



CITY OF EL MIRAGE

DEVELOPMENT APPLICATION FORM

Official Use

Case No: _____ Date Received: _____ Planning & Zoning Commission Meeting: _____ City Council Meeting: _____

PURPOSE

Development Applications are reviewed by the Technical Advisory Committee (TAC) with the intent to provide the applicant specific information in preparation to meeting the City's technical standards and requirements for the proposed development project. Information provided by TAC is based on applicant submittals and should be considered actual and detailed in nature.

ACTION REQUESTED (Check one)

- | | |
|--|---|
| <input checked="" type="checkbox"/> Conditional Use Permit | <input type="checkbox"/> Site Plan Approval |
| <input type="checkbox"/> General Plan Amendment: <input type="checkbox"/> Major <input type="checkbox"/> Minor | <input checked="" type="checkbox"/> Site Plan Amendment |
| <input type="checkbox"/> Planned Area Development (PAD) | <input type="checkbox"/> Preliminary Plat |
| <input type="checkbox"/> Planned Area Development Amendment | <input type="checkbox"/> Final Plat |
| <input type="checkbox"/> Rezoning | <input type="checkbox"/> Other: _____ |

PROPERTY INFORMATION:

Name of Project: OAKRIDGE FARMS Acreage: 8[±]
 Property Address/Location: 12945 W. GREENWAY ROAD, EL MIRAGE, AZ 85335
 Assessor's Parcel Number: 501-33-988; -987

APPLICANT / OWNER INFORMATION:

Applicant: <u>DAVID BOHN-BFH GROUP</u>	Owner: <u>FIG DEVELOPMENT</u>
Address: <u>3707 E. SOUTHERN AVE</u>	Address: <u>295 W. CENTER ST</u>
City/ST/Zip: <u>MEGA, AZ 85206</u>	City/ST/Zip: <u>PROVO, UT 84601</u>
Phone: <u>480.734.1446</u>	Phone: <u>801.372.2077</u>
Email: <u>davidb@thebfhgroup.com</u>	Email: <u>garrette@figdev.com</u>
Signature: <u>[Signature]</u>	Signature: _____

(Agreement to act as agent for owner)

(Authorization for agent to act for owner)

- Application Form
- Comprehensive Site Plan
- Deed and/or Title Report
- Drainage Report
- A.L.T.A. Survey
- Phase I Environment Site Assessment
- Preliminary Landscape Plans
- Filing Fee (see Fee Schedule starting on page 9)

NARRATIVE REPORT FOR “FIG – OAKRIDGE FARMS”

Located in the El Mirage, Arizona.

Application for Site Plan and CUP Amendment approval

Prepared For:

FIG DEVELOPMENT

295 W. Center Street

Provo, UT 84601

Ph: 801.372.2077

Attn: Garrett Seely

Prepared By:

BFH *Group*

Ph: 480.734.1446

Email: dmbohn@gmail.com

Attn: David M. Bohn, P.E.

Job # 00201910030

Prepared: September 2020

**NARRATIVE REPORT
FOR “OAKRIDGE FARMS MULTI-FAMILY”**

TABLE OF CONTENTS	PAGE
1. APPLICATION REQUEST	2
2. LOCATION AND DESCRIPTION	2
3. HISTORICAL DATA.....	2
4. OPERATIONAL ASPECTS OF USE	3
5. PROPOSED INFRASTRUCTURE	4
7. DEVELOPMENT SCHEDULE	4
8. SUMMARY	5

1. APPLICATION REQUEST

Per request by the applicant, the purpose of the narrative is to request for a Conditional Use Permit (CUP) Amendment as well as a Site Plan Approval to the proposed 8 acre townhouse residential development located on 12945 W. Greenway Road, El Mirage, AZ 85335.

2. LOCATION AND DESCRIPTION

The proposal is to develop an 8 acre townhouse multi-family residential development with clubhouse, garages and community amenities. The property is located to the east of Dysart Road and just south of Greenway Road and is currently vacant undeveloped land. The site currently has a Conditional Use Permit approval for 180 units. The development is proposing to amend this approval for 194 units.

Immediately west of the proposed site is an existing commercial property that is owned by several owners, but IIP Oasis, LLC is the main. To the south and west of the site, will be proposed commercial pads that are currently undergoing the development process with the City. Coordination with this developer is already initiated.

Access to the property will be proposed at three separate locations. The main access point will be found along the existing road to the east which is nameless. This roadway is considered private, but easement documents allow for ingress and egress to the public. Two secondary access points will be found at the northwest and southwest of the site. The northwest will access via the existing commercial site and will be emergency only, while the southwest entrance will access through the same Private Street loop road.

3. HISTORICAL DATA

This property is surrounded on three sides by existing developments. On the north, is found Greenway Road and an existing residential subdivision (City of Surprise). To the east and south, is located an existing school (Surprise School) which belongs to the Dysart Unified School District. To the west is an existing commercial development that will be expanding along its southern portion.

The property is currently zoned as Urban Corridor (UC) in the City of El Mirage. Based on conversation with city staff, it is understood by the applicant that the City will require an application for a Conditional Use Permit as well as a Site Plan Approval for this property to be approved for multi-family residential use. It is further understood by the applicant that the property has been vacant undeveloped land for well over two decades.

Based on review of the area and the influence of the Luke Air Force Base fly zone, residential development within the City of El Mirage is significantly impacted. The location is ideal as it sits adjacent to an existing elementary school and the site provides a townhouse style product that is much needed within the City.

4. OPERATIONAL ASPECTS OF USE

The Private Street and primary access to the property is intended to remain as is with minor improvements that may include sidewalk and landscaping along its frontage. The secondary access to the commercial property on the west will be coordinated with that property owner / manager. No significant improvements along Greenway Road are anticipated at this time. Review and approval from Dysart Unified School District will be required prior to Construction Permit approval.

The site is a proposed multi-family residential community. It is intended to be gated at the entrances, including the west entrance to the commercial, with view fence along Greenway Road and the private east street. A CMU block wall will be located along the west to act as a barrier to the commercial property.

The property will be managed by either onsite or offsite property management. Either the property management or an established HOA will maintain internal roadways, infrastructure, buildings, landscaping, amenities, etc. Typical hours of operation will be 9 am to 5 pm, but considering the nature of the property, it is understood that these hours are not absolute. It is anticipated that the development is intended for newly married / younger family and retiree residents.

5. PROPOSED INFRASTRUCTURE

Electric service is provided by APS. Domestic Water and sewer will be provided by the City of El Mirage. Refuse is by private contract. Police is provided by the City of El Mirage. Fire is the City of El Mirage. No natural gas will be used on the project. All utilities within the site will be privately operated and maintained.

PUBLIC UTILITIES	SERVICE PROVIDERS
Fire Protection	El Mirage
Police Protection	El Mirage
School District	Dysart Unified School District
Water	El Mirage
Wastewater	El Mirage
Telephone	Century Link, Cox
Natural Gas	NA
Refuse	Private Contractor
Electric	APS

As noted, Greenway Road is fully developed as well as the Private Street loop road surrounding the property along the east and south. Although any major improvements to the existing infrastructure is not anticipated, a full traffic impact study will be provided with the Development Application submittal. As part of the improvements to the site, the existing drainage pattern will be altered however the developer and his engineer will ensure that all onsite retention requirements are met. At time of the Development Application, a full Drainage Report shall be provided for approval.

6. DEVELOPMENT SCHEDULE

It is not expected that this property will be developed in phases. A development schedule has not been established as of yet, however it is expected that the permit and entitlement process at the City will take approximately 8-12 months for final approvals. At which time, the developer will initiate construction and constructions is expected to take another 9-12 months depending on market conditions.

7. SUMMARY

The Oakridge Farms site is ideal for a multi-family development. There is a demand in the area for affordable housing in El Mirage and inadequate supply. More housing in this area will generate a higher demand for commerce, including supermarkets, convenience stores, offices, retail, etc. It is the intent and desire of the developer to work hand in hand with the City as well as the neighbors to create a viable development that benefits not only the existing neighborhood, but also the future residents.

LEGAL DESCRIPTION:

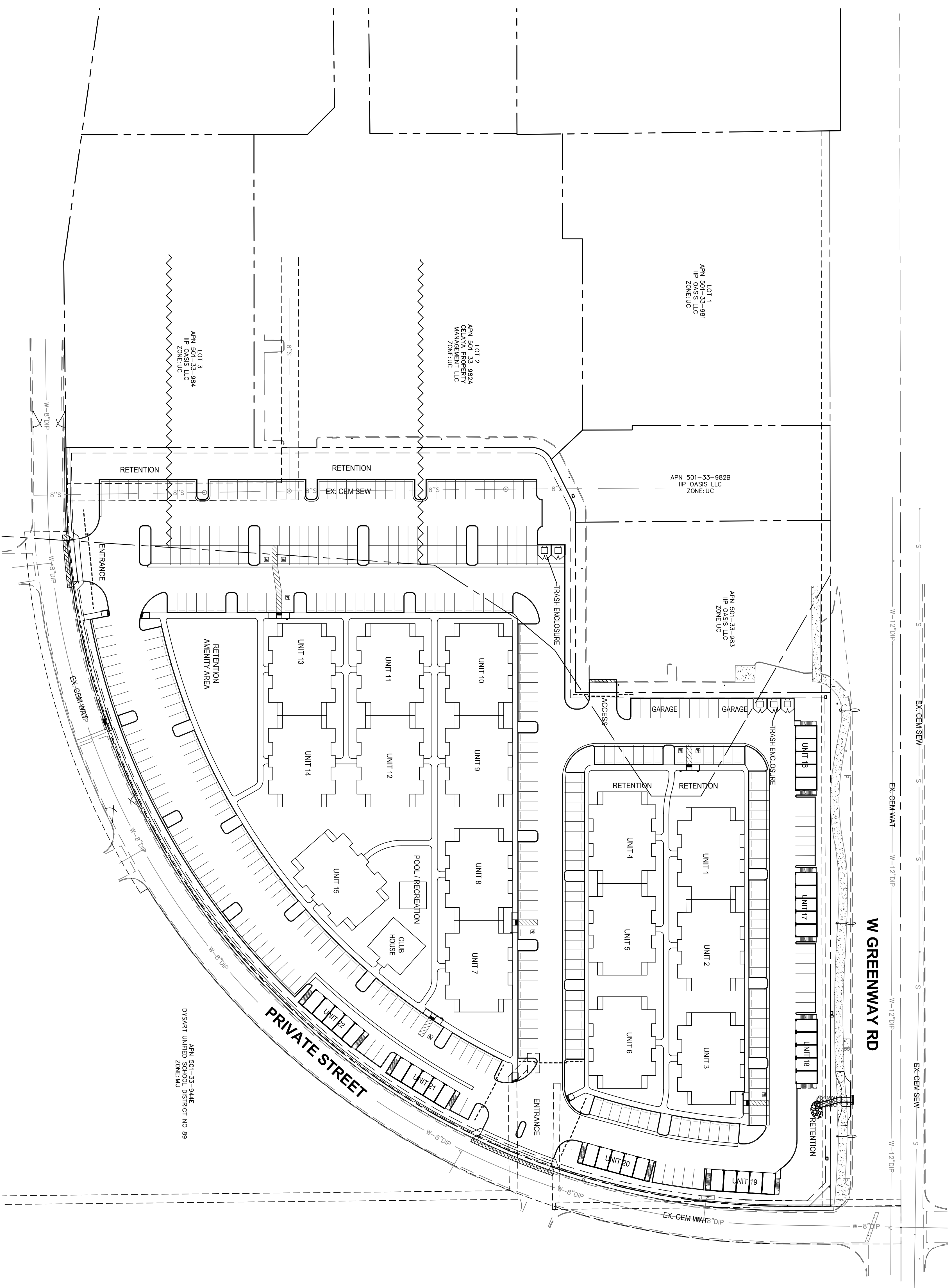
THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE COUNTY OF MARICOPA, STATE OF ARIZONA, AND IS DESCRIBED AS FOLLOWS:
 PARCEL NO. 1:
 LOT 6, MIRAGE OASIS, ACCORDING TO THE PLAT RECORDED IN BOOK 976 OF MAPS, PAGE 17 AND CERTIFICATE OF CORRECTION RECORDED IN RECORDING NO. 2009-0228969, RECORDS OF MARICOPA COUNTY, ARIZONA.
 PARCEL NO. 2:
 NON-EXCLUSIVE EASEMENT RIGHTS APPURTENANT TO PARCEL NO. 1 ABOVE AS SET FORTH IN RECIPROCAL ACCESS EASEMENT AGREEMENT IN RECORDED IN RECORDING NO. 2009-0768147, RECORDS OF MARICOPA COUNTY, ARIZONA.
 PARCEL NO. 3:
 A NON-EXCLUSIVE EASEMENT FOR PEDESTRIAN AND VEHICULAR INGRESS AND EGRESS AS SET FORTH IN EASEMENT AGREEMENT RECORDED IN RECORDING NO. 20041290781, RECORDS OF MARICOPA COUNTY, ARIZONA.

