HUNTER
ENGINEERING
CIVIL AND SURVEY

Preliminary Sewer Basis of Design Report For 101 & Princess Dr.

NWC of Princess Drive and 101 Freeway Scottsdale, Arizona 85255

PRELIMINARY Basis of Design Report

- ☐ ACCEPTED
- ☑ ACCEPTED AS NOTED
- ☐ REVISE AND RESUBMIT

CITY OF SCOTTSDALE
SCOTTSDALE WATER
9379 E San Salvador Dr.
Scottsdale, AZ 85258

Disclaimer: If accepted; the preliminary approval is granted under the condition that a final basis of design report will also be submitted for city review and approval (typically during the DR or PP case). The final report shall incorporate further water or sewer design and analysis requirements as defined in the city design standards and policy manual and address those items noted in the preliminary review comments (both separate and included herein). The final report shall be submitted and approved prior to the plan review submission.
For questions or clarifications contact the Water Resources Planning and Engineering Department at 480-312-5685.

BY RRahman **DATE** 9/5/2024

August 2024
1st Zoning 1/16/24
2nd Zoning 5/10/24
3rd Zoning 8/5/24

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

Preliminary

~~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

Table of Contents

1.0 INTRODUCTION

This sewer 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.

It is anticipated the proposed speculative buildings will be distribution use with two tenants and two small office components for each building. The maximum allowed office area

All documents submitted need to be consistent.
Per Floor plan drawings, submitted to City,
Building A has a office area of 5,410 SF

for the entire project is 20,000sf, therefore it is anticipated that each building will have 5,000sf of office per building. Each building could have two tenants each with an estimated 2,500sf office. The actual office areas may vary with the future the total office area being spread throughout the site as needed.

The distribution use in Scottsdale is considered warehouse which is considered storage to be analyzed as a commercial use for water demands. However, the site is zoned industrial and the distribution use would never generate anywhere near a commercial or retail use. For example, it is anticipated that each tenant would need four single stall bathrooms totaling eight single stall bathrooms per building. Therefore, the distribution portion of the site will be analyzed as an industrial use so the water demands more accurately reflect the anticipated use demands.

Per Figure 7-1.2 Average Day Sewer Demand in the City of Scottsdale *Design Standards & Policies Manual* a demand of 0.4 gallons per day per building square foot was used for the proposed office use in each building. The design peaking factor is 3.0. See Appendix B for a summary of these calculations.

Since the City of Scottsdale dose not have an industrial sewer demand or peaking factor, Wastewater flows for the proposed distribution use 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. See Appendix C. This results in wastewater flows of 50gpd per every 1,000 sf of building. 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. See Appendix B for a summary of these calculations.

According to the calculations provided in Appendix B the proposed site will have an estimated Average Daily Flow total of 14.3 gpm and a Peak Hour Flow of 53.4 gpm. Each building will have its own service with the highest building sewer demand of 18.5 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 greater than the Peak Hour Flow of 53.4 gpm for the largest building. Therefore, the max individual building flow will be less than 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.

The available capacity of the frontage and downstream sewer lines are unknown. For the Final BOD (DR Case), conduct Sewer Flow Monitoring minimum at two locations per DSPM Section 7-1.202.E. Coordinate with Water Resources for the location of sewer monitoring manholes. If the sewer flow monitoring shows that the frontage and downstream sewer lines do not have the sewer capacity, the Developer must install, at their expense, all on-site and off-site sewer improvements necessary to serve their development per DSPM Section 7-1.400 and SRC,

