modeling to determine capacity) or the developer must sufficiently prove that no adverse effects will be experienced from existing or future users of the line. Once these criteria have been met, the development may connect to system at the discretion of the City Engineer.

General Plan Amendments: If changes are contemplated for the City's General Plan (i.e. higher density housing, higher wastewater industries, larger planning area etc.) the proposed change should be input into the model for two reasons. The first is to verify if the proposed change impacts the existing downstream interceptor system. The second is to verify the master planned sizing of proposed facilities shown in this report.

The City of Casa Grande Wastewater Master Plan Update and Interceptor Sewer Modeling will allow the City unlimited planning possibilities for their wastewater collection system going forward. In the future, as more historic data becomes available, there will be opportunity to review this plan to ensure the assumptions made are still valid; thus insuring the City can continue to operate its collection system in the most efficient way possible.

8.0 REFERENCES

Arizona Administrative Code (AAC) Title 18, Chapter 9, Article 3, Part E. Type 4 General Permits

Burris Road Sewer Design Report, June 2008, *D.N.A. Inc.*

City of Casa Grande General Plan 2020, July 2009, *City of Casa Grande*

Gila Bend Highway Sewer Line Extension Design Report, March 2013, *Sunrise Engineering, Inc.*

Infrastructure Improvements Plan and the Land Use Assumptions Report, July 2012, *TischlerBise*

Land Use Master Plan for Copper Mountain Ranch, March 1999, *The Jack Johnson Company*

Preliminary Wastewater Collection System Basis of Design Report for Phoenix Mart, September 2011, *SKG Enterprises*

Sewer Model Report – Rodeo Road Interceptor Sewer, February 2009, *Olsson Associates*

Wastewater Master Plan Phase I Conceptual Plan, August 2006, *Carollo*

Water and Sewer Impact Report for Regional Gateway Commerce Park, September 2013, *prepared for Chasse R.E. & Financial Group by CEG*

9.0 ACKNOWLEDGMENTS

The City of Casa Grande Public Works Department made significant contributions to the completion of the Wastewater Master Plan Update. Individuals who provided feedback, assisted in data collection, and spent many hours attending project meetings, reviewing submittals and coordinating with the project team, include: Kevin Louis, Gregory Smith, Terry McKeon, and Jamie White. Their efforts were invaluable during the course of the project.

APPENDIX A

ADEQ Minimum Standards

TITLE 18. ENVIRONMENTAL QUALITY

CHAPTER 9. DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER POLLUTION CONTROL

ARTICLE 3. AQUIFER PROTECTION PERMITS - GENERAL PERMITS
PART E. TYPE 4 GENERAL PERMITS

Section

R18-9-E301. 4.01 General Permit: Sewage Collection Systems
R18-9-E302. 4.02 General Permit: Septic Tank with Disposal by Trench, Bed, Chamber Technology, or Seepage Pit, Less Than 3000 Gallons Per Day Design Flow
R18-9-E303. 4.03 General Permit: Composting Toilet, Less Than 3000 Gallons Per Day Design Flow
R18-9-E304. 4.04 General Permit: Pressure Distribution System, Less Than 3000 Gallons Per Day Design Flow
R18-9-E305. 4.05 General Permit: Gravelless Trench, Less than 3000 Gallons Per Day Design Flow
R18-9-E306. 4.06 General Permit: Natural Seal Evapotranspiration Bed, Less Than 3000 Gallons Per Day Design Flow
R18-9-E307. 4.07 General Permit: Lined Evapotranspiration Bed, Less Than 3000 Gallons Per Day Design Flow
R18-9-E308. 4.08 General Permit: Wisconsin Mound, Less Than 3000 Gallons Per Day Design Flow
R18-9-E309. 4.09 General Permit: Engineered Pad System, Less Than 3000 Gallons Per Day Design Flow
R18-9-E310. 4.10 General Permit: Intermittent Sand Filter, Less Than 3000 Gallons Per Day Design Flow
R18-9-E311. 4.11 General Permit: Peat Filter, Less Than 3000 Gallons Per Day Design Flow
R18-9-E312. 4.12 General Permit: Textile Filter, Less Than 3000 Gallons Per Day Design Flow
R18-9-E313. 4.13 General Permit: Denitrifying System Using Separated Wastewater Streams, Less Than 3000 Gallons Per Day Design Flow
R18-9-E314. 4.14 General Permit: Sewage Vault, Less Than 3000 Gallons Per Day Design Flow
R18-9-E315. 4.15 General Permit: Aerobic System, Less Than 3000 Gallons Per Day Design Flow
R18-9-E316. 4.16 General Permit: Nitrate-Reactive Media Filter, Less Than 3000 Gallons Per Day Design Flow
R18-9-E317. 4.17 General Permit: Cap System, Less Than 3000 Gallons Per Day Design Flow
R18-9-E318. 4.18 General Permit: Constructed Wetland, Less Than 3000 Gallons Per Day Design Flow
R18-9-E319. 4.19 General Permit: Sand-Lined Trench, Less Than 3000 Gallons Per Day Design Flow
R18-9-E320. 4.20 General Permit: Disinfection Devices, Less Than 3000 Gallons Per Day Design Flow
R18-9-E321. 4.21 General Permit: Surface Disposal, Less Than 3000 Gallons Per Day Design Flow
R18-9-E322. 4.22 General Permit: Subsurface Drip Irrigation Disposal, Less Than 3000 Gallons Per Day Design Flow
R18-9-E323. 4.23 General Permit: 3000 to Less Than 24,000 Gallons Per Day Design Flow
Table 1. Unit Design Flows

PART E. TYPE 4 GENERAL PERMITS

R18-9-E301. 4.01 General Permit: Sewage Collection Systems

A. A 4.01 General Permit allows for construction and operation of a new sewage collection system or expansion of an existing sewage collection system involving new construction as follows:
   1. A sewage collection system or portion of a sewage collection system that serves downstream from the point where the daily design flow is 3000 gallons per day based on Table 1, Unit Design Flows, except a gravity sewer line conveying sewage from a single building drain directly to an interceptor, collector sewer, lateral, or manhole regardless of daily design flow;
   2. A sewage collection system that includes a manhole; or
   3. A sewage collection system that includes a force main or lift station serving more than one dwelling.

B. Performance. An applicant shall design, construct, and operate a sewage collection system so that the sewage collection system:
   1. Provides adequate wastewater flow capacity for the planned service area;
   2. Minimizes sedimentation, blockage, and erosion through maintenance of proper flow velocities throughout the system;
   3. Prevents releases of sewage to the land surface through appropriate sizing, capacities, and inflow and infiltration prevention measures throughout the system;
   4. Protects water quality through minimization of exfiltration losses from the system;
   5. Provides for adequate inspection, maintenance, testing, visibility, and accessibility;
   6. Maintains system structural integrity; and
   7. Minimizes septic conditions in the sewage collection system.

C. Notice of Intent to Discharge. In addition to the Notice of Intent to Discharge requirements specified in R18-9-A301(B), an applicant shall submit the following information:
   1. A statement on a form approved by the Director, signed by the owner or operator of the sewage treatment facility that treats or processes the sewage from the proposed sewage collection system.
      a. The statement shall affirm that the additional volume of wastewater delivered to the facility by the proposed sewage collection system will not cause any flow or effluent quality limits of the individual permit for the facility to be exceeded.
      b. If the facility is classified as a groundwater protection permit facility under A.R.S. § 49-241.01(C), or if no flow or effluent limits are applicable, the statement shall affirm that the design flow of the facility will not be exceeded;
   2. If the proposed sewage collection system delivers wastewater to a downstream sewage collection system under different ownership or control, a statement on a form approved by the Director, signed by the owner or operator of the downstream sewage collection system, affirming that the downstream system can maintain the performance required by subsection (B) when receiving the increased flows;
   3. A general site plan showing the boundaries and key aspects of the project;
   4. Construction quality drawings that provide overall details of the site and the engineered works comprising the project including:
      a. The plans and profiles for all sewer lines, manholes, force mains, depressed sewers, and lift stations with sufficient detail to allow Department verification of design and performance characteristics;
      b. Relevant cross sections showing construction details and elevations of key components of the sewage collection system to allow Department verification of design and performance characteristics, including the slope of each gravity sewer segment stated as a percentage; and
      c. Drainage features and controls, and erosion protection as applicable, for the components of the project; and
      d. Horizontal and vertical location of utilities within the area affected by the sewer line construction;
   5. Documentation of design flows for significant components of the sewage collection system and the basis for calculating the design flows;
   6. Drawings, reports, and other information that are clear, reproducible, and in a size and format specified by the Department. The applicant may submit the drawings in a Department-approved electronic format; and
   7. Design documents, including plans, specifications, drawings, reports, and calculations that are signed, dated, and sealed by an Arizona-registered professional engineer. The designer shall use good engineering judgment by following engineering standards of practice, and rely on appropriate engineering methods, calculations, and guidance.

D. Design requirements.
   1. General Provisions. An applicant shall design and construct a new sewage collection system or an expansion of an existing sewage collection system involving new construction, according to the requirements of this general permit. An applicant shall:
      a. Base design flows for components of the system on unit flows specified in Table 1, Unit Design Flows.
      b. Design gravity sewer lines and all other sewage collection system components, including, manholes, force mains, lift stations, depressed sewers, and appurtenant devices and structures to accommodate maximum sewage flows as follows:
         i. Any point in a sewer main when flowing full can accommodate a peak wet weather flow calculated by multiplying the sum of the upstream sources of flow from Table 1, Unit Design Flows by a dry weather peaking factor based on upstream population, as tabulated below, and adding a wet weather infiltration and inflow rate based on either a percentage of peak dry weather flow or a gallons per acre rate of flow;

Upstream Population	Dry Weather Peaking Factor
100	3.62
200	3.14
300	2.90
400	2.74
500	2.64
600	2.56
700	2.50
800	2.46
900	2.42
1000	2.38
1001 to 10,000	$PF = (6.330 \times p^{-0.231}) + 1.094$
10,001 to 100,000	$PF = (6.177 \times p^{-0.233}) + 1.128$
More than 100,000	$PF = (4.500 \times p^{-0.174}) + 0.945$
PF = Dry Weather Peaking Factor p = Upstream Population	

ii. For a lift station serving less than 600 single family dwelling units (d.u.), use either of the following methods to size the pumps for peak dry weather flow in gallons per minute and add an allowance for wet weather flow and infiltration:
(1) Peak dry weather flow = 17 d.u.0.42, or
(2) Peak dry weather flow = 11.2 (population)0.42

iii. If justified by the applicant, the Department may accept lower unit flow values in the served area due to significant use of low-flow fixtures, hydrographs of actual flows, or other factors;

c. Use the "Uniform Standard Specifications for Public Works Construction" (revisions through 2004) and the "Uniform Standard Details for Public Works Construction" (revisions through 2004) published by the Maricopa Association of Governments, and the "Standard Specifications for Public Improvements," (2003 Edition), and "Standard Details for Public Improvements," (2003 Edition), published jointly by Pima County Wastewater Management and the City of Tucson, as the applicable design and construction criteria, unless the Department approves alternative design standards or specifications. An applicant in a county other than Maricopa and Pima shall use design and construction criteria from either the Maricopa Association of Governments or the Pima County Wastewater Management and the City of Tucson for the facility unless alternative criteria are designated by the Department.

i. This material is incorporated by reference and does not include any later amendments or editions of the incorporated material.

ii. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the Maricopa Association of Governments, 302 N. 1st Avenue, Suite 300, Phoenix, Arizona 85003, or on the web at http://www.mag.maricopa.gov/archive/Newpages/on-line.htm; or from Pima County Wastewater Management, 201 N. Stone Avenue, Tucson, Arizona 85701-1207, or on the web at http://www.pima.gov/wwm/stddet;

d. Ensure that sewage collection system components are separated from drinking water distribution system components as specified in 18 A.A.C. 5, Article 5;

e. Ensure that sewage collection system components are separated from reclaimed water system components as specified in 18 A.A.C. 9, Article 6; and

f. Request review and approval of an alternative to a design feature specified in this Section by following the requirements in R18-9-A312(G).