SITE PLAN - AMENDMENT

FOR

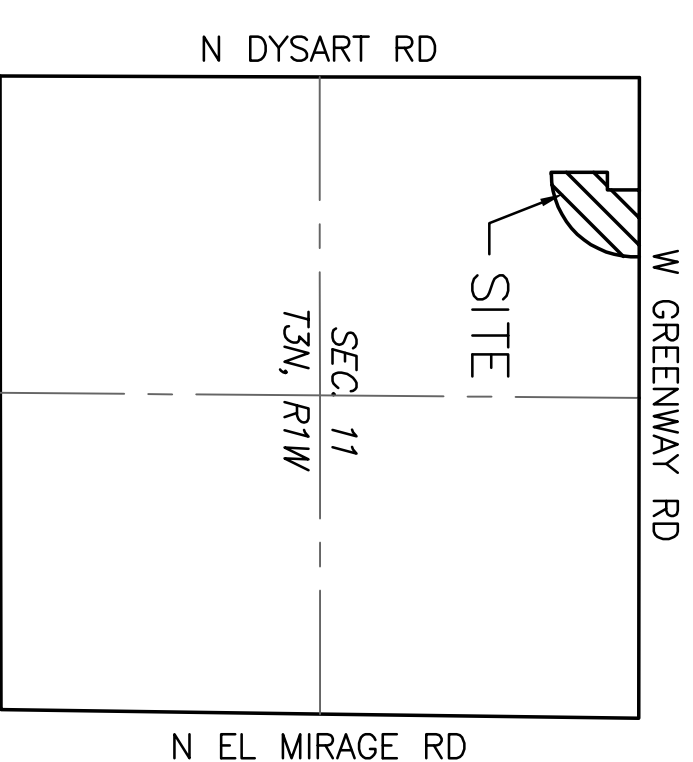
OAKRIDGE FARMS

EL MIRAGE, ARIZONA
 A PORTION OF NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 3 NORTH,
 RANGE 1 WEST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN,
 MARICOPA COUNTY, ARIZONA



W GREENWAY RD

PRIVATE STREET



W WADELL RD

N EL MIRAGE RD

VICINITY MAP

N.T.S.

DEVELOPER

FIG DEVELOPMENT
 295 W. CENTER STREET
 PROVO, UT 84601
 PHONE: 801.372.2077
 ATTN: GARRETT SEELY

ENGINEER

BFH GROUP
 3707 E. SOUTHERN AVENUE
 MESA, ARIZONA, 85206
 PHONE: 480.734.1446
 ATTN: DAVID M. BOHN

SURVEYOR

HARVEY LAND SURVEYING, INC.
 P.O. BOX 10772
 CASA GRANDE, ARIZONA, 85130
 PHONE: 520.876.4786
 ATTN: COLIN D. HARVEY

BENCHMARK

THE NORTHEAST CORNER OF SECTION 10 TOWNSHIP 3 NORTH, RANGE 1 WEST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, SAID POINT ALSO BEING GDAC POINT NUMBER 30826-1 DESCRIBED AS A FOUND BRASS CAP IN A HANDHOLE 0.5', STAMPED 'CITY OF SURPRISED', ELEVATION = 1166.317' (NAVD 88 DATUM)

BASIS OF BEARING

THE WEST LINE OF THE NORTHWEST QUARTER OF SECTION 11, TOWNSHIP 3 NORTH, RANGE 1 WEST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA BEARING N00°40'25"W. (ASSUMED BEARING)

FLOOD NOTE:

ZONE "X" (SHADED) IS LABELED AS: AREAS OF 0.2% ANNUAL CHANCE FLOOD. AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD.

ZONE "AE" IS LABELED AS: AN AREA INUNDAED BY 1% ANNUAL CHANCE OF FLOODING, FOR WHICH BFES HAVE BEEN DETERMINED.

KEY MAP
 1" = 50'

PROJECT DESCRIPTION

A PROPOSED 8+ ACRE MULTI-FAMILY RESIDENTIAL DEVELOPMENT CONSISTING OF 194 UNITS, LOCATED SOUTHEAST OF INTERSECTION OF DYSART ROAD AND GREENWAY ROAD IN EL MIRAGE, AZ.

NOT APPROVED FOR CONSTRUCTION

	JOB NO. 201910030
SHEET NO. 1	1 OF 1

CALL TWO WORKING DAYS BEFORE YOU DIG
(602) 263-1100
 1-800-STAKE-IT
 (OUTSIDE MARICOPA COUNTY)

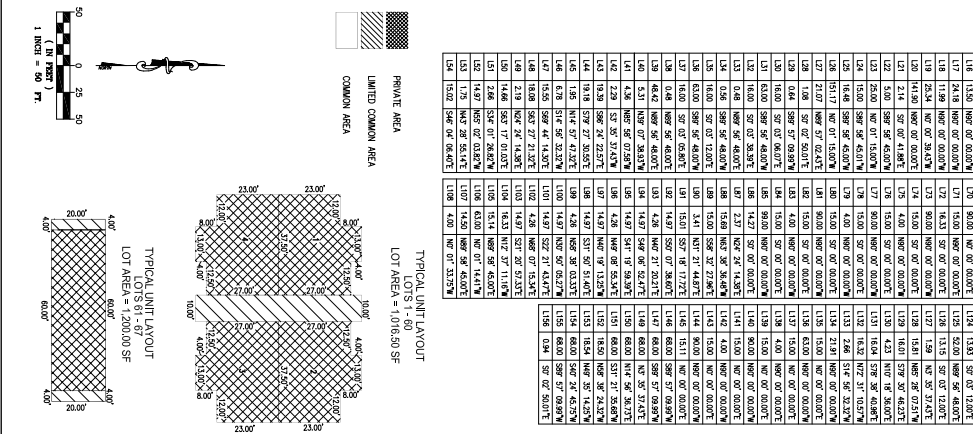
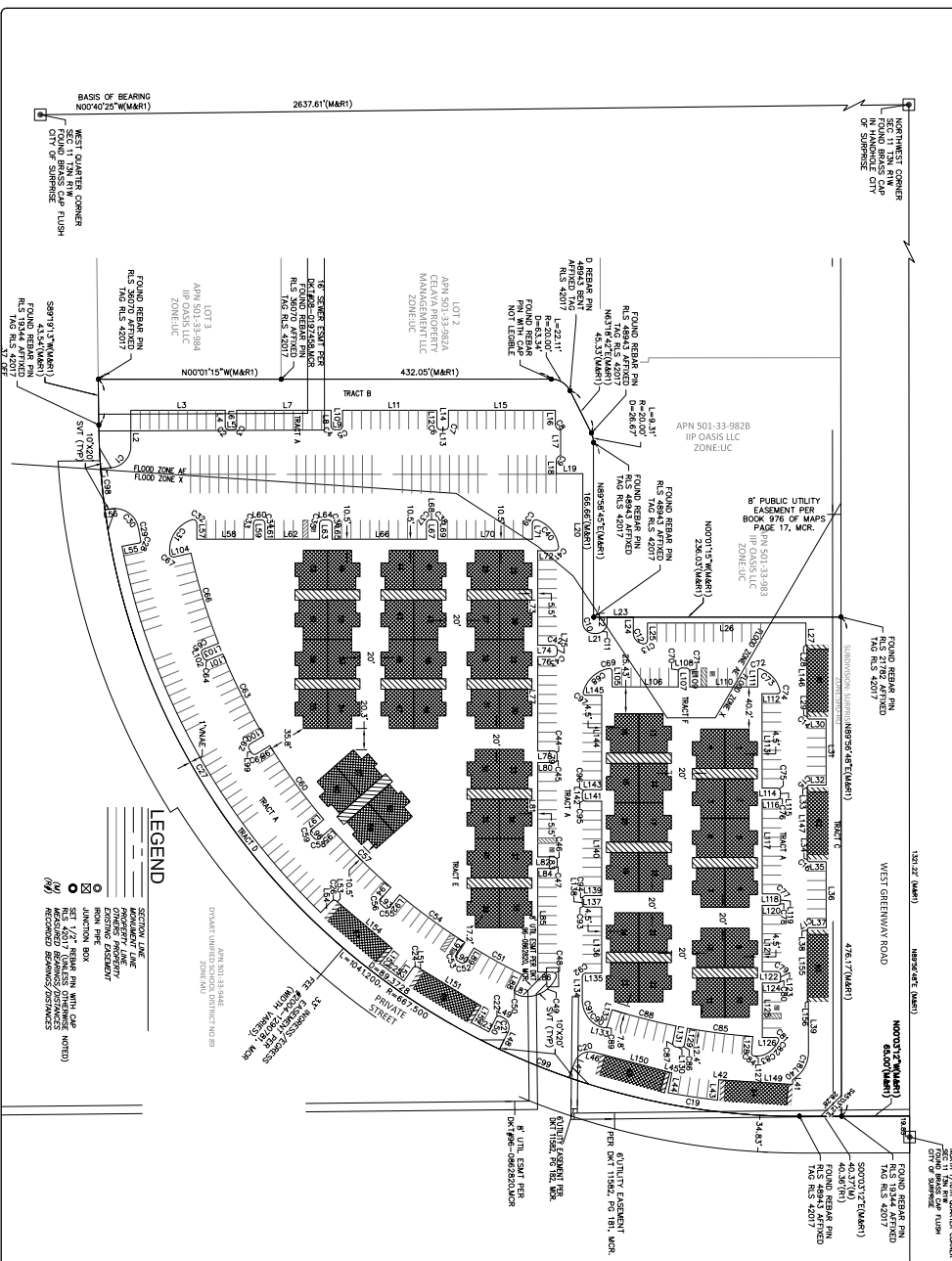
COVER SHEET

PROJECT: **FIG DYSART AND GREENWAY**
 MULTI-FAMILY
 EL MIRAGE, ARIZONA

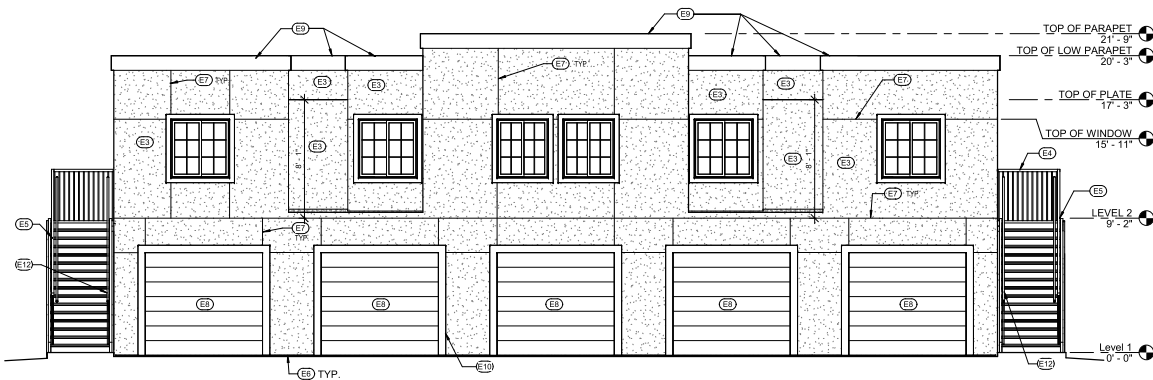
NO.	REVISIONS:

