

WASTEWATER BASIS OF DESIGN REPORT

2nd Street & Bishop Lane Scottsdale, Arizona

Prepared for:

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Prepared by:

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Address applicable comments below and herein on plans and subsequent review and/or planning phases:

1) An in-lieu agreement needs to be executed as the Osborn sewer system is over-allocated and no capacity is available in Osborn. The City is in the planning stages of a parallel sewer. This development will be expected to pay an in lieu of construction fee to cover a fair share of the new sewer's cost. A fair share will be proportional to both the length of new sewer utilized by the development and the portion of the new sewer design capacity used under peak conditions. Provide this basic information as part of this design report. This is a Water Resource Department policy/requirement.

2) Sewer capacity for 12-inch and less pipeline is based on d/D of 0.65, thus the lowest slope portion of 8" sewer has capacity 400gpm (east/west Goldwater segment @ 0.95%). Proposed peak flows are 380gpm w/ 100gpm pool backwash. However, flows to west of Goldwater and Bishop are not included. 20gpm of peak capacity for this area would be 46 condo units. Based on small size and existing development in the area this unaccounted flow seems reasonable and the 40ft segment of 8" sewer should still have sufficient capacity.



PRELIMINARY Basis of Design Report	
<input type="checkbox"/> ACCEPTED	
<input checked="" type="checkbox"/> ACCEPTED AS NOTED	
<input type="checkbox"/> REVISE AND RESUBMIT	
<small>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.</small>	
BY Idillon	DATE 11/4/2019



2ND STREET & BISHOP LANE

WASTEWATER BASIS OF DESIGN REPORT

SEPTEMBER 2019

Prepared By:

Kimley»»Horn

Contents

1.0 Introduction	1
2.0 Wastewater Collection System.....	2
3.1 Intent and Scope	2
3.2 Sewer Infrastructure.....	2
3.3 Wastewater Design Flows	2
3.4 Analysis.....	2
4.0 Conclusion	4
5.0 References.....	5

Appendices

Appendix A – Vicinity Map

Appendix B –Utility Plan

Appendix C – Onsite Sewer Capacity Calculations

Appendix D – Bishop Lane Sewer Exhibit Capacity Calculations

Appendix E – Bishop Lane Sewer Capacity Calculations

1.0 INTRODUCTION

Kimley-Horn and Associates, Inc. has prepared this Wastewater Basis of Design Report for the proposed luxury apartment development at the southwest corner of 2nd Street and Bishop Lane in Scottsdale, Arizona. This report will demonstrate that the proposed project conforms to the City of Scottsdale design requirements.

2nd Street & Bishop Lane, the “project”, encompasses approximately 1.13 ± net acres and contains a 210,857 square foot, eight-story apartment with a 93,372 square foot two-level underground parking garage. The project lies within a portion of the Northeast Quarter of Section 27, Township 2 North, Range 4 East of the Gila and Salt River Baseline and Meridian in Maricopa County, Arizona. More specifically, the project is bounded by East 2nd Street to the north followed by North Bishop Lane to the east followed by Moe Tavassoli Oriental Rugs to the south, and a public alley followed by existing commercial buildings to the west. The site slopes from the northwest to the southeast at approximately 1.0%. See **Appendix A** for the Vicinity Map.

2.0 WASTEWATER COLLECTION SYSTEM

2.1 INTENT AND SCOPE

The intent of this section is to evaluate the proposed and existing sewer infrastructure and wastewater design flows for the development. As a result of this analysis, it will be determined if the proposed and existing sewer infrastructure is capable supporting the proposed development in accordance with the City of Scottsdale Design Standards & Policies Manual (**Reference 1**).

2.2 SEWER INFRASTRUCTURE

There is an existing 6-inch sewer main in the alley west of the site. An 8-inch VCP sewer main also exists in North Bishop Lane to the east of the site.

A proposed 6-inch PVC sewer service with a slope of 1.00% will connect to the existing 8-inch sewer main in North Bishop lane, east of the site. Refer to **Appendix B** for the Preliminary Utility Plan.

2.3 WASTEWATER DESIGN FLOWS

The following calculations are based on information provided in Section 7-1.403 of **Reference 1**:

Table 3: Wastewater Design Flow

Building	Building Area (SF)	# Units	Average Daily Flow ¹ (GPD)	Peak Flow ² (GPD)	Peak Flow (GPM)	Peak Flow ³ w/ Pool Backwash (GPM)
Apartment and Garage	304,229	199	27,860	125,370	87	187

Notes:

1. Wastewater flows are based on 140 gallons per unit per day for high density condominium land use.
2. Design peaking factor for high density condominium is 4.5.
3. 100 GPM maximum design assumption. Backwash pump and pipe sizing will be done by the pool designer under separate permit.

