HUNTER
ENGINEERING

CIVIL AND SURVEY

Final Sewer Basis of Design Report
For
101 & Princess Dr.
NWC of Princess Drive and 101 Freeway
Scottsdale, Arizona 85255

FINAL Basis of Design Report

☐ APPROVED

☑ APPROVED AS NOTED

☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE

SCOTTSDALE WATER
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 apritchard DATE 4/28/2024

Registered Professional Engineer (Civil)
CERTIFICATE NO.
42104
LARRY M.
TALBOTT
Date Signed 1/16/24
ARIZONA U.S.A

January 2024

Prepared by:
Hunter Engineering, Inc.
10450 North 74th Street, #200
Scottsdale, AZ 85258

FINAL SEWER BASIS OF DESIGN REPORT
FOR

101 & PRINCESS DR.

NWC OF PRINCESS DRIVE AND 101 FREEWAY
SCOTTSDALE, ARIZONA 85255

PREPARED FOR

LGE DESIGN BUILD
1200 NORTH 52ND STREET
PHOENIX, AZ 85008

PREPARED BY

LARRY TALBOTT
HUNTER ENGINEERING, INC.
10450 NORTH 74TH STREET, #200
SCOTTSDALE, AZ 85258
(480) 991-3985

H.E. PROJECT NO. LGEC319

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Table of Contents

1.0 INTRODUCTION

This water design report has been prepared under a contract from LGE Design Build, developer of the 101 & Princess Dr. project. The purpose of this report is to provide a final sewer analysis, required by the City of Scottsdale, to support this development. Preparation of this report has been done according to the procedures detailed in Chapter 4 of the *City of Scottsdale Design Standards & Policies Manual dated January, 2018 (CSDSPM) (Reference 1) and the City of Phoenix Water Services Department, Design Standards Manual for Water and Wastewater Systems, 2017 (COPWSD) (Reference 2).* The City of Phoenix reference was utilized for the sewer demands where Scottsdale's design standards do not supply demand flows for specific building uses.

This development project is located along the west side of the Loop 101 Freeway just north of Princess Drive within the City of Scottsdale, Maricopa County, Arizona. The proposed project is currently four undeveloped parcels within the Perimeter Center master development.

The existing parcel is bound by existing commercial developments to the north and west, Princess Drive to the south and the Loop 101 Freeway to the east. The site is specifically located in the east half of section 36, Township 4 North, Range 4 East, of the Gila and Salt River Base and Meridian. Figure 1, in Appendix A, illustrates the location of the project site in relation to the City of Scottsdale street system. Access to the site is provided from 85th Street, St. John Road and the existing private drive for the existing hotel along the southwestern property boundary.

The development proposes the construction of four new warehouse buildings. Site improvements will include construction of driveway entrances, a parking lot, sidewalk/hardscape, landscape areas, and supporting infrastructure including new storm water drainage system, water, sewer and fire line service. The overall project site is approximately 17 acres.

2.0 EXISTING CONDITIONS

There is an existing 8" VCP sewer within 85th Street, St. John Road and Princess Road adjacent to the site. There are three existing sewer services to the site off 85th Street and a single existing sewer service to the site off Princess Drive.

3.0 PROPOSED SEWER COLLECTION SYSTEM

This project proposes to connect to the existing sewer services where applicable. Where connection to the existing sewer services is not feasible a new service connection to the main will be provided. See the Concept Utility Plans in Appendix A for proposed service stub locations and sizes. Wastewater flows for the proposed site were calculated in accordance with the CSDSPM (Reference 1) and City of Phoenix Water Services Department, Design Standards Manual for Water and Wastewater Systems, 2021. Wastewater flows of 50gpd per every 1,000 sf of building were calculated in accordance with the City of Phoenix design standards as

Scottsdale does not have a demand flow for Industrial. The peaking was calculated as 4.21 using Harmon's Formula per the City of Phoenix design standards and an assumed population of one person per 2,100 sf of building as Scottsdale does not have peaking factors for Industrial.

According to the calculations provided in Appendix B the proposed buildings will have an estimated Average Daily Flow total of 9.2 gpm and a Peak Hour Flow of 38.8 gpm. The final plumbing design for the buildings is not complete at this time. Therefore, the proposed sewer service is calculated based on the minimum 1.20% for a 6" sewer service for each building.