2. Gravity sewer lines. An applicant shall:

a. Ensure that any sewer line that runs between manholes, if not straight, is of constant horizontal curvature with a radius of curvature not less than 200 feet;

b. Cover each sewer line with at least 3 feet of earth cover meeting the requirements of subsection (D)(2)(h). The applicant shall:

i. Include at least one note specifying this requirement in construction plans;

ii. If site-specific limitations prevent 3 feet of earth cover, provide the maximum cover attainable, construct the sewer line of ductile iron pipe or other design of equivalent or greater tensile and compressive strength, and note the change on the construction plans; and

iii. Ensure that the design of the pipe and joints can withstand crushing or shearing from any expected static and live load to protect the structural integrity of the pipe. Construction plans shall note locations requiring these measures;

c. If sewer lines cross or are constructed in floodways;

i. Place the lines at least 2 feet below the level of the 100-year storm scour depth and calculated 100-year bed degradation and construct the lines using ductile iron pipe or pipe with equivalent tensile strength, compressive strength, shear resistance, and scour protection.

ii. If it is not possible to maintain the 2 feet of clearance specified in subsection (D)(2)(c)(i), using the process described in R18-9-A312(G), provide a design that ensures that the sewer line will withstand any lateral and vertical load for the scour and bed degradation conditions specified in subsection (D)(2)(c)(i);

iii. Ensure that sewer lines constructed in a floodway extend at least 10 feet beyond the boundary of the 100-year storm scouring;

iv. If a sewer line is constructed in a floodway and is longer than the applicable maximum manhole spacing distance in subsection (D)(3)(a), using the process described in R18-9-A312(G), provide a design that ensures the performance standards in subsection (B) are met; and

v. Note locations requiring these measures on the construction plans;

d. Ensure that each sewer line is 8 inches in diameter or larger except the first 400 feet of a dead end sewer line with no potential for extension may be 6 inches in diameter if the design flow criteria specified in subsections (D)(1)(a) and (D)(1)(b) are met and the sewer line is installed with a slope sufficient to achieve a velocity of at least 3 feet per second when flowing full. If the line is extended, the applicant seeking the extension shall replace the entire length with larger pipe to accommodate the new design flow unless the applicant demonstrates with engineering calculations that using the existing 6-inch pipe will accommodate the design flow;

e. Design sewer lines with at least the minimum slope calculated from Manning's Formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second when flowing full.

i. An applicant may request a smaller minimum slope under R18-9-A312(G) if the smaller slope is justified by a quarterly program of inspections, flushings, and cleanings.

ii. If a smaller minimum slope is requested, the applicant shall not specify a slope that is less than 50 percent of that calculated from Manning's formula using a coefficient of roughness of 0.013 and a sewage velocity of 2 feet per second.

iii. The ratio of flow depth in the pipe to the diameter of the pipe shall not exceed 0.75 in peak dry weather flow conditions;

f. Design sewer lines to avoid a slope that creates a sewage velocity greater than 10 feet per second. The applicant shall construct any sewer line carrying a flow with a normal velocity of greater than 10 feet per second using ductile iron pipe or pipe with equivalent erosion resistance, and structurally reinforce the receiving manhole or sewer main;

g. Design and install sewer lines, connections, and fittings with materials that meet or exceed manufacturer's specifications consistent with this Chapter to:

i. Limit inflows, infiltration, and exfiltration;

ii. Resist corrosion in the ambient electrochemical environment;

iii. Withstand anticipated static and live loads; and

iv. Provide internal erosion protection;

h. Indicate trenching and bedding details applicable for each pipe material and size in the design plans. Unless the Department approved alternative design standards or specifications under subsection (D)(1)(c), the applicant shall place and bed the sewer lines in trenches following the specifications in "Trench Excavation, Backfilling, and Compaction" (Section 601) revised 2004, published by the Maricopa Association of Governments; and "Rigid Pipe Bedding for Sanitary Sewers" (WWM 104) revised July 2002, and "Flexible Pipe Bedding for Sanitary Sewers" (WWM 105) revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).

i. Perform a deflection test of the total length of all sewer lines made of flexible materials to ensure that the installation meets or exceeds the manufacturer's recommendations and record the results;

j. Test each segment of the sewer line for leakage using the applicable method below and record the results:

i. "Standard Test Method for Installation of Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, F1417-92(1998)," published by the American Society for Testing and Materials;

ii. "Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method, C924-02 (2002)," published by the American Society for Testing and Materials;

iii. "Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines, C828-03 (2003)," published by the American Society for Testing and Materials;

iv. "Standard Test Method for Hydrostatic Infiltration Testing of Vitrified Clay Pipe Lines, C1091-03a (2003)," published by the American Society for Testing Materials;

v. "Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines, C969-02 (2002)," published by the American Society for Testing Material; or

vi. "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, D2321-00 (2000)," published by the American Society for Testing Materials; or

vii. The material listed in subsections (D)(2)(j)(i) through (vi) is incorporated by reference and does not include any later amendments or editions of the incorporated material. Copies of the incorporated material are available for inspection at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or may be obtained from the American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959;

k. Test the total length of the sewer line for uniform slope by lamp lighting, remote camera or similar method approved by the Department, and record the results; and

l. Minimize the planting within the disturbed area of new sewage collection system construction of plant species having roots that are likely to reach and damage the sewer or impair the operation of the sewer or visual and vehicular access to any manhole.

3. Manholes.

a. An applicant shall install manholes at all grade changes, size changes, alignment changes, sewer intersections, and at any location necessary to comply with the following spacing requirements:

Sewer Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
Less than 8	400
8 to less than 18	500
18 to less than 36	600
36 to less than 60	800
60 or greater	1300

b. The Department shall allow greater manhole spacing if the applicant follows the procedure provided in R18-9-A312(G) and provides documentation showing the operator possesses or has available specialized sewer cleaning equipment suitable for the increased spacing.

c. The applicant shall ensure that manhole design is consistent with "Pre-cast Concrete Sewer Manhole" #420-1, revised January 1, 2004 and #420-2, revised January 1, 2001, "Offset Manhole for 8" - 30" Pipe" #421 (1998), and "Sewer Manhole and Cover Frame Adjustment" #422, revised January 1, 2001, published by the Maricopa Association of Governments; and "Manholes and Appurtenant Items" (WWM 201 through WWM 211, except WWM 204, 205, and 206), revised July 2002, published by Pima County Wastewater Management. This material is part of the material incorporated by reference in subsection (D)(1)(b).

d. The applicant shall not locate manholes in areas subject to more than incidental runoff from rain falling in the immediate vicinity unless the manhole cover assembly is designed to restrict or eliminate stormwater inflow.

e. The applicant shall test each manhole using one of the following test protocols:

i. Watertightness testing by filling the manhole with water. The applicant shall ensure that the drop in water level following presoaking does not exceed 0.0034 of total manhole volume per hour;

ii. Negative air pressure testing using the "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test, C1244-02e1 (2002)," published by the American Society for Testing and Materials. This material is incorporated by reference, does not include any later amendments or editions of the incorporated material and may be viewed at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007, or obtained from the American Society for Testing and Materials International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959; or

iii. Holiday testing of a lined manhole constructed with uncoated rebar using the "High-Voltage Electrical Inspection of Pipeline Coatings, RP0274-2004 (2004)," published by the National Association of Corrosion Engineers (NACE International). This material is incorporated by reference as modified below, does not include any later amendments or editions of the incorporated material and may be viewed at the Arizona Department of Environmental Quality, 1110 W. Washington, Phoenix, AZ 85007 or obtained from NACE International, 1440 South Creek Drive, Houston, Texas 77084-4906. The following substitutions apply:

(1) Where the word "metal" is used in the standard, use the word "surface" instead; and

(2) Where the words "pipe" or "pipeline" are used, use the word "manhole" instead.

f. The applicant shall perform manhole testing under subsection (D)(3)(e) after installation of the manhole cone or top riser to verify watertightness integrity of the manhole from the top of the cone or riser down.

i. Upon satisfactory test results, the applicant shall install the manhole ring and any spacers, complete the joints, and seal the manhole to a watertight condition.

ii. If the applicant can install the manhole cone or top riser, spacers, and ring to final grade without disturbance or adjustment by later construction, the applicant may perform the testing from the top of the manhole ring on down.

g. The applicant shall locate a manhole to provide adequate visibility and vehicular maintenance accessibility following construction.

4. Force mains. An applicant may install a force main if it meets the following design, installation, and testing requirements. The applicant shall:
    a. Design force mains to maintain a minimum flow velocity of 3 feet per second and a maximum flow velocity of 7 feet per second. The applicant may design for sustained periods of flow above 7 feet per second, if the applicant justifies the design using the process specified in R18-9-A312(G);
    b. Ensure that force mains have the appropriate valves and controls required to prevent drainback to the lift station. If drainback is necessary during cold weather to prevent freezing, the control system may allow manual or automatic drainback;
    c. Incorporate air release valves or other appropriate components in force mains at all high points along the line to eliminate air accumulation. If engineering calculations provided by the applicant demonstrate that air will not accumulate in a given high point under typical flow conditions, the Department shall waive the requirement for an air release valve;
    d. Design restrained joints or thrust blocks on force mains to accommodate water hammer, surge control, and to prevent excessive movement of the force main. Submitted construction plans shall show restrained joint or thrust block locations and details;
    e. If a force main is proposed to discharge directly to a sewage treatment facility without entering a flow equalization basin, include in the Notice of Intent to Discharge a statement from the owner or operator of the sewage treatment facility that the design is acceptable;
    f. Design a force main to withstand a pressure of 50 pounds per square inch or more above the design working pressure for two hours and test upon completion to ensure no leakage;
    g. Supply flow to a force main using a lift station that meets the requirements of subsection (D)(5); and
    h. Ensure that force mains are designed to control odor.
5. Lift stations. An applicant shall:
    a. Secure a lift station to prevent tampering and affix on its exterior, or on the nearest vertical object if the lift station is entirely below grade, at least one warning sign that includes the 24-hour emergency phone number of the owner or operator of the collection system;
    b. Protect lift stations from physical damage from a 100-year flood event. An applicant shall not construct a lift station in a floodway;
    c. Lift station wet well design.
        i. Ensure that the minimum wet well volume in gallons is 1/4 of the product of the minimum pump cycle time, in minutes, and the total pump capacity, in gallons per minute;
        ii. Protect the wet well against corrosion to provide at least a 20-year operational life;
        iii. Ensure that wet well volume does not allow the sewage retention time to exceed 30 minutes unless the sewage is aerated, chemicals are added to prevent or eliminate hydrogen sulfide formation, or adequate ventilation is provided. Notwithstanding these measures, the applicant shall not allow the septic condition of the sewage to adversely affect downstream collection systems or sewage treatment facility performance;
        iv. Ensure that excessively high or low levels of sewage in the wet well trigger an audible or visible alarm at the wet well site and at the system control center;
        v. Ensure that a wet well designed to accommodate more than 5000 gallons per day has a horizontal cross-sectional area of at least 20 square feet; and
        vi. Ensure that lift stations are designed to prevent odor from emanating beyond the lift station site;
    d. Equip a lift station wet well with at least two pumps. The applicant shall ensure that:
        i. The pumps are capable of passing a 2.5-inch sphere or are grinder pumps;
        ii. The lift station is capable of operating at design flow with any one pump out of service; and
        iii. Piping, valves, and controls are arranged to allow independent operation of each pump;
    e. Not use suction pumps if the sewage lift is more than 15 feet. The applicant shall ensure that other types of pumps are self-priming and that pump water brake horsepower is at least 0.00025 times the product of the required discharge, in gallons per minute, and the required total dynamic head, in feet; and
    f. For lift stations receiving an average flow of more than 10,000 gallons per day, include a standby power source and redundant wastewater level controls in the lift station design that will provide immediate service and remain available for 24 hours per day if the main power source or controls fail.
6. Depressed sewers. An applicant shall:
    a. Size the depressed sewer to attain a minimum velocity of 3 feet per second through all barrels of the depressed sewer when the flow equals or exceeds the design daily peak dry weather flow,
    b. Design the depressed sewer to convey the sewage flow through at least two parallel pipes at least 6 inches in diameter,
    c. Include an inlet and outlet structure at each end of the inverted sewer,
    d. Design the depressed sewer so that the barrels are brought progressively into service as flow increases to its design value, and
    e. Design the depressed sewer to minimize release of odors to the atmosphere.

