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** 9/9/2024

3 engineering
planning civil engineering surveying

Silverstone Parcel D

NEC Scottsdale Rd and Williams Dr
Preliminary Sewer Basis Design Report
3 engineering Job #: 5315
August 26, 2024
15-ZN-2005#4

Pool backwash equalization tank with 10 gpm metering pump will be stipulated as a requirement for the final plat. DSPM 7-1.202.

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SILVERSTONE – PARCEL D

PRELIMINARY SEWER BASIS OF DESIGN REPORT

Prepared for:

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Phone: (480) 824-4175

Expires 12/31/2024
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July 11, 2024

Revised August 26, 2024

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Job Number 5315

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1. Introduction

The project site, Silverstone Parcel D, is located in Section 14, Township 14 North, Range 4 East of the Gila and Salt River Meridian, Maricopa County, Arizona within the City of Scottsdale. The project is located North of Williams Drive, West of 74th Street, and East of Scottsdale Road at 22602 N. 74th Street, Scottsdale, Arizona 85255. The site is bounded on the north by an existing senior living facility, on the west by Scottsdale Road and Vacant Land, on the south by Williams Road and commercial property, and east by 74th Street and an existing senior living facility. See Appendix A for a vicinity map.

The site is a proposed 100-lot single-family attached residential subdivision project.

2. Design Documentation

The purpose of this design report is to verify that the existing City of Scottsdale sewer system can accommodate demands generated by the proposed project. Manning's Equation was used to model and analyze the proposed sewer system for compliance with the City of Scottsdale design requirements. Demands were calculated using the City of Scottsdale Design Standards & Policies Manual criteria. It is our opinion that this report is in accordance with the City of Scottsdale Design Standards & Policies Manual.

3. Existing Conditions

The property currently exists as a vacant parcel. See Appendix A for Aerial Map. The topography has an approximate slope of one percent (1.50%) and has an overall general slope from northeast to southwest.

The site is bounded on the north by an existing senior living facility, on the west by Scottsdale Road and Vacant Land, on the south by Williams Road and commercial property, and east by 74th Street and an existing senior living facility. There is an existing 8" sewer line along the western and northern boundary of the site within sewer easements, along with a 12" sewer line within the 74th Street and Williams Drive R/Ws. The 12" sewer line within Williams Drive will be used to service the proposed project. See Exhibit SE1 for sewer line layout.

4. Proposed Conditions

The project proposes a 100-lot single-family attached residential subdivision on approximately 13.5 acres. The site proposes a pool. Refer to Section 5 regarding discussion of the pool and requirements during construction document preparation. 8" sewer lines are proposed within the development to service the lots. Each proposed lot will have a 4" sewer line serving it from the 8" public sewer line. It is proposed that this project will tie connect into the existing 12" sewer line within Williams Drive at the project's entrance via a new manhole being installed over the existing line. See Exhibit SE1 for the sewer system layout. All sewer lines shall be placed a minimum of six (6) feet horizontally from any structural footing or substantial improvement and shall not be placed within seven (7) feet from the trunk of any tree. The proposed sewer line is to be public onsite and will be owned and maintained by the City of Scottsdale. An easement for Private Access, Refuse, Emergency Services, Drainage, Water, Sewer, and PUE shall be dedicated over the entire private street tract (Tract C). Tract C is 46-feet in width. Note, that no private utilities are allowed longitudinally within sewer easement.

5. ***Computations***

Based on coordination with the City of Scottsdale, this area does not have sewer capacity issues. The following demand criteria was used in determining system demands for the proposed site.

