PRELIMINARY WASTEWATER BASIS OF DESIGN REPORT
FOR
Gallery

A residential community located in the
City of Scottsdale, Arizona

Accepted w/ Comments
City of Scottsdale
Water Resources Administration
9379 E. San Salvador
Scottsdale, AZ 85258

DougMann 9.24.15

Prepared:

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Prepared for:

K Hovnanian Great Western Homes, LLC
20830 N. Tatum Boulevard, Suite 250
Phoenix, Arizona 85050
Tel: (480) 824-4200

EXP. 9-30-16

Prepared by:

Hoskin Ryan Consultants, Inc
6245 N. 24th Parkway, Suite 100
Phoenix, AZ 85016
Tel: (602) 252-8384

Hoskin • Ryan Consultants, Inc.
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1.0 INTRODUCTION

1.1 Project Description

K Hovnanian Great Western Homes is planning the development of a 1.2-acre high density residential subdivision known as Gallery. Gallery is being developed in one phase.

The purpose of this report is to provide a preliminary basis of design for the wastewater system for the proposed development of Gallery. The proposed site will be developed in one phase and includes 18 single-family residential lots, a community pool, and open space. This report has been prepared to meet the requirements of the City of Scottsdale, the Maricopa County Environmental Services Department (MCESD), the Arizona Administrative Code (AAC), and the Arizona Department of Environmental Quality (ADEQ).

1.2 Project Location

Gallery is located southeast of the intersection of 71st Street and Earll Drive in Scottsdale, Arizona. The site is bounded on the north by Earll Drive, on the east by an existing automotive repair service, on the west by a small apartment complex, and on the south by an accident repair shop.

More specifically, the project is located within the southeast quarter of Section 27 of Township 2 North, Range 4 East, of the Gila and Salt River Meridian, within the City of Scottsdale, Arizona. The location of the property is depicted in *Exhibit 1- Location and Vicinity Map.*

1.3 Topographic Conditions

The existing topography for the Gallery varies slightly. The site has a gradient fall of approximately 2 feet from the north to south, sloping at approximately 0.65%. Onsite elevations range from approximately 1,241 to 1,243 feet above mean sea level (MSL). The project site currently is undeveloped land.

1.4 Existing Facilities/Conditions

There is an existing 12-inch sewer line that crosses the site along the west property line. There is also an abandoned 8-inch line along the west property line. Offsite wastewater flow will travel from south of the site and pass through the site before entering the existing system on Earll Drive. The existing sewer line at Earll Dr. flows to the east. From there, the sewer line flows to the City of Scottsdale ~~Wastewater Treatment Plant~~ Princess Metering Station. The 8-inch and 12-inch sewer pipes along the west lot must be capped and abandoned per applicable state and county requirements.

2.0 WASTEWATER DESIGN PARAMETERS

2.1 Population

Gallery will consist of 18 single-family residential units on approximately 1.2-acres. The average population used is 2.5 people per single-family residential dwelling unit. The total residential population is estimated to be 45.

2.2 Wastewater Flow Design Criteria

The design criteria used in this Preliminary Wastewater Basis of Design Report was based upon the criteria required by the City of Scottsdale Design Standards & Policies Manual (Ref. 1). The specific design criteria used for this report are listed below:

- All construction shall comply with MAG Standards and Specifications and the City of Scottsdale Design Standards.
- The population is 2.5 persons per dwelling unit (single family residential).

- High density residential have an average flow of 140 gpd per unit
- The average wastewater flow per residential person per unit is 100 gpcd (gallons per capita per day).
- Sewer lines are designed to provide mean velocities, when flowing full, of not less than 2.5 fps and not more than 10 fps based on Manning's formula.
- The maximum daily flow is calculated by multiplying the average daily flow by a peaking factor of 4.0 for single family residential.
- A Manning's roughness coefficient ("n") of 0.013 is used.
- For dry weather peak hour flows, the depth to diameter ratio (d/D) for diameters less than 12 inches shall be no greater than 0.65 for the max flow condition and no greater than 0.70 for diameters 12 inches and greater.
- Sewer pipe material will be per City of Scottsdale's Wastewater Design Standards as indicated in City of Scottsdale Allowable Materials List. Sewer lines 8 inches through 15-inches may be VCP or PVC SDR35.
- The sewer capacities are based on the minimum slope between nodes. A minimum slope of 0.0052 ft/ft for 8-inch pipe and 0.0030 ft/ft for 12-inch pipe will be used for this report.

3.0 PROPOSED WASTEWATER SYSTEM

3.1 Proposed Wastewater Design

The sewer lines needed for Gallery will be constructed within the site and will connect to the existing sewer line in Earll Drive. The current land uses are the basis for the size and location of all proposed infrastructure within this report. The downstream sewer mains are of sufficient size to accept generated flows from the development. The sewer and water lines will be located within a 20 foot wide water easement.