E. Additional Discharge Authorization requirements. An applicant shall:

1. Supply a signed, dated, and sealed Engineer's Certificate of Completion in a format approved by the Department that provides the following:
   a. Confirmation that the project was completed in compliance with the requirements of this Chapter, as described in the plans and specifications corresponding to the Construction Authorization issued by the Director, or with changes that are reflected in as-built plans submitted with the Engineer's Certificate of Completion;
   b. As-built plans, if required, that are properly identified and numbered; and
   c. Satisfactory field test results from deflection, leakage, and uniform slope testing;
2. Provide any other relevant information required by the Department to determine that the facility conforms to the terms of the 4.01 General Permit; and
3. Provide a signed certification on a form approved by the Department that:
   a. Confirms that an operation and maintenance manual exists for the sewage collection system;
   b. Confirms that the operation and maintenance manual addresses components of operation and maintenance specified on the certification form;
   c. Provides the 24-hour emergency number of the owner or operator of the sewage collection system; and
   d. Provides an address where the operation and maintenance manual is maintained and confirms that the manual is available for inspection at that address by the Department on request.

F. Operation and maintenance requirements. The permittee shall:
1. Operate the new sewage collection system or expansion of an existing sewage collection system involving new construction using the operation and maintenance manual certified by the owner or operator in subsection (E)(3), to meet the performance standards specified in subsection (B), unless the permittee is operating the sewage collection system under a CMOM Plan under the general permit established in R18-9-C305;
2. Ensure that the sewage collection system is operated according to the operator certification requirements in 18 A.A.C. 5, Article 1; and
3. For safety during operation and maintenance of lift station and other confined space components of the sewage collection system, follow all applicable state and federal confined space entry requirements.

G. Recordkeeping. A person owning or operating a facility permitted under this Section shall maintain the documents listed in subsection (E) for the life of the facility and make them available to the Department upon request.

H. Repairs.
1. A Notice of Intent to Discharge is not required for sewage collection system repairs. Repairs include work performed in response to deterioration or damage of existing structures, devices, and appurtenances with the intent to maintain or restore the system to its original design flow and operational characteristics. Repairs do not include changes in vertical or horizontal alignment.
2. Components used in the repair shall meet the design, installation, and operational requirements of this Section.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 235, effective January 1, 2001 (Supp. 00-4). Amended by final rulemaking at 11 A.A.R. 4544, effective November 12, 2005 (05-3).

Table 1. Unit Design Flows

Wastewater Source	Applicable Unit	Sewage Design Flow per Applicable Unit, Gallons Per Day
Airport	Passenger (average daily number) Employee	4 15
Auto Wash	Facility	Per manufacturer, if consistent with this Chapter
Bar/Lounge	Seat	30
Barber Shop	Chair	35
Beauty Parlor	Chair	100
Bowling Alley (snack bar only)	Lane	75
Camp Day camp, no cooking facilities Campground, overnight, flush toilets	 Camping unit Camping unit	 30 75

Campground, overnight, flush toilets and shower Campground, luxury Camp, youth, summer, or seasonal	Camping unit Person Person	150 100-150 50
Church Without kitchen With kitchen	Person (maximum attendance) Person (maximum attendance)	5 7
Country Club	Resident Member Nonresident Member	100 10
Dance Hall	Patron	5
Dental Office	Chair	500
Dog Kennel	Animal, maximum occupancy	15
Dwelling For determining design flow for sewage treatment facilities under R18-9-B202(A)(9)(a) and sewage collection systems under R18-9-E301(D) and R18-9-B301(K), excluding peaking factor.	Person	80
Dwelling For on-site wastewater treatment facilities per R18-9-E302 through R18-9-E323: Apartment Building 1 bedroom 2 bedroom 3 bedroom 4 bedroom Seasonal or Summer Dwelling (with recorded seasonal occupancy restriction) Single Family Dwellings Other than Single Family Dwelling, the greater flow value based on: Bedroom count 1-2 bedrooms Each bedroom over 2 Fixture count	Apartment Apartment Apartment Apartment Resident see R18-9-A314(D)(1) Bedroom Bedroom Fixture unit	200 300 400 500 100 see R18-9-A314(D)(1) 300 150 25
Fire Station	Employee	45
Hospital All flows Kitchen waste only Laundry waste only	Bed Bed Bed	250 25 40
Hotel/motel Without kitchen With kitchen	Bed (2 person) Bed (2 person)	50 60
Industrial facility Without showers With showers Cafeteria, add	Employee Employee Employee	25 35 5
Institutions Resident Nursing home Rest home	Person Person Person	75 125 125
Laundry Self service Commercial	Wash cycle Washing machine	50 Per manufacturer, if consistent with this Chapter
Office Building	Employee	20

Park (temporary use) Picnic, with showers, flush toilets Picnic, with flush toilets only Recreational vehicle, no water or sewer connections Recreational vehicle, with water and sewer connections Mobile home/Trailer	 Parking space Parking space Vehicle space Vehicle space Space	 40 20 75 100 250
Restaurant/Cafeteria With toilet, add Kitchen waste, add Garbage disposal, add Cocktail lounge, add Kitchen waste disposal service, add	Employee Customer Meal Meal Customer Meal	20 7 6 1 2 2
Restroom, public	Toilet	200
School Staff and office Elementary, add Middle and High, add with gym & showers, add with cafeteria, add Boarding, total flow	 Person Student Student Student Student Person	 20 15 20 5 3 100
Service Station with toilets	First bay Each additional bay	1000 500
Shopping Center, no food or laundry	Square foot of retail space	0.1
Store Public restroom, add	Employee Square foot of retail space	20 0.1
Swimming Pool, Public	Person	10
Theater Indoor Drive-in	 Seat Car space	 5 10

Note: Unit flow rates published in standard texts, literature sources, or relevant area or regional studies are considered by the Department, if appropriate to the project.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 235, effective January 1, 2001 (Supp. 00-4). Amended by final rulemaking at 11 A.A.R. 4544, effective November 12, 2005 (05-3).

APPENDIX B

City of Casa Grande Standards

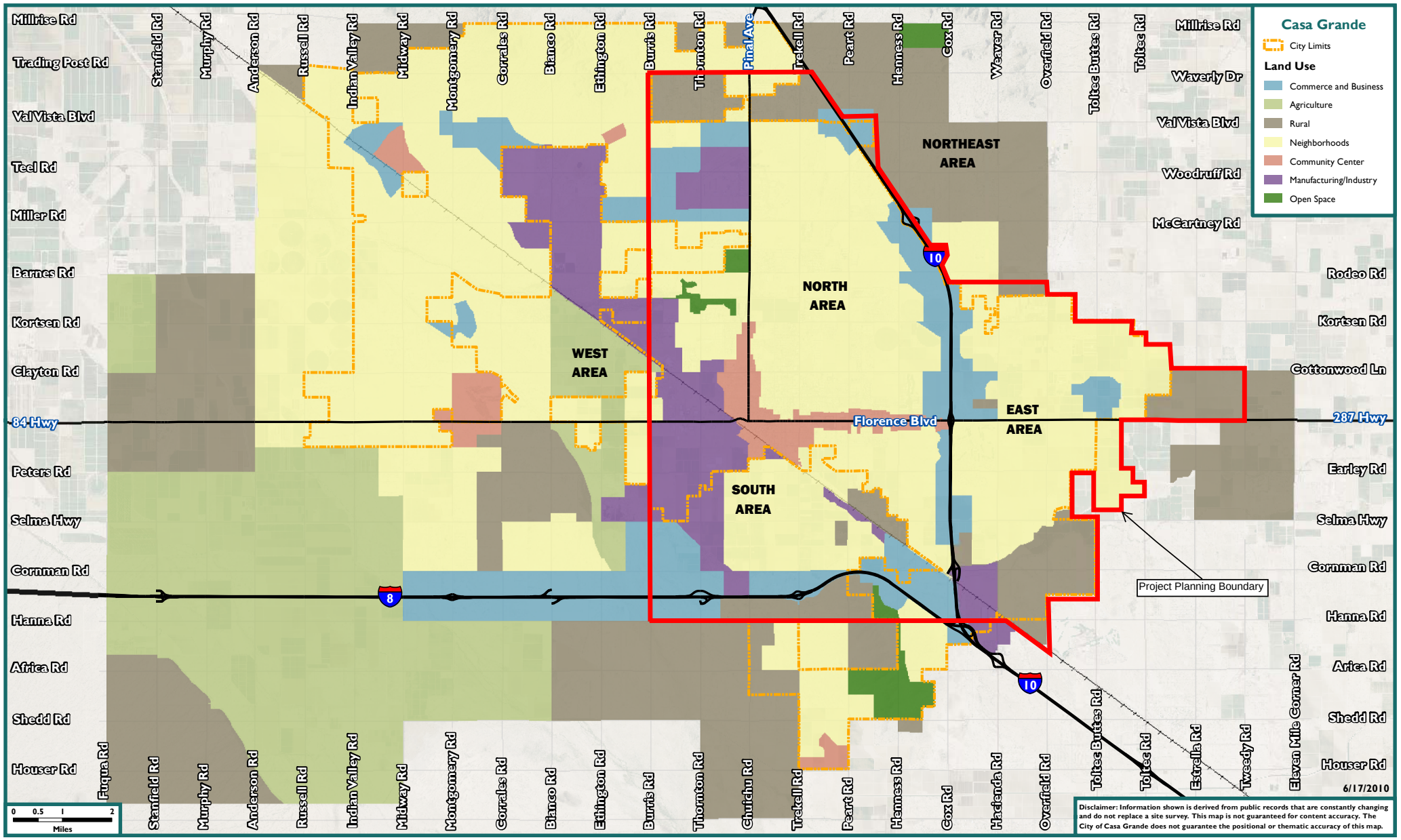
Title 16 SUBDIVISIONS / Chapter 16.16 DESIGN STANDARDS / 16.16.390 Public land reservation requirements.
Table 4
Design Factors

Residential			
Land Use	**Density (U/AC)**	**Persons**	**Per day**
Urban Ranch	**1**	**3.5**	**100**
Rural Ranch	**0.3**	**3.5**	**100**
Suburban Homestead	**0.5**	**3.5**	**100**
Single-Family (R-1)	**4.5**	**3.3**	**100**
Mobile Home Subd. (R-4)	**4.5**	**3.3**	**100**
Patio Home	**5.5**	**3.0**	**100**
Mobile Home Park (R-5)	**9**	**2.8**	**95**
Duplex-Fourplex (R-2)	**9**	**2.8**	**95**
Townhome	**12**	**2.5**	**95**
Condominium	**20**	**2.3**	**90**
Apartments (R-3)	**20**	**2.3**	**90**
Commercial			
Small stores, offices, and miscellaneous businesses (one and two stores)			As Directed by the City Engineer
Shopping Center (P.C.C.)			As Directed by the City Engineer
Industrial & High Rise Commercial/Office			As Directed by the City Engineer

