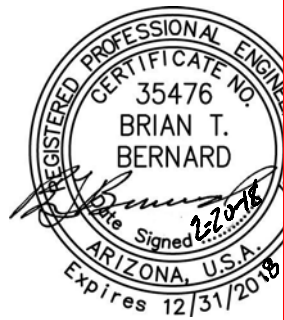


# Sewer Basis of Design Report

Sereno Canyon Phase 4

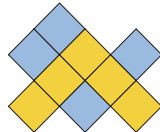


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February 20, 2018

## FINAL Basis of Design Report

- APPROVED
- APPROVED AS NOTED
- REVISE AND RESUBMIT



9379 E San Salvador Dr.  
Scottsdale, AZ 85258

Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, and approval of a revised basis of design report prior to the plan review submission.; this approval is not a guarantee of construction document acceptance. For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY scan

DATE 6/27/2018

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## **1.0 INTRODUCTION**

### **1.1 General Description**

This Sewer Basis of Design Report has been prepared to describe how sanitary sewer services will be provided to the proposed Sereno Canyon Phase 4 and Resort development, for Toll Brothers' Arizona Construction Company. The project is located within the City of Scottsdale, Arizona. This is the final design phase of the Sereno Canyon Development that was developed by Crown Development in 2005. The development was to be subdivided into four phases. Phase 1 improvements have been completed. Phase 2 and Phase 3 will be completed in the future. Phase 4 design of the project is approximately 121.65 acres with a total of 268 residential dwelling units and 29 Resort Casitas and a Health Center/Spa with 14,500 square feet. The Health Center/Spa is to be used by the residents of Sereno Canyon. The Health Center/Spa is not going to be a public restaurant. The property is located on rolling terrain. The southern and western portions of the property slope to the north and to the east. The southeast portion of the property slope to the northeast and to the east. The site is within the elevation range from 2688 to 2855.

This analysis will present the design requirements for the collection system for the entire project and offsite lots *See Figure 2: Sewer Distribution Map.*

### **1.2 Location**

The project is located in Section 11, Township 4 North, Range 5 East of the Gila and Salt River Baseline and Meridian, Maricopa County, Arizona. It is bound on the south by Pinnacle Peak Road Alignment, on the west by 122nd Street and Phase 2 of Sereno Canyon, on the north by Phase 1 and Phase 3 of Sereno Canyon, and on the east by N. 128th Street and rural residential parcels. This property is located within Quarter Section map 45-57, and 45-58. *See Figure 1, Vicinity Map.*

### **1.3 Purpose**

This report has been prepared to analyze the construction of the sanitary sewer system that will serve Phase 4. However, the report shall provide technical information for the sanitary sewer distribution system for the entire Sereno Canyon project. This report analyzes the final design for the sewer distribution system. The lift station detailed design will be completed during the construction document process. The city will operate the Lift Station. The lift station is to be designed per the City's Lift Station Design Criteria, Dated Oct. 15<sup>th</sup>, 2015.

## **2.0 COLLECTION SYSTEM DESCRIPTION**

### **2.1 Existing Collection System**

Phase 4 of the Sereno Canyon development will connect to the City of Scottsdale existing sewer system. Approximately 97 dwelling units from phase 4 will convey their sewer flows to the existing 8 inch sewer pipe within East Alameda Road. The remaining 171 dwelling units will convey their sewer flows to the existing 8 inch sewer line within the East Ranch Gate Road. This 8 inch line within the East Ranch Gate Road alignment conveys flows to an existing sewer lift station located east of the Sereno Canyon project at the intersection of 128<sup>th</sup> St. and W. Buckskin Trail. This existing lift station has a 350 gpm capacity. Both 8 inch sewer lines have adequate capacity to include the sewer flows from the Sereno Canyon Development. Table 1 shows the distribution of EDUs (Equivalent Dwelling Unit) for the entire project.