BFH GROUP
 2621 EAST CARMEL CIRCLE
 MESA, ARIZONA, 85204
 PHONE: 480.734.1446

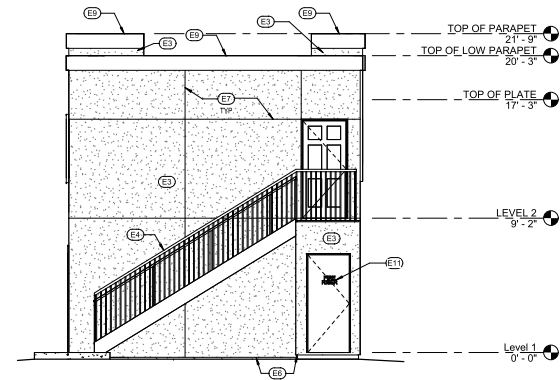
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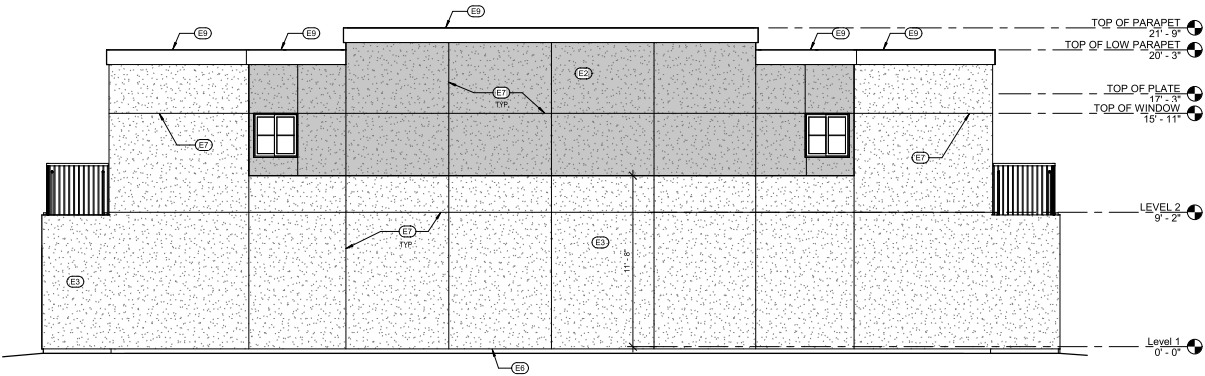
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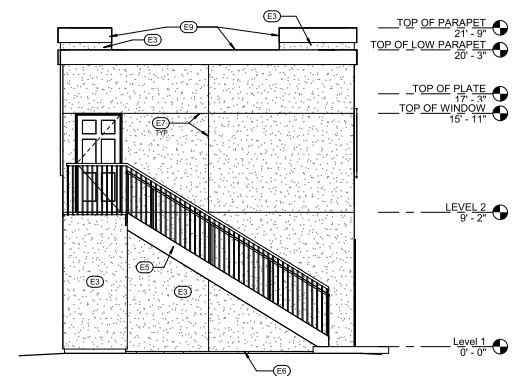
1 FRONT ELEVATION
1/4" = 1'-0"



2 RIGHT SIDE ELEVATION
1/4" = 1'-0"



3 REAR ELEVATION
1/4" = 1'-0"



4 LEFT SIDE ELEVATION
1/4" = 1'-0"

KEYNOTES	
E2	3" DEEP FOAM LAYER WITH STUCCO FINISH. WRAP STUCCO INTO WINDOW OPENING
E3	TYPICAL STUCCO SYSTEM ON 1" RIGID INSULATION
E4	42" TALL METAL GUARDRAIL. GUARDRAIL PANEL STYLE SHALL PREVENT THE PASSAGE OF 4" DIA. SPHERE.
E5	STAIRS WITH 36" HANDRAIL & 42" TALL GUARDRAIL
E6	WEEP SCREEN PER BASE OF WALL DETAIL, TYP. AT BOTTOM OF WALLS
E7	CONTROL/EXPANSION JOINT. PROVIDE 9" SELF-ADHERING BITUMINOUS FLASHING CENTERED UNDER JOINT
E8	SECTIONAL GARAGE DOOR
E9	2" DEEP X 12" PARAPET CORNICE WITH SMOOTH STUCCO FINISH. SLOPE TOP TO OUTSIDE. PROVIDE SELF-ADHERING FLEXIBLE MEMBRANE FLASHING AT TOP AND DOWN 4" EACH FACE.
E10	1" DEEP X 6" WIDE FOAM TRIM WITH STUCCO FINISH, TYP. ALL GARAGE DOORS
E11	3" TALL PAINTED LETTERS, CONTRASTING WITH DOOR PAINT
E12	36" TALL HANDRAIL

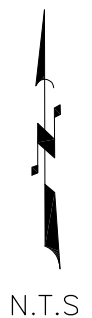
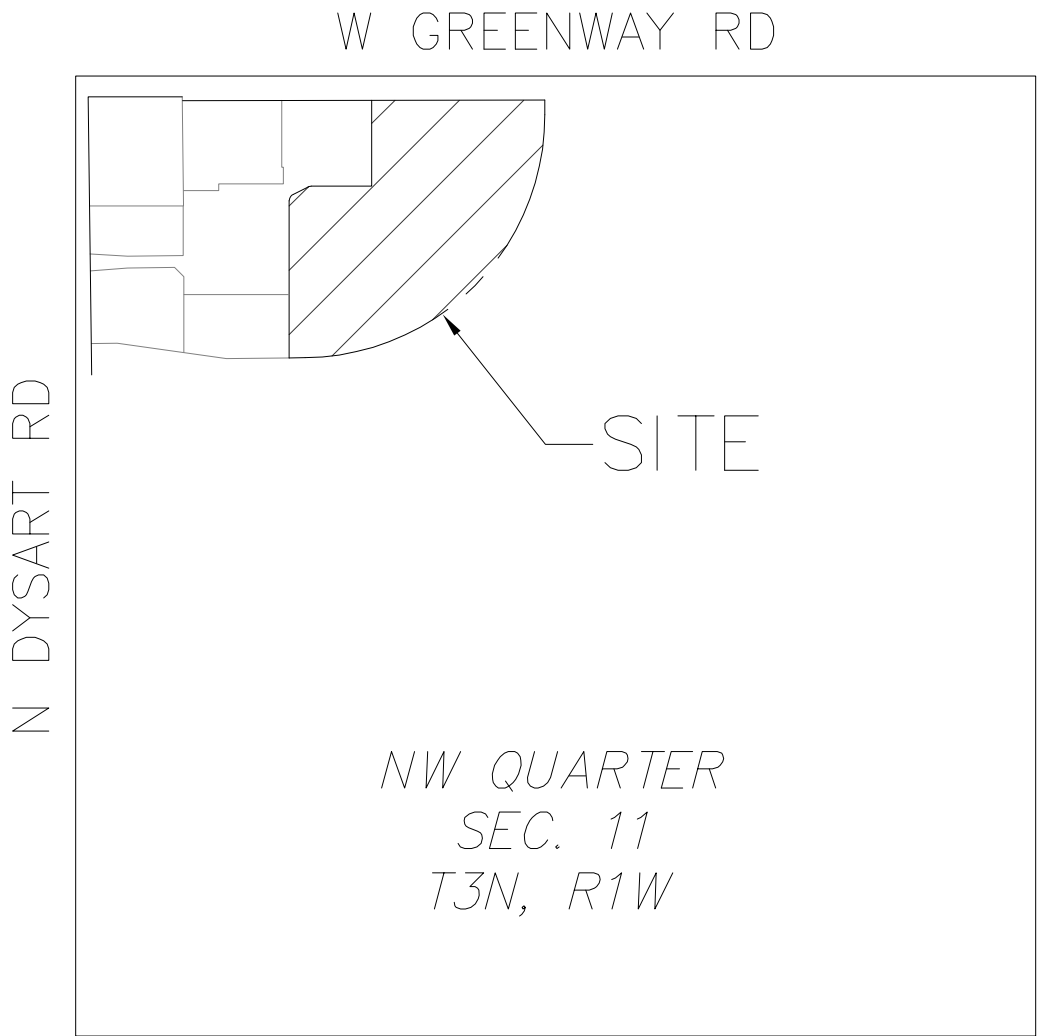
MOORADIAN & ASSOCIATES
4578 N. First Avenue, Suite 140 Tucson, AZ 85718
T: (520) 408-8117 F: (520) 408-0028

PROJECT NO: 10953a
DATE: 06/09/20
DRAWN BY: Author
CHECKED BY: Checker
SCALE: 1/4" = 1'-0"
SHEET TITLE:
EXTERIOR ELEVATIONS
DRAWING NO:
A2.1

Sierra Building
VILLAGE AT GREENWAY
DYSART RD & GREENWAY RD
EL MIRAGE, AZ

CLIENT:
VOLLKOMMEN CONSTRUCTION

MARK	DATE	DESCRIPTION



BFH GROUP 3707 E. SOUTHERN AVENUE MESA, ARIZONA, 85206 PHONE: 480.734.1446	VICINITY MAP	
	"OAKRIDGE FARMS" EL MIRAGE, ARIZONA <small>JOB #: 201910030</small>	FIGURE 1

FINAL DRAINAGE REPORT FOR “OAKRIDGE FARMS”

**Located in City of El Mirage, Maricopa County,
ARIZONA.**

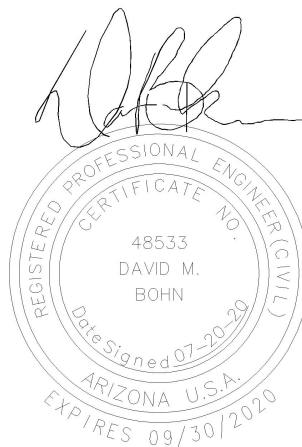
Prepared For:

FIG DEVELOPMENT
295 W. Center Street
Provo, UT 84601
Ph: 801.372.2077
Attn: Garrett Seely

Prepared By:

BFH Group

3707 E. Southern Avenue
Mesa, AZ 85206
PH: 480.734.1446
EMAIL: dmbohn@gmail.com
Attn: David M. Bohn, P.E.



Job # 00201910030
Prepared: June 2020

**FINAL DRAINAGE REPORT
FOR “OAKRIDGE FARMS”**

TABLE OF CONTENTS		PAGE
1.0	Introduction.....	1
2.0	Location.....	1
3.0	Site Description and Existing Development.....	1
4.0	FEMA Floodplain Classification.....	1
5.0	Offsite Drainage Description.....	2
5.1	Background.....	2
5.2	Existing Off-site Flow Management.....	2
6.0	On-site Drainage Design Description.....	2
7.0	Hydrology.....	3
7.1	Methodology.....	3
7.2	Parameters.....	3
7.3	Results.....	4
7.4	Confidence Checks and Sensitivity Analysis.....	4
8.0	Hydraulics.....	4
8.1	Methodology.....	4
8.2	Parameters.....	4
8.3	Results.....	4
8.4	Confidence Checks and Sensitivity Analysis.....	4
9.0	Storm Water Retention and First Flush Requirements.....	4
10.0	Minimum Finished Floor Elevation Requirements.....	5
11.0	Storm Water Pollution Prevention Plan (SWPPP).....	5
12.0	Sedimentation and Erosion Hazards Discussion.....	5
13.0	Storm Water Permits Requirements.....	5
14.0	Conclusions and Recommendations.....	5
15.0	References.....	6

FIGURES:

- Figure 1 Vicinity Map
- Figure 2 FIRM
- Figure 3 On-site Drainage Map

APPENDICES:

- Appendix A On-site Hydrology Supporting Calculations

1.0 INTRODUCTION

The Oakridge Farms is a proposed residential development located at the southeast corner of Dysart Road and Greenway Road. The Oakridge Farms is a portion of land located in northwest quarter of Section 11, T3N, R1W of the Gila and Salt River Meridian, Maricopa County, Arizona. See the attached Vicinity Map (Figure 1) for the general site location.

