

CAVASSON

LOCATED NEAR THE NORTHWEST CORNER OF THE HAYDEN ROAD AND LOOP 101
FRONTAGE ROAD INTERSECTION

FINAL

~~PRELIMINARY~~ SEWER REPORT-CAVASSON GRAYHAWK

BASIS OF DESIGN

June 11, 2021

Project No.: 18114-601

PREPARED FOR:

GDI ML CAVASSON, LLC
7377 E. DOUBLETREE RANCH ROAD
SCOTTSDALE, AZ 85258
(480) 998-2661

PREPARED BY:

HUBBARD ENGINEERING
1201 S. ALMA SCHOOL ROAD, SUITE 12000
MESA, AZ 85210
(480) 892-3313
MICHAEL S. WOLF, PE

FINAL Basis of Design Report

APPROVED

APPROVED AS NOTED

REVISE AND RESUBMIT



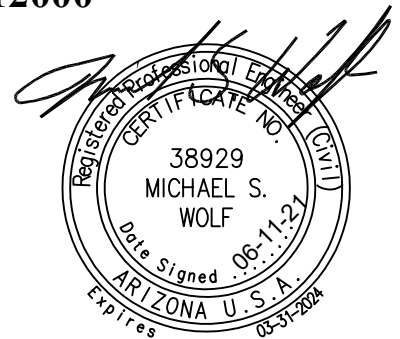
Disclaimer: If approved; the approval is granted under the condition that the final construction documents submitted for city review will match the information herein. Any subsequent changes in the water or sewer design that materially impact design criteria or standards will require re-analysis, re-submittal, 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 scan

DATE 7/23/2021



HUBBARD
ENGINEERING



24-DR-2021
6/23/2021

TABLE OF CONTENTS

1.	INTRODUCTION.....	1
1.1	PROJECT SCOPE.....	1
1.2	SITE DESCRIPTION.....	1
1.3	PROJECT TYPE.....	3
1.4	REGULATORY REQUIREMENTS.....	3
2.	PROJECT DESCRIPTION.....	3
2.1	TIE IN TO EXISTING SYSTEM.....	3
2.2	SERVICE AREA.....	4
2.3	RIGHT OF WAY AND EASEMENTS.....	4
3.	DESIGN FLOWS AND BASIS OF DESIGN.....	4
3.1	AVERAGE DAILY FLOW.....	4
3.2	PEAK DAILY FLOW.....	5
3.3	PIPE CAPACITY AND VELOCITY CALCULATIONS.....	5
4.	DESIGN CRITERIA.....	6
4.1	FLOW VELOCITIES.....	6
4.2	MANHOLES.....	6
4.3	MINIMUM PIPE SIZING.....	6
4.4	PIPE MATERIAL.....	6
4.5	SEWER COVER AND SEPARATION.....	6
5.	CONCLUSIONS AND RECOMMENDATIONS.....	7
6.	REFERENCES.....	7