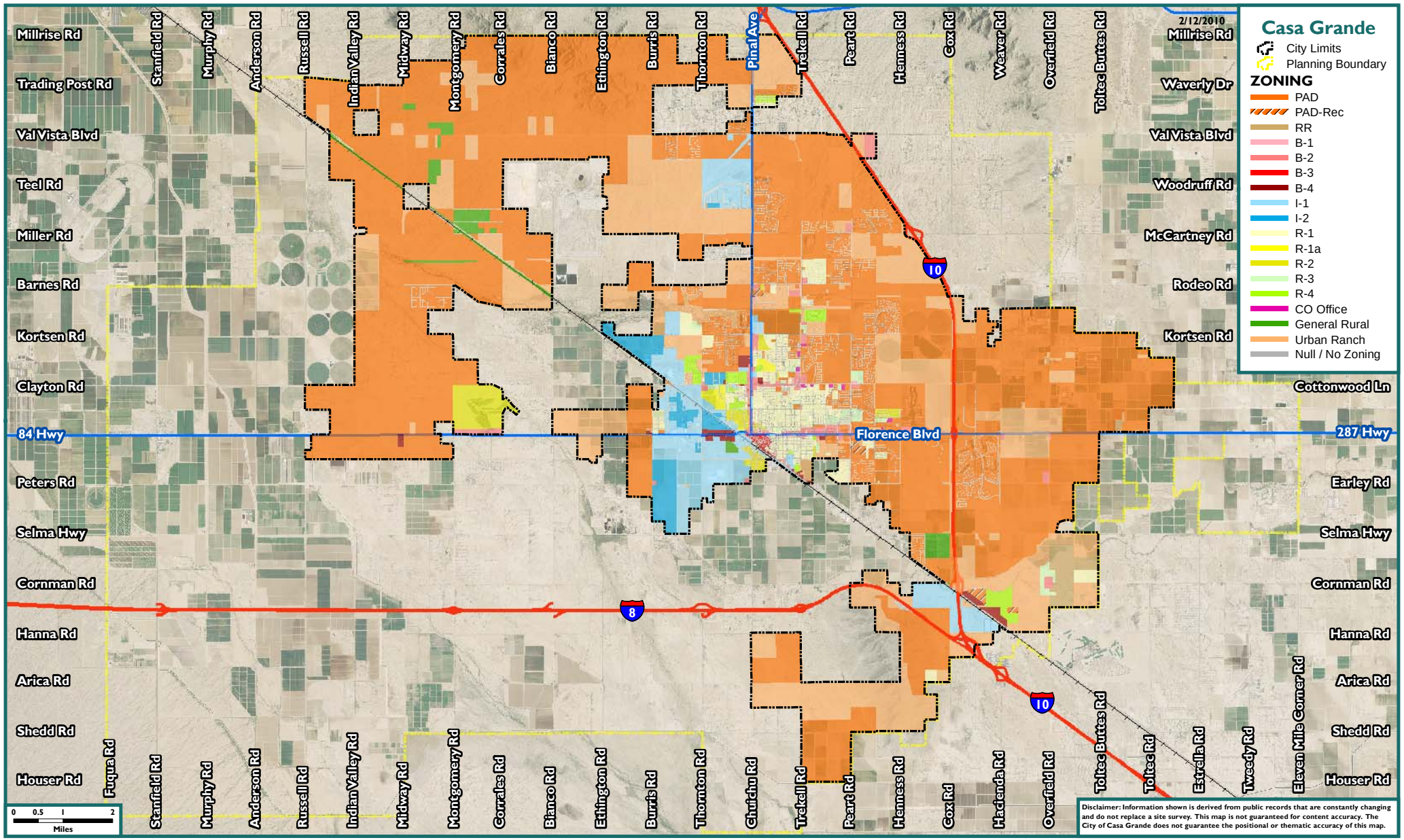
Planned Unit Development	As Directed by the City Engineer

APPENDIX C

City of Casa Grande
General Plan 2020 Map & Zoning Map



2020 General Plan



Approved Zoning

APPENDIX D

2014 Flow Data:
Loading Table, Allocated Loads,
Known Loads & Calibration

2014 Flow Data - Loading Table

Usage Type	Category	Land Use Descriptions	Source of Data	Density (Units/AC)	People Per Unit	ERU Density (Units/AC)	People Per ERU	Daily Flows (GCD)	Coverage Load (Capita/AC)	Coverage Field	Unit Load (GPD/AC)	Load Factor (CFS/AC)	Load Field
B-1	Commercial	Neighborhood Business Zone	TOQC/Gilbert Loadings	-	-	3.1	2.79	70.0	8.6	Coverage1	600	0.0009	Load1
B-2	Commercial	General Business Zone	TOQC/Gilbert Loadings	-	-	3.1	2.79	70.0	8.6	Coverage1	600	0.0009	Load1
B-3	Commercial	Central Business Zone	TOQC/Gilbert Loadings	-	-	4.1	2.79	70.0	11.4	Coverage1	800	0.0012	Load1
B-4	Commercial	Community Service Zone	TOQC/Gilbert Loadings	-	-	6.7	2.79	70.0	18.6	Coverage1	1,300	0.0020	Load1
CO	Commercial	Commercial Office Zone	TOQC/Gilbert Loadings	-	-	3.1	2.79	70.0	8.6	Coverage1	600	0.0009	Load1
GR	Residential	General Rural Zone (county)	See Rural Ranch	0.3	2.79	0.3	2.79	70.0	0.8	Coverage1	59	0.0001	Load1
I-1	Industrial	Garden & Light Industrial Zone	City Engineer	-	-	7.7	2.79	70.0	21.4	Coverage1	1,500	0.0023	Load1
I-2	Industrial	General Industrial Zone	City Engineer	-	-	7.7	2.79	70.0	21.4	Coverage1	1,500	0.0023	Load1
N/A	-	Not Available	-	-	-	-	-	-	-	-	-	-	-
PAD	Mixed	Planned Area Development Zone	Average of True Density	3.5	2.4	3.1	2.79	70.0	8.5	Coverage1	597	0.0009	Load1
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	Average of True Density	3.5	2.4	3.1	2.79	70.0	8.5	Coverage1	597	0.0009	Load1
R-1	Residential	Single-Family (R-1)	General Plan 2020*	3.5	2.79	3.5	2.79	70.0	9.8	Coverage1	684	0.0011	Load1
R-1a	Residential	Single-Family (R-1)	General Plan 2020*	3.5	2.79	3.5	2.79	70.0	9.8	Coverage1	684	0.0011	Load1
R-2	Residential	Duplex-Fourplex (R-2)	General Plan 2020*	9.0	2.09	6.7	2.79	70.0	18.8	Coverage1	1,317	0.0020	Load1
R-3	Residential	Apartments (R-3)	General Plan 2020*	20.0	2.09	15.0	2.79	70.0	41.8	Coverage1	2,926	0.0045	Load1
R-4	Residential	Mobile Home Subd. (R-4)	General Plan 2020*	3.5	2.42	3.0	2.79	70.0	8.5	Coverage1	593	0.0009	Load1
RR	Residential	Rural Ranch	General Plan 2020*	0.3	2.79	0.3	2.79	70.0	0.8	Coverage1	59	0.0001	Load1
UR	Residential	Urban Ranch	General Plan 2020*	1.0	2.79	1.0	2.79	70.0	2.8	Coverage1	195	0.0003	Load1

Notes

1. Additional source data includes Ch. 16.16 Design Standards and the Infrastructure Improvements Plan. However, density was ultimately checked against the General Plan 2020.
2. Color coding from Casa Grande's online interactive zoning map.
3. ERU density based on Single-Family Residential.
4. Per Infrastructure Improvements Plan all non-residential development demand is 0.09 GAL/SF of building. Based on 1,000 GAL/AC of nonresidential development and 0.25 floor-to-area (FAR) ratio.
5. Commercial and industrial loadings where based on the City's recommendation of 1,500 gallons per acre per day for industrial and Gilbert commercial loadings for commercial.
8. All daily flows based on the Infrastructure Improvements Plan (70 gallons per capita per day).
9. Coverage from industrial and commercial were calculated from equivalent populations based on 70 GCD.
10. Zoning density is not neccesarily a true reflection of actual density.

2014 Flow Data - Allocated Loads

Usage Type	Category	Land Use Descriptions	H2OMap Input (Load Factor, CFS/AC)	H2OMap Output (Area, SF)	H2OMap Output (Area, AC)	H2OMap Output (Allocated Load1, CFS)	H2OMap Input (Load Factor, Capita/AC)	H2OMap Output (Allocated Coverage1, Capita)	Calculated ERUs
B-1	Commercial	Neighborhood Business Zone	0.0009	792,647	18.20	0.0169	8.6	156	56
B-2	Commercial	General Business Zone	0.0009	14,184,570	325.63	0.3023	8.6	2,791	1,000
B-3	Commercial	Central Business Zone	0.0012	1,970,923	45.25	0.0560	11.4	517	185
B-4	Commercial	Community Service Zone	0.0020	4,007,281	91.99	0.1850	18.6	1,708	612
CO	Commercial	Commercial Office Zone	0.0009	800,421	18.38	0.0171	8.6	158	56
GR	Residential	General Rural Zone (county)	0.0001	0	0.00	0.0000	0.8	0	0
I-1	Industrial	Garden & Light Industrial Zone	0.0023	23,273,337	534.28	1.2400	21.4	11,449	4,104
I-2	Industrial	General Industrial Zone	0.0023	22,641,521	519.78	1.2063	21.4	11,138	3,992
N/A	-	Not Available	0.0000	0	0.00	0.0000	0.0	0	0
PAD	Mixed	Planned Area Development Zone	0.0009	158,269,564	3,633.37	3.3549	8.5	30,976	11,103
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	0.0009	609,444	13.99	0.0129	8.5	119	43
R-1	Residential	Single-Family (R-1)	0.0011	55,601,122	1,276.43	1.3500	9.8	12,464	4,467
R-1a	Residential	Single-Family (R-1)	0.0011	1,819,235	41.76	0.0442	9.8	408	146
R-2	Residential	Duplex-Fourplex (R-2)	0.0020	8,174,340	187.66	0.3823	18.8	3,530	1,265
R-3	Residential	Apartments (R-3)	0.0045	8,251,035	189.42	0.8575	41.8	7,918	2,838
R-4	Residential	Mobile Home Subd. (R-4)	0.0009	12,789,138	293.60	0.2693	8.5	2,487	891
RR	Residential	Rural Ranch	0.0001	0	0.00	0.0000	0.8	0	0
UR	Residential	Urban Ranch	0.0003	16,083,691	369.23	0.1116	2.8	1,030	369
Totals:						9.4063		86,849	31,129