The approximate gross acreage of the Oakridge Farms is approximately 8 total acres and is currently zoned as Urban Corridor (UC). The general topography of the site demonstrates a gentle slope from the northeast to southwest.

The purpose of this report is to describe the conceptual grading and drainage design for this site, including connections to existing system.

2.0 LOCATION

The Oakridge Farms is a portion of land located in northwest quarter of Section 11, T3N, R1W of the Gila and Salt River Base and Meridian, Maricopa County, Arizona. See the attached Vicinity Map (Figure 1) for the general site location.

3.0 SITE DESCRIPTION AND EXISTING DEVELOPMENT

Immediately west of the proposed site is an existing commercial property that is owned by several owners, but IIP Oasis, LLC is the main. To the south and west of the site, will be proposed commercial pads that are currently undergoing the development process with the City. Coordination with this developer is already initiated.

4.0 FEMA FLOODPLAIN CLASSIFICATION

Maricopa County, Arizona Flood Insurance Rate Map (FIRM) panel number 04016C1680L, dated 10/16/2013 indicates that this site falls within Flood Zone "X" and Flood Zone "AE"

(see Figure 2). Zone "X" (shaded) is defined by the Federal Emergency Management Agency as: Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. Zone "AE" is defined as an area inundated by 1% annual chance flooding, for which BFEs have been determined.

There are no habitable structures proposed within Flood Zone AE and the historical drainage pattern is designed to be maintained.

5.0 OFFSITE DRAINAGE DESCRIPTION

5.1 BACKGROUND

The project site is bounded by an existing commercial development to the west, an existing residential subdivision Surprise South II to the north and Greenway Road, an existing elementary school, Surprise Elementary, to the east and south. The topography around the site slopes from northeast to southwest at an approximate overall slope of 0.50%. Considering the infill nature of the site, the existing developments that surround the property, it is assumed that each individual development will retain its own drainage for the 100 yr 1 hr event.

The majority of the property is found within flood Zone X, however a portion of the property along the west side is inundated by flood Zone AE. Based on the current site plan, it is not intended by the developer to propose residential units in this area. All that will be proposed in this area includes open parking and open space. The proposed grading for the site will allow the existing flood plain Zone AE to be conveyed through the property without inundating the proposed residential units as well as the existing commercial or school surrounding the property.

Proposed grading and drainage for the site will retain the 100 yr 1 hr storm event and will reduce the existing runoff flow rate to the south. Based on the proposed grading and drainage design for Oakridge Farms and the existing grading immediately adjacent to the site, offsite flows onto the site will be negligibly impacted and onsite flows offsite will be reduced.

5.2 EXISTING OFFSITE FLOW MANAGEMENT

As described above, it is not expected that the development of this property will negatively impact the existing flows in the area.

6.0 ONSITE DRAINAGE DESIGN DESCRIPTION

The drainage areas are delineated based on proposed layout. Figure 3 shows the proposed drainage areas and drainage patterns. Onsite runoff will enter the retention basins and underground storage via proposed catch basins and storm drain pipes. The provided retention

basins are sufficient to hold the runoff volume generated by 100yr-1hr storm event per City of El Mirage standards; 2.40 inches depth of precipitation.

The runoff coefficient (C-value) for determining the 100-year peak flow was obtained from Table 3.2 of the Maricopa County Drainage Design Manual, Hydrology. A C-value of 0.85 was utilized for the overall consideration of this site and 0.95 for the offsite evaluation. See Appendix A for detailed calculations.

The retention storage for this project will be provided in the form of open retention basins. The supporting calculations indicate that sufficient storage is provided to retain 100yr-1hr storm. Figure 3 shows the onsite retention drainage area. To be based on future infield observations by Torrent Resources, an assumed percolation rate of 0.10 cfs is utilized to determine the quantity of drywells needed. A total of 6 drywells are proposed to drain the basins within 36 hours. Upon installation, the contractor shall be responsible to test the drywells to ensure that the integrity of the design is maintained.

7.0 HYDROLOGY

7.1 METHODOLOGY

Since this site and all contributing areas are less than 160 acres, the Rational Method was utilized for the hydrology and drainage design standards. The standard equation for this is:

$Q=CiA$, where Q is the runoff flow, C is the runoff coefficient, and i represents the rainstorm intensity, and A is the contributing area. Another equation used in this analysis which is related to the above mentioned:

$V=C*D*A$, where V is the required volume, C is the weighted runoff coefficient, P is the 100 year 1 hour rainfall depth (2.40 inches) and A is the contributing area. See Appendix A for more detailed calculations.

7.2 PARAMETERS

Considering the existing development and the aforementioned methodology, the following are the development parameters:

- a) The site will retain runoff generated by 100-year 1-hour storm event.
- b) Maximum retention basin side slopes is 4:1.

- c) All retention basins will drain within 36 hours by means of drywells.
- d) Finished floors shall be set at a minimum of 14 inches above the ultimate site outfall, 12 inches above the high water level of the corresponding retention basins, and 12 inches above the base flood elevations.

7.3 RESULTS

In order to comply with City of El Mirage Development Standards Manual, the following shall be implemented:

- a) Four proposed retention basins will retain 100 year, 1 hour storm as required by the City. See Appendix A for supporting calculations.
- b) A maximum slope of 4:1 is the current conditions.
- c) All the proposed retention basins shall be drained within the specified 36 hour timeframe via drywells.

7.4 CONFIDENCE CHECKS AND SENSITIVITY ANALYSIS

An overall excess of 4% retention is provided. This may accommodate for a storm that may exceed the 100 year, 1 hour storm. Should a storm exceeding the 100 year event or two 100 year events back to back occurs, basins shall fill to capacity and begin to outfall to the south-west, and will continue its historical drainage pattern.

8.0 HYDRAULICS

8.1 METHODOLOGY

Not Applicable.

8.2 PARAMETERS

Not Applicable.

8.3 RESULTS

Not Applicable.

8.4 CONFIDENCE CHECKS AND SENSITIVITY ANALYSIS

Not Applicable.

9.0 STORMWATER RETENTION AND FIRST FLUSH REQUIREMENTS

As mentioned in Section 7 of this report, the Oakridge Farms is a multi-family residential development that will make provisions to retain the storm water runoff from the 100-year, 1-

hour duration storm. Retention basins have been sized to retain the entire storm event with 4% excess.

10.0 MINIMUM FINISHED FLOOR REQUIREMENTS

All the structures that are being proposed in this subdivision will be raised sufficiently such that it shall be a minimum of 14" above all local and ultimate outfall locations to avoid any possibility of flooding damage, 12 inches above the high water level of the corresponding retention basins, and 12 inches above the base flood elevations. All finished floor elevations are protected from onsite and offsite flows within the right of way and / or those flowing through.

11.0 STORMWATER MANAGEMENT PLAN (SWPPP)

A Stormwater Management Plan has been submitted with the engineering documents.

12.0 SEDIMENTATION AND EROSION HAZARDS

The potential for sedimentation and erosion hazards within the site are minimal at best and should be considered negligible.

13.0 STORMWATER PERMITS REQUIREMENTS

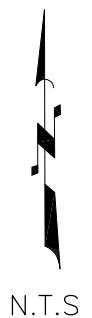
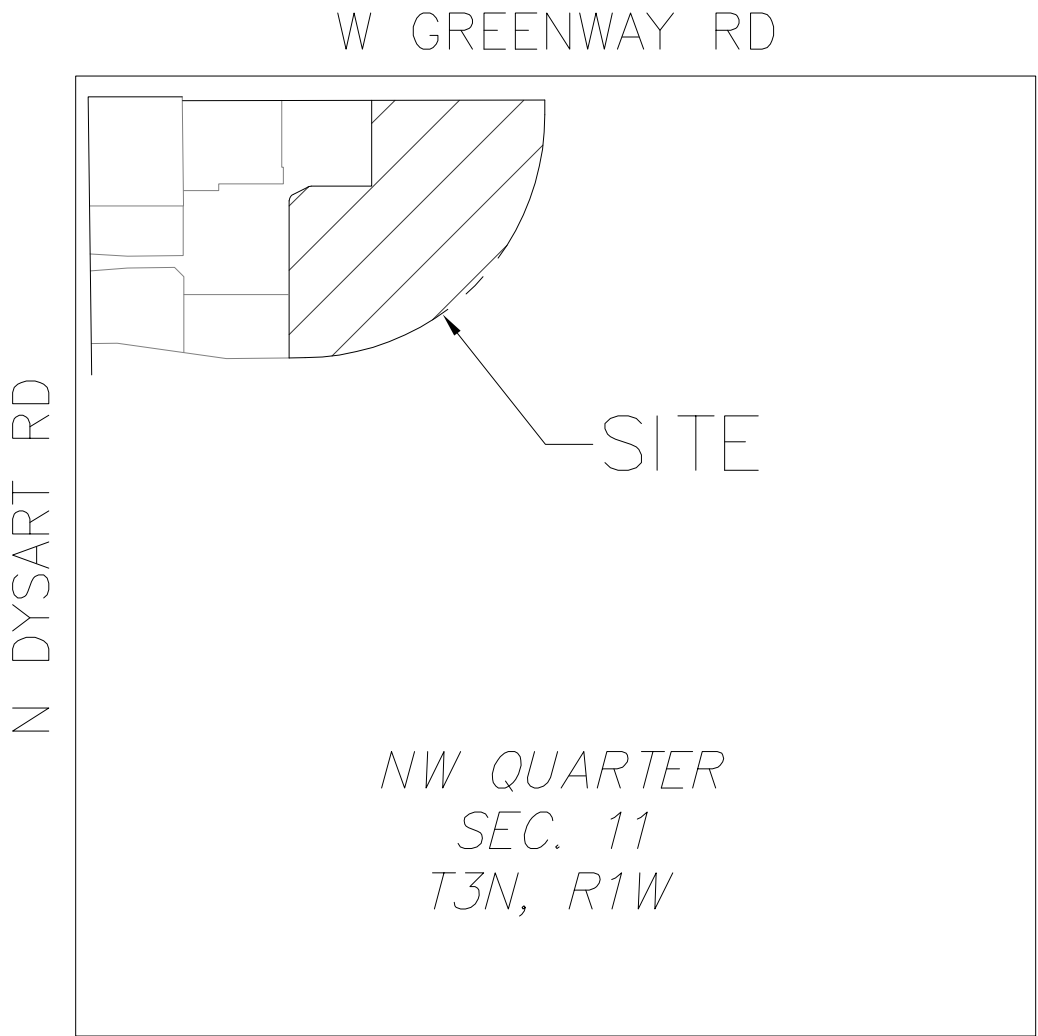
Construction permits for this project will be obtained through the City of El Mirage.