FIGURES

Figure 1.1 Site Vicinity Map

APPENDICES

Appendix A Sewer Capacity and Velocity Calculations

EXHIBITS

Exhibit 1 Sewer Map



1. INTRODUCTION

1.1 Project Scope

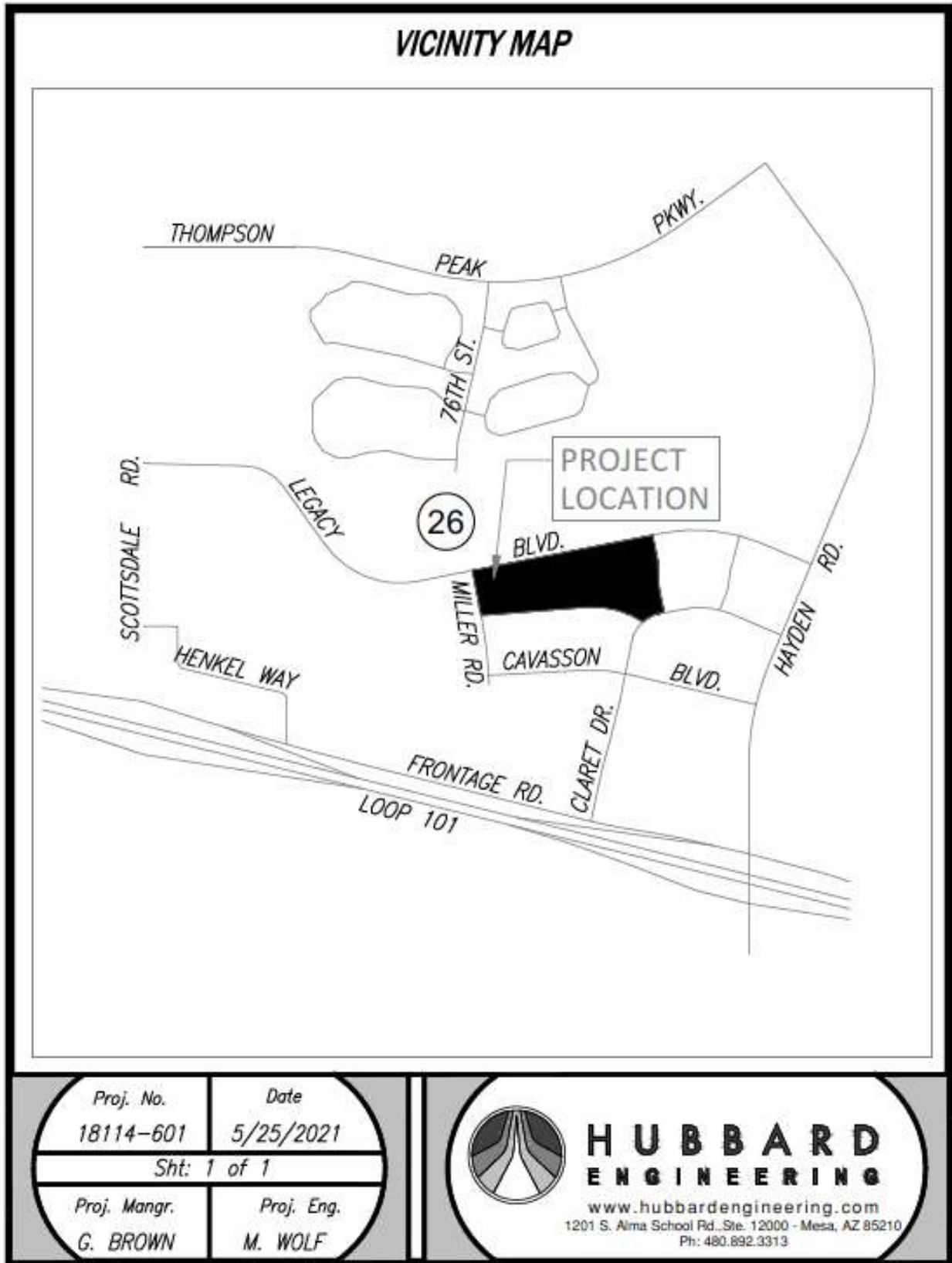
This report presents the results of a *Final Sewer Study* conducted by Hubbard Engineering at the request of GDI ML Cavasson, LLC (“Client”), for the Grayhawk Residences at Cavasson Development (“Site”). The purpose of this report is to provide a detailed analysis for the proposed sanitary sewer system for the development. The sewer analysis in this report adheres to the City of Scottsdale’s *2012 Water Reuse Master Plan Update* and the approved *Cavasson Master Wastewater Report* dated March 26, 2019.

1.2 Site Description

The project site is located in the southeast quarter of Section 26, Township 4N, Range 4E of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. The site is currently undeveloped, and prior to Nationwide Realty Investor’s acquisition, was held in trust by the Arizona State Land Department (ASLD) as a portion of the overall Crossroads East development, which encompasses approximately 883 gross acres. The Grayhawk Residences at Cavasson development is located in the Northwest corner of the overall Crossroads East development, near the Legacy Boulevard and Miller Road intersection. The land naturally falls from northeast to southwest.

The project site is bounded by undeveloped desert to the south, Reveille Road to the east, North Miller Road to the west, and Legacy Boulevard to the north. The site location is shown in **Figure 1.1 – Vicinity Map**.

Figure 1.1 – Vicinity Map



1.3 Project Type

The overall Cavasson project is being developed by Nationwide Reality Investors as a master planned, mixed use development with office, retail, hotels, and multifamily residential parcels with public and private roadways that run adjacent and through the development. The Grayhawk Residences at Cavasson will include construction of a new apartment complex with 402 dwelling units over the 18.6 acre site in multiple buildings. Improvements will also include surrounding access drives, parking, and extending existing private utility stubs to service the building.

The analysis for the overall development was conducted in Hubbard's *Master Sewer Report Phase 3 Update* and will be referenced as it applies to the Grayhawk Residences at Cavasson.