2014 Flow Data - Known Loads (Industrial)

INDUSTRIAL USER:	ABBOTT NUTRITION LABORATORIES	CGRMC	DAISY BRAND	DIAMOND PLASTICS CORPORATION	COMMONWEALTH (EHRMANN ARIZONA DAIRY, LLC)	FRANKLIN FOODS WEST	FRITO LAY, INC.	HEXCEL CORPORATION	METAL SOLUTIONS, LLC	MONSANTO COMPANY	PRICE INDUSTRIES, INC.	WALMART HVDC #7013	NATIONAL VITAMIN
Total YTD Flow - 2014	62,325,568	3,630,783	6,938,135	23,473	4,080,694	6,848,700	12,572,490	9,131,000	126,000	27,781	160,453	3,188,080	-
Average Monthly Flow - 2014	20,775,189	1,210,261	2,312,712	7,824	1,360,231	2,282,900	4,190,830	3,043,667	42,000	9,260	53,484	1,062,693	-
Average Daily Flow - 2014	692,506	40,342	77,090	261	45,341	76,097	139,694	101,456	1,400	309	1,783	35,423	-
Permit Allotted (GPD)	830,000	65,000	95,000	0	-	125,000	300,000	170,000	25,000	15,000	5,500	No Limit	-
Percentage Used - 2014	83.43	62.06	81.15	Zero Discharger;	-	60.88	46.56	59.68	5.60	2.06	32.41	-	-
Total Annual Flow - 2013	215,021,354	16,192,300	25,754,089	52,850	-	5,610,600	52,753,982	38,464,000	466,000	29,714	643,933	5,824,630	-
Average Monthly Flow - 2013	19,547,396	1,472,027	2,341,281	4,805	-	510,055	4,795,817	3,496,727	42,364	2,701	58,539	529,512	-
Average Daily Flow - 2013	651,580	49,068	78,043	160	-	17,002	159,861	116,558	1,412	90	1,951	17,650	-
Permit Allotted (GPD)	830,000	65,000	95,000	0	-	125,000	300,000	170,000	25,000	15,000	5,500	No Limit	-
Percentage Used - 2013	78.50	75.49	82.15	Zero Discharger;	-	13.60	53.29	68.56	5.65	0.60	35.48	-	-
Total Annual Flow - 2012	211,276,946	18,259,500	23,066,734	-	-	-	41,182,392	31,881,000	636,000	24,897	506,488	8,310,000	-
Average Monthly Flow - 2012	21,127,695	1,825,950	2,306,673	-	-	-	4,575,821	3,542,333	70,667	4,949	50,649	923,333	-
Average Daily Flow - 2012	694,990	60,064	75,877	-	250,000	150,000	150,520	116,524	2,325	163	1,666	30,373	10,000
Permit Allotted (GPD)	830,000	65,000	95,000	0	-	125,000	300,000	170,000	25,000	15,000	5,500	No Limit	-
Percentage Used - 2012	83.73	92.41	79.87	Zero Discharger;	-	120.00	50.17	68.54	9.30	1.09	30.29	-	-
Study Area:	South	North	South	South	South	South	South	South	South	South	South	South	South
MH (ID) Allocated:	5443	8354	7022	-	50006	50008 (4789)	8027	5211	4810	7823	3044	3047	5207
Flow Used (GPD):	694,990	60,064	80,000	-	45,341	76,097	150,520	116,524	2,325	163	1,666	30,373	10,000
Flow Used (CFS):	1.0753	0.0929	0.1238	-	0.0702	0.1177	0.2329	0.1803	0.0036	0.0003	0.0026	0.0470	0.0155
Peaking population (97.1):	7157.5	618.6	823.9	-	467.0	783.7	1550.2	1200.0	23.9	1.7	17.2	312.8	103.0
Peaking population (70):	9928.4	858.1	1142.9	-	647.7	1087.1	2150.3	1664.6	33.2	2.3	23.8	433.9	142.9
Custom peaking value:	-	-	7.2	-	3.375	-	-	-	-	-	-	-	3
Notes:	18" Dedicated Line	-	-	-	-	-	-	-	-	Modified	-	-	-

2014 Flow Data - Calibration

ID	ACRES	OLD ZONE	OLD CFS/AC	OLD CAPITA/AC	FLOW REMOVED	COVERAGE REMOVED	NEW CFS/AC	NEW CAPITA/AC	FLOW ADDED	COVERAGE ADDED	DENSITY	LOAD 1 Δ	COVERAGE 1 Δ	NOTES
2612	101.7	PAD	0.0010	8.9	0.0980	905	0.0011	9.8	0.1082	999	3.5	0.0102	94	
2612	77.31	PAD	0.0010	8.9	0.0745	688	0.0008	7.4	0.0621	574	2.66	-0.0124	-114	
2597	80.32	PAD	0.0010	8.9	0.0774	715	0.0009	8.6	0.0748	690	3.08	-0.0027	-25	
4747	234	I-2	0.0023	21.4	0.5431	5014	N/A	N/A	0.0603	0	N/A	-0.4827	-5,014	Peak Flow Given
4231	52.12	PAD	0.0010	8.9	0.0502	464	0.0009	8.6	0.0485	448	3.08	-0.0017	-16	
4107	36.37	PAD	0.0010	8.9	0.0351	324	0.0009	8.6	0.0338	313	3.08	-0.0012	-11	
3447	45.18	PAD	0.0010	8.9	0.0435	402	0.0009	8.6	0.0419	387	3.07	-0.0016	-15	
3444	12.81	PAD	0.0010	8.9	0.0123	114	0.0009	8.6	0.0119	110	3.07	-0.0005	-4	
1822	45.66	PAD	0.0010	8.9	0.0440	406	0.0009	8.6	0.0424	391	3.07	-0.0016	-15	
7000	182.5	PAD	0.0010	8.9	0.0000	0	0.0013	11.6	0.2294	2,118	4.16	0.2294	2,118	
2695	57.66	PAD	0.0010	8.9	0.0000	0	0.0011	10.5	0.0659	608	3.78	0.0659	608	
1696	53.48	PAD	0.0010	8.9	0.0515	476	0.0011	10.5	0.0609	563	3.77	0.0094	87	
3848	98.62	R-1	0.0015	14.0	0.1495	1380	0.0011	9.7	0.1040	960	3.49	-0.0455	-420	
3162	32.06	PAD	0.0010	8.9	0.0309	285	0.0005	4.7	0.0165	152	1.7	-0.0144	-133	
2625	36.9	PAD	0.0010	8.9	0.0356	328	0.0005	4.7	0.0190	175	1.7	-0.0166	-153	
2472	13.68	PAD	0.0010	8.9	0.0132	122	0.0005	4.7	0.0070	65	1.7	-0.0062	-57	
2040	77.29	PAD	0.0010	8.9	0.0745	688	0.0011	9.8	0.0817	755	3.5	0.0073	67	
3115	58.63	PAD	0.0010	8.9	0.0565	522	0.0009	8.7	0.0553	510	3.12	-0.0012	-11	
1009	3.84	PAD	0.0010	8.9	0.0037	34	0.0015	14.0	0.0058	54	5.02	0.0021	20	
1013	13.48	PAD	0.0010	8.9	0.0130	120	0.0015	14.0	0.0204	189	5.02	0.0075	69	
1906	34.81	PAD	0.0010	8.9	0.0335	310	0.0010	8.8	0.0333	308	3.17	-0.0002	-2	
1261	51.74	PAD	0.0010	8.9	0.0499	460	0.0008	7.1	0.0399	368	2.55	-0.0100	-92	
1265	18.16	PAD	0.0010	8.9	0.0175	162	0.0008	7.1	0.0140	129	2.55	-0.0035	-32	
1264	169.26	PAD	0.0010	8.9	0.1631	1506	0.0008	7.1	0.1304	1,204	2.55	-0.0327	-302	
2267	51.76	PAD	0.0010	8.9	0.0499	461	0.0008	7.1	0.0399	368	2.55	-0.0100	-92	
3519	32.02	PAD	0.0010	8.9	0.0309	285	0.0009	8.7	0.0301	278	3.11	-0.0008	-7	
3518	25.42	PAD	0.0010	8.9	0.0245	226	0.0009	8.7	0.0239	221	3.11	-0.0006	-6	
3012	43.94	R-1	0.0015	14.0	0.0666	615	0.0012	10.9	0.0519	479	3.91	-0.0147	-136	
											Total Δ	-0.3292	-3,597	

APPENDIX E

Committed Flow Data: Loading Table, Allocated Loads & Known Loads

Committed Flow Data - Loading Table

Usage Type	Category	Land Use Descriptions	Source of Data	Density (Units/AC)	People Per Unit	ERU Density (ERUs/AC)	People Per ERU	Daily Flows (GCD)	Coverage Load (Capita/AC)	Coverage Field	Unit Load (GPD/AC)	Load Factor (CFS/AC)	Load Field
B-1	Commercial	Neighborhood Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
B-2	Commercial	General Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
B-3	Commercial	Central Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
B-4	Commercial	Community Service Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
CO	Commercial	Commercial Office Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
GR	Residential	General Rural Zone (county)	See Rural Ranch	0.3	3.5	0.3	3.3	80.0	1.1	Coverage6	84	0.0010	Load6
I-1	Industrial	Garden & Light Industrial Zone	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage6	1,500	0.0023	Load6
I-2	Industrial	General Industrial Zone	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage6	1,500	0.0023	Load6
N/A	-	Not Available	-	-	-	-	-	-	-	-	-	-	-
PAD	Mixed	Planned Area Development Zone	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage6	1,573	0.0024	Load6
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage6	1,573	0.0024	Load6
R-1	Residential	Single-Family (R-1)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
R-1a	Residential	Single-Family (R-1)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
R-2	Residential	Duplex-Fourplex (R-2)	General Plan 2020*	9.0	2.8	7.6	3.3	80.0	25.2	Coverage6	2,016	0.0031	Load6
R-3	Residential	Apartments (R-3)	General Plan 2020*	20.0	2.3	13.9	3.3	80.0	46.0	Coverage6	3,680	0.0057	Load6
R-4	Residential	Mobile Home Subd. (R-4)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
RR	Residential	Rural Ranch	General Plan 2020*	0.3	3.5	0.3	3.3	80.0	1.1	Coverage6	84	0.0001	Load6
UR	Residential	Urban Ranch	General Plan 2020*	1.0	3.5	1.1	3.3	80.0	3.5	Coverage6	280	0.0004	Load6
GP2020	Commercial	Commerce and Business	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
GP2020	Industrial	Manufacturing/Industrial	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage6	1,500	0.0023	Load6
GP2020	-	Agriculture and Open Space	-	-	-	-	-	-	-	-	-	-	-
GP2020	Residential	Community Center	General Plan 2020*	4.5	3.30	4.5	3.3	80.0	14.9	Coverage6	1,188	0.0018	Load6
GP2020	Mixed	Rural Category	General Plan 2020*	0.6	3.5	0.6	3.3	80.0	2.1	Coverage6	168	0.0003	Load6
GP2020	Mixed	Neighborhoods Category	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage6	1,573	0.0024	Load6

Notes

1. Additional source data includes Ch. 16.16 Design Standards and the Infrastructure Improvements Plan. However, density was ultimately checked against the General Plan 2020.
2. Color coding from Casa Grande's online interactive zoning map.
3. ERU density based on Single-Family Residential.
4. Per Infrastructure Improvements Plan all non-residential development demand is 0.09 GAL/SF of building. Based on 1,000 GAL/AC of nonresidential development and 0.25 floor-to-area (FAR) ratio.
5. Commercial loadings where based on the City's recommendation of 1,188 GPD/AC (equivalent to R-1). 1,000 GPD/AC doesn't account for possible zoning conversions from Commercial to Residential.
6. Industrial loadings where based on the City's recommendation of 1,500 GPD/AC.
7. All daily flows based on ADEQ Minimum Standards (80 gallons per capita per day).
8. Coverage from industrial and commercial were calculated from equivalent populations based on 80 GCD.
9. Zoning density is not neccesarily a true reflection of actual density.