14.0 CONCLUSIONS & RECOMMENDATIONS

1. The proposed grading design will mitigate any ponding of onsite flows within the project boundary and would ultimately outfall the onsite flows at the historical outfall location at the southwest side of the property.
2. Seven retention basins are designed to retain the runoff volumes generated by the 100-year 2-hour storm precipitation. Storm water flows from events exceeding the 100-year storm will flow through the site and exit to the historical outfall location at the southwest corner of the project boundary while maintaining the historical drainage pattern.
3. All habitable structures are proposed to be a minimum of 14" above the local and ultimate outfall elevations.
4. The site is located partially within a flood zone – Zone AE. No habitable structure is proposed within Zone AE.

15.0 REFERENCES

1. Federal Emergency Management Agency, National Flood Insurance Rate Map, Maricopa County, Arizona, Panel Number 04013C1680L, effective 10/16/2013.
2. City of El Mirage Design Standards Manual
3. FCDMC Drainage Design Manual, Volume-I, Hydrology.
4. FCDMC Drainage Design Manual, Volume-2, Hydraulics.
5. Drainage Policies and Standards for Maricopa County, Arizona.



BFH GROUP 3707 E. SOUTHERN AVENUE MESA, ARIZONA, 85206 PHONE: 480.734.1446	VICINITY MAP	
	"OAKRIDGE FARMS" EL MIRAGE, ARIZONA <small>JOB #: 201910030</small>	<small>FIGURE</small> 1

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

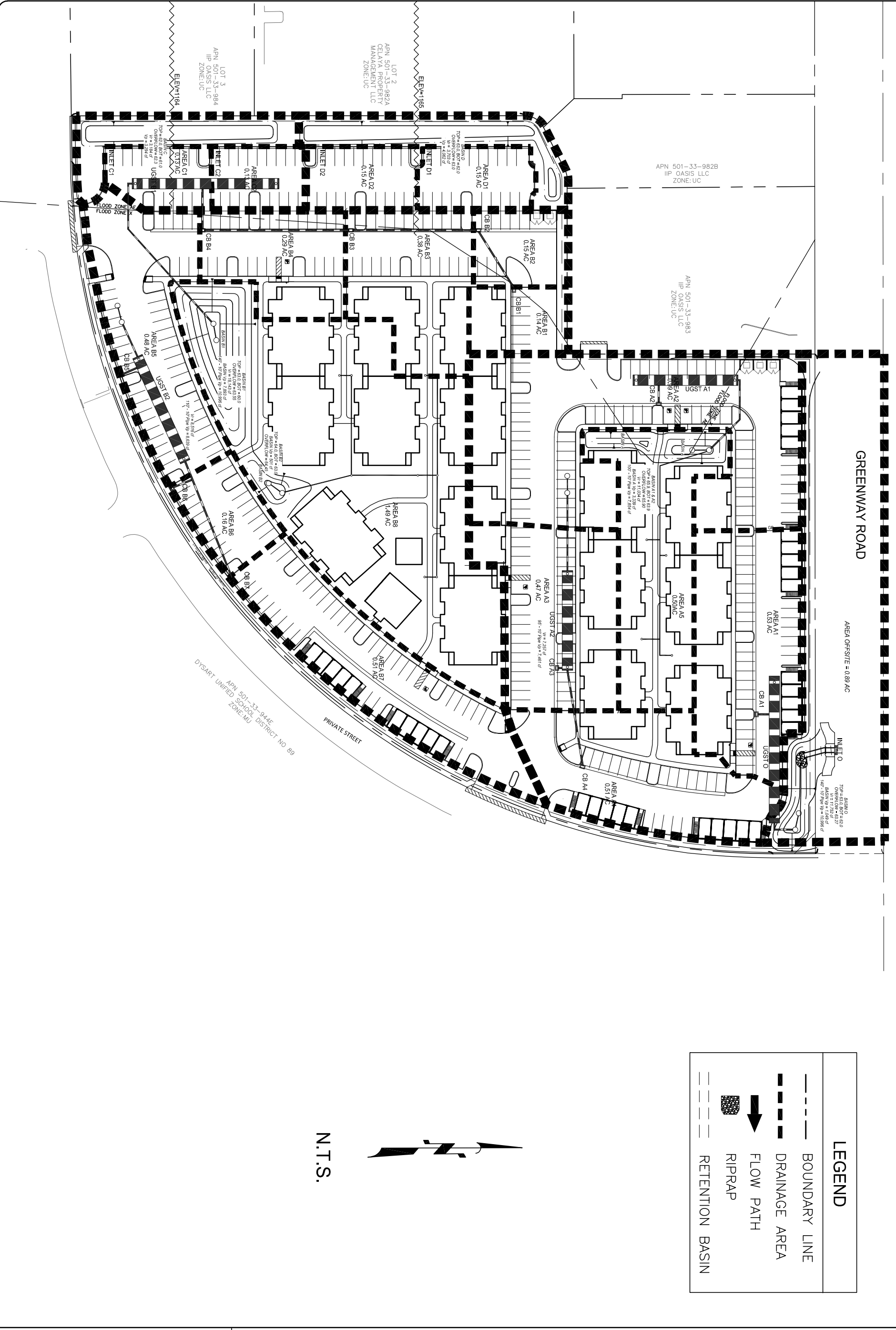
	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway

	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee, See Notes, Zone X
	Area with Flood Risk due to Levee Zone D

	NO SCREEN
	Area of Minimal Flood Hazard Zone X
	Area of Undetermined Flood Hazard Zone D

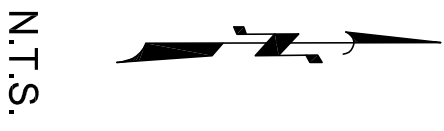
	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall

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LEGEND

- BOUNDARY LINE
- - - DRAINAGE AREA
- FLOW PATH
- ▨ RIPRAP
- ▭ RETENTION BASIN



ONSITE DRAINAGE MAP

PROJECT:
"OAKRIDGE FARMS"

EL MIRAGE, ARIZONA

BFH GROUP
 3707 E. SOUTHERN AVENUE
 MESA, ARIZONA 85206
 PHONE: 480.734.1446

Job No.: 201910030	Drawn By: DMB
Checked: DB	1st Submission:
2nd Submission:	3rd Submission:
JOB NO. 201910030	
FIGURE 3	

APPENDIX A



NOAA Atlas 14, Volume 1, Version 5
Location name: El Mirage, Arizona, USA*
Latitude: 33.6225°, Longitude: -112.3389°
Elevation: 1166.9 ft**
 * source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

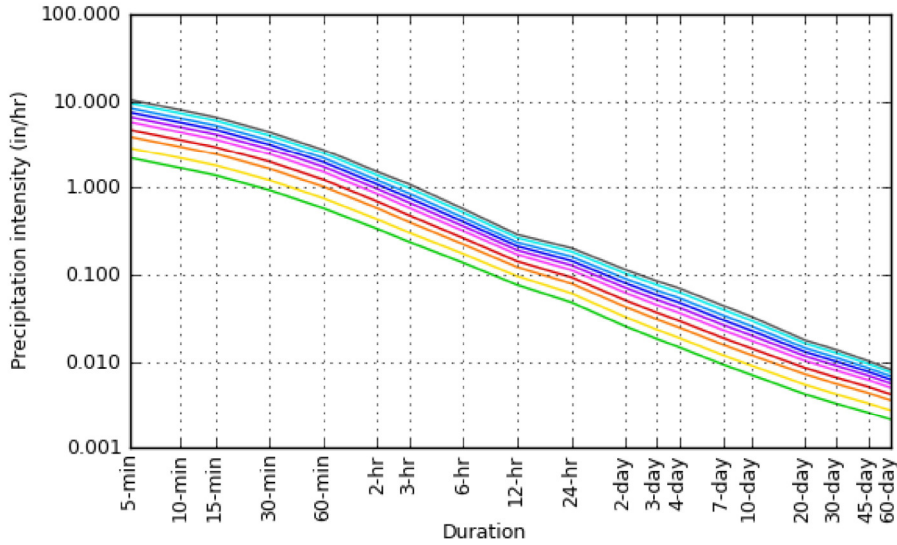
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.21 (1.79-2.78)	2.88 (2.33-3.64)	3.91 (3.14-4.92)	4.70 (3.77-5.89)	5.78 (4.58-7.22)	6.62 (5.16-8.23)	7.49 (5.74-9.30)	8.38 (6.31-10.4)	9.56 (7.02-11.9)	10.5 (7.52-13.0)
10-min	1.68 (1.36-2.12)	2.19 (1.78-2.77)	2.98 (2.39-3.74)	3.58 (2.87-4.48)	4.40 (3.49-5.50)	5.04 (3.93-6.26)	5.70 (4.37-7.07)	6.38 (4.80-7.92)	7.28 (5.34-9.05)	7.96 (5.72-9.91)
15-min	1.39 (1.12-1.75)	1.81 (1.46-2.28)	2.46 (1.98-3.09)	2.96 (2.37-3.70)	3.64 (2.88-4.54)	4.16 (3.25-5.18)	4.71 (3.61-5.84)	5.27 (3.97-6.55)	6.01 (4.42-7.48)	6.58 (4.73-8.19)
30-min	0.934 (0.756-1.18)	1.22 (0.986-1.54)	1.65 (1.33-2.08)	1.99 (1.60-2.49)	2.45 (1.94-3.06)	2.81 (2.19-3.49)	3.17 (2.43-3.94)	3.55 (2.67-4.41)	4.05 (2.97-5.04)	4.43 (3.19-5.51)
60-min	0.578 (0.467-0.730)	0.753 (0.611-0.952)	1.02 (0.824-1.29)	1.23 (0.988-1.54)	1.52 (1.20-1.89)	1.74 (1.35-2.16)	1.96 (1.50-2.44)	2.20 (1.65-2.73)	2.51 (1.84-3.12)	2.74 (1.97-3.41)
2-hr	0.334 (0.276-0.412)	0.430 (0.355-0.533)	0.578 (0.474-0.711)	0.690 (0.562-0.848)	0.844 (0.677-1.03)	0.962 (0.761-1.17)	1.09 (0.844-1.32)	1.21 (0.924-1.47)	1.38 (1.03-1.68)	1.52 (1.11-1.84)
3-hr	0.238 (0.195-0.295)	0.304 (0.251-0.379)	0.402 (0.331-0.499)	0.479 (0.392-0.590)	0.585 (0.471-0.715)	0.670 (0.531-0.818)	0.760 (0.592-0.927)	0.855 (0.654-1.04)	0.988 (0.734-1.20)	1.10 (0.793-1.34)
6-hr	0.137 (0.116-0.165)	0.173 (0.147-0.209)	0.223 (0.188-0.268)	0.263 (0.220-0.314)	0.317 (0.261-0.378)	0.360 (0.292-0.428)	0.405 (0.323-0.480)	0.452 (0.354-0.536)	0.517 (0.394-0.614)	0.569 (0.424-0.677)
12-hr	0.076 (0.065-0.090)	0.096 (0.083-0.113)	0.122 (0.104-0.143)	0.142 (0.121-0.167)	0.170 (0.143-0.198)	0.191 (0.158-0.222)	0.212 (0.174-0.248)	0.235 (0.189-0.274)	0.265 (0.208-0.311)	0.289 (0.222-0.341)
24-hr	0.048 (0.042-0.055)	0.061 (0.054-0.070)	0.079 (0.069-0.090)	0.093 (0.081-0.106)	0.113 (0.098-0.127)	0.128 (0.111-0.145)	0.144 (0.124-0.163)	0.161 (0.137-0.182)	0.184 (0.155-0.208)	0.202 (0.168-0.229)
2-day	0.026 (0.022-0.029)	0.033 (0.028-0.038)	0.043 (0.037-0.049)	0.051 (0.044-0.058)	0.062 (0.053-0.071)	0.071 (0.060-0.081)	0.080 (0.068-0.091)	0.090 (0.075-0.103)	0.103 (0.086-0.118)	0.114 (0.094-0.131)
3-day	0.018 (0.016-0.021)	0.023 (0.020-0.027)	0.031 (0.027-0.035)	0.037 (0.032-0.042)	0.045 (0.039-0.052)	0.051 (0.044-0.059)	0.058 (0.050-0.067)	0.066 (0.055-0.075)	0.076 (0.063-0.087)	0.084 (0.070-0.097)
4-day	0.015 (0.013-0.017)	0.019 (0.016-0.022)	0.025 (0.022-0.029)	0.029 (0.026-0.034)	0.036 (0.031-0.042)	0.042 (0.036-0.048)	0.048 (0.041-0.055)	0.054 (0.045-0.062)	0.063 (0.052-0.072)	0.070 (0.058-0.080)
7-day	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.016 (0.014-0.018)	0.019 (0.016-0.022)	0.023 (0.020-0.027)	0.027 (0.023-0.031)	0.030 (0.026-0.035)	0.034 (0.029-0.039)	0.040 (0.033-0.046)	0.044 (0.036-0.051)
10-day	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.014 (0.012-0.016)	0.018 (0.015-0.020)	0.020 (0.017-0.023)	0.023 (0.020-0.026)	0.026 (0.022-0.029)	0.030 (0.025-0.034)	0.033 (0.027-0.038)
20-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.009 (0.007-0.010)	0.010 (0.009-0.012)	0.012 (0.010-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.016)	0.016 (0.014-0.018)	0.018 (0.015-0.020)
30-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.006 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.009 (0.008-0.010)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.014)	0.014 (0.012-0.016)
45-day	0.003 (0.002-0.003)	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.010)	0.009 (0.008-0.011)	0.010 (0.009-0.012)
60-day	0.002 (0.002-0.002)	0.003 (0.002-0.003)	0.004 (0.003-0.004)	0.004 (0.004-0.005)	0.005 (0.004-0.006)	0.006 (0.005-0.006)	0.006 (0.005-0.007)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.008 (0.007-0.009)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