1.4 Regulatory Requirements

The following documents were utilized in the preparation of this report:

- City of Scottsdale, *Design Standards & Policies Manual*.
- City of Scottsdale, *Water Reuse Master Plan Update 2012*.
- Arizona Department of Environmental Quality (ADEQ), *Engineering Bulletin 11: Minimum Requirements for Design, Submission of Plans and Specifications of Sewage Works*.
- Arizona Department of Environmental Quality (ADEQ), *Aquifer Protection Permit (APP) Program*.
- Maricopa Association of Governments (MAG), *Uniform Standard Specifications and Details for Public Works Construction, 2021 Edition*.
- *2015 Edition of the International Plumbing Code*.
- City of Scottsdale, *Ordinance No. 4346*.
- Hubbard Engineering, *Master Wastewater Report for Cavasson, Phase 3 Update, May 21, 2021*.

2. PROJECT DESCRIPTION

2.1 Tie in to Existing System

The Grayhawk Residences at Cavasson sewer system will tie into the existing sewer system through multiple existing stubs that have been provided to the property. The west two thirds of the development will be serviced by a combination of two existing stubs provided from Legacy Boulevard and one existing stub provided from Miller Road. Of these two thirds, the majority will be serviced by the existing 12-inch sewer stub off of Miller Road and the two 8-inch stubs from Legacy Boulevard will service a total of 5 buildings. The remaining third of the site will be serviced by two existing 8-inch stubs provided off of Reveille Road and Claret Drive. See **Exhibit 1** for tie in locations.

2.2 Service Area

The proposed Cavasson development is located within the City of Scottsdale's Service Area, specifically within the Sub-basin 4 collection area, per Figure 1-3 in the City of Scottsdale's *2012 Water Reuse Master Plan Update*. Details regarding the capacity and infrastructure within this service area are further discussed in the approved *Cavasson Master Wastewater Report*.

The proposed sewer for the Grayhawk Residences at Cavasson will service 402 dwelling units within the apartment complex and two pools. See **Exhibit 1** for the proposed sewer layout.

2.3 Right of Way and Easements

All proposed sewer lines installed with The Grayhawk Residences at Cavasson development will be private. These private mains will connect to the public sewer at existing stubs described in Section 2.1 of this report.

3. DESIGN FLOWS AND BASIS OF DESIGN

3.1 Average Daily Flow

In accordance with Table 2-4 of the City of Scottsdale's *2012 Water Reuse Master Plan Update*, and Table 2 of Hubbard Engineering's *Master Wastewater Report for Cavasson Phase 3 Update*, the design unit load for Multi-family residential properties is 3,808 gallons per acre per day.

In coordination with the City of Scottsdale staff, a multiplying factor of 1.06 is applied to the Average Daily Flow to account for the development's increased allowable Floor Area Ratio (FAR) of 0.85 from the City's Zoning Ordinance standard of 0.80. Determination of this multiplying factor is discussed in further detail in the approved *Cavasson Master Wastewater Report*.

In addition to the unit demands, The Grayhawk Residences at Cavasson will have two 25,000 gallon pools which will result in an additional 100 gpm load per pool in accordance with the 2021 City of Scottsdale *Design Standards and Policies Manual*. Since multiple pools are proposed, only 50% of the total number of pools will be assumed to backwash simultaneously at a rate of 100 gpm each. As a result, 100 gpm will be added to the average daily flow with a maximum of 25,000 gallons per pool applied for the daily total.

Total Average Daily Flow = (3,808 gpad) x (18.66 acres) x (1.06) = 75,509 gpd +50,000 gpd = 125,509 gpd = 152.306 gpm = 0.339 cfs

3.2 Peak Daily Flow

In accordance with the approved *Cavasson Master Wastewater Report*, a peaking factor is calculated using Harmon's equation and then is applied to the Average Daily Flow (ADF) to determine the Peak Daily Flow (PDF). The pool backwash flow does not have a peaking factor applied to it in accordance with the 2021 City of Scottsdale *Design Standards and Policies Manual*.