2.4 ANALYSIS

Sanitary sewer lines will be designed to maintain a maximum depth to diameter ratio (d/D) of 0.65 and minimum full flow velocity of 2.5 ft/sec and a maximum full flow velocity of 10.0 ft/sec in the ultimate peak flow condition. To verify the proposed 6-inch sewer on-site has adequate capacity to serve the project, design flows were analyzed with Flow Master using minimum and maximum pipe design slopes. The sewer capacity for a six-inch pipe at the minimum design slope of 1.0% is 252 gpm. Pool backwash shall be connected to the sanitary sewer system and not discharge to the storm drain system. For the purpose of the design we have assumed a pool backwash flow rate of 100 gpm. Actual backwash discharge rate shall not exceed 100 gpm. Backwash pump and pipe sizing will be done by the pool designer under separate permit. Refer to **Appendix C** for the Onsite Sewer Capacity Calculations.

The existing 8-inch sewer main in North Bishop Lane was hydraulically analyzed for capacity to accommodate the proposed development. According to the City's quarter section maps, the

west?

existing line services several adjacent commercial businesses to the east and north of the proposed development. Using the estimated existing building areas and City of Scottsdale DS&PM sewer demand factors, design flows for each building contributing to the 8-inch main are summarized in the table below.

Table 4: Bishop Lane Wastewater Design Flow

Building	APN	Building Area (SF)	Demand (GPD/SF or GPD/Unit)	ADD (GPM)	Peaking Factor	Peak Demand ¹ (GPM)	Max Day (GPM)
Restaurant #1	130-12-977	14,580	1.2	12.15	6	72.9	24.3
Restaurant #2	130-13-432	10236.5	1.2	8.53	6	51.2	17.1
Restaurant #3	130-13-432	10236.5	1.2	8.53	6	51.2	17.1
Office #1	130-13-008C	10,341	0.4	2.87	3	8.6	5.7
Commercial/Retail	130-13-007A	8,699	0.5	3.02	3	9.1	6.0
Proposed Apartments		199 (units)	140	19.35	4.5	187.1	38.7
TOTAL				54.45		380.01	108.90

Notes:

1. 100 GPM maximum design assumption for multifamily pool backwash. Backwash pump and pipe sizing will be done by the pool designer under separate permit.

Refer to **Appendix D** for the Bishop Lane Sewer Exhibit.

87gpm +100gpm pool backwash



To verify the existing 8-inch sewer has adequate capacity to serve the project and adjacent developments, design flows were analyzed with Flow Master using minimum and maximum pipe design slopes. Using survey verified data, the existing 8-inch sewer main in Bishop Lane adjacent to the site has a calculated slope of approx. 1.0%. The sewer capacity for an 8-inch pipe at the minimum design slope of 1.0% is 542 gpm. Considering an estimated peak demand of 380 GPM from Table 4 above, the calculated (d/D) ratio for the 8-inch main is approx. 0.61 which meets the City's criteria of 0.65 max.

Refer to **Appendix E** for the Bishop Lane Sewer Capacity Calculations.

400gpm @ 0.95% and d/D=0.65 (max design)