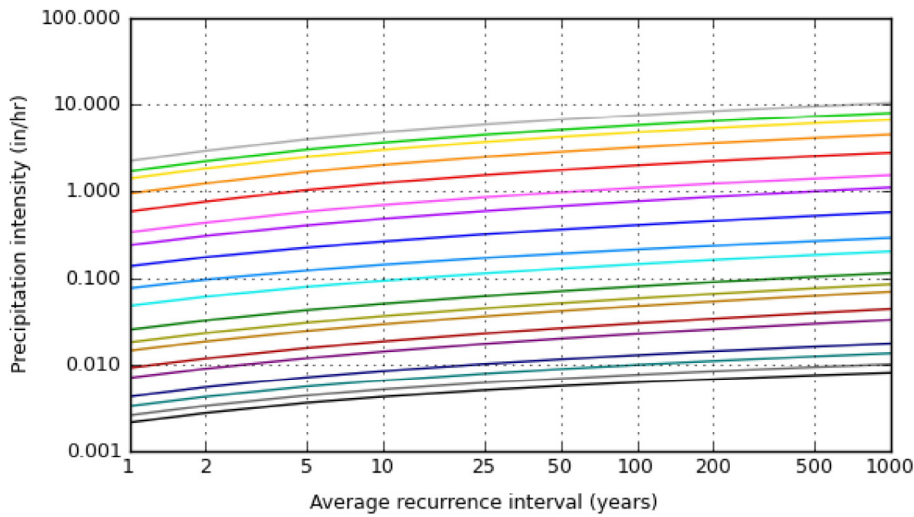
[Back to Top](#)

PF graphical

PDS-based intensity-duration-frequency (IDF) curves
 Latitude: 33.6225°, Longitude: -112.3389°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

APPENDIX A
OAKRIDGE FARMS
RETENTION CALCULATION SUMMARY

<i>DRAINAGE AREA</i>	<i>RETENTION BASIN</i>	<i>AREA (ACRES)</i>	<i>V_R (CF)</i>	<i>D (FT)</i>	<i>A_T (SF)</i>	<i>A_B (SF)</i>	<i>V_P (CF)</i>	<i>% EXCESS</i>
100YR-2HR RETENTION CALCULATION								
OFFSITE+A1	BASIN O	1.42	11,752	1.00	1,756	341	1,049	
	UGST O			LENGTH=	140	LF	10,996	2%
AREA A2+A5	BASIN A	1.49	11,034	2.00	3,001	338	3,339	
	UGST A1			LENGTH=	100	LF	7,854	1%
AREA A3+A4	UGST A2	0.98	7,257	LENGTH=	95	LF	7,461	3%
AREA B1-B4; B8	BASIN B1-B2	2.45	18,143	3.00	4,803	459	8,394	
	UGST B1			LENGTH=	140	LF	10,996	7%
AREA B5-B7	UGST B2	1.15	8,516	LENGTH=	110	LF	8,639	1%
AREA C	BASIN C	0.43	3,184	1.00	4,097	2,491	3,294	3%
AREA D	BASIN D	0.50	3,703	1.00	5,274	2,850	4,062	10%
		8.42	63,589				66,083	4%

Retention Required (R_R) = C x (P/12) x A

Where:

C = Runoff Coefficient, Per Table 6.3 "Rational Method Developed Condition C Coefficients". Drainage Policies and Standards for Maricopa County, Arizona. Onsite C-value = 0.85; Offsite C-value = 0.95.

P = 100YR-1HR precipitation depth = 2.40 inches (City of El Mirage Design Standards Manual)

A = Contributing Area (AC)

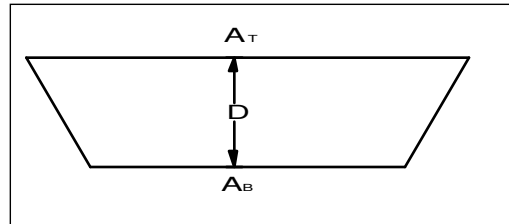
Retention Provided (R_P) = [(A_T + A_B) / 2] x D / 43560

Where:

A_T = Basin Top Area (SF)

A_B = Basin Bottom Area (SF)

D = Basin Depth (FT)



**APPENDIX A
OAKRIDGE FARMS
DRYWELL CALCULATIONS**

<i>RETENTION AREAS</i>	<i>STORAGE VOLUME OF BASIN (CF)</i>	<i>PERC. RATE PER DRYWELL (CFS)</i>	<i>DRYWELLS REQD.</i>	<i>TIME TO DRAIN BASIN (HR)</i>	<i>TIME < 36 hr ?</i>
A2+A5	11,034	0.10	1	30.6	YES
A3+A4	7,257	0.10	1	20.2	YES
B1 - B4 + B8	18,143	0.10	2	25.2	YES
B5 - B7	8,516	0.10	1	23.7	YES
O + A1	11,752	0.10	1	32.6	YES

**Percolation is based on common rates in the area. At time of construction, contractor will build and test one (1) drywell to verify the number required per retention basin.

FULL MAJOR ROAD CAPACITY
(10-YEAR DESIGN STORM)

Where:	<u>6" curb</u>
n = Manning's coefficient	0.015
P = Wetted Perimeter (ft)	29.01
A = Cross-sectional area (sf)	2.24
R = Hydraulic Radius - A/P (ft)	0.08
S = Longitudinal Slope (ft/ft)	
Q = Street capacity (cfs)	

In General:

For 6" curb: $Q_{10} = 40.35 \times S^{1/2}$

FULL MAJOR ROAD CAPACITY
(100-YEAR DESIGN STORM)

Where:

	<u>6" curb</u>
n = manning's coefficient	0.015
P = Wetted Perimeter (ft)	61.88
A = Cross-sectional area (sf)	31.24
R = Hydraulic Radius - A/P (ft)	0.50
S = Longitudinal Slope (ft/ft)	
Q = Street capacity (cfs)	

In General:

For 6" curb: $Q_{100} = 1967.49 \times S^{1/2}$

**APPENDIX A
OAKRIDGE FARMS
DISCHARGE CALCULATIONS**

Weighted "C"-value: 0.85

10 YR	AREA NAME	CURB HEIGHT (inches)*	DRAINAGE AREA	CONTR. AREA	RUNOFF LENGTH	WEIGHTED SLOPE ¹	AVG. V ²	TIME OF CONC ²	10YR RAINFALL INTENSITY ³	100YR RAINFALL INTENSITY ³	Q _{10YR} RUNOFF	Q _{100YR} RUNOFF	SLOPE AT CONCENTRATION POINT (ft/ft)	Q ALLOWABLE 10 YR	Q ALLOWABLE 100 YR	STATUS ?
				(acres)	(feet)	(ft/ft)	(fps)	(minutes)	(in/hr)	(in/hr)	(cfs)	(cfs)		(cfs)	(cfs)	
	AREA A1	6"	AREA A1	0.53	187	0.0043	0.79	8.9	4.03	6.42	1.81	2.89	0.0042	2.61	127.51	OK
	AREA A2	6"	AREA A2	0.99	218	0.0050	0.86	9.2	3.80	6.06	3.20	5.10	0.0065	3.25	158.62	OK
	AREA A3	6"	AREA A3	0.47	137	0.0091	1.15	7.0	4.48	7.13	1.79	2.85	0.0056	3.02	147.23	OK
	AREA A4	6"	AREA A4	0.51	169	0.0101	1.21	7.3	4.25	6.77	1.84	2.94	0.0069	3.35	163.43	OK
	AREA B1	6"	AREA B1	0.14	102	0.0108	1.25	6.4	4.48	7.13	0.53	0.85	0.0100	4.03	196.75	OK
	AREA B2	6"	AREA B2	0.15	127	0.0071	1.02	7.1	4.25	6.77	0.54	0.86	0.0060	3.13	152.40	OK
	AREA B3	6"	AREA B3	0.38	158	0.0054	0.89	8.0	4.25	6.77	1.37	2.19	0.0050	2.85	139.12	OK
	AREA B4	6"	AREA B4	0.29	177	0.0062	0.95	8.1	4.03	6.42	0.99	1.58	0.0060	3.13	152.40	OK
	AREA B5	6"	AREA B5	0.48	258	0.0066	0.98	9.4	3.80	6.06	1.55	2.47	0.0050	2.85	139.12	OK
	AREA B6	6"	AREA B6	0.16	105	0.0219	1.79	6.0	4.70	7.49	0.64	1.02	0.0045	2.71	131.98	OK
	AREA B7	6"	AREA B7	0.51	396	0.0027	0.62	15.6	2.96	4.71	1.28	2.04	0.0047	2.77	134.88	OK
	AREA C1	6"	AREA C1	0.13	147	0.0102	1.22	7.0	4.25	6.77	0.47	0.75	0.0045	2.71	131.98	OK
	AREA C2	6"	AREA C2	0.13	146	0.0089	1.14	7.1	4.25	6.77	0.47	0.75	0.0045	2.71	131.98	OK
	AREA D1	6"	AREA D1	0.15	161	0.0087	1.13	7.4	4.25	6.77	0.54	0.86	0.0070	3.38	164.61	OK
	AREA D2	6"	AREA D2	0.15	147	0.0156	1.51	6.6	4.48	7.13	0.57	0.91	0.0056	3.02	147.23	OK
	AREA O	6"	AREA O	0.89	362	0.0027	0.63	14.6	3.08	4.91	2.33	3.71	0.0016	8.41	78.70	OK

¹ Slope is a weighted value over the longest gutter flow length.

² Initial TC= 5 minutes. TC=5+(Runoff Length / Avg. V)/60.