The peaking factor is calculated as:

On the scale of this individual development use
DSPM 7-1.403, Section A

$$1 + \frac{14}{4 + p_1^{0.5}} = \text{Peaking Factor}$$

Where p_1 is the population upstream divided by 1,000. This results in:

$$1 + \frac{14}{4 + 3196^{0.5}} = 3.42$$

Therefore, the total peak flow is:

$$\text{Total Peak Flow} = (3.42) \times (75,509 \text{ gpd}) = 258,161 \text{ gpd} + 50,000 \text{ gpd} = 308,161 \text{ gpd} \\ = 279.28 \text{ gpm} = 0.622 \text{ cfs}$$

3.3 Pipe Capacity and Velocity Calculations

The pipe capacity of the proposed system was calculated using the Manning's Equation:

$$Q = (k/n) \times (R_h^{2/3}) \times (S^{1/2}) \times A$$

where:

- Q = flow rate, ft^3/s ;
- k = conversion factor = $1.4859 \text{ ft}^{1/3}/\text{s}$;
- n = headloss coefficient;
- R_h = hydraulic radius, ft;
- S = slope, ft/ft;
- A = pipe cross sectional area, ft.

A summary of the calculated full flow pipe capacities and velocities can be found in **Appendix A**.

4. DESIGN CRITERIA

4.1 Flow Velocities

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*, all sanitary sewers within the city shall be designed and constructed such that the mean velocity in the pipe, when flowing full, shall not be less than two and a half (2.5) feet per second (fps). At this velocity, the sewer flow will typically allow the pipe to be "self-cleaning" and minimizes the settlement of solids within the pipe.

Additionally, to prevent abrasion and erosion of the pipe material, the velocity of the peak flow shall not exceed 10 fps.

4.2 Manholes

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*, manholes are required at all changes of grade, pipe size, pipe material or alignment and at distances not to exceed 500 feet for 8-15 inch diameter lines. Additional sewer manhole requirements include:

- The horizontal angle between two lines cannot be less than 90 degrees.
- Manholes shall have a minimum 0.10-foot drop across the trough.
- The difference in invert elevations between inflow and outflow lines shall not exceed one pipe diameter unless a drop connection is installed.

4.3 Minimum Pipe Sizing

The existing stubs are four 8-inch diameter stubs and one 12-inch diameter stub.

4.4 Pipe Material

All new sewer lines are proposed be PVC SDR-35, in accordance with the City of Scottsdale's *Design Standards and Policies Manual*.

4.5 Sewer Cover and Separation

In accordance with the City of Scottsdale's *Design Standards and Policies Manual*:

- The sewer collection system shall have a minimum cover of four feet from the crown of a sewer pipe to finish grade.
- The sewer collection system shall have a minimum horizontal distance of six feet from a water line.
- The minimum vertical clearance of a water line crossing under or over a sanitary sewer line must be two feet.

5. CONCLUSIONS AND RECOMMENDATIONS

1. The project site is located within the City of Scottsdale Sub-basin 4 collection area.
2. Design unit flows for each land use type were determined from the City of Scottsdale's *2012 Water Reuse Master Plan Update*.
3. The Average Daily Flow is 125,509 gallons per day = 152.31 gpm
4. The Total Peak Flow is 308,161 gallons per day = 279.28 gpm = 0.622 cfs

6. REFERENCES

1. City of Scottsdale, *Design Standards & Policies Manual*, January 18, 2018.
2. Carollo Engineers, *City of Scottsdale Water Reuse Master Plan Update 2012*, 2012.
3. Coe & Van Loo Consultants, Inc. (CVL) *Arizona State Land Department- Crossroads East Wastewater Master Plan Update*, April 13, 2008.
4. Arizona Department of Environmental Quality (ADEQ). *Engineering Bulletin 11: Minimum Requirements for Design, Submission of Plans and Specifications of Sewage Works*. May 1978.
5. Arizona Department of Environmental Quality (ADEQ). *Aquifer Protection Permit (APP) Program*.
6. Maricopa Association of Governments (MAG). *Uniform Standard Specifications and Details for Public Works Construction*. January 2018.
7. International Code Council. *2015 Edition of the International Plumbing Code*. January 1, 2015.
8. City of Scottsdale, *Ordinance No. 4346*, June 17, 2018.
9. City of Scottsdale, *Ordinance No. 1147*, June 17, 2018.

Appendix A
Sewer Capacity and Velocity Calculations
Grayhawk Residences at Cavasson