Table 1. Sewer EDU Distribution

	E, Alameda RD. EDUs	E. Ranch Gate Rd. Lift Station EDUs	Total EDUs
Phase 1	2	54	56
Phase 2	14	0	14
Phase 3	0	19	19
Phase 4	97	171	268
Resort	0	29	29
	113	273	386

EDU = Equivalent Dwelling Unit = 1 single family residential unit

The Sereno Canyon development is part of a Facility Payback Agreement (Agreement No. 2010-169-COS). First Administrative Amendment to the Facility Payback Agreement (Agreement No. 2010-169-COS-A1), Paragraph 9, states: “...Developer has sewer system capacity reserved for 302 EDUs”. The agreement states that the Sereno Sewer Pump Station has a capacity to provide service to 611 single family residential lots or equivalent dwelling units (EDUs). Out of 611 EDUs, 302 EDUs are reserved for Sereno Canyon Phase 1-4 and the remaining 309 EDUs capacity will be allocated on a first-come-first-serve basis and reserved upon payment of the applicable Sewer Facility Payback fees. Sereno Canyon allocation of EDUs to the Sereno Sewer Pump Station is as follows:

**Phase 1** = 54 EDUs

**Phase 2** = None

**Phase 3** = 19 EDUs

**Phase 4** = 171 EDUs

**Resort** = 29 EDUs

**Total** = **273 EDUs** (see Table 1 above)

Based on this, the total EDUs from Sereno Canyon for the Sewer Pump Station is **below** the ‘reserved’ capacity of 302 EDUs. Therefore, Agreement No. 210-169-COS-A1 “**does not**” affect this development and sewer service beyond the capacity of the Sewer Pump Facility “**does not**” need to be secured

## 2.2 Proposed Collection System

The proposed collection system will convey the wastewater demand flows within a gravity pipe system. Of the 268 dwelling units and the 29 Resort Casitas and Health Center/Spa, sewer flows from 97 units will be conveyed to the existing 8 inch sewer line within the E. Alameda Road alignment. The remaining 171 units and the 29 casitas and Health Center/Spa will be conveyed to the 8 inch sewer line within the E. Ranch Gate Road alignment along the northern property boundary of Phase 1 of the Sereno Canyon Development. Of the 171 units, 130 dwelling units will be conveyed in an 8 inch sewer pipe line to a local proposed on-site lift station. This lift station is design for a 170 gpm capacity. No off-site flows are proposed to be conveyed to this proposed lift station. The location of the on-site lift station is near the

northeast property of Phase 4. The lift station will discharge the demand flows from the lift station within a 3 inch force main to the proposed Biofilter site located near the intersection of the collector road and the Health Center/Spa. From the biofilter the flows will connect to the proposed SSMH-(56) then gravity feed north thru Phase 3 of Sereno Canyon and connect to the existing 8 inch sewer line within the E. Ranch Gate Road alignment. From the connection to the existing 8 inch sewer line in E. Ranch Gate Rd, the flows will be conveyed to the existing lift station located east of the project at the intersection of N. 128<sup>th</sup> Street and E. Buckskin Trail. All pipes within the project are to be gravity 8-inch diameter sewer pipe lines. *See Figure 2: Sewer Distribution Map.*

That portion of the sewer line within Phase 3 should be constructed to allow wastewater flows from Phase 4 Lift Station to reach out the existing pipe on E. Ranch Gate Rd.

### **3.0 BASIS OF DESIGN**

#### **3.1 Design Flow Rates**

As per the City of Scottsdale this Basis of Sewer Design Report was prepared according Design Standards & Policies Manual, dated January 2010. The following is a summary of the design criteria upon which this study is based.

##### Basis of Sewer Design

- The total number of units phase 4 = 268 dwelling unit plus 29 Resort Casitas
- Per the City of Scottsdale design standards section 7-1.403 residential design flow will be 100 gallons per capita day with 2.5 persons per dwelling unit.
- Resort demand flows will be 380 gallons per casita (room)
- Health Center/Spa flows will be 1.2 gpd per square foot
- A peaking factor of 4 will be used for residential dwellings
- A peaking factor of 4.5 will be used for the casitas
- A peaking factor of 6 will be used for Spa

##### Sewer flow was calculated as follows:

Total residential units = 268

Total Resort Casitas = 29

Total average day Flow = 100 gpcd x 2.5 persons x 268 units = 67,000 gpd

Total average day flows = 29 casitas x 380 = 11,020 gpd

Restaurant at Resort = 14,500 sf Spa x 1.2 = 17,400 gpd

Average Daily Flow = 81.54 gpm = 0.1816 cfs

Residential Peak Day Flow = 46.53 gpm x 4 = 186.11 gpm = 0.4147 cfs

Spa Casitas Peak Day Flows = 7.65 gpm x 4.5 = 34.44 gpm = 0.0767 cfs

Spa Peak Day Flow = 12 gpm x 6 = 72.5 gpm = 0.1615 cfs

Peak Hour Flow = 0.6529 cfs x 1.7 = 1.1099 cfs

The collection system design criterion is based on the City of Scottsdale DSPM. The following represents the design criteria for the collection system:

- Mean full flow velocity = 2.5 feet per second
- Peak Flow velocity = 10.0 feet per second maximum.
- The Manning's roughness coefficient,  $n=0.013$  for all pipe materials.
- Maximum sewer capacity:  $d/D=65\%$  at peak flow conditions.
- Manhole spacing shall not exceed 500 feet for sewer lines less than 18 inches in diameter
- The minimum drop in elevation from the invert to the outlet of a manhole shall be 0.1 feet.
- The minimum manhole diameter shall be 48 inches for manholes less than 10 feet deep and the pipe is less than 15 inches in diameter.
- MAG Standard 601 and 615 and any subsequent MAG specification and details, shall be followed for trench bedding.
- Minimum slopes: Use the minimum slope of 0.52% calculated from Manning's Formula using a sewage velocity of 2.5 feet per second when flowing full.
- Force Main shall be designed per the DSPM under section 7-1.403. and City of Scottsdale Sewer Lift Station Design Criteria Revised 10/15/2015.
- Lift Station design shall include an allowance of 35 gpm per pump for swimming pool discharge.
- Line separation shall be designed per the DSPM under section 7-1.407.

### 3.2 Sewer Capacity

The Sereno Canyon Phase 4 development will accumulate 95,420 gallons per day average day flow at buildout. At Peak Day Flows the Phase 4 development will accumulate 421,991 gallons per day at buildout for Phase 4 of the development. The existing lift station located east of the Sereno Canyon Development has a design capacity of 350 gpm. The peak dry weather flows contributing from the development to the existing lift station are **290.09 gpm**. These flows include the required 35 gpm allowance per pump for swimming pool discharge. The Peak Wet Weather Flows are calculated to be **318.86 gpm**. Based on the analysis the existing sewage lift station has adequate capacity for the development.

#### 4.0 ON-SITE IMPROVEMENTS

The collection system for the community is to be a gravity sewer system. The pipes shall be constructed within the proposed streets and dedicated sewer easements. The onsite gravity sewer collection system will collect and convey portions of the sewer flows to the existing 8 inch sewer line in E. Alameda Road, and a proposed Lift Station that will be constructed near the east property boundary of phase 4. This lift station is to discharge the sewer flows within a 3-inch diameter force main. The force main will be constructed within the proposed street section for the project. The force main will connect to a proposed odor control discharge divergence structure (Biofilter) located in a tract to be deeded to the City of Scottsdale, along the north right of way line of the collector street and the entry to the resort. From this structure, the flows will be discharged to a proposed sewer manhole depicted as SSMH-(56) in Figure 2. Flows within this proposed 8 inch sewer line system are conveyed to the north within the N. 125<sup>th</sup> Street alignment to an existing manhole in Phase 1 of Sereno Canyon, depicted as Exist SSMH- (6) in Figure 2. From this existing manhole an 8- inch gravity pipe is constructed within the N. 125<sup>th</sup> Place alignment which connects to an existing 8 inch sewer line within the E. Ranch Gate Road alignment. Then the flows will be conveyed to the existing lift station located east of the Sereno Canyon Development at the northeast corner of the intersection of 128<sup>th</sup> Street and E. Buckskin Trail. See *Figure 2: Sewer Distribution Map*.

The proposed Lift Station will be designed per the minimum requirements per Scottsdale DSPM, Section 7-1.403 and City of Scottsdale Sewer Lift Station Design Criteria Revised 10/15/2015. The total peak dry weather flows for the dwelling units being conveyed to the proposed on-site lift station are calculated to be 131.31 gpm plus the required 35 gpm flow allowance for swimming pool discharge for a total of 166.31 gpm. The proposed lift station should have a minimum capacity of 170 gpm. Final design calculations for the Lift Station will be completed with the final design phase of the project. The elevation difference from the order control structure and the proposed Lift Station is 51 feet. The flow velocities in the force main must be between 4 and 6 feet per second.

See Appendix A for calculations and a summary of the proposed system design and capacity. The appendix shows the proposed sewer slopes, projected peak flows fates, and pipe flow capacities meeting minimum design standards. Final hydraulics will be included in a Final Basis of Design Report along with the Final Improvement Plans.

Figure 1: Vicinity Map



Figure 2: Sewer Distribution Map

## **Appendix A: Proposed System Design and Capacity**

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