The capacity of the proposed 6" sewer service line at the minimum slope is 209 gpm on a max d/D ratio of 0.65. Which is far greater than the Peak Hour Flow of 38.8gpm for the entire site. Therefore, the individual building flows will be less than the total site flows and well below the service capacity flows.

The sanitary sewer pipe and fitting material for this project has been designated as PVC SDR-35. Trenching and bedding details for this project are to be per MAG Standard Specifications Section 601. Trench width above the installed pipe may be as wide as necessary to properly brace/install the work. Bedding backfill and compaction shall be installed per MAG Standard Specification 601.4. Service lines should connect to sewer according to MAG Standard Detail No. 440-3.

4.0 CONCLUSIONS

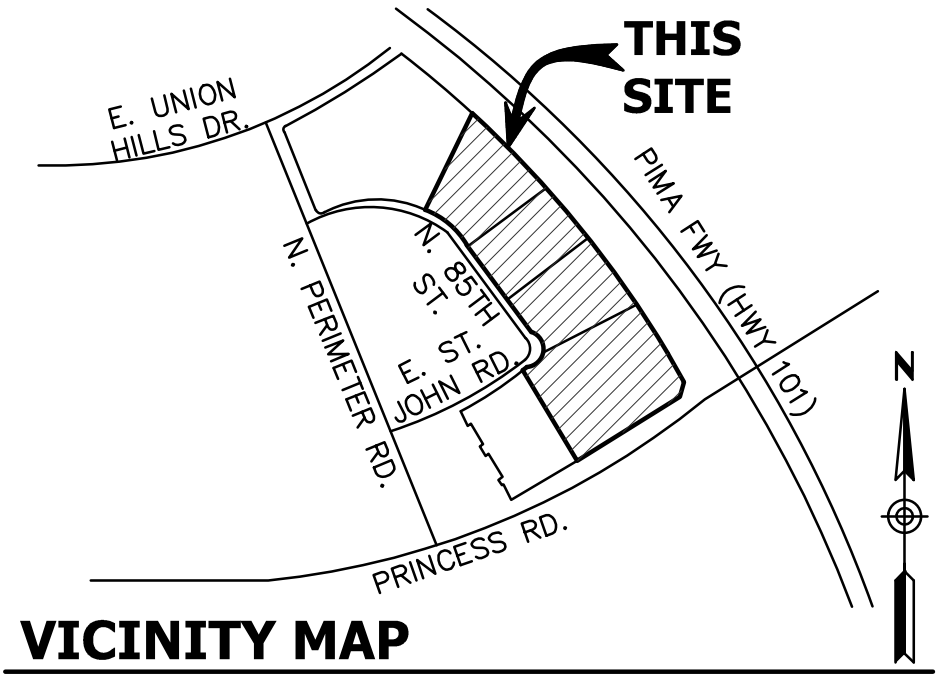
Based on the results of this study, it can be concluded that:

- The proposed sewer services are adequate to support this development.

5.0 REFERENCES

1) City of Scottsdale Design Standard & Policies Manual, January 2018 (Ref 1).
2) City of Phoenix Water Services Department, Design Standards Manual for Water and Wastewater Systems, 2017 (Ref 2).
3) Final Master Design Report - Sanitary Sewer for Corporate Center at DC Ranch, dated April 2006 and prepared by Hunter Engineering (Ref 3).

APPENDIX A
FIGURES



VICINITY MAP

H:\LGEC319\Drainage\FEMA\LG19FEMA.dwg, 1/9/2024 9:32:34 AM, ltalbott

VICINITY MAP
FIGURE 1

2-ZN-2010#2
2/13/24

PROPOSED BUILDING D
LF88=1599.50

PROPOSED BUILDING C
LF88=1596.75

PROPOSED BUILDING B
LF88=1594.25

HWY 101

ADDED GNEREAL NOTE FOR VERTICAL SEPARATION TO BE PER CITY STANDARDS AND DETAILS.

Verify that there is adequate vertical separation between the sewer lateral and storm drain. DSPM 7-1.407 and 408

ADDED GNEREAL NOTE FOR VERTICAL SEPARATION TO BE PER CITY STANDARDS AND DETAILS.