Channel Report

MH #1 Full Site Peak Flow Capacity

Circular

Diameter (ft) = 1.00

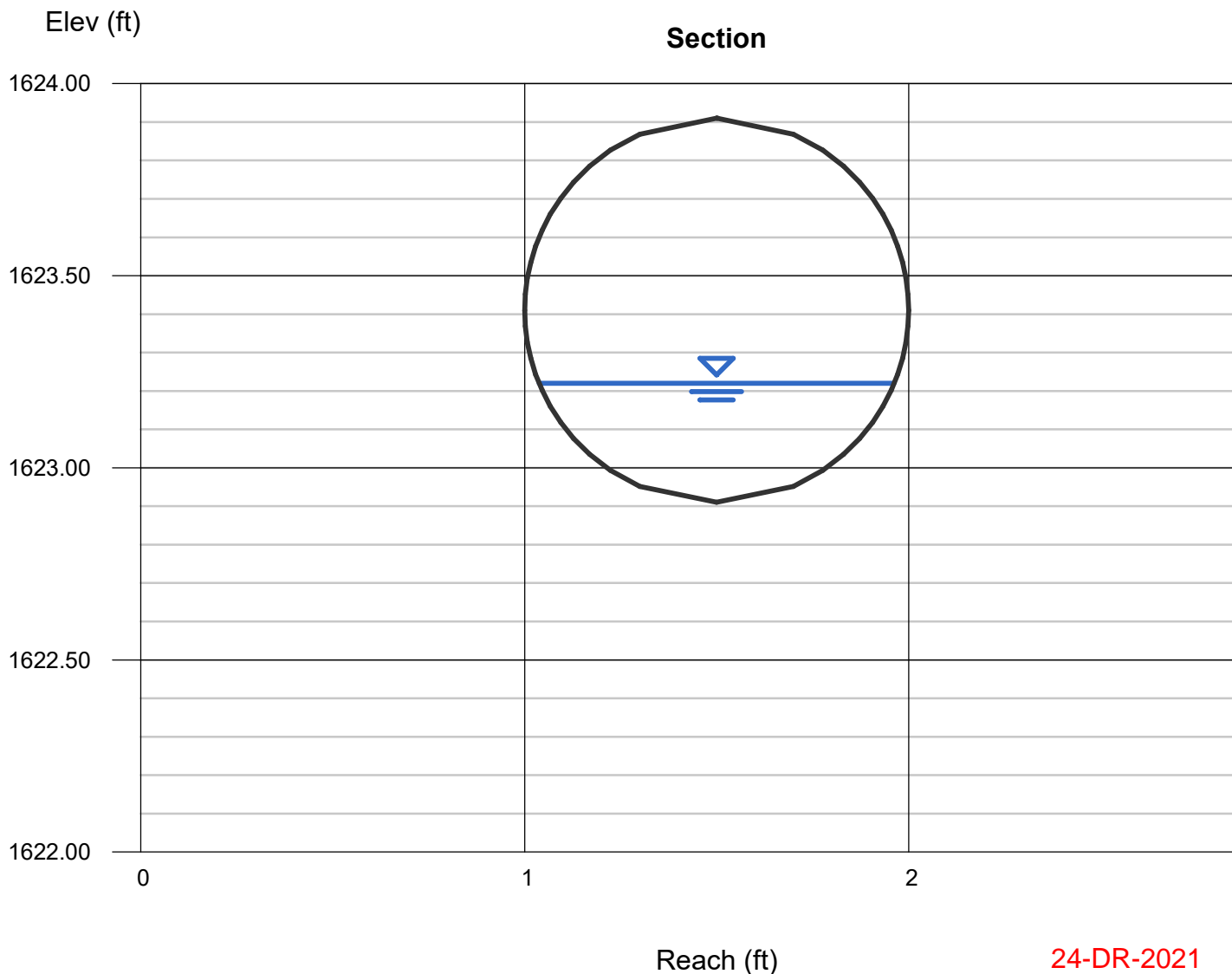
Invert Elev (ft) = 1622.91
Slope (%) = 0.75
N-Value = 0.013

Highlighted

Depth (ft) = 0.31
Q (cfs) = 0.620
Area (sqft) = 0.21
Velocity (ft/s) = 2.97
Wetted Perim (ft) = 1.18
Crit Depth, Yc (ft) = 0.33
Top Width (ft) = 0.93
EGL (ft) = 0.45