1. 100 lots
2. Persons per dwelling unit = 2.5 person/du
3. Average Day Flow Rate = 100 gallons per capita per day x 2.5 person/du = 250 gpd
4. Design Flow = Peak Flow = Average Day flow x 4.0 = 250 x 4 = 1,000 gpd

TABLE 2: ON-SITE SEWER DEMANDS	
Number of Lots	100
Avg. daily demand	25,000 gpd
Design Flow Rate	100,000 gpd

Average daily demand: 100 lots x 250 gpd = 25,000 gpd
= 25,000 gpd/1440 mpd = 17.36 gpm

Peak Factor = 4 (per DS&PM based on population)

Design flow rate = 4 x 25,000 gpd = 100,000 gpd
= 100,000 gpd/1440 mpd = 69.40 gpm

In addition to the proposed lots, the site currently proposes a 20,000 gallon +\- pool. In order to restrict additional demand to the existing City sewer system due to pool backwashing, backwash shall be contained in an 6,000 gallon equalization tank (or as approved by the pool designer), and shall have a restricted and metered pump with a maximum discharge of 10 gpm or 14,400 gpd. The backwashing line shall be connected to a dedicated 4" service to the pool area that then connects to the 8-inch main line within the private streets of the site. The top of the mainline sewer shall be below the discharge invert of the p-trap of the tank line. In addition, no other sewer connections shall be connected to this pool sewer service or the equalization tank. As part of the final design plans for the pool, the following considerations and/or requirements must be made as part of the pool design:

- All relevant details on the pool backwash management system should be submitted including (if applicable) pump design flow and head loss calcs and corresponding pump cut sheet and pump curve showing the operating point (pressure/flow) of the pump at or near the maximum allowable sewer discharge flow rate.
- All relevant design details, criteria and specification for this system shall be shown on the submitted and sealed plans and reviewed and approved by Water Resources.
- Consideration should be given in final pool design to the equalization tank material and (if applicable) backwash waste metering pump with respect to the chlorine levels in the backwash flow and potential for rapid corrosion of concrete and metals. Plastic tanks and pump with plastic impeller and body pumps should be utilized (example Fibroc).
- Pump redundancy is at the discretion of the designer/owner however, controls, interlocks, or valves (e.g. 3-way valve) must prevent both pumps from discharging simultaneously and exceeding the maximum flow.
- Discharging to the sewer must involve:

- For pumped line: an above the ground gooseneck pipe section with combination air/vacuum release valve at the top (example ARI), this prevents any possible back up or siphoning back to the tank
- For a pumped or a gravity line: a p-trap below grade and adjacent to the equalization tank to prevent migration of sewage or sewer gases back into the equalization tank. (or if/as plumbing code addresses such a configuration)

0.4 gpd/sf

For the purpose of design, the 10 gpm (14,400 gpd) of the pool shall be added to the peak demand of 69.40 gpm (100,000 gpd) for a total of 79.40 gpm (114,400 gpd). Manning's Equation was used to model and analyze the proposed sewer system for compliance with the City of Scottsdale design requirements. Manning's equation was based on a minimum sewer slope of 0.43% in order to maintain a velocity of 2.5 fps at d/D of 0.65. A minimum slope of 0.52% is required to maintain a velocity of 2.5 fps at full flow. Refer to Appendix B for loading of the sewer line and Exhibit SE1 for the Sewer System Layout Exhibit.

Office

At the request of the City of Scottsdale, a comparison is being made of the proposed sewer demand for the residential site, versus the originally zoned commercial development that was proposed on the site. Per Appendix C, Parcel D was proposed as a 165,000 SF commercial site. The average day sewer demand for commercial property is 0.50 gal/day/sf, which equates to 82,500 gal/day. Applying peak demand factors of 3, this equals 247,500 gal/day. The peak demand for the proposed residential site is 100,000 gal/day, which is substantially less than the original development plan; therefore, puts less demand on the City's sewer infrastructure.

Plus pool backwash flows. DSPM 7-1.202

6. ***Summary***

The Peak Flow for the proposed site is 114,400 gpd. Based on the results from the sewer system analysis the proposed system has a capacity at d/D=0.65 of 268.99 gpm or 387,346 gpd. Therefore, there is adequate capacity to service the site. Any pool design shall comply with the criteria detail in Section 5, and backwashing shall be metered and restricted to 10 gpm (1,440 gpd).