Verify that there is adequate vertical separation between the sewer lateral and storm drain. DSPM 7-1.407 and 408

SEWER
IE=81.25

6" SS

EX MH
RIM=89.88
IE=79.34 NE
IE=79.30 SE
IE=79.34 W

CONNECT
TO EX. WM

CONNECT
TO EX. SS
IE=79.69, 6"
IE=79.02, 8"

35' EX R/W
20' EX BC
1' EX SS
24' EX W
21' EX BC

EX MH
RIM=88.55
IE=78.01 N
IE=78.01 E
IE=77.96 W
IE=77.88 S

CONNECT
TO EX. WM

CONNECT
TO EX. SS
IE=75.15, 6"

SEWER
IE=75.75

6" SS

EX MH
RIM=86.11
IE=74.18 N
IE=74.211 E
IE=74.13 W
IE=74.08 S

10" W
20' WTR ESMT
FH
FIRE
DOM
WM
RR
BFF
SEWER EASEMENT
STORM DRAIN EASEMENT

MATCH LINE SEE SHEET C5

0 40' 80'
SCALE 1"=40'

NO.	DATE	REVISION	BY

PURPOSE:
1ST CONCEPT SUBMITTAL

DESIGN BY: LT
DRAWN BY: DC
CHECKED BY: LT

HUNTER ENGINEERING
CIVIL AND SURVEY
10446 NORTH 74TH STREET
SUITE 140
SCOTTSDALE, AZ 85258
P 480 991 3985

Registered Professional Engineer
CERTIFICATE NO.
42104
LARRY M. TALBOTT
Date Signed 1/15/24
ARIZONA U.S.A.

CONCEPTUAL UTITILY PLAN
FOR
101 AND PRINCESS
101 AND PRINCESS
SCOTTSDALE ARIZONA

CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
AR ZONA811
CALL 811 OR CLICK ARIZONA811.COM

THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

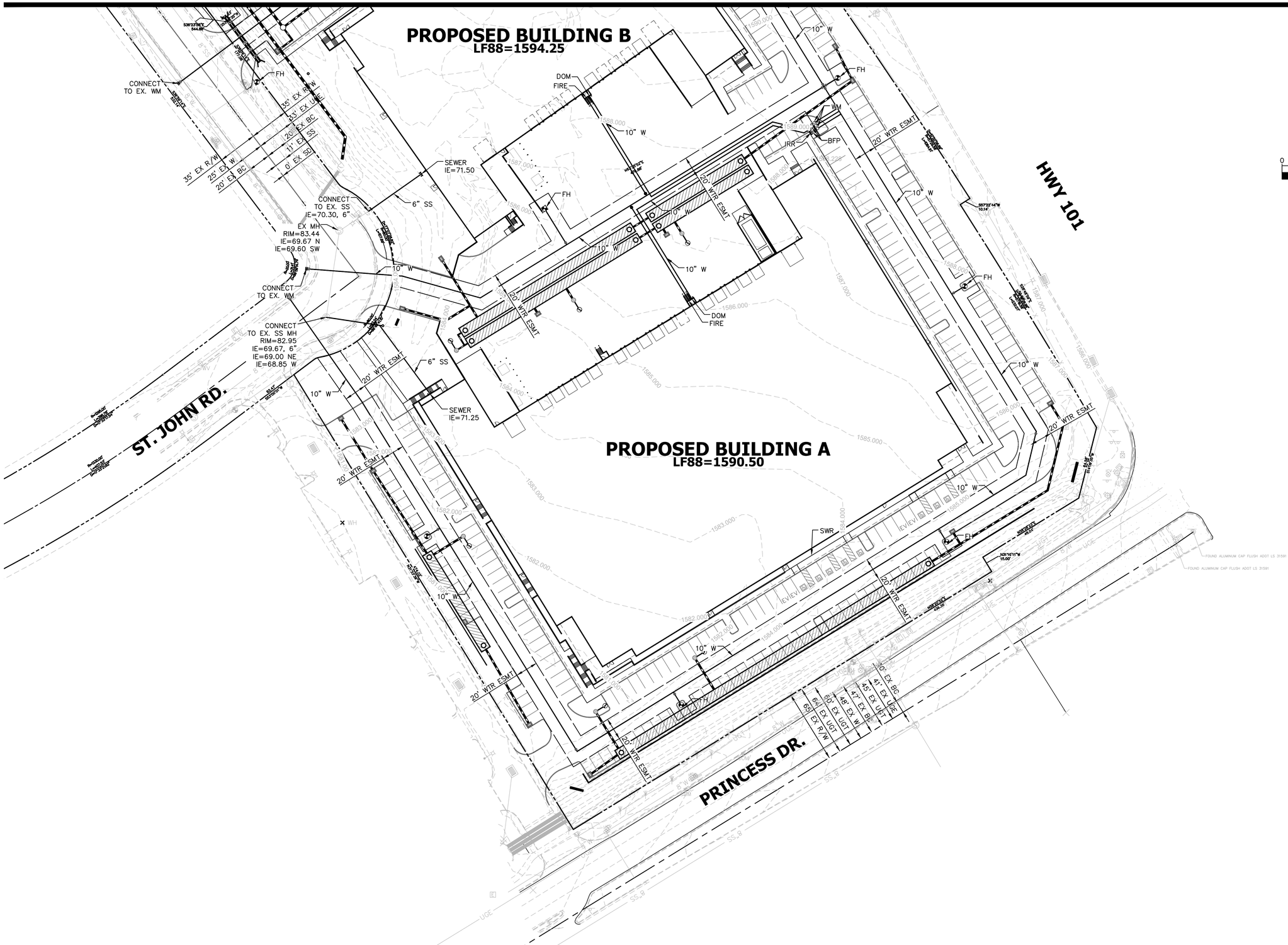
PROJECT NAME:
101
AND
PRINCESS

HE NO.: LGEC319
SCALE: 1"=40'

SHEET:
C4

2-ZN-2010#2
2/13/24

MATCH LINE SEE SHEET C4



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CONCEPTUAL UTITILY PLAN FOR 101 AND PRINCESS 101 AND PRINCESS SCOTTSDALE ARIZONA

CONTACT ARIZONA 811 AT LEAST 2 FULL WORKING DAYS BEFORE YOU BEGIN EXCAVATION
AR ZONA811
CALL 811 OR CLICK ARIZONA811.COM

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PROJECT NAME: 101 AND PRINCESS

HE NO.: LGEC319
SCALE: 1"=40'

SHEET: C5

2-ZN-2010#2
2/13/24

APPENDIX B
SEWER CAPACITY WORK SHEET

Demand value accepted based on Dimensioned Site Plan notations that the building usage will be office and warehouse.

UNDERSTOOD

Project: 101 & Princess Dr.
Project No.: LGEC319
City: Scottsdale
Date: 1/10/2024

PROJECTED SANITARY SEWER LOADS

Land Use	Building Area (sf)	Average Day Sewer Demand (gpd) City of Phoenix Water Services Dept. Deisgn Standards Manual Table 8. Water and Wastewater Design Flows		Peaking Factor	Average Daily Flow (gpd)	Average Daily Flow (gpm)	Peak Flow (gpm)
Building A - Industrial	101,198	50.0	gpd/1000sf	4.21	5,060	3.5	14.7
Building B - Industrial	54,592	50.0	gpd/1000sf	4.21	2,730	1.9	8.0
Building C - Industrial	55,925	50.0	gpd/1000sf	4.21	2,796	1.9	8.0
Building D - Industrial	55,925	50.0	gpd/1000sf	4.21	2,796	1.9	8.0
Total Buiding	267,640				**13,382**	**9.2**	**38.8**

HUNTER ENGINEERING

Worksheet
Worksheet for Circular Channel

Project Description	
Worksheet	6" Service
Flow Element	Circular Chann
Method	Manning's Forr
Solve For	Discharge

Input Data		
Mannings Coeffic	0.013	
Channel Slope	012000	ft/ft
Depth	0.33	ft
Diameter	6.0	in

Results		
Discharge	209	gpm
Flow Area	0.1	ft²
Wetted Perime	0.94	ft
Top Width	0.00	ft
Critical Depth	0.35	ft
Percent Full	65.0	%
Critical Slope	0.009994	ft/ft
Velocity	3.44	ft/s
Velocity Head	0.18	ft
Specific Energy	0.51	ft
Froude Numbe	1.14	
Maximum Disc	297	gpm
Discharge Full	276	gpm
Slope Full	0.006866	ft/ft
Flow Type	Supercritical	