Calculations

Compute by: Known Q
Known Q (cfs) = 0.62



Channel Report

MH #9 Full Site Peak Flow Capacity

Circular

Diameter (ft) = 0.67

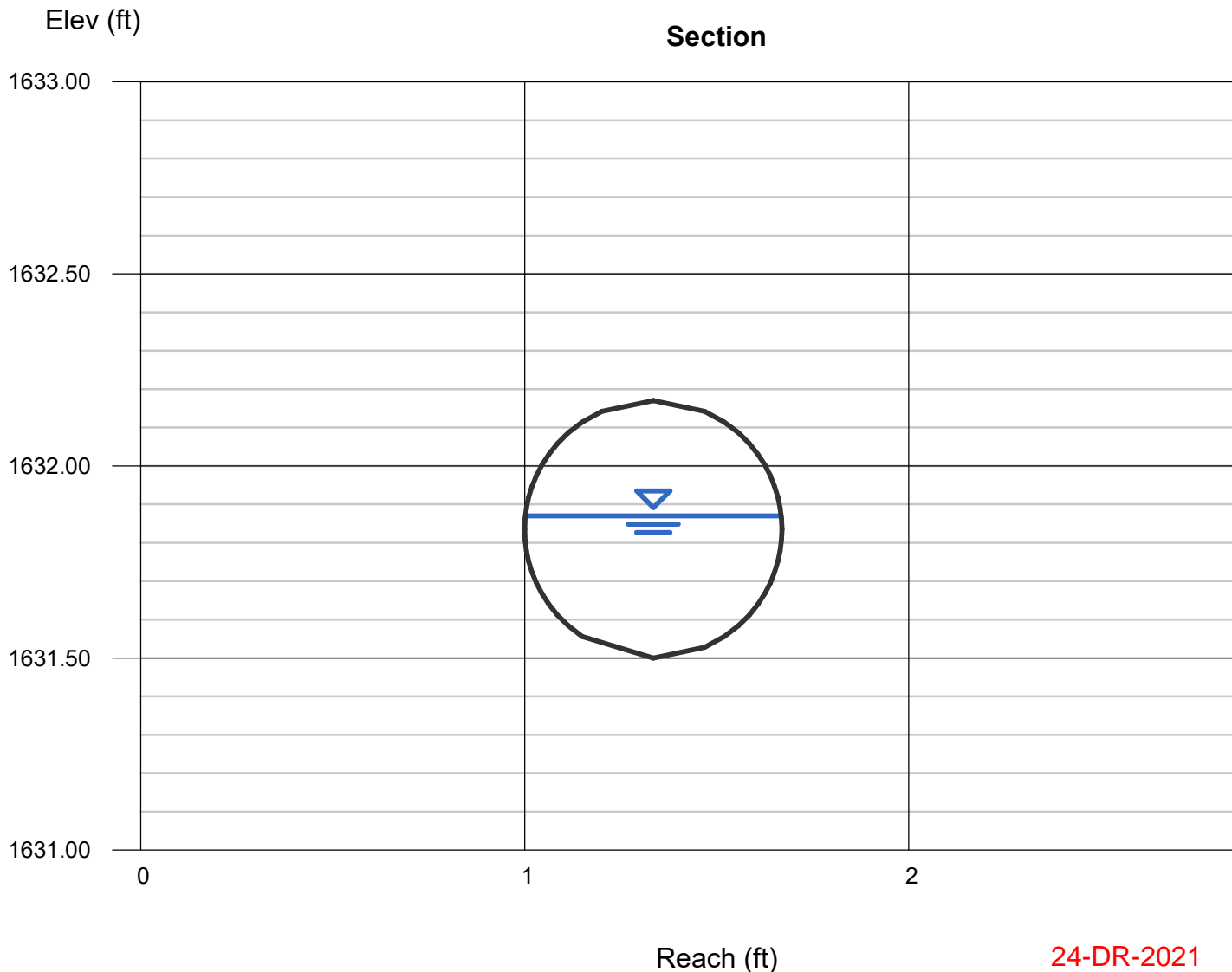
Invert Elev (ft) = 1631.50
Slope (%) = 0.75
N-Value = 0.013

Highlighted

Depth (ft) = 0.37
Q (cfs) = 0.620
Area (sqft) = 0.20
Velocity (ft/s) = 3.09
Wetted Perim (ft) = 1.13
Crit Depth, Yc (ft) = 0.37
Top Width (ft) = 0.67
EGL (ft) = 0.52