³ Per NOAA Atlas 14 - see attachment

APPENDIX A - INLET CAPACITIES

CB A1

Drainage Areas:	AREA A1	
Curb Height:	6	inches
Contributory Area:	0.53	acres
Runoff Length:	187	ft
Weighted Slope:	0.0043	ft/ft
Average Velocity:	0.79	fps
Time of Concentration:	8.9	min
10-yr Rainfall Intensity:	4.03	in/hr
Peak 10-yr Flow:	1.81	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

$g = 32.2 \text{ ft/s}^2$
 $L = 3$
 $d = 0.21$
 $W = 2$
 $Q \text{ (cfs)} = 14.12$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA A1	1.8	1	0.80	0.1285	per plan	2	14.12

Notes

- (1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.
- (2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB A2

Drainage Areas:	AREA A2	
Curb Height:	6	inches
Contributory Area:	0.99	acres
Runoff Length:	218	ft
Weighted Slope:	0.0050	ft/ft
Average Velocity:	0.86	fps
Time of Concentration:	9.2	min
10-yr Rainfall Intensity:	3.80	in/hr
Peak 10-yr Flow:	3.20	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

g= 32.2 ft/s²
L= 3 **d=** 0.21
W= 2 **Q(cfs)=** 14.12

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA A2	3.2	1	0.80	0.2267	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB A3

Drainage Areas:	AREA A3	
Curb Height:	6	inches
Contributory Area:	0.47	acres
Runoff Length:	137	ft
Weighted Slope:	0.0091	ft/ft
Average Velocity:	1.15	fps
Time of Concentration:	7.0	min
10-yr Rainfall Intensity:	4.48	in/hr
Peak 10-yr Flow:	1.79	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

g= 32.2 ft/s²
L= 3 **d=** 0.21
W= 2 **Q(cfs)=** 14.12

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA A3	1.8	1	0.80	0.1266	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB A4

Drainage Areas:	AREA A4	
Curb Height:	6	inches
Contributory Area:	0.51	acres
Runoff Length:	169	ft
Weighted Slope:	0.0101	ft/ft
Average Velocity:	1.21	fps
Time of Concentration:	7.3	min
10-yr Rainfall Intensity:	4.25	in/hr
Peak 10-yr Flow:	1.84	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

L= 3 **g=** 32.2 ft/s²
W= 2 **d=** 0.21
Q(cfs)= 14.12

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA A4	1.8	1	0.80	0.1305	per plan	2	14.12

Notes

- (1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.
 (2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B1

Drainage Areas:

AREA B1

Curb Height:

6 inches

Contributory Area:

0.14 acres

Runoff Length:

102 ft

Weighted Slope:

0.0108 ft/ft

Average Velocity:

1.25 fps

Time of Concentration:

6.4 min

10-yr Rainfall Intensity:

4.48 in/hr

Peak 10-yr Flow:

0.53 cfs

Capacity of CATCH BASIN(S):

14.12 cfs

OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5} \quad g = 32.2 \text{ ft/s}^2$$

$$L = 3 \quad d = 0.21$$

$$W = 2 \quad Q \text{ (cfs)} = 14.12$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B1	0.5	1	0.80	0.0377	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B2

Drainage Areas:

AREA B2

Curb Height:

6 inches

Contributory Area:

0.15 acres

Runoff Length:

127 ft

Weighted Slope:

0.0071 ft/ft

Average Velocity:

1.02 fps

Time of Concentration:

7.1 min

10-yr Rainfall Intensity:

4.25 in/hr

Peak 10-yr Flow:

0.54 cfs

Capacity of CATCH BASIN(S):

14.12 cfs

OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

$g = 32.2 \text{ ft/s}^2$
 $L(\text{ft}) = 3$
 $d = 0.21 \text{ ft}$
 $W(\text{ft}) = 2$
 $Q(\text{cfs}) = 14.12$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B2	0.5	1	0.80	0.0384	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B3

Drainage Areas:	AREA B3	
Curb Height:	6	inches
Contributory Area:	0.38	acres
Runoff Length:	158	ft
Weighted Slope:	0.0054	ft/ft
Average Velocity:	0.89	fps
Time of Concentration:	8.0	min
10-yr Rainfall Intensity:	4.25	in/hr
Peak 10-yr Flow:	1.37	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

$g = 32.2 \text{ ft/s}^2$
 $L = 3$
 $W = 2$
 $d = 0.21$
 $Q \text{ (cfs)} = 14.12$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B3	1.4	1	0.80	0.0973	per plan	2	14.12

Notes

- (1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.
 (2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B4

Drainage Areas:	AREA B4	
Curb Height:	6	inches
Contributory Area:	0.29	acres
Runoff Length:	177	ft
Weighted Slope:	0.0062	ft/ft
Average Velocity:	0.95	fps
Time of Concentration:	8.1	min
10-yr Rainfall Intensity:	4.03	in/hr
Peak 10-yr Flow:	0.99	cfs
Capacity of CATCH BASIN(S):	14.12	cfs OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5}$$

$g = 32.2 \text{ ft/s}^2$
 $L = 3$
 $W = 2$
 $d = 0.21$
 $Q(\text{cfs}) = 14.12$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B4	1.0	1	0.80	0.0703	per plan	2	14.12

Notes

- (1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.
 (2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B5

Drainage Areas:

AREA B5

Curb Height:

6 inches

Contributory Area:

0.48 acres

Runoff Length:

258 ft

Weighted Slope:

0.0066 ft/ft

Average Velocity:

0.98 fps

Time of Concentration:

9.4 min

10-yr Rainfall Intensity:

3.80 in/hr

Peak 10-yr Flow:

1.55 cfs

Capacity of CATCH BASIN(S):

14.12 cfs

OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5} \quad g = 32.2 \text{ ft/s}^2$$

$$L = 3 \quad d = 0.21$$

$$W = 2 \quad Q \text{ (cfs)} = 14.12$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B5	1.6	1	0.80	0.1099	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B6

Drainage Areas:

AREA B6

Curb Height:

6 inches

Contributory Area:

0.16 acres

Runoff Length:

105 ft

Weighted Slope:

0.0219 ft/ft

Average Velocity:

1.79 fps

Time of Concentration:

6.0 min

10-yr Rainfall Intensity:

4.70 in/hr

Peak 10-yr Flow:

0.64 cfs

Capacity of CATCH BASIN(S):

14.12 cfs

OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5} \quad g = 32.2 \text{ ft/s}^2$$

$$L = 3 \quad d = 0.21$$

$$W = 2 \quad Q \text{ (cfs)} = 14.12$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B6	0.6	1	0.80	0.0453	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

CB B7

Drainage Areas:

AREA B7

Curb Height:

6 inches

Contributory Area:

0.51 acres

Runoff Length:

396 ft

Weighted Slope:

0.0027 ft/ft

Average Velocity:

0.62 fps

Time of Concentration:

15.6 min

10-yr Rainfall Intensity:

2.96 in/hr

Peak 10-yr Flow:

1.28 cfs

Capacity of CATCH BASIN(S):

14.12 cfs

OK

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = 0.8LW(2gd)^{0.5} \quad g = 32.2 \text{ ft/s}^2$$

$$L = 3 \quad d = 0.21$$

$$W = 2 \quad Q \text{ (cfs)} = 14.12$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlets	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA B7	1.3	1	0.80	0.0909	per plan	2	14.12

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.19.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

INLET C1

Drainage Areas:	AREA C1	
Curb Height:	6	inches
Contributory Area:	0.13	acres
Runoff Length:	147	ft
Weighted Slope:	0.0102	ft/ft
Average Velocity:	1.22	fps
Time of Concentration:	7.0	min
10-yr Rainfall Intensity:	4.25	in/hr
Peak 10-yr Flow:	0.47	cfs OK
Capacity of CATCH BASIN(S):	2.05	cfs

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = C_o h L (2g d_o)^{1/2} \quad d_i^{(3)} \text{ (ft)} = 0.50$$

$$C_o = 0.67 \quad d_o \text{ (ft)} = d_i - h/2$$

$$h \text{ (ft)} = 0.46 \quad d_o \text{ (ft)} = 0.27$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlet Width ft	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA C1	0.5	1	0.80	0.5	per plan	2	2.05

Notes

- (1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.10.
 (2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

INLET C2

Drainage Areas:	AREA C2	
Curb Height:	6	inches
Contributory Area:	0.13	acres
Runoff Length:	146	ft
Weighted Slope:	0.0089	ft/ft
Average Velocity:	1.14	fps
Time of Concentration:	7.1	min
10-yr Rainfall Intensity:	4.25	in/hr
Peak 10-yr Flow:	0.47	cfs OK
Capacity of CATCH BASIN(S):	2.05	cfs

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = C_o h L (2gd_o)^{1/2} \quad d_i^{(3)} \text{ (ft)} = 0.50$$

$$C_o = 0.67 \quad d_o \text{ (ft)} = d_i - h/2$$

$$h \text{ (ft)} = 0.46 \quad d_o \text{ (ft)} = 0.27$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlet Width ft	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA C2	0.5	1	0.80	0.5	per plan	2	2.05

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.10.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

INLET D1

Drainage Areas:	AREA D1		
Curb Height:	6	inches	
Contributory Area:	0.15	acres	
Runoff Length:	161	ft	
Weighted Slope:	0.0087	ft/ft	
Average Velocity:	1.13	fps	
Time of Concentration:	7.4	min	
10-yr Rainfall Intensity:	4.25	in/hr	
Peak 10-yr Flow:	0.54	cfs	OK
Capacity of CATCH BASIN(S):	2.05	cfs	

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = C_o h L (2gd_o)^{1/2} \quad d_i^{(3)} \text{ (ft)} = 0.50$$

$$C_o = 0.67 \quad d_o \text{ (ft)} = d_i - h/2$$

$$h \text{ (ft)} = 0.46 \quad d_o \text{ (ft)} = 0.27$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlet Width ft	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA D1	0.5	1	0.80	0.5	per plan	2	2.05

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.10.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

INLET D2

Drainage Areas:	AREA D2		
Curb Height:	6	inches	
Contributory Area:	0.15	acres	
Runoff Length:	147	ft	
Weighted Slope:	0.0156	ft/ft	
Average Velocity:	1.51	fps	
Time of Concentration:	6.6	min	
10-yr Rainfall Intensity:	4.48	in/hr	
Peak 10-yr Flow:	0.57	cfs	OK
Capacity of CATCH BASIN(S):	2.05	cfs	

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = C_o h L (2gd_o)^{1/2} \quad d_i^{(3)} \text{ (ft)} = 0.50$$

$$C_o = 0.67 \quad d_o \text{ (ft)} = d_i - h/2$$

$$h \text{ (ft)} = 0.46 \quad d_o \text{ (ft)} = 0.27$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlet Width ft	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA D2	0.6	1	0.80	0.6	per plan	2	2.05

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.10.

(2) Catch basin design based on the 10-year peak discharge.

APPENDIX A - INLET CAPACITIES

INLET 0

Drainage Areas:	AREA O		
Curb Height:	6	inches	
Contributory Area:	0.89	acres	
Runoff Length:	362	ft	
Weighted Slope:	0.0027	ft/ft	
Average Velocity:	0.63	fps	
Time of Concentration:	14.6	min	
10-yr Rainfall Intensity:	3.08	in/hr	
Peak 10-yr Flow:	2.33	cfs	OK
Capacity of CATCH BASIN(S):	5.13	cfs	

Known Values and Equations

$$Q \text{ (cfs)}^{(1)} = C_o h L (2gd_o)^{1/2} \quad d_i^{(3)} \text{ (ft)} = 0.50$$

$$C_o = 0.67 \quad d_o \text{ (ft)} = d_i - h/2$$

$$h \text{ (ft)} = 0.46 \quad d_o \text{ (ft)} = 0.27$$

Catch Basin location	$Q_{10YR}^{(2)}$ cfs	Number of Inlets	Clogging Factor	Required Inlet Width ft	Catch Basin Type	Inlet Width ft	Capacity Provided cfs
AREA O	2.3	1	0.80	2.3	per plan	5	5.13

Notes

(1) Per FCDMC Drainage Design Manual, Volume II, Hydraulics, equation 3.10.