3.2 Wastewater Flow Calculations

The wastewater flows for Gallery are summarized in Table 3.2.1 below. The average daily flow (ADF) and maximum daily flow (MDF) are based on the most downstream manhole on the line. Sewer demand calculations are included in the Appendix.

Table 3.2.1 – Gallery Daily Flow Summary

SERVICE	AVG. DAILY FLOW (GPD)	(GPM)	MAX. DAILY FLOW (GPD)	(GPM)
OFFSITE*	27,994	19.44	111,976	77.74
ONSITE	4,500	3.13	18,000	12.50

*Existing manhole that services two commercial buildings and high density residential.

3.3 Pipe Sizing Calculations

The proposed wastewater pipes sizes were developed utilizing the previously outlined 0430design criteria in Section 2. All pipes have been designed to convey the maximum daily flow at or less than a depth to Diameter (d/D) ratio of 0.65 for pipes less than 12 inches in diameter. All mean velocities, while flowing full, will exceed 2.5 fps. Exhibit 2, in conjunction with the wastewater demand calculations in the Appendix, show the location, size, flow rate, and contributing flows for each pipe section throughout the wastewater collection system.

4.0 CONCLUSIONS

Based on the analysis presented in this Preliminary Wastewater Basis of Design Report, the following conclusions are drawn:

1. This report was prepared in accordance with the recommendations and design parameters of the City of Scottsdale.

2. The proposed wastewater system and velocities for Gallery are in accordance with the City of Scottsdale design criteria.

3. The selected pipe sizes meet the design specifications required by the City of Scottsdale. The design flows within Gallery will not negatively impact the capacity of the existing downstream sewer lines. The proposed wastewater system will ultimately flow to the City of Scottsdale WWTP.

4. The computerized pipe capacity analysis was completed utilizing an Excel spreadsheet program based on Manning's Equation. The sewer system will accommodate all contributing flows based on the design criteria in Section 2.2.

5. The design of the wastewater system was based on generally accepted engineering practices and in accordance with City of Scottsdale requirements.

EACH unit has own sewer service connection to public MAIN.

5.0 REFERENCES

1. *City of Scottsdale, Design Standards & Policies Manual*, January 2010.
2. *Arizona Administrative Code, Title 18, Chapter9, Code No. R18-9-E301*, September 2005.
3. *Arizona Department of Environmental Quality, Engineering Bulletin No. 11, Chapter IV*, July 1978.

APPENDIX

GALLERY
WASTEWATER FLOW AND PIPE CAPACITY CALCULATIONS

FROM	TO	CONTRIBUTING UNITS	ADF/UNIT[3] (GPD)	ADF (GPD)	TOTAL ADF (GPD)	DESIGN VELOCITY[2] (ADF) (FPS)	SERVICE AREA POPULATION	TOTAL POPULATION	PEAKING FACTOR	MDF (GPD)	PIPE SIZE (IN.)	PIPE SLOPE[1] (FT/FT)	PIPE CAPACITY (GPD)	SURPLUS CAPACITY (GPD)	% CAPACITY	FLOW DEPTH (IN.)	DEPTH/ DIAMETER (IN./IN.)	DESIGN VELOCITY[2] (MDF) (FPS)
E1[4]	E2	152	140	21,280	21,280	0.93	0	0	4.50	95,760	12	0.0030	1,261,154	1,165,394	7.6	2.24	0.19	1.45
E1[3]	E2	1	6714	6,714	6,714	0.60	0	0	3.00	20,142	12	0.0030	1,261,154	1,241,012	1.6	1.06	0.09	0.85
E2	A1	0	250	0	27,994	1.00	0	0	4.00	111,976	12	0.0030	1,261,154	1,149,178	8.9	2.42	0.20	1.55
A1	E3	18	250	4,500	32,494	1.05	45	45	4.00	129,976	12	0.0030	1,261,154	1,131,178	10.3	2.60	0.22	1.58
TOTAL		171			32,494		45		4.00	129,976								