Calculations

Compute by: Known Q
Known Q (cfs) = 0.62



Channel Report

MH #10 Full Site Peak Flow Capacity

Circular

Diameter (ft) = 0.67

Invert Elev (ft) = 1632.00

Slope (%) = 0.75

N-Value = 0.013

Calculations

Compute by: Known Q

Known Q (cfs) = 0.62

Highlighted

Depth (ft) = 0.37

Q (cfs) = 0.620

Area (sqft) = 0.20

Velocity (ft/s) = 3.09

Wetted Perim (ft) = 1.13

Crit Depth, Yc (ft) = 0.37

Top Width (ft) = 0.67

EGL (ft) = 0.52

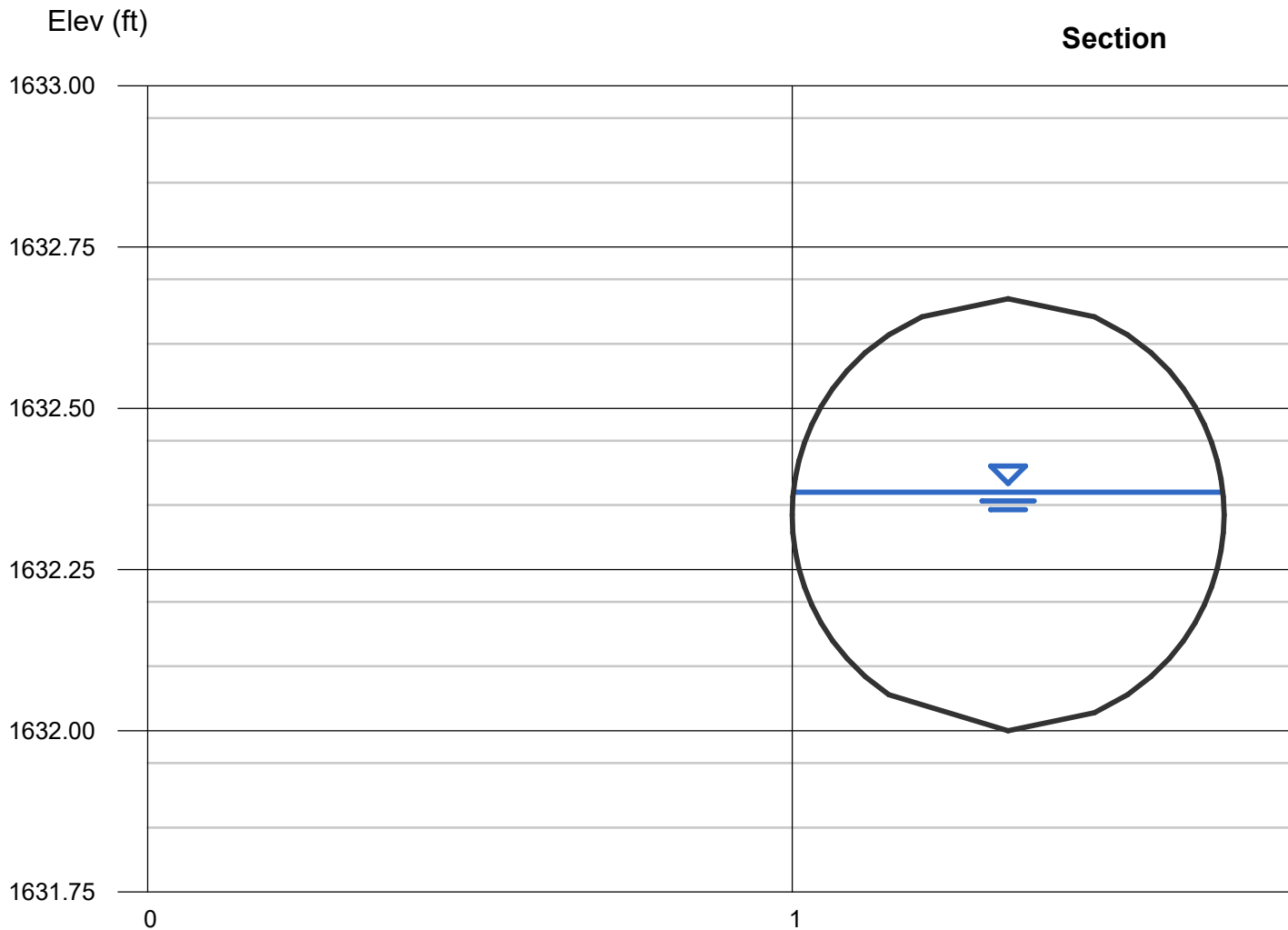
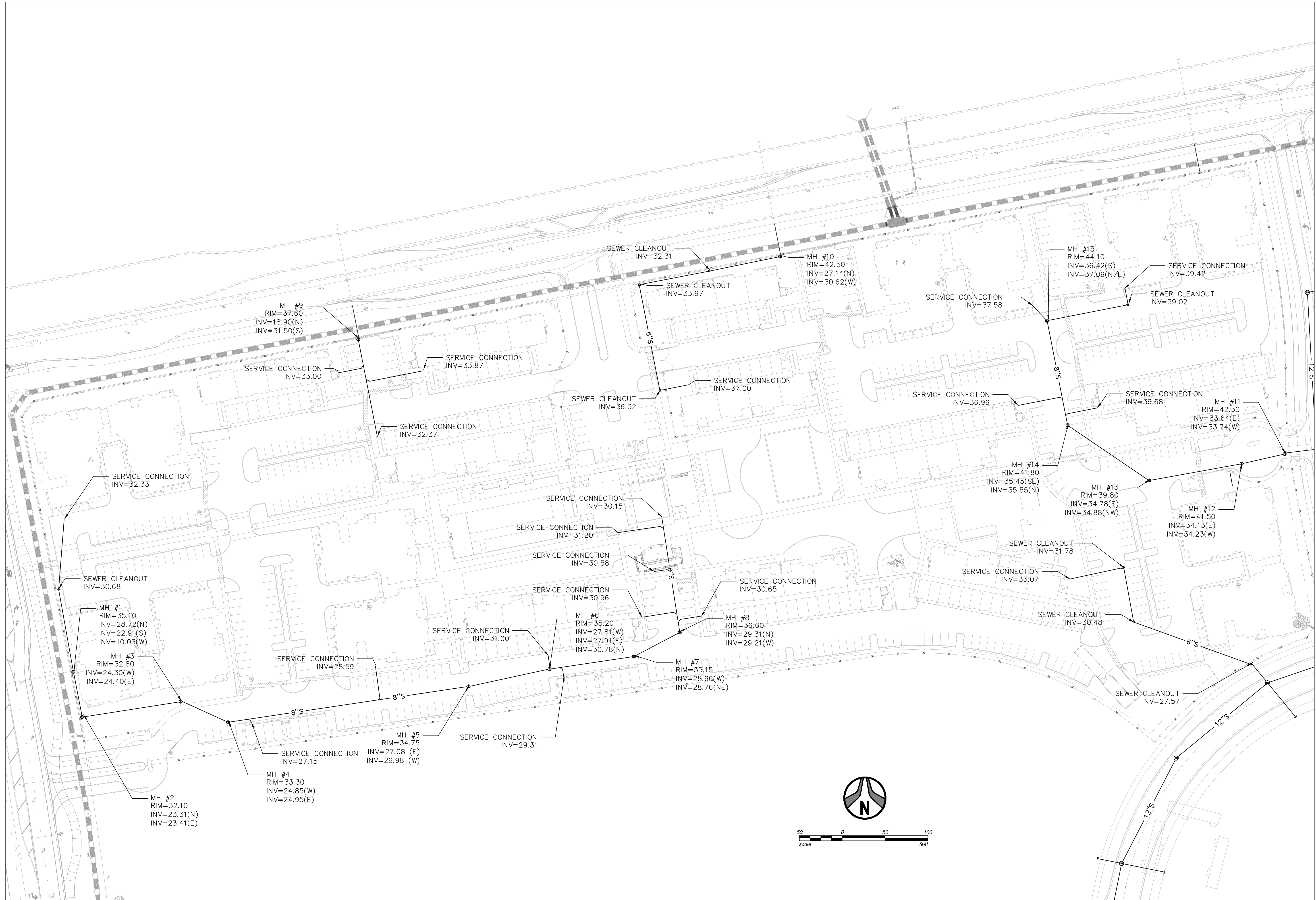


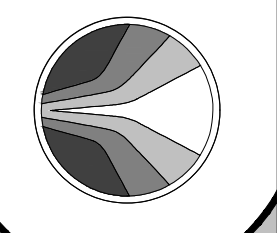
Exhibit 1
Sewer System Layout
Grayhawk Residences at Cavasson

P:\2021\18114\Design-Reports\18114-601\Sewer\Plan\18114-601_Sewer_Map_08_2021 - 1001.dwg



1201 S. Alma School Rd.
Suite 12000
Mesa, AZ 85210
PH: 480.892.3313

HUBBARD
ENGINEERING
www.hubbardengineering.com



SEWER MAP EXHIBIT
THE GRAYHAWK RESIDENCES AT CAVASSON
A PORTION OF THE NORTHWEST QUARTER OF SECTION 1 X
TOWNSHIP 3 SOUTH, RANGE 7 EAST OF THE GILA AND SALT RIVER
MERIDIAN, MARICOPA COUNTY, ARIZONA

Date: 6/8/2021
Project Eng: G. BROWIN

Project No.: 18114-601
Project Mgr.: M. WOLF



811
Call before you dig.
1.800.STAKE.IT
602.263.1100