3.0 CONCLUSION

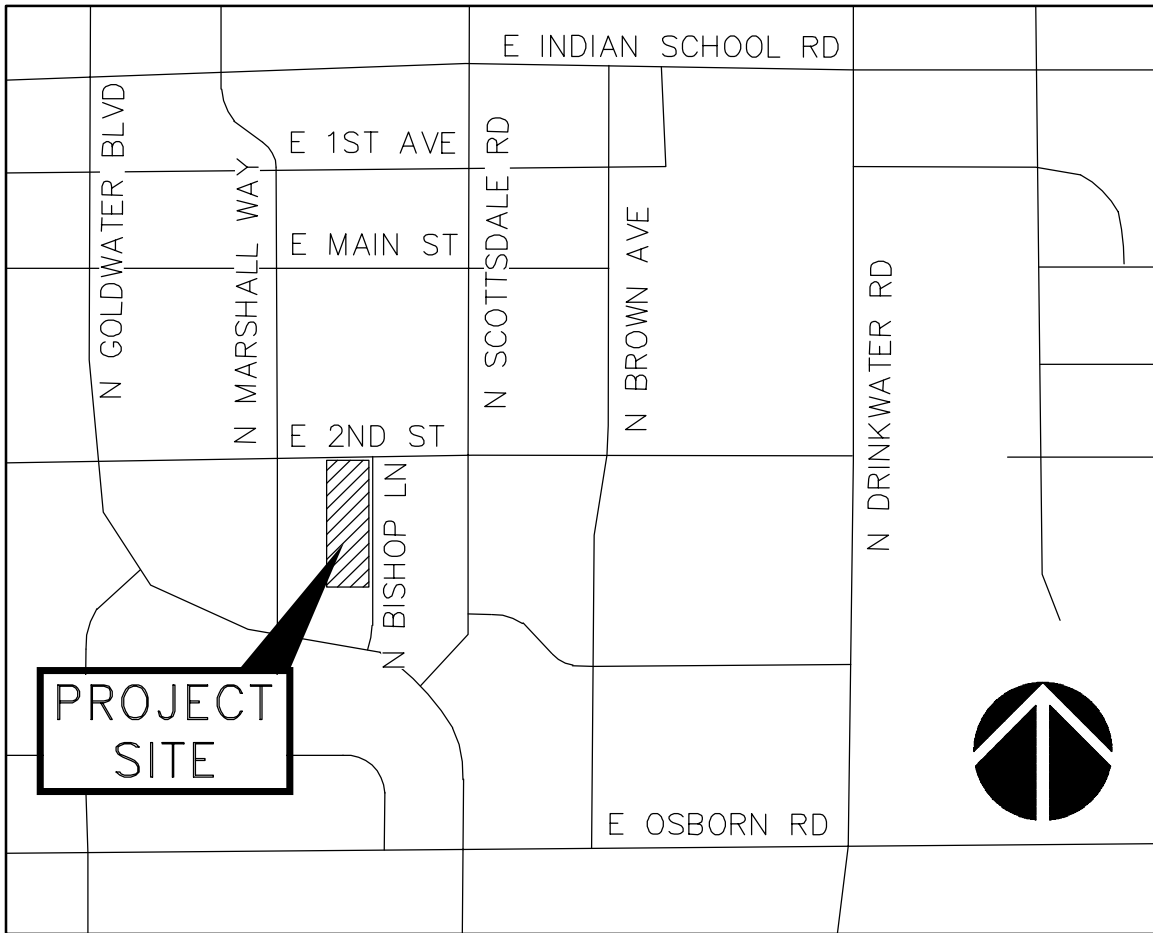
Wastewater

This development proposes to connect the building sewer services to the existing 8-inch sewer main in Bishop Lane. The proposed onsite 6-inch PVC private sanitary sewer service has adequate capacity for the flows generated by the proposed building and its associated uses. The existing 8-inch public sanitary sewer main in Bishop Lane also has capacity available to accommodate the proposed development along with the existing properties it currently serves.

4.0 REFERENCES

1. City of Scottsdale, *Design Standards and Policies Manual*. 2018.

Appendix A – Vicinity Map



VICINITY MAP

SCOTTSDALE, AZ
N.T.S.



Appendix B –Utility Plan

Appendix C – Onsite Sewer Capacity Calculations

Worksheet for 6" Service (min design slope)

Project Description	
Friction Method	Manning
	Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	6.0 in
Diameter	6.0 in
Results	
Discharge	251.83 gal/min
Flow Area	0.2 ft ²
Wetted Perimeter	1.6 ft
Hydraulic Radius	1.5 in
Top Width	0.00 ft
Critical Depth	4.6 in
Percent Full	100.0 %
Critical Slope	0.012 ft/ft
Velocity	2.86 ft/s
Velocity Head	0.13 ft
Specific Energy	0.63 ft
Froude Number	(N/A)
Maximum Discharge	270.89 gal/min
Discharge Full	251.83 gal/min
Slope Full	0.010 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	64.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	4.6 in
Channel Slope	0.010 ft/ft
Critical Slope	0.012 ft/ft

Worksheet for 6" Service (max design slope)

Project Description	
Friction Method	Manning
	Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.080 ft/ft
Normal Depth	6.0 in
Diameter	6.0 in
Results	
Discharge	712.28 gal/min
Flow Area	0.2 ft ²
Wetted Perimeter	1.6 ft
Hydraulic Radius	1.5 in
Top Width	0.00 ft
Critical Depth	5.9 in
Percent Full	100.0 %
Critical Slope	0.074 ft/ft
Velocity	8.08 ft/s
Velocity Head	1.02 ft
Specific Energy	1.52 ft
Froude Number	(N/A)
Maximum Discharge	766.20 gal/min
Discharge Full	712.28 gal/min
Slope Full	0.080 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	5.9 in
Channel Slope	0.080 ft/ft
Critical Slope	0.074 ft/ft

