

WASTEWATER

BASIS OF DESIGN REPORT

2nd Street & Bishop Lane
Scottsdale, Arizona

Prepared for:

The Morgan Group, Inc.
3001 Brighton Blvd., Suite 445
Denver, CO 80216

Prepared by:

291347001
November 2019
Copyright © 2019, Kimley-Horn and Associates, Inc

9-ZN-2019
11/18/19

2ND STREET & BISHOP LANE

WASTEWATER BASIS OF DESIGN REPORT



NOVEMBER 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.

The City of Scottsdale Water Service Department is preparing an in-lieu agreement as the Osborn sewer system is over-allocated and no capacity is available in the Osborn sewer system. This development will be expected to pay an in lieu of construction fee to cover a portion of the sewer main's cost. The portion will be dependent upon the length of the new sewer utilized by the development and the portion of the new sewer design capacity used under peak conditions.

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 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.

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 0.95% is 400 gpm to satisfy the (d/D) ratio of 0.65. 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.

3.0 CONCLUSION

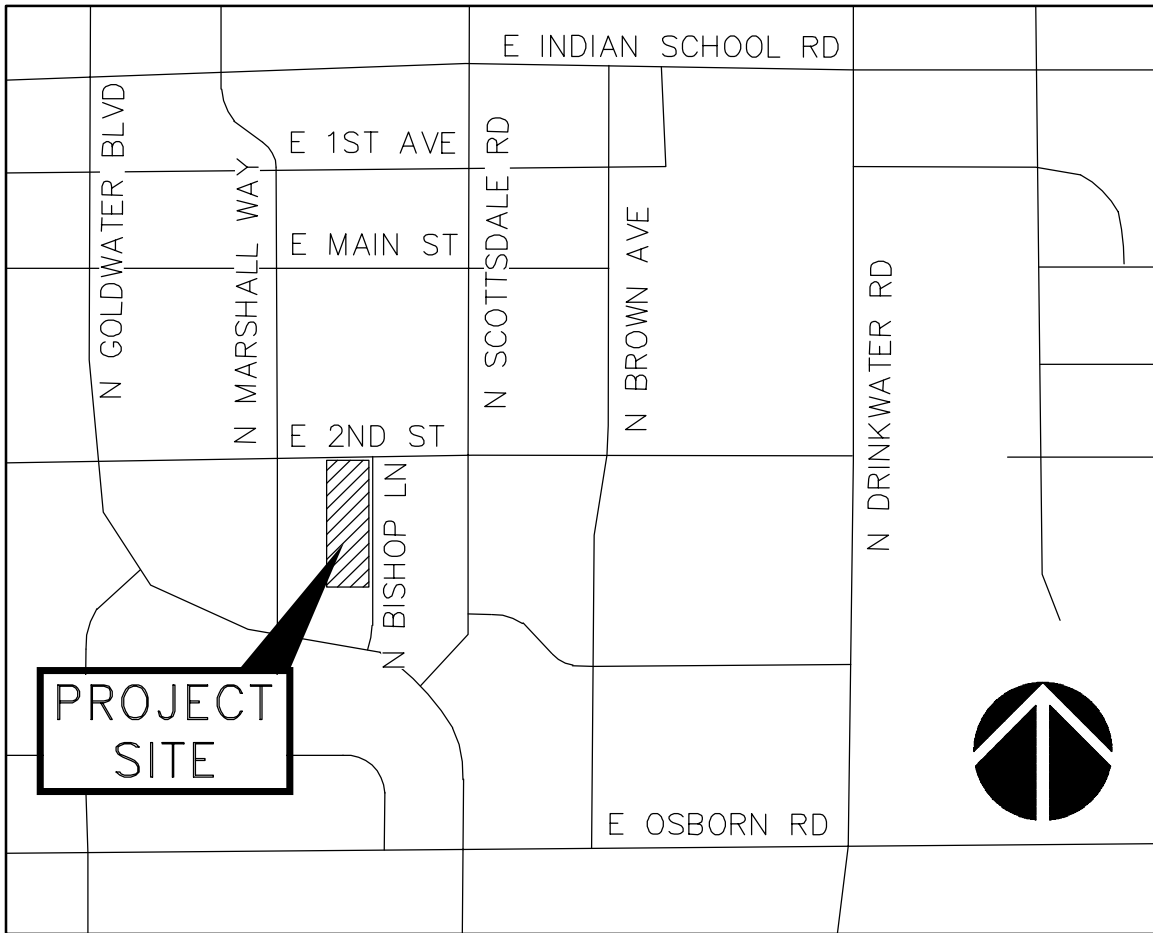
Wastewater

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

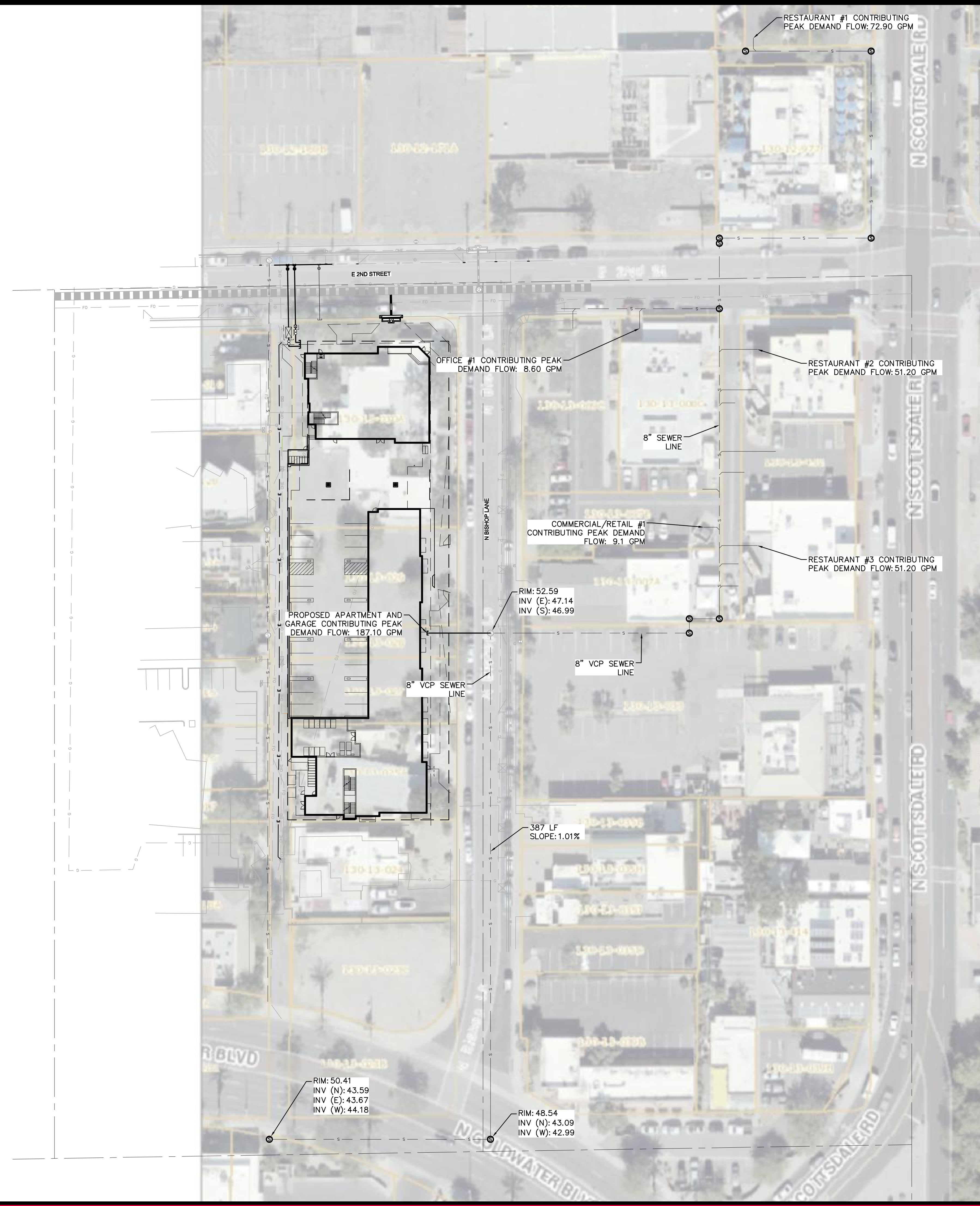