4.0 CONCLUSIONS

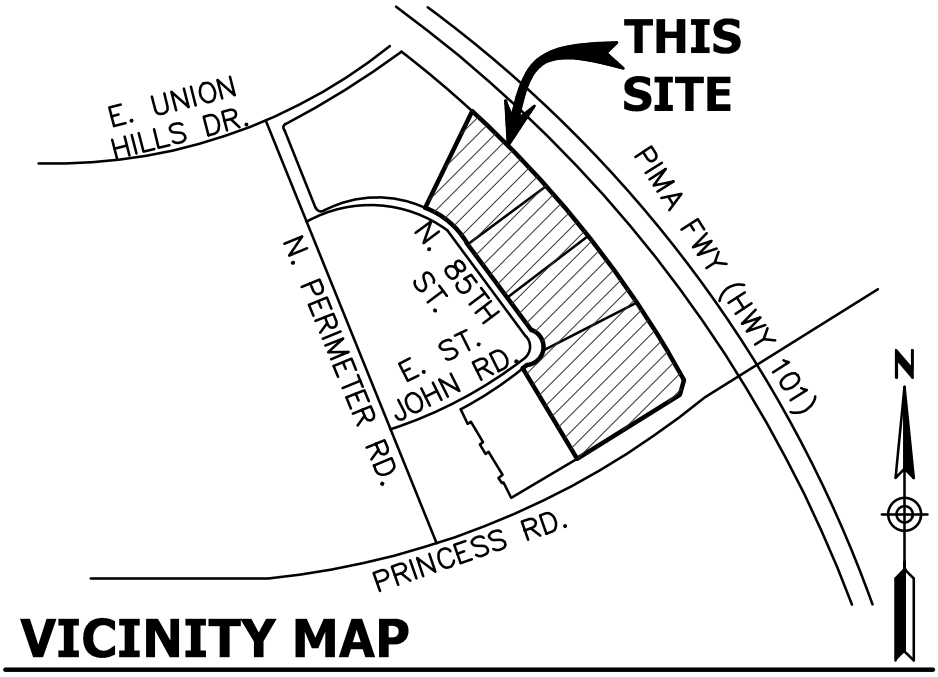
Based on the results of this study, it can be concluded that:

- 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).