Committed Flow Data - Allocated Loads

Usage Type	Category	Land Use Descriptions	H2OMap Input (Load Factor, CFS/AC)	H2OMap Output (Area, SF)	H2OMap Output (Area, AC)	H2OMap Output (Allocated Load1, CFS)	H2OMap Input (Load Factor, Capita/AC)	H2OMap Output (Allocated Coverage1, Capita)	Calculated ERUs
B-1	Commercial	Neighborhood Business Zone	0.0018	0	0.00	0.0000	14.9	0	0
B-2	Commercial	General Business Zone	0.0018	0	0.00	0.0000	14.9	0	0
B-3	Commercial	Central Business Zone	0.0018	0	0.00	0.0000	14.9	0	0
B-4	Commercial	Community Service Zone	0.0018	0	0.00	0.0000	14.9	0	0
CO	Commercial	Commercial Office Zone	0.0018	0	0.00	0.0000	14.9	0	0
GR	Residential	General Rural Zone (county)	0.0010	0	0.00	0.0000	1.1	0	0
I-1	Industrial	Garden & Light Industrial Zone	0.0023	0	0.00	0.0000	18.8	0	0
I-2	Industrial	General Industrial Zone	0.0023	0	0.00	0.0000	18.8	0	0
N/A	-	Not Available	0.0000	0	0.00	0.0000	-	0	0
PAD	Mixed	Planned Area Development Zone	0.0024	0	0.00	0.0000	19.7	0	0
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	0.0024	0	0.00	0.0000	19.7	0	0
R-1	Residential	Single-Family (R-1)	0.0018	0	0.00	0.0000	14.9	0	0
R-1a	Residential	Single-Family (R-1)	0.0018	0	0.00	0.0000	14.9	0	0
R-2	Residential	Duplex-Fourplex (R-2)	0.0031	0	0.00	0.0000	25.2	0	0
R-3	Residential	Apartments (R-3)	0.0057	0	0.00	0.0000	46.0	0	0
R-4	Residential	Mobile Home Subd. (R-4)	0.0018	0	0.00	0.0000	14.9	0	0
RR	Residential	Rural Ranch	0.0001	0	0.00	0.0000	1.1	0	0
UR	Residential	Urban Ranch	0.0004	0	0.00	0.0000	3.5	0	0
GP2020	-	Agriculture	0.0000	0	0.00	0.0000	0	0	0
GP2020	Commercial	Commerce and Business	0.0018	0	0.00	0.0000	14.9	0	0
GP2020	Residential	Community Center	0.0018	1,038,612	23.84	0.0428	14.9	354	105
GP2020	Industrial	Manufacturing/Industrial	0.0023	31,248,552	717.37	1.6459	18.8	13,453	4,029
GP2020	Mixed	Neighborhoods Category	0.0024	29,778,237	683.61	1.6366	19.7	13,434	4,007
GP2020	-	Open Space	0.0000	0.0201	0.00	0.0000	0	0	0
GP2020	Mixed	Rural Category	0.0003	0	0.00	0.0000	2.1	0	0
Totals:						3.3253		27,241	8,141

Committed Flow Data - Known Loads

Platted or Non-P	GIS .shp	Load	LOTS	POPULATION	ADF (MGD)	ADF (CFS)	DESIGN_FLO (MGD - Peak Dry Weather)	DESIGN_FLO (CFS)	Load 5 MH ID (s)
Non-Platted	X	yes	0	863	0.08831	0.1366	0.21724		3292
Non-Platted	X	yes	0	426	0.04257	0.0659	0.11664		7085
Non-Platted		yes	0	0	0		0.03900	0.0603	4747 (LOAD 2)
Non-Platted	X	yes	0	0	0		0.46799	0.7241	8773
Non-Platted		yes	0	0	0		0.63000	0.9748	3444 (LOAD 2)
Non-Platted		yes	0	0	0		0.27300	0.4224	2722
Non-Platted		no	9	500	0.00758	0.0117	0.02000		7994 (LOAD 6)
Non-Platted	X	no	0	280	0.14675	0.2271	0.46080		50006
Non-Platted	X	yes	0	0	0		0.43700	0.6761	8010
Non-Platted		yes	0	0	0		0.29930	0.4631	7823
Non-Platted		yes	0	175	0.01609	0.0249	0.05824		2597
Non-Platted		yes	0	0	0		0.13000	0.2011	3044
Non-Platted		yes	0	2,456	0.02466	0.0381	0.05424		1527 (LOAD 1)
Non-Platted	X	yes	0	726	0.09738	0.1507	0.24345		624400
Non-Platted	X	yes	0	702	0.09738	0.1507	0.24345		624400
Non-Platted	X	yes	0	0	0		0.84500	1.3074	4110 & 9023
Non-Platted	X	yes	0	515	0.05963	0.0923	0.15741		5304
Non-Platted	X	yes	0	573	0.02713	0.0420	0.07163		5337
Non-Platted	X	yes	0	1,680	0.06109	0.0945	0.13440		626200 (2/3), 626400 (1/3)
Non-Platted	X	yes	1879	5,825	0.46599	0.7210	-		626200 (2/3), 626400 (1/3)
Non-Platted		yes	0	743	0.10698	0.1655	0.26744		70114 or 5963
Non-Platted	X	yes	0	0	0		0.53000	0.8200	5460
Non-Platted	X	yes	0	2,273	0.15076	0.2333	0.41914		3766
Non-Platted		yes	0	0	0		0.06600	0.1021	1367
Non-Platted		yes	482	1,499	0.1199	0.1855	Calculate		8307
Non-Platted	X	yes	0	2,306	0.33027	0.5110	0.92848		5217
Non-Platted	X	yes	0	753	0.24124	0.3733	0.60311		8012
Platted	X	yes	757	2,667	0.12972	0.2007	0.28539		8001
Platted	X	yes	290	468	0.04680	0.0724	0.12823		1592
Platted	X	yes	312	0	0		0.09360	0.1448	9378
Platted	X	yes	293	967	0.11393	0.1763	0.27570		2695(2/3) & 3456 (1/3)
Platted	X	yes	198	1,180	0.05370	0.0831	0.11814		4996
Platted	X	yes	283	780	0.31152	0.4820	0.77880		7085
Platted	X	yes	366	1,208	0.05491	0.0850	0.12080		8827
Platted	X	yes	24	14,400	0.89371	1.3828	1.56400		7994
Platted	X	yes	124	410	0.04092	0.0633	0.11212		5368
Platted	X	yes	109	360	0.03597	0.0557	0.10431		1503
Platted	X	partial	67	109	0.13500	0.1091	0.38700		2612
Platted	X	yes	262	675	0.05399	0.0835	0.02480		2070
Platted	X	yes	192	634	0.07409	0.1146	0.18967		2612
Platted	X	yes	10	30	0.00330	0.0046	0.01194		3240
Platted	X	yes	130	429	0.03788	0.0586	0.10380		2612
Platted	X	yes	279	921	0.03806	0.0589	0.09210		2597
Platted	X	yes	246	812	0.03301	0.0511	0.08120		2597
Platted	X	partial	113	351	0.02811	0.0435	0.00000		1149
Platted	X	yes	51	0	0		0.06093	0.0943	1822
Platted	X	yes	40	0	0		0.04778	0.0739	1822
Platted	X	partial	3	14	0.0011	0.0017	0.00000		3092
Platted	X	yes	344	459	0.02094	0.0324	0.05738		5315
Platted	X	yes	145	344	0.04101	0.0635	0.11893		1444
Platted	X	yes	160	378	0.04093	0.0633	0.11870		1444
Platted	X	partial	121	279	0.05525	0.0855	0.17350		1444
Platted	X	yes	178	0	0.00000	0.0000	0.11300	0.1748	1264
Platted	X	yes	177	585	0.35598	0.5508	0.93977		3522
Platted	X	yes	159	528	0.05135	0.0795	0.13557		3489
Platted	X	yes	158	521	0.05038	0.0779	0.13300		3489
Platted	X	yes	164	0	0.00000	0.0000	0.13900	0.2151	1264
Platted	X	partial	62	193	0.01543	0.0239	0.00000		2307
Platted	X	partial	41	128	0.01020	0.0158	0.00000		2302
Platted	X	yes	97	302	0.01312	0.0203	0.03280		1696
Platted	X	yes	11	37	0.00102	0.0016	0.00370		2612
Platted	X	yes		36,463	1.41123	2.1835	1.05840	1.6376	628200
Platted	X	partial	28	87	0.00697	0.0108	0.01000		2744
Platted	X	yes	5	17	0.00055	0.0009	0.00200		3901
Platted	X	yes	30	93	0.00653	0.0101	0.00000	0.0000	3904
Platted	X	yes	268	1,274	0.23182	0.3587	0.51000		7263
Platted	X	partial	20	35	0.00177	0.0015	0.00640		3162
Platted	X	yes	75	240	0.02229	0.0345	0.07000		5299
Platted	X	partial	31	1,976	0.45836	0.2745	1.00840		5060
Platted	X	yes	189	0	0.00000	0.0000	0.06300	0.0975	4097
Platted	X	partial	141	187	0.04635	0.0305	0.12700		4160
Platted	X	partial	142	208	0.04635	0.0338	0.12700		4183
Platted	X	partial	123	174	0.04635	0.0327	0.12700		4209
Platted	X	partial	135	294	0.04460	0.0455	0.12220		4108
Platted	X	partial	106	185	0.03500	0.0286	0.10150		4325
Platted	X	partial	127	271	0.04190	0.0419	0.11481		4325
Platted	X	partial	5	1,320	0.00700	0.0093	0.01540		4112
Total					7.01670	10.12855	4.62400	7.15439	

APPENDIX F

Future Loading Table: Loading Table, Allocated Loads & Known Loads

Future Flow Data - Loading Table

Usage Type	Category	Land Use Descriptions	Source of Data	Density (Units/AC)	People Per Unit	ERU Density (ERUs/AC)	People Per ERU	Daily Flows (GCD)	Coverage Load (Capita/AC)	Coverage Field	Unit Load (GPD/AC)	Load Factor (CFS/AC)	Load Field
B-1	Commercial	Neighborhood Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
B-2	Commercial	General Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
B-3	Commercial	Central Business Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
B-4	Commercial	Community Service Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
CO	Commercial	Commercial Office Zone	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
GR	Residential	General Rural Zone (county)	See Rural Ranch	0.3	3.5	0.3	3.3	80.0	1.1	Coverage7	84	0.0010	Load7
I-1	Industrial	Garden & Light Industrial Zone	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage7	1,500	0.0023	Load7
I-2	Industrial	General Industrial Zone	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage7	1,500	0.0023	Load7
N/A	-	Not Available	-	-	-	-	-	-	-	-	-	-	-
PAD	Mixed	Planned Area Development Zone	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage7	1,573	0.0024	Load7
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage7	1,573	0.0024	Load7
R-1	Residential	Single-Family (R-1)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
R-1a	Residential	Single-Family (R-1)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
R-2	Residential	Duplex-Fourplex (R-2)	General Plan 2020*	9.0	2.8	7.6	3.3	80.0	25.2	Coverage7	2,016	0.0031	Load7
R-3	Residential	Apartments (R-3)	General Plan 2020*	20.0	2.3	13.9	3.3	80.0	46.0	Coverage7	3,680	0.0057	Load7
R-4	Residential	Mobile Home Subd. (R-4)	General Plan 2020*	4.5	3.3	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
RR	Residential	Rural Ranch	General Plan 2020*	0.3	3.5	0.3	3.3	80.0	1.1	Coverage7	84	0.0001	Load7
UR	Residential	Urban Ranch	General Plan 2020*	1.0	3.5	1.1	3.3	80.0	3.5	Coverage7	280	0.0004	Load7
GP2020	Commercial	Commerce and Business	City Engineer	-	-	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
GP2020	Industrial	Manufacturing/Industrial	City Engineer	-	-	5.7	3.3	80.0	18.8	Coverage7	1,500	0.0023	Load7
GP2020	-	Agriculture and Open Space	-	-	-	-	-	-	-	-	-	-	-
GP2020	Residential	Community Center	General Plan 2020*	4.5	3.30	4.5	3.3	80.0	14.9	Coverage7	1,188	0.0018	Load7
GP2020	Mixed	Rural Category	General Plan 2020*	0.6	3.5	0.6	3.3	80.0	2.1	Coverage7	168	0.0003	Load7
GP2020	Mixed	Neighborhoods Category	Average of Residential Uses	6.3	3.1	6.0	3.3	80.0	19.7	Coverage7	1,573	0.0024	Load7

Notes

1. Additional source data includes Ch. 16.16 Design Standards and the Infrastructure Improvements Plan. However, density was ultimately checked against the General Plan 2020.
2. Color coding from Casa Grande's online interactive zoning map.
3. ERU density based on Single-Family Residential.
4. Per Infrastructure Improvements Plan all non-residential development demand is 0.09 GAL/SF of building. Based on 1,000 GAL/AC of nonresidential development and 0.25 floor-to-area (FAR) ratio.
5. Commercial loadings where based on the City's recommendation of 1,188 GPD/AC (equivalent to R-1). 1,000 GPD/AC doesn't account for possible zoning conversions from Commercial to Residential.
6. Industrial loadings where based on the City's recommendation of 1,500 GPD/AC.
7. All daily flows based on ADEQ Minimum Standards (80 gallons per capita per day).
8. Coverage from industrial and commercial were calculated from equivalent populations based on 80 GCD.
9. Zoning density is not neccesarily a true reflection of actual density.