Worksheet for 6" Service (min design slope)

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

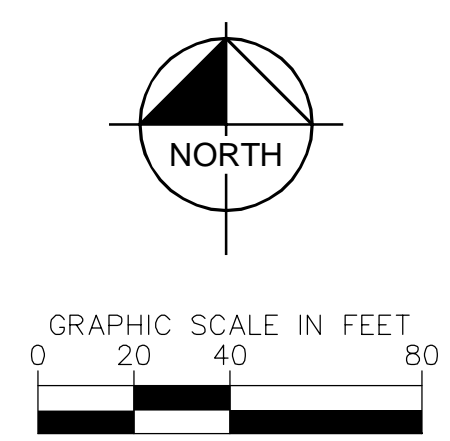
Appendix D – Bishop Lane Sewer Exhibit



LEGEND

- PROPOSED PRIVATE FIRE LINE
- PROPOSED DOMESTIC WATER LINE
- PROPOSED SANITARY SEWER MAIN
- EXISTING SANITARY SEWER MAIN
- EXISTING GAS LINE
- PROPOSED STORM DRAIN PIPES
- PROPOSED VAULTED WATER METER
- PROPOSED BACKFLOW PREVENTER
- EXISTING SANITARY SEWER MANHOLE
- EXISTING FIRE HYDRANT

FOR REFERENCE ONLY.
NOT FOR CONSTRUCTION OR PERMITTING.



SEWER CAPACITY EXHIBIT

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

Building	Use	Sewage Demand	Demand Criteria	Peaking Factor	Sewage Peak Design Flow [GPD]
		SF or Unit	GDP/SF or GPD/Unit		
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 GDP
Fc = 380.01 GPM

Capacity Calculation:

Diameter = **8** in
 Cross-Section Area = **0.35** ft²
 Min Design Slope = **0.0095** ft/ft
 Max Design Slope = **0.0095** ft/ft
 Manning's "n" = **0.013**
 Min Full Flow Velocity = **3.4** > 2 ft/s
 Max Full Flow Velocity = **3.4** < 10 ft/s
 Full Flow Capacity* = **400** gpm > Fw

Meet Criteria?
YES
YES
YES

*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

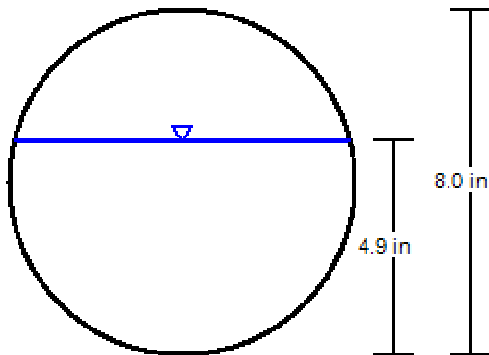
Worksheet for 8" VCP Sewer Main (Bishop Ln)

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