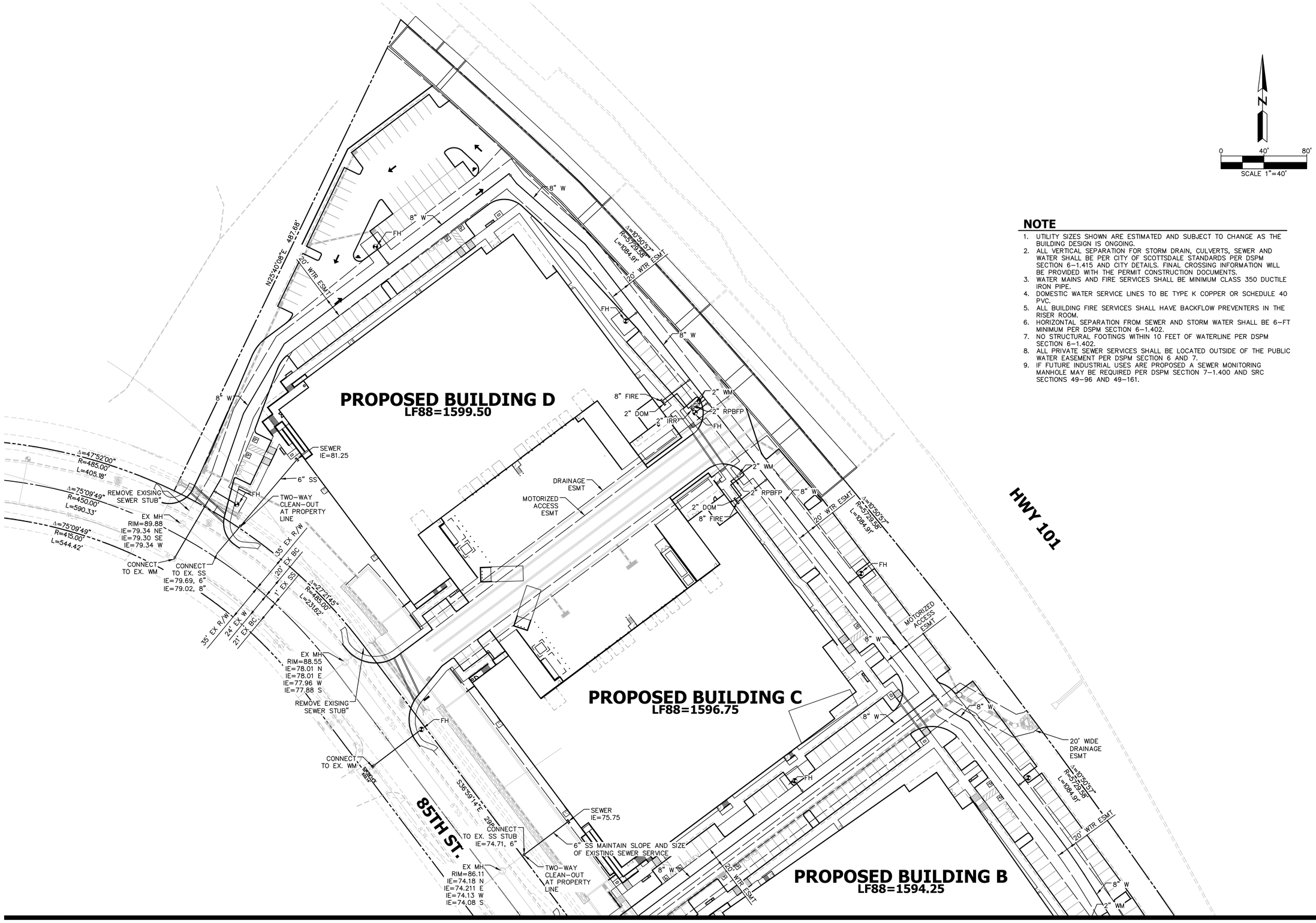
APPENDIX A
FIGURES



VICINITY MAP

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

VICINITY MAP
FIGURE 1



MATCH LINE SEE SHEET C5

0 40' 80'

SCALE 1"=40'

NOTE

1. UTILITY SIZES SHOWN ARE ESTIMATED AND SUBJECT TO CHANGE AS THE BUILDING DESIGN IS ONGOING.
2. ALL VERTICAL SEPARATION FOR STORM DRAIN, CULVERTS, SEWER AND WATER SHALL BE PER CITY OF SCOTTSDALE STANDARDS PER DSPM SECTION 6–1.415 AND CITY DETAILS. FINAL CROSSING INFORMATION WILL BE PROVIDED WITH THE PERMIT CONSTRUCTION DOCUMENTS.
3. WATER MAINS AND FIRE SERVICES SHALL BE MINIMUM CLASS 350 DUCTILE IRON PIPE.
4. DOMESTIC WATER SERVICE LINES TO BE TYPE K COPPER OR SCHEDULE 40 PVC.
5. ALL BUILDING FIRE SERVICES SHALL HAVE BACKFLOW PREVENTERS IN THE RISER ROOM.
6. HORIZONTAL SEPARATION FROM SEWER AND STORM WATER SHALL BE 6–FT MINIMUM PER DSPM SECTION 6–1.402.
7. NO STRUCTURAL FOOTINGS WITHIN 10 FEET OF WATERLINE PER DSPM SECTION 6–1.402.
8. ALL PRIVATE SEWER SERVICES SHALL BE LOCATED OUTSIDE OF THE PUBLIC WATER EASEMENT PER DSPM SECTION 6 AND 7.
9. IF FUTURE INDUSTRIAL USES ARE PROPOSED A SEWER MONITORING MANHOLE MAY BE REQUIRED PER DSPM SECTION 7–1.400 AND SRC SECTIONS 49–96 AND 49–161.

NO.	DATE	REVISION	BY

PURPOSE: 2ND DRB 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 6/17/24
ARIZONA U.S.A.