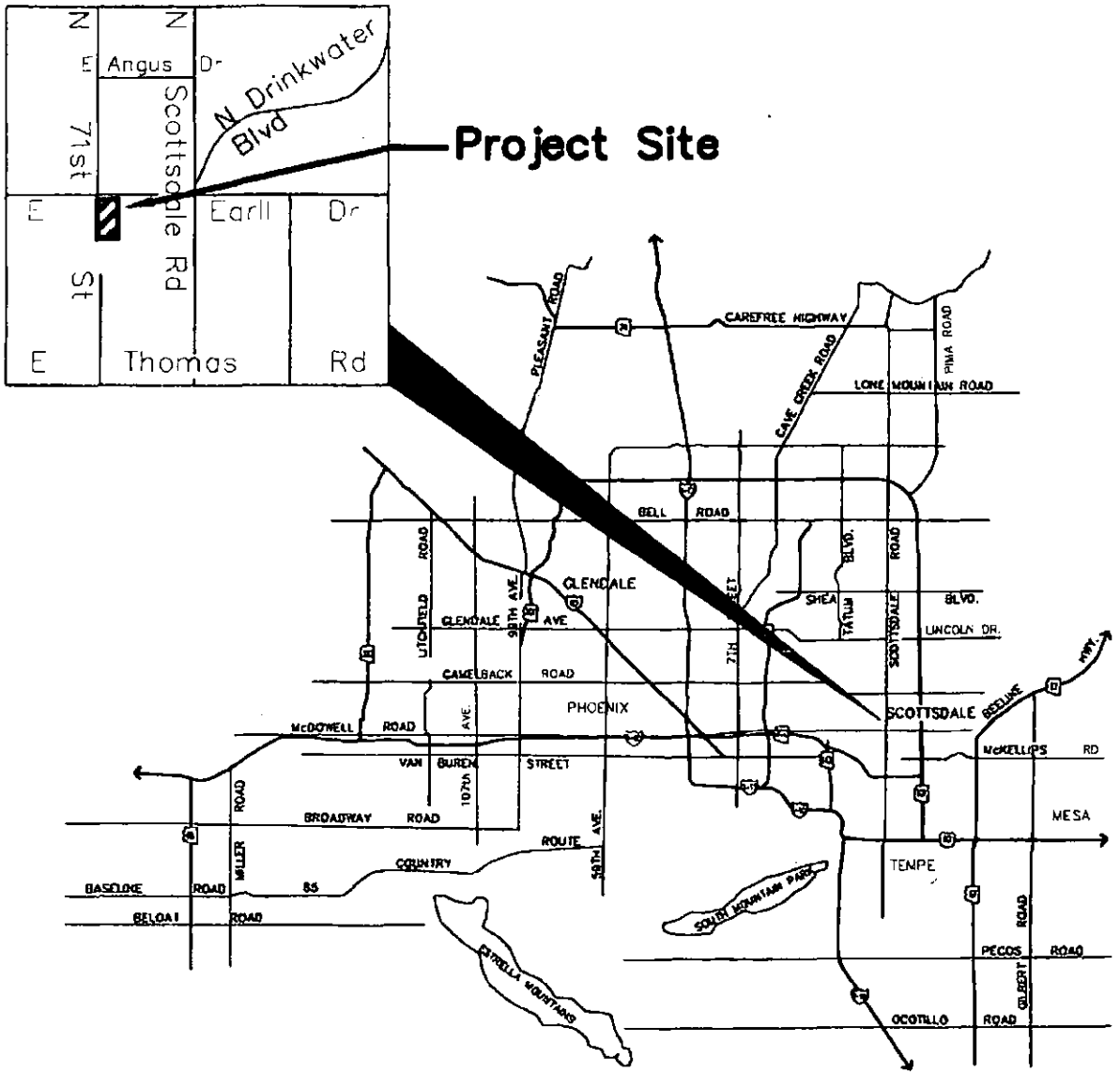
Achieve better slope if At All possible

Notes:
(1) Sewer capacities are based on the minimum slope in the sewer run.
(2) Based on ADEQ Bulletin No.11 Figure IV-3, Velocity and Discharge for Partially Full Circular Sewers.
(3) Commercial average day flows are calculated using sq. ft based on City of Scottsdale Requirements
(4) Flow is calculated from offsite high density residential apartment complex
(5) Flow is calculated from two offsite commericial buildings

Residential Ave. Daily Flow per unit = 250 GPD
Residential Ave. Daily Flow per capita = 100
Population/D.U. = 2.5
Manning's n = 0.013

Full Flow Capacity = $1.4861/n * A * R^{2/3} * S^{1/2}$
$A = \pi/4 * (D/12)^2$
R = D/4 For Circular Pipe Flowing full
S = Pipe slope
D = Pipe Diameter in Inches