Future Flow Data - Allocated Loads

Usage Type	Category	Land Use Descriptions	H2OMap Input (Load Factor, CFS/AC)	H2OMap Output (Area, SF)	H2OMap Output (Area, AC)	H2OMap Output (Allocated Load1, CFS)	H2OMap Input (Load Factor, Capita/AC)	H2OMap Output (Allocated Coverage1, Capita)	Calculated ERUs
B-1	Commercial	Neighborhood Business Zone	0.0018	0	0.00	0.0000	14.9	0	0
B-2	Commercial	General Business Zone	0.0018	2,242,084	51.47	0.0924	14.9	765	226
B-3	Commercial	Central Business Zone	0.0018	0	0.00	0.0000	14.9	0	0
B-4	Commercial	Community Service Zone	0.0018	441,370	10.13	0.0182	14.9	151	45
CO	Commercial	Commercial Office Zone	0.0018	0	0.00	0.0000	14.9	0	0
GR	Residential	General Rural Zone (county)	0.0010	0	0.00	0.0000	1.1	0	0
I-1	Industrial	Garden & Light Industrial Zone	0.0023	0	0.00	0.0000	18.8	0	0
I-2	Industrial	General Industrial Zone	0.0023	0	0.00	0.0000	18.8	0	0
N/A	-	Not Available	0.0000	0	0.00	0.0000	-	0	0
PAD	Mixed	Planned Area Development Zone	0.0024	255,711,597	5,870.33	14.0539	19.7	115,359	34,406
PAD-RV	Mixed	PAD-RV Park Overlay Zoning District	0.0024	808,875	18.57	0.0445	19.7	365	109
R-1	Residential	Single-Family (R-1)	0.0018	3,484,294	79.99	0.1436	14.9	1,189	352
R-1a	Residential	Single-Family (R-1)	0.0018	0	0.00	0.0000	14.9	0	0
R-2	Residential	Duplex-Fourplex (R-2)	0.0031	0	0.00	0.0000	25.2	0	0
R-3	Residential	Apartments (R-3)	0.0057	3,487,487	80.06	0.4552	46.0	3,674	1,114
R-4	Residential	Mobile Home Subd. (R-4)	0.0018	4,677,882	107.39	0.1928	14.9	1,596	472
RR	Residential	Rural Ranch	0.0001	20,197,990	463.68	0.0463	1.1	509	113
UR	Residential	Urban Ranch	0.0004	95,843,360	2,200.26	0.8779	3.5	7,682	2,149
GP2020	-	Agriculture	0.0000	1,138,412	26.13	0.0000	0	0	0
GP2020	Commercial	Commerce and Business	0.0018	230,032,317	5,280.82	9.4819	14.9	78,489	23,213
GP2020	Residential	Community Center	0.0018	15,137,564	347.51	0.6240	14.9	5,165	1,528
GP2020	Industrial	Manufacturing/Industrial	0.0023	126,541,063	2,904.98	6.6649	18.8	54,478	16,317
GP2020	Mixed	Neighborhoods Category	0.0024	549,351,956	12,611.39	30.1924	19.7	247,829	73,916
GP2020	-	Open Space	0.0000	399,017.3690	9.16	0.0000	0	0	0
GP2020	Mixed	Rural Category	0.0003	120,449,753	2,765.15	0.8275	2.1	5,792	2,026
Totals:						63.7155*		523,044	155,986

Notes

1. Model output totals do not include all of the East Area loading. Part of the future East Area Allocated Loads were manually entered into the model.

Future Flow Data - Known Loads

PAD	Land Use Description	Unpeaked Flow (GPD)	Unpeaked Flow (CFS)	H2OMap MH ID	Units	Population	Population Equiv.
Regional Gateway Commerce Park	Mixed Commercial/Business/Office/Light Industrial	857,200	1.3263	70090	-	-	10,715
Copper Mountain Ranch	Residential	3,445,459	5.3309	70140	13,716	43,068	-
Copper Mountain Ranch	Hotel/Resort (600 rooms)	96,000	0.1485	70140	600	1,200	-
Copper Mountain Ranch	School (Flow based on other school within C.G.)	24,656	0.0381	70140	-	2,456	-
Copper Mountain Ranch	Community Business (91 AC)	108,108	0.1673	70140	-	-	1,351
CMR TOTAL	*Mixed Use*	*3,674,224*	*5.6849*	*70140*	*14,316*	*46,724*	*1,351*
Daisy Brand (Load Doubled)	Heavy Industrial	80,000	0.1238	7022	-	1,143	-

APPENDIX G

Individual Project Cost Estimates

Project 1

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

2014 Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling
Owner: City of Casa Grande
Prepared By: RP/JT

7/31/14

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,318	LF	$155.00	$824,262
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$98,630
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	5,318	LF	$20.00	$106,356
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	10	EA	$2,500.00	$24,658
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$52,695.33	$52,695
30	Traffic Control	10%	LS	$105,390.66	$105,391
31	Engineering & Administration	10%	LS	$105,390.66	$105,391
32	Staking and Construction Management	10%	LS	$105,390.66	$105,391
				Sub-Total	**$1,422,774**
				20% Contingency	$284,555
				PROJECT TOTAL	**$1,707,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

Project 2

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	4,004	LF	$148.00	$592,628
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	9	EA	$10,000.00	$90,085
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	4,004	LF	$20.00	$80,085
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	9	EA	$2,500.00	$22,521
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$39,265.94	$39,266
30	Traffic Control	10%	LS	$78,531.87	$78,532
31	Engineering & Administration	10%	LS	$78,531.87	$78,532
32	Staking and Construction Management	10%	LS	$78,531.87	$78,532
				Sub-Total	**$1,060,180**
				20% Contingency	$212,036
				PROJECT TOTAL	**$1,272,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

Project 3

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	519	LF	$200.00	$103,833
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	4,732	LF	$215.00	$1,017,478
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$97,527
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	519	LF	$22.00	$11,422
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	4,732	LF	$22.00	$104,114
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	10	EA	$2,500.00	$24,382
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$67,937.77	$67,938
30	Traffic Control	10%	LS	$135,875.54	$135,876
31	Engineering & Administration	10%	LS	$135,875.54	$135,876
32	Staking and Construction Management	10%	LS	$135,875.54	$135,876
				Sub-Total	**$1,834,320**
				20% Contingency	$366,864
				PROJECT TOTAL	**$2,201,000**

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Project 4

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	4,447	LF	$152.00	$675,966
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$98,943
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	4,447	LF	$22.00	$97,837
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	10	EA	$2,500.00	$24,736
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$44,874.10	$44,874
30	Traffic Control	10%	LS	$89,748.21	$89,748
31	Engineering & Administration	10%	LS	$89,748.21	$89,748
32	Staking and Construction Management	10%	LS	$89,748.21	$89,748
				Sub-Total	**$1,211,601**
				20% Contingency	$242,320
				PROJECT TOTAL	**$1,454,000**

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Project 5

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	3,032	LF	$148.00	$448,752
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	2,243	LF	$152.00	$340,971
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	12	EA	$10,000.00	$115,507
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	5,275	LF	$20.00	$105,507
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	12	EA	$2,500.00	$28,877
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$51,980.67	$51,981
30	Traffic Control	10%	LS	$103,961.33	$103,961
31	Engineering & Administration	10%	LS	$103,961.33	$103,961
32	Staking and Construction Management	10%	LS	$103,961.33	$103,961
				Sub-Total	**$1,403,478**
				20% Contingency	$280,696
				PROJECT TOTAL	**$1,684,000**

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Project 6

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	24,234	LF	$225.00	$5,452,668
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,318	LF	$335.00	$1,781,629
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	38	EA	$10,000.00	$379,405
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$380,685.10	$380,685
30	Traffic Control	10%	LS	$761,370.21	$761,370
31	Engineering & Administration	10%	LS	$761,370.21	$761,370
32	Staking and Construction Management	10%	LS	$761,370.21	$761,370
				Sub-Total	**$10,278,498**
				20% Contingency	$2,055,700
				PROJECT TOTAL	**$12,334,000**

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Project 7

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,464	LF	$200.00	$1,092,770
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$101,064
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$59,691.73	$59,692
30	Traffic Control	10%	LS	$119,383.46	$119,383
31	Engineering & Administration	10%	LS	$119,383.46	$119,383
32	Staking and Construction Management	10%	LS	$119,383.46	$119,383
				Sub-Total	**$1,611,677**
				20% Contingency	$322,335
				PROJECT TOTAL	**$1,934,000**

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Project 8

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,319	LF	$200.00	$1,063,827
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	10	EA	$10,000.00	$98,652
16	Jack & Bore Major Canal Crossing	1	LF	$165,000.00	$165,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$66,373.95	$66,374
30	Traffic Control	10%	LS	$132,747.90	$132,748
31	Engineering & Administration	10%	LS	$132,747.90	$132,748
32	Staking and Construction Management	10%	LS	$132,747.90	$132,748
				Sub-Total	**$1,792,097**
				20% Contingency	$358,419
				PROJECT TOTAL	**$2,151,000**

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Project 9E

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Committed Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,372	LF	$144.00	$773,516
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	9,978	LF	$155.00	$1,546,629
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,228	LF	$175.00	$914,909
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	15,841	LF	$200.00	$3,168,138
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	15,887	LF	$225.00	$3,574,496
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	83	EA	$10,000.00	$833,466
16	Jack & Bore Major Canal Crossing	1	LF	$165,000.00	$165,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$548,807.68	$548,808
30	Traffic Control	10%	LS	$1,097,615.37	$1,097,615
31	Engineering & Administration	10%	LS	$1,097,615.37	$1,097,615
32	Staking and Construction Management	10%	LS	$1,097,615.37	$1,097,615
				Sub-Total	**$14,817,807**
				20% Contingency	$2,963,561
				PROJECT TOTAL	**$17,781,000**

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Project 10

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	7,977	LF	$175.00	$1,395,937
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	2,715	LF	$200.00	$542,946
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	19	EA	$10,000.00	$188,192
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	10,692	LF	$22.00	$235,213
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	19	EA	$2,500.00	$47,048
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$120,466.78	$120,467
30	Traffic Control	10%	LS	$240,933.55	$240,934
31	Engineering & Administration	10%	LS	$240,933.55	$240,934
32	Staking and Construction Management	10%	LS	$240,933.55	$240,934
				Sub-Total	**$3,252,603**
				20% Contingency	$650,521
				PROJECT TOTAL	**$3,903,000**

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Project 11

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	6,811	LF	$148.00	$1,008,064
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	3,533	LF	$152.00	$537,060
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	22	EA	$10,000.00	$216,891
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	10,345	LF	$20.00	$206,891
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	22	EA	$2,500.00	$54,223
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$101,156.37	$101,156
30	Traffic Control	10%	LS	$202,312.75	$202,313
31	Engineering & Administration	10%	LS	$202,312.75	$202,313
32	Staking and Construction Management	10%	LS	$202,312.75	$202,313
				Sub-Total	**$2,731,222**
				20% Contingency	$546,244
				PROJECT TOTAL	**$3,277,000**

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Project 12

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	34,374	LF	$390.00	$13,405,692
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	43	EA	$10,000.00	$429,670
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	1	EA	$250,000.00	$250,000
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	1	EA	$8,000.00	$8,000
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$704,668.10	$704,668
30	Traffic Control	10%	LS	$1,409,336.19	$1,409,336
31	Engineering & Administration	10%	LS	$1,409,336.19	$1,409,336
32	Staking and Construction Management	10%	LS	$1,409,336.19	$1,409,336
				Sub-Total	**$19,026,039**
				20% Contingency	$3,805,208
				PROJECT TOTAL	**$22,831,000**

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Project 13

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	15,745	LF	$152.00	$2,393,301
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	27	EA	$10,000.00	$272,423
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$133,286.21	$133,286
30	Traffic Control	10%	LS	$266,572.41	$266,572
31	Engineering & Administration	10%	LS	$266,572.41	$266,572
32	Staking and Construction Management	10%	LS	$266,572.41	$266,572
				Sub-Total	**$3,598,728**
				20% Contingency	$719,746
				PROJECT TOTAL	**$4,318,000**

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Project 14

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	3,733	LF	$152.00	$567,418
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	7,587	LF	$155.00	$1,175,991
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,430	LF	$200.00	$1,085,910
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	29	EA	$10,000.00	$289,160
16	Jack & Bore Major Canal Crossing	1	LF	$165,000.00	$165,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$164,173.94	$164,174
30	Traffic Control	10%	LS	$328,347.87	$328,348
31	Engineering & Administration	10%	LS	$328,347.87	$328,348
32	Staking and Construction Management	10%	LS	$328,347.87	$328,348
				Sub-Total	**$4,432,696**
				20% Contingency	$886,539
				PROJECT TOTAL	**$5,319,000**

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Project 15

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	3,733	LF	$152.00	$567,418
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	7,587	LF	$155.00	$1,175,991
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,430	LF	$200.00	$1,085,910
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	29	EA	$10,000.00	$289,160
16	Jack & Bore Major Canal Crossing	1	LF	$165,000.00	$165,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$164,173.94	$164,174
30	Traffic Control	10%	LS	$328,347.87	$328,348
31	Engineering & Administration	10%	LS	$328,347.87	$328,348
32	Staking and Construction Management	10%	LS	$328,347.87	$328,348
				Sub-Total	**$4,432,696**
				20% Contingency	$886,539
				PROJECT TOTAL	**$5,319,000**

*In providing opinions of probable construction cost the Client understands that the Engineer has no control over costs or the price of labor, equipment or materials, or over the Contractor's method of pricing, and that the opinion of probable construction cost provided herein is made on the basis of the Engineer's qualifications and experience. The Engineer makes no warranty, expressed or implied, as the accuracy if such opinions compared to bid or actual costs.