Hunter
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

2-ZN-2010#2
2/13/24

APPENDIX C
REFERENCES

CITY OF SCOTTSDALE

DESIGN STANDARDS & POLICIES MANUAL

2-ZN-2010#2
2/13/24

LAND USE	DEMAND (gpd)	DESIGN PEAKING FACTOR
Commercial/Retail	0.5 per sq. ft.	3
Office	0.4 per sq. ft.	3
Restaurant	1.2 per sq. ft.	6
High Density Condominium (Condo)	140 per unit	4.5
Resort Hotel (includes site amenities)	380 per room.	4.5
School: without cafeteria	30 per student	6
School: with cafeteria	50 per student	6
Cultural	0.1 per sq. ft.	3
Clubhouse for Subdivision Golf Course	100 per patron x 2 patrons per du per day	4.5
Fitness Center/ Spa/ Health club	0.8 per sq. ft.	3.5

FIGURE 7-1.2 AVERAGE DAY SEWER DEMAND IN GALLONS PER DAY & PEAKING FACTORS BY LAND USE

HYDRAULIC DESIGN 7-1.404

No public SS lines will be less than 8 inches in diameter unless permission is received in writing from the Water Resources Department.

SS lines shall be designed and constructed to give mean full flow velocities equal to or greater than 2.5 fps, based upon Manning's Formula, using an "n" value of 0.013.

To prevent abrasion and erosion of the pipe material, the maximum velocity will be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, submit a hydraulic analysis along with construction recommendations to the Water Resources Department for consideration. In no case will velocities greater than 15 fps be allowed.

Actual velocities shall be analyzed for minimum, average day and peak day design flow conditions for each reach of pipe.

The SS system shall be designed to achieve uniform flow velocities through consistent slopes. Abrupt changes in slope shall be evaluated for hydraulic jump.

The depth to diameter ratio (d/D) for gravity SS pipes 12 inches in diameter and less shall not exceed 0.65 in the ultimate peak flow condition. This d/D ratio includes an allowance for system infiltration and inflow.

The d/D for gravity drains greater than 12 inches diameter shall not exceed 0.70 for the ultimate peak flow condition. This d/D includes an allowance for system infiltration and inflow.

Measures to mitigate hydrogen sulfide shall be analyzed at manhole drops, abrupt changes in pipe slope or direction and at changes in pipe diameter.

MANHOLES AND CLEAN OUTS 7-1.405

Manholes in city streets shall be located near the center of the inside traffic lane, rather than on or near the line separating traffic lanes. Manholes shall not be in bike trails, equestrian trails, sidewalks, crosswalks or wash crossings. Manholes are required at all

City of Phoenix
Water Services Department

DESIGN STANDARDS MANUAL FOR WATER AND WASTEWATER SYSTEMS

2021

Water Services Department
200 West Washington Street
Phoenix, Arizona 85003-1697
Phone: (602) 495-5601
Fax: (602) 495-5461

2-ZN-2010#2
2/13/24

in Chapter IV, Section C), are not always adequate to meet water demands. For some projects, a detailed analysis of domestic and fire flow demands may be required to properly define requirements for system design.

1. Water and Sewer Design Flows

The following **Table 8**, *Water and Wastewater Design Flows* shall be used to calculate both water and sewer design flows utilized in the preparation of engineering design reports, plans, and specifications.

Table 8. Water and Wastewater Design Flows.

Land Use	Unit	Water Average Daily Flow/Unit (gal)	Wastewater Average Daily flow/Unit (gal)
Single Family Residential	Dwelling	360	240
Multi-family	Dwelling	240	180
Commercial (retail/mall)	1000 ft^2	125	75
Commercial (office)	1000 ft^2	115	90
Warehousing/Big Box Retail	1000 ft^2	30	25
Industrial	1000 ft^2	65	50
Schools	Student	25	20
Hotel (no restaurant)	Room	140	100
Hotel (with restaurant)	Room	200	150
Resort	Room	300	210
Hospital (all flows)	Bed	500	300
Landscape Water Requirements			
General Landscaping	Acre	4,374	N/A
Public Right of Way or Streetscape	Acre	1,339	N/A
Surface Water	Acre	5,335	N/A

