

# PRELIMINARY WASTEWATER REPORT

## FOR

# PHOENIX COUNTRY DAY SCHOOL PERFORMING ARTS CENTER

### PARADISE VALLEY, ARIZONA

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#### 1.0 INTRODUCTION

#### 1.1 Background and Project Location

Phoenix Country Day School Performing Arts Center (the Project) is a proposed performing arts school building within the overall existing Phoenix Country Day School (PCDS) campus, located south of Stanford Drive and west of 40<sup>th</sup> Street in the Town of Paradise Valley (the Town), Arizona. The Project occupies approximately 20.4 acres in a portion of Section 13, Township 2 North, Range 3 East of the Gila and Salt River Meridian. Figure 1 in Appendix A provides a vicinity map for the Project and the overall PCDS campus. It is estimated that approximately 800 students are enrolled at the PCDS campus.

#### 1.2 General Description

The Project will consist of a single performing arts school building with a footprint of approximately 18,250 square feet, parking areas, and landscaped areas. The performing arts building will replace an existing parking lot, adding to the 13 existing buildings within the PCDS campus. The PCDS campus and surrounding area generally drain south and east at approximately 1.3 percent towards the Echo Canyon Wash The wastewater infrastructure for the Project will be owned and operated by the City of Phoenix.

#### 1.3 Purpose of Report

The purpose of this Preliminary Wastewater Report (Report) is to identify and evaluate the proposed wastewater system infrastructure required for serving the Project in accordance with the *Design Standards Manual for Water and Wastewater Systems* (City of Phoenix, 2021). This Report discusses the existing wastewater infrastructure within the Project vicinity and identifies anticipated average daily wastewater flows and peak wastewater flows generated by the Project. It also identifies anticipated sewer main sizes and alignments and presents results from a hydraulic analysis of the proposed wastewater infrastructure.

#### 2.0 DESIGN CRITERIA

#### 2.1 City of Phoenix Design Criteria

The proposed wastewater system infrastructure for the Project has been prepared and evaluated consistent with the City's current design criteria as identified in the *Design Standards Manual for Water and Wastewater Systems* (City of Phoenix, 2021). A summary of the design criteria established for the Project is provided in Table 1 below.



TABLE 1				
WASTEWATER SYSTEM DESIGN CRITERIA <sup>1</sup>				
	Category	Value	Unit	
Average I	Daily Flow			
	Schools	20	gpd/Student	
Peaking I	Factors			
Harmon's Equation – PF = $1+14/(4+P^{1/2})$ P = Population (in thousands)				
System L	ayout			
	Minimum Sewer Depth of Cover <sup>2</sup>	7.0	ft	
	Minimum Pipe Diameter 8 inches			
	Maximum Manhole Spacing (dia. < 15") 400 ft			
	Manhole Invert Drop (45° - 90°)	0.1'	Drop across manhole	
Minimum	Pipe Slopes			
	8-inch	0.00380	ft/ft	
System P	Performance	-		
	Manning's Roughness Coefficient (n)	0.013		
	Minimum Velocity 2.1 fps		fps	
Sewer Capacity Ratio (d/D, max at peak flow) 0.75				
Notes: 1. Design criteria based on the <i>Design Standards Manual for Water and Wastewater Systems</i> (City of Phoenix, 2021). 2. Or sufficient depth to serve the ultimate drainage area to include serviceable areas outside of the development project.				

#### 3.0 WASTEWATER FLOWS

#### 3.1 Land Use

The Project will consist of a single additional school building and open space uses. Table 2 shows the anticipated land use and density for the Project.

TABLE 2				
LAND USE AND DENSITY				
Land Use		Area (ac)	Population (Students)	
Performing Arts Building	Schools	0.6	800	
Grand Total	-	0.6	800	

#### 3.2 Wastewater Flow Calculations

Anticipated wastewater flows for the Project have been calculated in accordance with the design criteria listed in Table 1 and the land use listed in Table 2. A summary of the wastewater flows is presented in Table 3. Table B.1 in Appendix B presents more detailed wastewater flow calculations for the Project.



TABLE 3					
FLOW SUMMARY					
Phase	Average Daily Flow		Peaking	Peak Daily Flow	
	gpd	gpm	Factor	gpd	gpm
Performing Arts Building	16,000	11.1	3.9	61,766	42.9

### 4.0 WASTEWATER SYSTEM INFRASTRUCTURE

#### 4.1 Existing Wastewater System Infrastructure

Existing wastewater infrastructure immediately adjacent to the Project has been identified from the City of Phoenix Quarter Section maps, which show an 8-inch gravity sewer main within Stanford Drive that flows east to 40<sup>th</sup> Street, then south within 40<sup>th</sup> Street, upsizing to a 12-inch sewer main, which ultimately outfalls to an existing 21-inch gravity main flowing west in Camelback Road. There is existing wastewater infrastructure, including a lift station within the PCDS campus which serve the existing buildings.