EXISTING 18" SEWER LINE

EXISTING 8" SEWER LINE

EXISTING SEWER ESMT.

EXISTING 8" SEWER LINE

EXISTING 12" SEWER LINE

A minimum of 6' is required between sewer and edge of easement. DSPM 7-1.412

LOCAL STREET (PRIVATE)
N.T.S.

(1) ROLL OR VERTICAL DEPENDING ON DRAINAGE
(2) AN EASEMENT FOR PRIVATE ACCESS, REFUSE, EMERGENCY SERVICES, DRAINAGE, WATER, SEWER, AND PUE SHALL BE DEDICATED OVER THE ENTIRE PRIVATE STREET TRACT (TRACT C

SCOTTSDALE ROAD

PRIVATE STREET

PROPOSED MANHOLES (TYP)

PROPOSED 8" SEWER LINE

PROP 20,000 GAL. POOL ±

APROX. EQUALIZER TANK LOCATION

PRIVATE STREET

PRIVATE STREET

PRIVATE STREET

74TH STREET

Vertical

MAINTAIN 2-FT SEPARATION WITH STORM DRAIN

WILLIAMS DRIVE

EXISTING 8" SEWER LINE

EXISTING 12" SEWER LINE

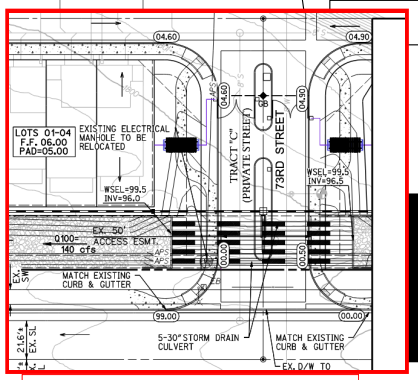
EXISTING MANHOLES (TYP)

CONNECT TO EXISTING SEWER LINE

Provide additional protection for sewer per DSPM 7-1.408

with new manhole.

SCALE: 1"=150'