EXHIBITS



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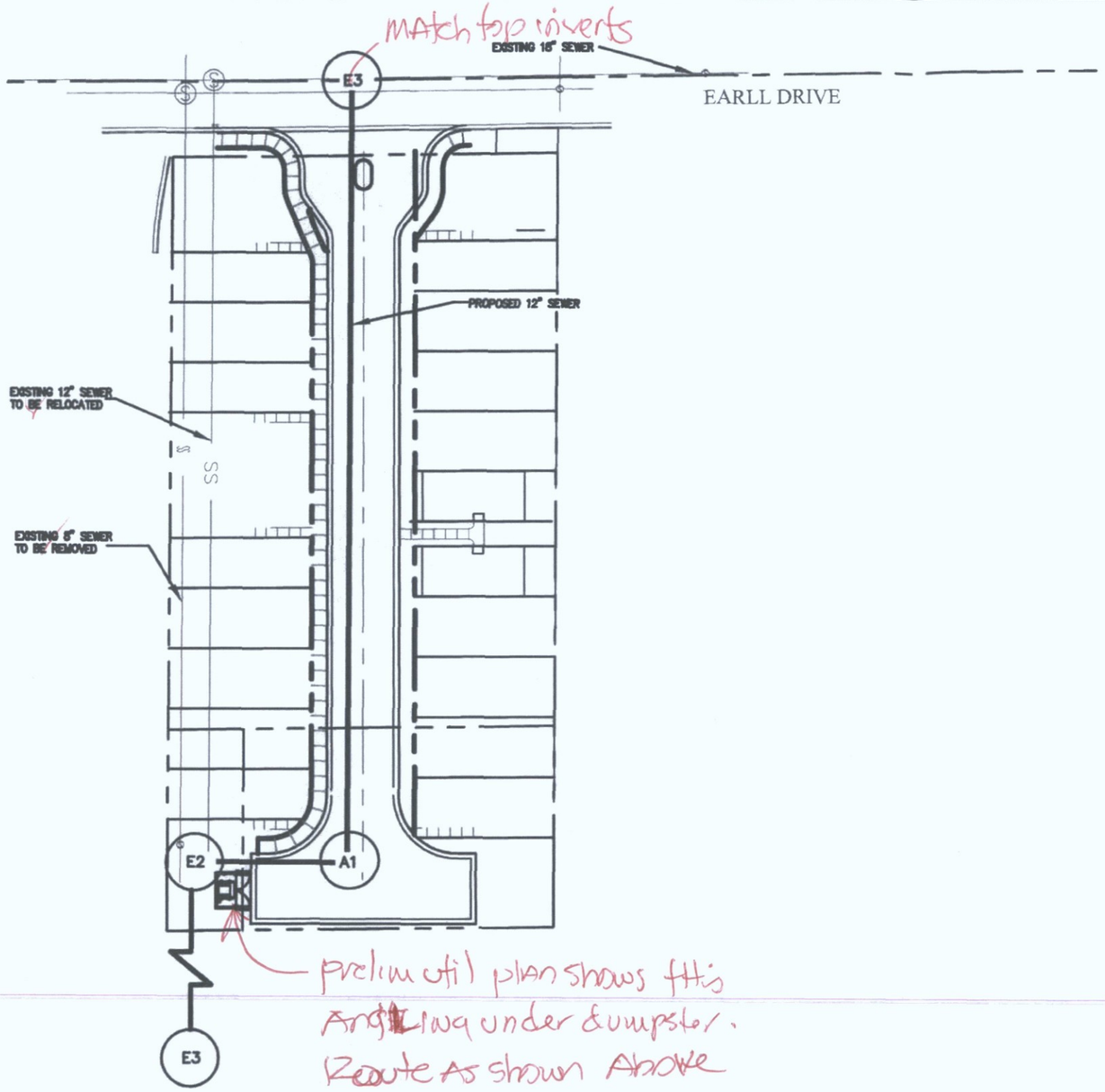
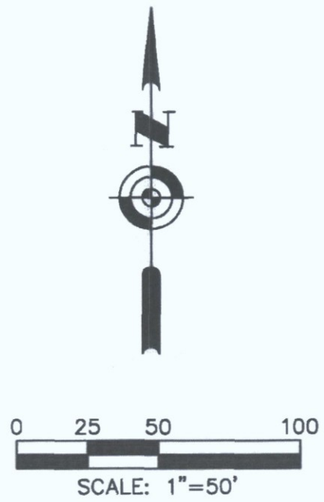
Hoskin•Ryan Consultants
creative engineering solutions
6245 N. 24th Parkway Suite #100 Phoenix, AZ 85016
Office (602) 252-8384 | Fax (602) 252-8385 | ww.hoskinryan.com

The Gallery
At 71st St & Earll Dr
Location and Vicinity Map

FIGURE 1





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Hoskin•Ryan Consultants
creative engineering solutions
6245 N. 24th Parkway Suite #100 Phoenix, AZ 85016
Office (602) 252-8384 | Fax (602) 252-8385 | ww.hoskinryan.com

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GALLERY SEWER MAP

EXHIBIT 2