NOTES: The following Italicized notes are for Table 8, Water and Wastewater Design Flows

*Complete design flows are not provided for **industrial and hospital facilities** because case-by-case evaluation is necessary due to varying water demands observed for these use types. Some industrial uses such as data warehouses, food processing, bottling plants, and semi-conductor manufacturing can use more than ten times as much water as compared to warehousing or dry assembly manufacturing with no cooling tower use. Water use in hospitals varies greatly depending upon cooling tower and boiler use, the extent to which the hospital is used as a research and teaching facility, the amount of out-patient versus in-patient services provided, and the types of equipment used. Estimates of anticipated water use and wastewater generation must be produced for each new development or major expansion using projections of demands taking into account the following types of categories:*

- ***Water for cooling towers**: Cooling towers use can make up more than fifty percent of water demand at industrial facilities having large refrigeration units or cooling of servers. In most cases, cooling towers use twenty to forty percent of the water requirements for industrial operations and hospitals.*
- ***Water used as an input for production**: In some manufacturing operations, water is used as an input in the manufacturing process and must be included in demand projections because of the large volumes used. Examples include ice-making, soft-drink or water bottling operations, and food manufacturing such as industrial bakeries.*
- ***Water used in production/activities**: In many manufacturing operations water is used for cooling, cleaning, or other operational activities and must be included in demand projections. Examples include metal forming and finishing, semi-conductor wafer production, and aerospace parts manufacturing. Processes employing newer technologies tend to use less water than older technologies, but estimates must be made on a location and process-specific basis. Some medical facilities are now using the newer medical imaging techniques and sterilization processes that use little or no water, while some medical equipment still requires significant amounts of water.*
- ***Bed to space ratios and mix of services**: Bed to space ratios and services provided in hospitals can vary greatly. These variations depend upon the proportion of space necessary to provide 24/7 nursing care, full linen service, and full food service*

to patients staying overnight. Furthermore, some hospitals are highly specialized and focus on particular types of treatment and/or research while others provide general and emergency services only. Water use on a per-square-foot or per-bed-basis can even vary significantly between different parts of hospitals, so large expansions will require an individual analysis.

2. Water Peak Flow

Peak Flow shall be calculated as 1.7 times the average daily flow.

NOTE: *For clarification, the following example characterizes the calculations performed to determine the design flows and quantities involved in a hypothetical facility.*

EXAMPLE: Hypothetical water demand/flow evaluation (not including fire flows).

ASSUME: A 1000 dwelling unit multi-family development.

CRITERIA: From **Table 8***, Water and Wastewater Design Flows*.
Average daily flow = 240 gallons per unit per day (gpupd)
Average total daily flow = 1,000 x 240 = 240,000 gallons per day (GPD)
Peak daily flow = 240,000 GPD x 1.7 (peaking factor)
Peak daily flow = 408,000 GPD

3. Sewer Peak Flow

All gravity sewer mains shall be designed for peak flow conditions. Peak flow is calculated as the product of the peaking factor and the average daily flow. The peaking factor should be calculated from Harmon's formula.

Design Flow = Peak Flow = Q Peak = Q avg [1+14/ (4+ $P^{1/2}$)], Where P = Population/1,000

F. WATER AND SEWER MAIN ABANDONMENT METHODS

There are three approved methods of abandoning water and sewer mains in public ROW and easements:

a. Total removal of pipe.

b. Crush pipe in place by mechanical means. This cannot be applied to asbestos cement pipe.

c. Leave pipe in place and fill with low strength grout.

No other methods are acceptable.

G. WATER AND SEWER STUBS OR TAPS AHEAD OF PAVING

City of Phoenix does not allow new stubs or taps ahead of paving unless the property owner can provide a conceptual design report and a site plan demonstrating the appropriate sizing and location of the mains or stubs. This applies to connections such as water/sewer stubs, water/sewer mains and service taps for fire lines and/or domestic use. The request for taps ahead of paving shall be submitted by the developer through a Water and Sewer Technical Appeal.

If the City approves the request for taps ahead of paving, and the size or location changes after the installation due to design changes, or for any other reason, it shall be the property owner's responsibility to abandon any unused infrastructure at the property owner's expense.

H. CROSS CONNECTIONS AND BACKFLOW PREVENTION

1. Cross Connection