From Preliminary Grading Plan for 15-ZN-2005#4

SILVERSTONE PARCEL D
SCOTTSDALE, ARIZONA

SEWER EXHIBIT - SE1

3engineering
planning civil engineering surveying

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15-ZN-2005#4

DATE:	PROJECT NO.
7/11/24	5315

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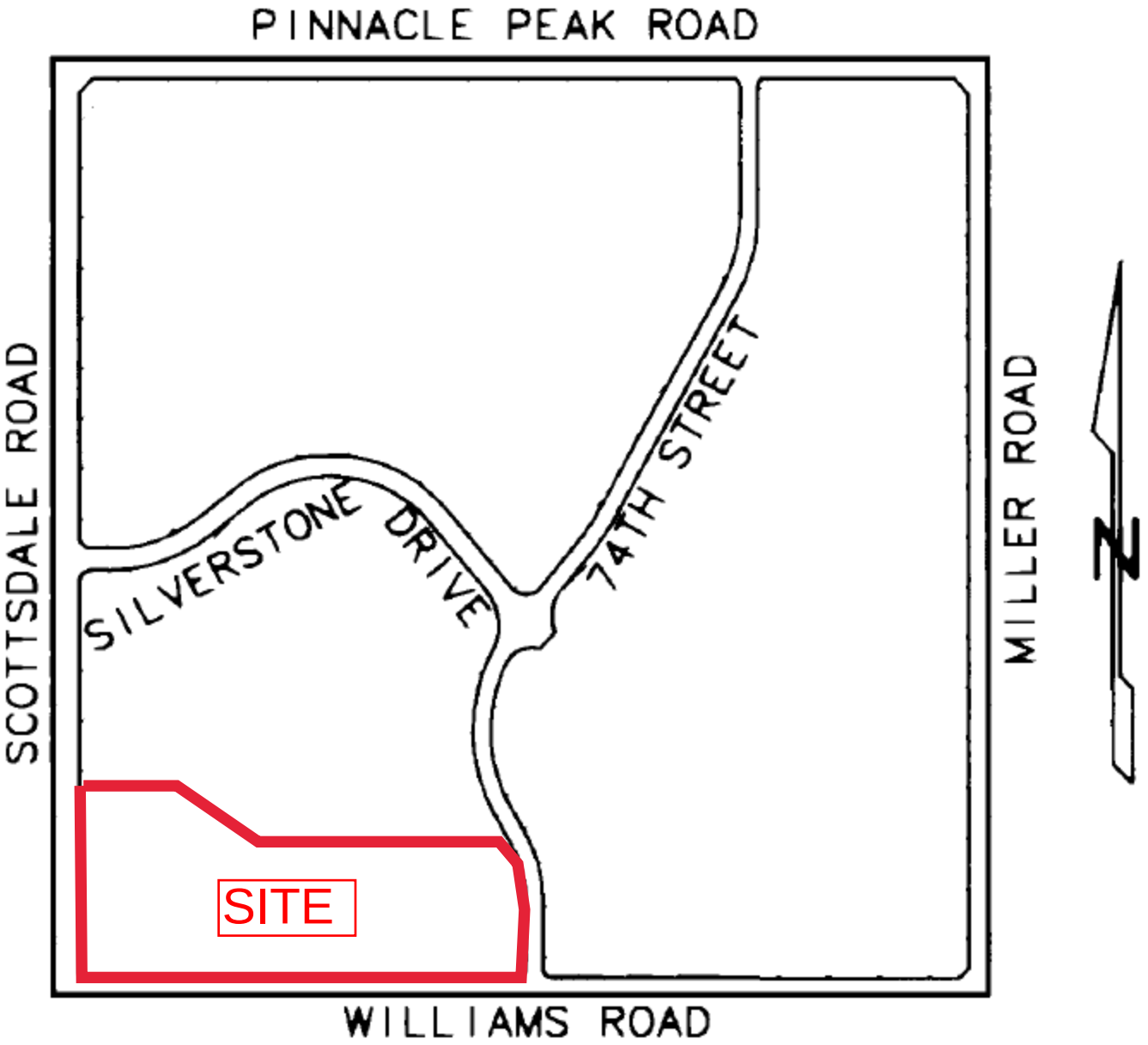
APPENDIX A

Vicinity & Aerial Map



SECTION 14
T.4N, R.4.E

VICINITY MAP

N.T.S.


AERIAL PHOTO OF SITE
SITE
N 74TH ST
N 74TH ST
E WILLIAMS DR
PARCEL D
212-03-596
SILVERSTONE AT PINNACLE PEAK MOD
MCR: 883-17
215-04-715
330'+/-
15-ZN-2005#

APPENDIX B

Sewer Capacity Calculations

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Minimum slope for 8" gravity sewer is 0.0044 ft/ft to achieve 2.5 ft/s velocity or greater with a Manning's roughness of 0.013.

Silverstone Parcel D

8-inch Sewer Slope at d/D = 0.65 & V = 2.5 ft/s

Set units: m | mm | ft | in

Pipe diameter, d_0	8 in
Manning roughness, n ?	.013
Pressure slope, S_0	.43 % rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	65 %

Results

Flow, Q	268.9869	gpm
Velocity, v	2.4953	ft/sec
Velocity head, h_v	0.0968	ft
Flow area	34.5868	sq. in.
Wetted perimeter	15.0039	in
Hydraulic radius	2.3052	in
Top width, T	7.6315	in
Froude number, F	0.72	
Shear stress (tractive force), tau	0.0516	psf

15-ZN-2005#4

2/13/24

Manning Formula Uniform Pipe Flow at Given Slope and Depth

Silverstone Parcel D (Aria)