Appendix D – Bishop Lane Sewer Exhibit

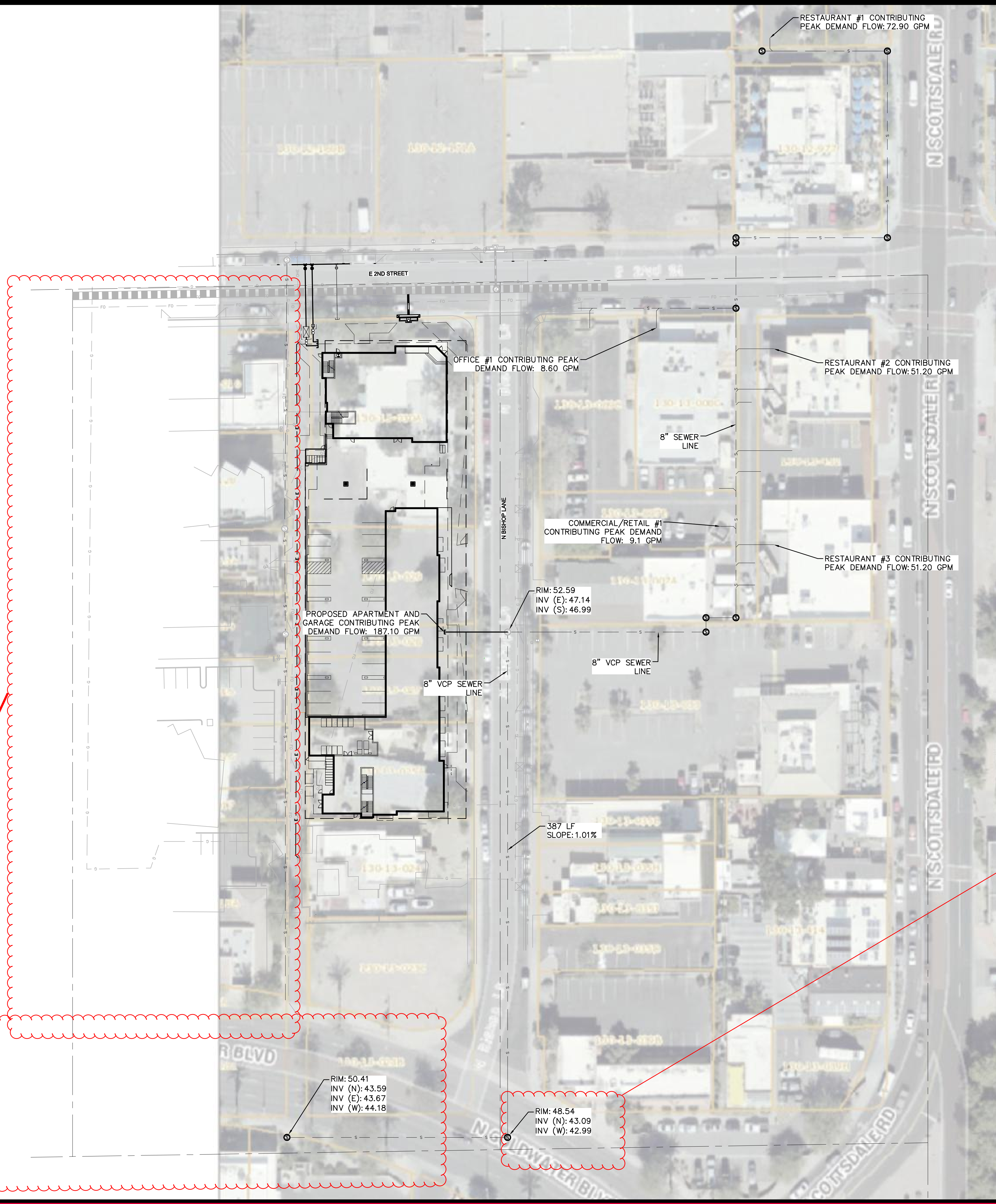
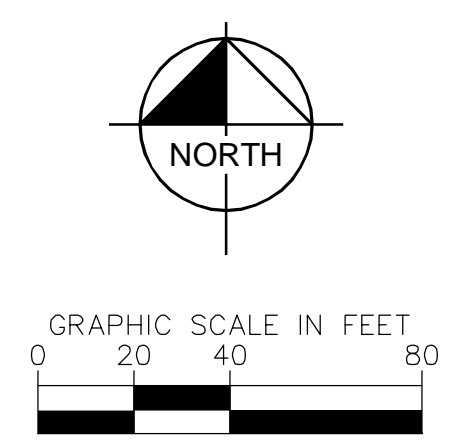
LEGEND