#### 4.2 Proposed Wastewater System Improvements

The proposed wastewater system infrastructure for the Project will consist of a private onsite sewer that will connect to the existing 8-inch gravity sewer main within Stanford Drive, shown in Appendix C. Alternatively, the Project may tie-in to existing wastewater infrastructure within the PCDS campus, provided that existing facilities prove adequate capacity and no adverse impacts occur as a result of development. The final design of the Project shall document evaluate and document the chosen alternative, and demonstrate that the proposed improvements and all downstream wastewater infrastructure provides adequate capacity to manage wastewater flows generated by the proposed building.

A sewer capacity analysis was completed to ensure there is adequate capacity for the Project. Table B.1 and B.2 in Appendix B presents the wastewater flow calculations and sewer capacity analysis for the Project. A proposed sewer connection to Stanford Drive was analyzed to demonstrate the there is sufficient capacity to convey the anticipated peak flows downstream. The proposed sewer was analyzed at a minimum slope of 0.0038 ft/ft, and can convey the 61,766 gpd (42.9 gpm) peak flow with a depth/diameter (d/D) ratio of 24.2%. The full pipe capacity at the minimum design slope is 482,747 gpd (335.2 gpm). Gravity sewers will be designed to ensure the normal depth of flow within the pipe does not exceed 75% of the pipe diameter during peak flow conditions.

#### 4.3 Wastewater System Phasing

The Project is anticipated to be developed in a single phase. In the event that the improvements are constructed in multiple phases, the downstream mains required to serve any given phase will be constructed simultaneously with said phase and will be sized for ultimate build-out conditions.



### 5.0 CONCLUSIONS

The proposed wastewater system discussed in this report will adequately serve the Project. This report has determined that:

- The projected average daily flow and peak flow generated by the Project are 16,000 gpd (11.1 gpm) and 61,766 gpd (42.9 gpm), respectively.
- The proposed onsite wastewater improvements will consist of a gravity sewer main that will convey wastewater flows to the existing, offsite 8-inch sewer main within Stanford Drive. Alternatively, the Project may connect to existing onsite wastewater infrastructure, to be detailed at final design of the Project.
- The proposed wastewater collection system meets the City of Phoenix design criteria listed in Table 1 of this report.
- The hydraulic model results in Appendix B show that the proposed sewer mains have sufficient capacity to convey the anticipated wastewater flows from the Project.

### 6.0 REFERENCES

City of Phoenix Water Services Department (2021). *Design Standards Manual for Water and Wastewater Systems*. 2021, Phoenix, AZ.



APPENDIX A

FIGURES





APPENDIX B

TABLES

# Table B.1 - Wastewater Flow CalculationsPhoenix Country Day School Performing Arts Center



Phoenix, Arizona September 2023

Land Lise	Gross Area (ac)	Population	Average Daily Flow		Peaking	Peak Daily Flow	
	GIUSS Alea (ac)	(Students)	(gpd)	(gpm)	Factor	(gpd)	(gpm)
Schools	0.6	800	16,000	11.1	3.86	61,766	42.9
Grand Total	0.6	800	16,000	11.1	3.9	61,766	42.9
Notes:							

Notes:

Design Criteria listed below is based on City of Phoenix's 2021 Design Standards Manual for Water and Wastewater systems.
 Per the Arizona Administrative Code Title 18-Chapter 9 (ADEQ, 2017).

Flow Factors:

School Average Daily Flow

20 gpd/student

Peaking Factors:

Peak Daily Flow (Harmons Equat  $Q_{peak} = Q_{ave*}[1+14 / (4+P^{1/2})]$ 

P = Population (in thousands)

# **Table B.2 - Sewer Capacity Calculations**

**Project:** Phoenix Country Day School Performing Arts Center Paradise Valley, Arizona





Performing Arts Center:	16,000	gpd
Total Average Day Flow:	16,000	gpd
Peaking Factor:	3.86	
Total Peak Flow:	61,766	gpd
Pipe Parameters:		
Sewer Diameter (D):	8	in.
Manning's n-value (n):	0.013	
Slope (S):	0.0038	ft/ft
Hydraulic Radius (R):	0.095	ft (part full pipe)
Hydraulic Radius (R):	0.167	ft (full pipe; R=D/4)
Manning's Equation: \	/ = (1.486/n) * R^(2/3) *	S^(1/2)
Velocity (V, part full pipe):	1.47	fps
Velocity (V, full pipe):	2.14	fps
Depth/Diameter (d/D):	24.2%	
% Capacity (Flow/Capacity, Q/Q <sub>full</sub> ):	12.8%	
(	Q = (1.49/n) * A * R^(2/3	s) * S^(1/2)
Pipe Capacity (Full Flow):	0.75 482.747	cfs gpd
Capacity (Excess Design):	420,948	gpd

Depth/Diameter (d/D) is less than 75% under peak flow conditions, therefore adequate capacity is available.

#### \*Notes:

1) Design criteria are based on the City of Phoenix Design Standards Manual for Water and Wastewater Systems (City of Phoenix, 2021).



APPENDIX C

EXCERPTS



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