CONCEPTUAL UTITILY PLAN FOR THE LOOP PERIMETER CENTER 101 AND PRINCESS SCOTTSDALE ARIZONA

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

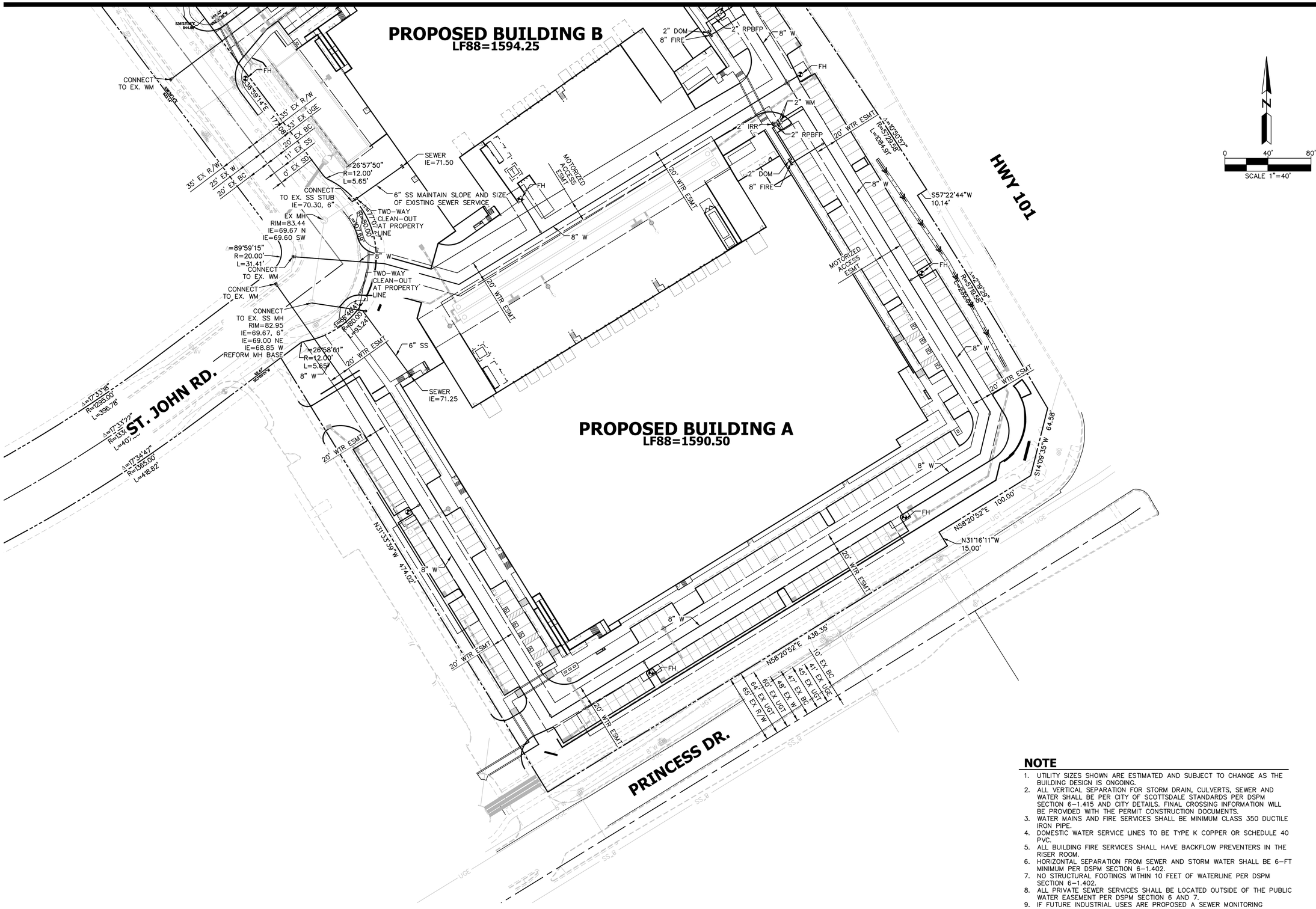
THESE PLANS ARE NOT APPROVED FOR CONSTRUCTION WITHOUT AN APPROVED SIGNATURE FROM THE GOVERNING MUNICIPALITY.

PROJECT NAME: THE LOOP PERIMETER CENTER

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

SHEET: C4

MATCH LINE SEE SHEET C4



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CIVIL AND SURVEY
10446 NORTH 74TH STREET
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Registered Professional Engineer
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PROJECT NAME: THE LOOP PERIMETER CENTER

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

SHEET: C5

APPENDIX B
SEWER CAPACITY WORK SHEET

Project: 101 & Princess Dr.
Project No.: LGEC319
City: Scottsdale
Date: 8/20/2024

Building A	101,772	sf
Building B	54,273	sf
Building C	55,503	sf
Building D	55,503	sf
Total	267,051	sf

PROJECTED SANITARY SEWER LOADS

Building 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 - Distribution	96,772	50.0	gpd/1000sf	4.21	4,839	3.4	14.3
Building B - Distribution	49,273	50.0	gpd/1000sf	4.21	2,464	1.7	7.2
Building C - Distribution	50,503	50.0	gpd/1000sf	4.21	2,525	1.8	7.6
Building D - Distribution	50,503	50.0	gpd/1000sf	4.21	2,525	1.8	7.6
Total Distribution	247,051				**12,353**	**8.7**	**36.6**

Building Use	Building Area (sf)	Average Day Sewer Demand (gpd) Per Table 7-1.2 Average Day Sewer Demand		Peaking Factor	Average Daily Flow (gpd)	Average Daily Flow (gpm)	Peak Flow (gpm)
Building A - Office	5,000	0.4	gpd/sf	3.00	2,000	1.4	4.2
Building B - Office	5,000	0.4	gpd/sf	3.00	2,000	1.4	4.2
Building C - Office	5,000	0.4	gpd/sf	3.00	2,000	1.4	4.2
Building D - Office	5,000	0.4	gpd/sf	3.00	2,000	1.4	4.2
Total Office	20,000				**8,000**	**5.6**	**16.8**
Total Building	267,051				**20,353**	**14.3**	**53.4**

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	

APPENDIX C
REFERENCES

CITY OF SCOTTSDALE

DESIGN STANDARDS & POLICIES MANUAL

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

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