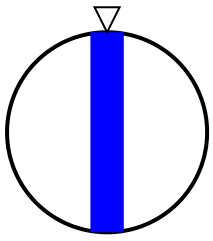
8" Sewer Line at 0.52%

Inputs

Pipe diameter, d_0	8	in
Manning roughness, n	.013	
Pressure slope (possibly ? equal to pipe slope), S_0	.0052	rise/run
Relative flow depth, y/d_0	100	%

Results

Flow depth, y	0.0000	
Flow area, a	0.0000	
Pipe area, a0	0.0000	
Relative area, a/a0	0.0000	
Wetted perimeter, P_w	25.1327	in
Hydraulic radius, R_h	2.0000	in
Top width, T	0.0000	in
Velocity, v	0.0000	
Velocity head, h_v	0.0295	m H2O
Froude number, F	0.00	
Average shear stress (tractive force), tau	2.5904	N/m^2
Flow, Q (See notes)	0.5631	MGD
Full flow, Q0	391.0590	gpm
Ratio to full flow, Q/Q0	1.0000	fraction



APPENDIX C

Original Zoning Table

STIPULATIONS FOR CASE 15-ZN-2005, 13-UP-2005

Revised stipulations after the Planning Commission hearing are shown in **BOLD CAPS** and ~~strikethrough~~.

PLANNING/ DEVELOPMENT

1. CONFORMANCE TO LAND USE PLAN. Development shall generally conform to the land use plan submitted by H&S International with a revision date of 10/4/2005. These stipulations take precedence over the above-referenced land use plan. The applicant understands and agrees that the approved density for each parcel is subject to drainage, topography, and other site planning concerns that will need to be resolved at the time of site plan or preliminary plat approval. Appropriate design solutions to these constraints may preclude achievement of the proposed units or density on any or all parcels. Any proposed significant change, as determined by the ~~Zoning Administrator~~ **CITY MANAGER OR DESIGNEE**, shall be subject to subsequent public hearings before the Planning Commission and City Council.

2. MAXIMUM DENSITY/INTENSITY. The maximum dwelling units/density and maximum intensity for Parcels shown on the above-referenced land use plan shall be as indicated in the land use budget table below, and as stipulated below.

Parcel	Acres	Comparable Zoning	Land Use	Floor Area/Units
A and B	4.48	C-O	Municipal	45,000 sq.ft.
C	12.47	C-2	Retail	95,000 sq.ft.
D	12.42	C-O	Office	165,000 sq.ft.
E	17.47	R-5	Residential	262 units
F	21.82	R-5	Residential	186 units
G	23.77	R-5	Residential	258 units
H	34.26	R-5	Residential	270 units
Wash/ Park	12.92	R-5	Wash/Park	–
Other	20.39	–	Streets, etc.	–
Total	**160.00**			**305,000 sq.ft./ 976 units**

The specific location of each parcel shall be determined at the time of site plan or preliminary plat review. Any redistribution of floor area or dwelling units is subject to ~~Zoning Administrator~~ **CITY MANAGER OR DESIGNEE** approval, and limited to the overall total outlined in the land use budget table. Additional floor area may be allowed for municipal uses if determined not be a significant change as determined by the ~~Zoning Administrator~~ **CITY MANAGER OR DESIGNEE**. Any redistribution request shall be submitted by the developer with the development review board application and shall include a revised master development plan and a revised land use budget table indicating the parcels with the corresponding reductions and increases. Any proposed significant change, as determined by the ~~Zoning Administrator~~ **CITY MANAGER OR DESIGNEE**, shall be subject to subsequent public hearings before the Planning Commission and City Council.

3. RESIDENTIAL HEALTH CARE FACILITY. The location of the residential health care facility shall be limited to Parcel H, and shall be limited to 60 units.

4. LIVE/WORK UNITS. A maximum of one-third of the dwelling units in Parcel E shall be allowed to be live/work units.