Project 16

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	1,510	LF	$144.00	$217,410
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	4	EA	$10,000.00	$40,196
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$12,880.28	$12,880
30	Traffic Control	10%	LS	$25,760.56	$25,761
31	Engineering & Administration	10%	LS	$25,760.56	$25,761
32	Staking and Construction Management	10%	LS	$25,760.56	$25,761
				Sub-Total	**$347,768**
				20% Contingency	$69,554
				PROJECT TOTAL	**$417,000**

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Project 17

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	2,639	LF	$144.00	$380,081
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	4,521	LF	$148.00	$669,049
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	15	EA	$10,000.00	$153,201
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$60,116.53	$60,117
30	Traffic Control	10%	LS	$120,233.06	$120,233
31	Engineering & Administration	10%	LS	$120,233.06	$120,233
32	Staking and Construction Management	10%	LS	$120,233.06	$120,233
				Sub-Total	**$1,623,146**
				20% Contingency	$324,629
				PROJECT TOTAL	**$1,948,000**

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Project 18

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,259	LF	$144.00	$757,303
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	12	EA	$10,000.00	$115,181
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$43,624.21	$43,624
30	Traffic Control	10%	LS	$87,248.42	$87,248
31	Engineering & Administration	10%	LS	$87,248.42	$87,248
32	Staking and Construction Management	10%	LS	$87,248.42	$87,248
				Sub-Total	**$1,177,854**
				20% Contingency	$235,571
				PROJECT TOTAL	**$1,413,000**

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Project 19

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,028	LF	$144.00	$723,976
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	11	EA	$10,000.00	$110,552
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$41,726.40	$41,726
30	Traffic Control	10%	LS	$83,452.80	$83,453
31	Engineering & Administration	10%	LS	$83,452.80	$83,453
32	Staking and Construction Management	10%	LS	$83,452.80	$83,453
				Sub-Total	**$1,126,613**
				20% Contingency	$225,323
				PROJECT TOTAL	**$1,352,000**

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Project 20

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	2,660	LF	$144.00	$383,010
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	6	EA	$10,000.00	$63,196
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$22,310.28	$22,310
30	Traffic Control	10%	LS	$44,620.56	$44,621
31	Engineering & Administration	10%	LS	$44,620.56	$44,621
32	Staking and Construction Management	10%	LS	$44,620.56	$44,621
				Sub-Total	**$602,378**
				20% Contingency	$120,476
				PROJECT TOTAL	**$723,000**

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Project 21

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	2,660	LF	$144.00	$383,010
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$152.00	$0
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	6	EA	$10,000.00	$63,196
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$22,310.28	$22,310
30	Traffic Control	10%	LS	$44,620.56	$44,621
31	Engineering & Administration	10%	LS	$44,620.56	$44,621
32	Staking and Construction Management	10%	LS	$44,620.56	$44,621
				Sub-Total	**$602,378**
				20% Contingency	$120,476
				PROJECT TOTAL	**$723,000**

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Project 22

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	53,038	LF	$144.00	$7,637,432
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	29,926	LF	$148.00	$4,429,094
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	14,690	LF	$152.00	$2,232,851
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	10,544	LF	$155.00	$1,634,373
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	13,156	LF	$175.00	$2,302,248
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	10,512	LF	$200.00	$2,102,444
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,239	LF	$215.00	$1,126,443
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	257	EA	$10,000.00	$2,571,636
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$1,201,826.01	$1,201,826
30	Traffic Control	10%	LS	$2,403,652.02	$2,403,652
31	Engineering & Administration	10%	LS	$2,403,652.02	$2,403,652
32	Staking and Construction Management	10%	LS	$2,403,652.02	$2,403,652
				Sub-Total	**$32,449,302**
				20% Contingency	$6,489,860
				PROJECT TOTAL	**$38,939,000**

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Project 23

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	1,326	LF	$144.00	$190,889
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	9,953	LF	$148.00	$1,473,059
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,309	LF	$152.00	$806,977
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	34	EA	$10,000.00	$341,756
16	Jack & Bore Major Canal Crossing	1	LF	$165,000.00	$165,000
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$148,884.04	$148,884
30	Traffic Control	10%	LS	$297,768.08	$297,768
31	Engineering & Administration	10%	LS	$297,768.08	$297,768
32	Staking and Construction Management	10%	LS	$297,768.08	$297,768
				Sub-Total	**$4,019,869**
				20% Contingency	$803,974
				PROJECT TOTAL	**$4,824,000**

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Project 24

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$144.00	$0
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$148.00	$0
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,698	LF	$152.00	$866,125
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$155.00	$0
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$175.00	$0
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$200.00	$0
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$215.00	$0
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	9	EA	$10,000.00	$94,970
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$48,054.74	$48,055
30	Traffic Control	10%	LS	$96,109.47	$96,109
31	Engineering & Administration	10%	LS	$96,109.47	$96,109
32	Staking and Construction Management	10%	LS	$96,109.47	$96,109
				Sub-Total	**$1,297,478**
				20% Contingency	$259,496
				PROJECT TOTAL	**$1,557,000**

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Project 25

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling 7/31/14
Owner: City of Casa Grande
Prepared By: RP/JT

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	71,457	LF	$144.00	$10,289,773
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	13,319	LF	$148.00	$1,971,248
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	10,677	LF	$152.00	$1,622,896
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	15,820	LF	$155.00	$2,452,170
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,317	LF	$175.00	$930,493
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,264	LF	$200.00	$1,052,772
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,228	LF	$215.00	$1,124,031
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$225.00	$0
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$280.00	$0
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$335.00	$0
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$390.00	$0
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	241	EA	$10,000.00	$2,410,627
16	Jack & Bore Major Canal Crossing	0	LF	$165,000.00	$0
17	Lift Station	0	EA	$250,000.00	$0
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	0	LF	$20.00	$0
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	0	LF	$22.00	$0
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	0	LF	$22.00	$0
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	0	EA	$2,500.00	$0
28	Remove or Salvage Existing Lift Station	0	EA	$8,000.00	$0
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$1,092,700.46	$1,092,700
30	Traffic Control	10%	LS	$2,185,400.92	$2,185,401
31	Engineering & Administration	10%	LS	$2,185,400.92	$2,185,401
32	Staking and Construction Management	10%	LS	$2,185,400.92	$2,185,401
				Sub-Total	**$29,502,912**
				20% Contingency	$5,900,582
				PROJECT TOTAL	**$35,403,000**

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Summary of All Projects

City of Casa Grande

SUNRISE ENGINEERING
2152 S. Vineyard, Suite 123
Mesa, Arizona 85210
Tel: (480) 768-8600 Fax: (480) 768-8609

2014, Commited and Future Recommendations Cost Estimate *

Project: Wastewater Master Plan Update & Interceptor Sewer Modeling
Owner: City of Casa Grande
Prepared By: RP/JT

7/31/14

No.	Item Description - Construction	Quantity	Unit	Unit Price	Total
1	8" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$138.00	$0
2	10" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$141.00	$0
3	12" Gravity Sewer Pipe (PVC SDR 35 ASTM)	159,728	LF	$144.00	$23,000,825
4	15" Gravity Sewer Pipe (PVC SDR 35 ASTM)	77,057	LF	$148.00	$11,404,377
5	18" Gravity Sewer Pipe (PVC SDR 35 ASTM)	66,076	LF	$152.00	$10,043,565
6	21" Gravity Sewer Pipe (PVC SDR 35 ASTM)	54,392	LF	$155.00	$8,430,694
7	24" Gravity Sewer Pipe (PVC SDR 35 ASTM)	31,678	LF	$175.00	$5,543,585
8	27" Gravity Sewer Pipe (PVC SDR 35 ASTM)	51,063	LF	$200.00	$10,212,641
9	30" Gravity Sewer Pipe (PVC SDR 35 ASTM)	15,200	LF	$215.00	$3,267,951
10	36" Gravity Sewer Pipe (PVC SDR 35 ASTM)	56,540	LF	$225.00	$12,721,428
11	42" Gravity Sewer Pipe (PVC SDR 35 ASTM)	1,918	LF	$280.00	$537,163
12	48" Gravity Sewer Pipe (PVC SDR 35 ASTM)	5,318	LF	$335.00	$1,781,629
13	54" Gravity Sewer Pipe (PVC SDR 35 ASTM)	34,374	LF	$390.00	$13,405,692
14	60" Gravity Sewer Pipe (PVC SDR 35 ASTM)	0	LF	$445.00	$0
15	60" Manhole (Precast Concrete)	995	EA	$10,000.00	$9,952,892
16	Jack & Bore Major Canal Crossing	5	LF	$165,000.00	$825,000
17	Lift Station	1	EA	$250,000.00	$250,000
18	Force Main	0	LF	$20.00	$0
19	Remove or Abandon Existing 10" Gravity Sewer Pipe	0	LF	$18.00	$0
20	Remove or Abandon Existing 12" Gravity Sewer Pipe	24,942	LF	$20.00	$498,839
21	Remove or Abandon Existing 15" Gravity Sewer Pipe	519	LF	$22.00	$11,422
22	Remove or Abandon Existing 18" Gravity Sewer Pipe	19,871	LF	$22.00	$437,164
23	Remove or Abandon Existing 21" Gravity Sewer Pipe	0	LF	$25.00	$0
24	Remove or Abandon Existing 24" Gravity Sewer Pipe	0	LF	$30.00	$0
25	Remove or Abandon Existing 36" Gravity Sewer Pipe	0	LF	$35.00	$0
26	Remove or Abandon Existing 42" Gravity Sewer Pipe	0	LF	$40.00	$0
27	Remove or Abandon Existing 60" Manhole	91	EA	$2,500.00	$226,444
28	Remove or Salvage Existing Lift Station	2	EA	$8,000.00	$16,000
29	Sawcut, Remove & Replace A.C. Pavement (Included w/Pipe Cost)	0	SY	$70.00	$0
29	Mobilization	5%	LS	$5,628,365.52	$5,628,366
30	Traffic Control	10%	LS	$11,256,731.04	$11,256,731
31	Engineering & Administration	10%	LS	$11,256,731.04	$11,256,731
32	Staking and Construction Management	10%	LS	$11,256,731.04	$11,256,731
				Sub-Total	**$151,965,869**
				20% Contingency	$30,393,174
				PROJECT TOTAL	**$182,359,000**

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APPENDIX H

Meeting Minutes