- F — PROPOSED PRIVATE FIRE LINE
- DW — PROPOSED DOMESTIC WATER LINE
- S — PROPOSED SANITARY SEWER MAIN
- S — EXISTING SANITARY SEWER MAIN
- G — EXISTING GAS LINE
- — PROPOSED STORM DRAIN PIPES
- ⊠ PROPOSED VAULTED WATER METER
- ∞ PROPOSED BACKFLOW PREVENTER
- EXISTING SANITARY SEWER MANHOLE
- ⊙ EXISTING FIRE HYDRANT

No flows from east...questionable

per round 1 comments the request was to analyze flows flow/capacity all the way to the manhole to the east of Bishop and Goldwater. This 40ft segment is missing as are flows to the east

FOR REFERENCE ONLY.
NOT FOR CONSTRUCTION OR PERMITTING.



Appendix E – Bishop Lane Sewer Capacity Calculations

Description:

One new 6" on-site PVC private sewer service is proposed to connect to an existing 8" sewer main in Bishop Lane. This sewer main ultimately discharges to the city of Scottsdale sewer main in North Goldwater Boulevard. Sewer demand calculations are based on number of units, existing parcel square footage, and the peaking factors as outlined in the city of Scottsdale DS&PM. See Appendix F (Sewer Exhibit) for building locations.

Design Sewage Flow Calculations

Fc = (CF*P)*PF Fc = Sewage Design Flow
 CF = Sewage Demand Rate per DS&PM
 P = Demand Criteria
 PF=Peaking Factor

<i>Building</i>	<i>Use</i>	<i>Sewage Demand SF or Unit</i>	<i>Demand Criteria GDP/SF or GPD/Unit</i>	<i>Peaking Factor</i>	<i>Sewage Peak Design Flow [GPD]</i>
Proposed Apartment & Garage	High Density Condomenium	199	140	4.5	125370
Restaurant #1	Restaurant	14580	1.2	6	104976
Restaurant #2	Restaurant	10236.5	1.2	6	73702.8
Restaurant #3	Restaurant	10236.5	1.2	6	73702.8
Office #1	Office	10341	0.4	3	12409.2
Commercial/Retail #1	Commercial/Retail	8699	0.5	3	13048.5
Total					403,209

Fc = 403,209 GPD
Fc = 380.01 GPM

Capacity Calculation:

Diameter = 8 in
 Cross-Section Area = 0.35 ft²
 Min Design Slope = 0.0050 ft/ft
 Max Design Slope = 0.0050 ft/ft
 Manning's "n" = 0.013
 Min Full Flow Velocity = 2.5 > 2 ft/s
 Max Full Flow Velocity = 2.5 < 10 ft/s
 Full Flow Capacity* = 542 gpm > Fw

Meet Criteria?
YES
YES
YES

why not use actual (City GIS) min slope?

criteria is d/D=0.65

*Peak Demand Flow includes 100 GPM maximum design assumption for a proposed pool backwash. Backwash pump and pipe sizing will be done by the pool designer under separate permit

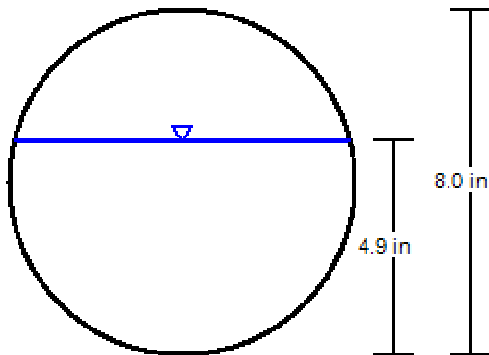
Worksheet for 8" VCP Sewer Main (Bishop Ln)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Diameter	8.0 in
Discharge	380.00 gpm
Results	
Normal Depth	4.9 in
Flow Area	0.2 ft ²
Wetted Perimeter	1.2 ft
Hydraulic Radius	2.3 in
Top Width	0.65 ft
Critical Depth	5.2 in
Percent Full	61.7 %
Critical Slope	0.008 ft/ft
Velocity	3.75 ft/s
Velocity Head	0.22 ft
Specific Energy	0.63 ft
Froude Number	1.118
Maximum Discharge	583.40 gpm
Discharge Full	542.34 gpm
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	61.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.9 in
Critical Depth	5.2 in
Channel Slope	0.010 ft/ft
Critical Slope	0.008 ft/ft

Cross Section for 8" VCP Sewer Main (Bishop Ln)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	4.9 in
Diameter	8.0 in
Discharge	380.00 gpm



V: 1
H: 1