(2) Catch basin design based on the 10-year peak discharge.

**OAKRIDGE FARMS
HYDRAULIC GRADE LINE CALCULATIONS**

STORM DRAIN PARAMETERS							HYDRAULIC GRADIENT CALCULATIONS										
From	To	Length (feet)	Pipe Dia. (inches)	Q _{10YR} (cfs)	Vel. (fps)	n	HGL dn (ft)	Hydraulic Slope (ft/ft)	Friction Loss (ft)	k	Minor Loss (ft)	Total Loss (ft)	HGL up (ft)	Grate/Rim Elev. (ft)	Freeboard (ft)	Status	
UGST 0	CB A1	11	18	1.81	1.03	0.013	57.10	0.0003	0.00	1.20	0.02	0.02	57.12	65.20	8.08	OK	
UGST A1	CB A2	26	18	3.20	1.81	0.013	57.90	0.0009	0.02	1.20	0.06	0.09	57.99	64.90	6.91	OK	
UGST A2	CB A3	98	18	3.63	2.05	0.013	58.00	0.0012	0.12	1.20	0.08	0.20	58.20	64.95	6.75	OK	
CB A3	CB A4	29	18	1.84	1.04	0.013	58.20	0.0003	0.01	0.20	0.00	0.01	58.21	63.80	5.59	OK	
UGST B1	CB B4	38	18	3.69	2.09	0.013	56.50	0.0012	0.05	1.20	0.08	0.13	56.63	63.20	6.57	OK	
CB B4	CB B3	138	18	2.70	1.53	0.013	56.63	0.0007	0.09	0.20	0.01	0.10	56.73	63.95	7.22	OK	
CB B3	CB B2	118	18	1.07	0.61	0.013	56.73	0.0001	0.01	0.20	0.00	0.01	56.74	64.55	7.81	OK	
CB B2	CB B1	64	18	0.53	0.30	0.013	56.74	0.0000	0.00	0.20	0.00	0.00	56.74	64.90	8.16	OK	
UGST B2	CB B5	15	18	1.55	0.88	0.013	51.80	0.0002	0.00	1.20	0.01	0.02	51.82	61.50	9.68	OK	
UGST B2	CB B6	28	18	2.12	1.20	0.013	51.80	0.0004	0.01	1.20	0.03	0.04	51.84	62.10	10.26	OK	
CB B6	CB B7	202	18	1.06	0.60	0.013	51.84	0.0001	0.02	0.20	0.00	0.02	51.86	63.05	11.19	OK	

Assumed Values for km:

0.2 for entrance losses

1.0 for flows entering a surcharged pipe or submerged outlet

0.2 for exit through bubbler grate

**OAKRIDGE FARMS
HYDRAULIC GRADE LINE CALCULATIONS**

STORM DRAIN PARAMETERS							HYDRAULIC GRADIENT CALCULATIONS									
From	To	Length (feet)	Pipe Dia. (inches)	Q _{100YR} (cfs)	Vel. (fps)	n	HGL dn (ft)	Hydraulic Slope (ft/ft)	Friction Loss (ft)	k	Minor Loss (ft)	Total Loss (ft)	HGL up (ft)	Grate/Rim Elev. (ft)	Freeboard (ft)	Status
UGST 0	CB A1	11	18	3.71	2.10	0.013	57.10	0.0013	0.01	1.20	0.08	0.10	57.20	65.20	8.00	OK
UGST A1	CB A2	26	18	5.10	2.88	0.013	57.90	0.0024	0.06	1.20	0.16	0.22	58.12	64.90	6.78	OK
UGST A2	CB A3	98	18	5.79	3.27	0.013	58.00	0.0031	0.30	1.20	0.20	0.50	58.50	64.95	6.45	OK
CB A3	CB A4	29	18	2.85	1.61	0.013	58.50	0.0007	0.02	0.20	0.01	0.03	58.53	63.80	5.27	OK
UGST B1	CB B4	38	18	5.88	3.33	0.013	56.50	0.0032	0.12	1.20	0.21	0.33	56.83	63.20	6.37	OK
CB B4	CB B3	138	18	4.30	2.44	0.013	56.83	0.0017	0.23	0.20	0.02	0.25	57.08	63.95	6.87	OK
CB B3	CB B2	118	18	1.71	0.97	0.013	57.08	0.0003	0.03	0.20	0.00	0.03	57.11	64.55	7.44	OK
CB B2	CB B1	64	18	0.85	0.48	0.013	57.11	0.0001	0.00	0.20	0.00	0.00	57.12	64.90	7.78	OK
UGST B2	CB B5	15	18	2.47	1.40	0.013	51.80	0.0006	0.01	1.20	0.04	0.04	51.84	61.50	9.66	OK
UGST B2	CB B6	28	18	3.37	1.91	0.013	51.80	0.0010	0.03	1.20	0.07	0.10	51.90	62.10	10.20	OK
CB B6	CB B7	202	18	1.68	0.95	0.013	51.90	0.0003	0.05	0.20	0.00	0.06	51.95	63.05	11.10	OK

Assumed Values for km:

- 0.2 for entrance losses
- 1.0 for flows entering a surcharged pipe or submerged outlet
- 0.2 for exit through bubbler grate

WATER / SEWER DESIGN REPORT FOR “OAKRIDGE FARMS”

**Located in City of El Mirage, Maricopa County,
ARIZONA.**

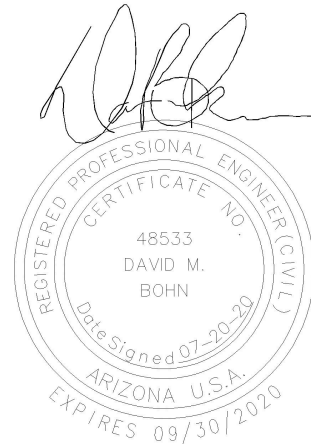
Prepared For:

FIG DEVELOPMENT
295 W. Center Street
Provo, UT 84601
Ph: 801.372.2077
Attn: Garrett Seely

Prepared By:

BFH Group

3707 E. Southern Avenue
Mesa, AZ 85206
PH: 480.734.1446
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Job # 00201910030
Prepared: June 2020

WATER & SEWER DESIGN REPORT FOR “OAKRIDGE FARMS”

TABLE OF CONTENTS		PAGE
1.0	INTRODUCTION.....	1
2.0	EXISTING UTILITY SYSTEMS.....	1
3.0	PROPOSED SYSTEM EXTENSIONS.....	2
4.0	WATER SYSTEM DESIGN & ANALYSIS.....	2
5.0	SEWER SYSTEM DESIGN & ANALYSIS.....	4

Exhibits

Exhibit “A” – Vicinity Map

Exhibit “B” – Water Sewer Key Map

Appendix “A” – Supporting Calculations

Water Demand Computation

EPANET Peak Hour Flow Results

EPANET Maximum Fire Draft Results

Sewer Demand Computation

Flow Test Results

1.0 INTRODUCTION

The Oakridge Farms is a proposed residential development located at the southeast corner of Dysart Road and Greenway Road. The Oakridge Farms is a portion of land located in northwest quarter of Section 11, T3N, R1W of the Gila and Salt River Meridian, Maricopa County, Arizona. See the attached Vicinity Map (Exhibit A) for the general site location.

The approximate gross acreage of the Oakridge Farms is approximately 8 total acres and is currently zoned as Urban Corridor (UC). The general topography of the site demonstrates a gentle slope from the northeast to southwest.

The purpose of this report is to describe the water and sewer distribution design for this site, including connections to existing system.

2.0 EXISTING UTILITY SYSTEMS

Existing public water main line is located immediately adjacent to this site as follows: Existing 8" DIP Water line along the private street to the east and an existing 8" Sewer line within an easement along the western property line. Currently, there are no onsite habitable structures and therefore no potable water and sewer service is provided to the site. The existing water infrastructure found in the private street services the existing elementary school to the east. The existing sewer line services the commercial complex to the west.

Fire hydrant flow test information for existing waterlines in the vicinity of the project site was obtained from EJ Flow Test. The static pressure representative of this area is set to approximately 54 psi (Appendix A). Based on this information, a constant pressure head of 54 psi was used as the supply pressure at the water tie-in location for this project.

3.0 PROPOSED SYSTEM EXTENSIONS

Each of the proposed system extensions and on-site waterlines has been designed in accordance with City of El Mirage Design Standards for Water and Wastewater Systems.

The proposed water system will connect to the existing 8" waterlines located within the private street at the south entrance and east entrance to the property. Proposed eight-inch (8") DIP water mains have been designed for the entire project development to provide potable water to the project. (Exhibit "B"- Water Sewer Key Map)

4.0 WATER SYSTEM DESIGN & ANALYSIS

The design of the water distribution system in "Oakridge Farms" is to provide potable water with adequate pressure to each residential unit. In addition, the system has been analyzed with fire hydrants and fire lines throughout the development and has been designed to provide sufficient pressure and flows to meet minimum fire flow requirements.

In designing the water lines for this development, several criteria had to be met per the requirement of the local and state statutes and standards:

- Water Design Flow shall be 240 GPD per unit
- Pressures between 50 and 100 psi during peak hour conditions with velocities that are less than 5 fps.
- Pressures greater than 20 psi during fire demand.
- Velocities less than 10 fps during fire flow conditions minimally throughout the system.
- Main line sizes not less than that approved by the City of El Mirage.

The computer software “EPANET 2.0” by the U.S. Environmental Protection Agency (EPA) was used to analyze the proposed water distribution mains for “Oakridge Farms”. Pressure testing information obtained indicates that the minimum pressure in the existing water transmission pipe network is 54 psi. To simulate this constant pressure source in the model, constant head reservoir was used at the two tie-in locations on the Private Street.

The following is a list of design parameters that were input into the program in order to run the analysis.

Residential Water Design Parameters, Water Design Flows:

- Average Day demand of 240 Gallons per day for multi-family residential.
- Max Day = Average Day x 1.7
- Peaking Hour = Max Day x 1.7
- Fire Flow = 1500..... GPM for farthest Fire hydrant / node in the system.
- All DIP pipes for water mains coefficient (C=120) for ductile iron pipe.

Water demand calculations for individual nodes were determined and are presented in Appendix A. The design standard requires two models to be performed. The first model analyzes the peak hour flow condition demanded by the residential unit and the second model analyzes the same condition plus one simultaneous fire flow demand at hydrant location (See EPANET schematic in Appendix A for node and pipe assignments).

Under peak hour flow conditions, the pressure is maintained at a minimum of 54.16 psi at each node. Pressure reductions due to elevation head loss were left out of the model for simplicity due to the shallow slope of the natural ground and negligible elevation difference.

The fire flow analysis was performed for the second model at hydrant location node 4. EPANET output of all the models is presented in Appendix A. From these results,

the peak demand analysis shows that the minimum pressure required at the water meter has been met. For fire simulations, a minimum pressure rating of 52.16 psi with a maximum velocity in the system of 7.55 fps was maintained for full buildout. Given this information, the proposed system is adequate to maintain pressure requirements under peak hour and peak hour plus fire flow conditions.

5.0 SEWER SYSTEM DESIGN & ANALYSIS

The 6" sewer service lines have been designed to convey wastewater from each residence unit. The proposed sewer main extension consists of 8" PVC lines and sewer manholes (Exhibit "B"). The system has been designed with sufficient depth to provide service to each apartment building and has sufficient slope to adequately convey wastewater to the tie-in location.

The sewer in "Oakridge Farms" has been designed as gravity flow with a minimum velocity of 2.1 fps for 8" diameter pipe flowing half full. In addition, the capacities of the on-site sewer lines were analyzed. The following parameters were used to perform the analysis:

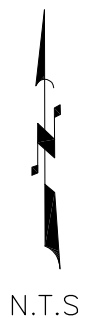
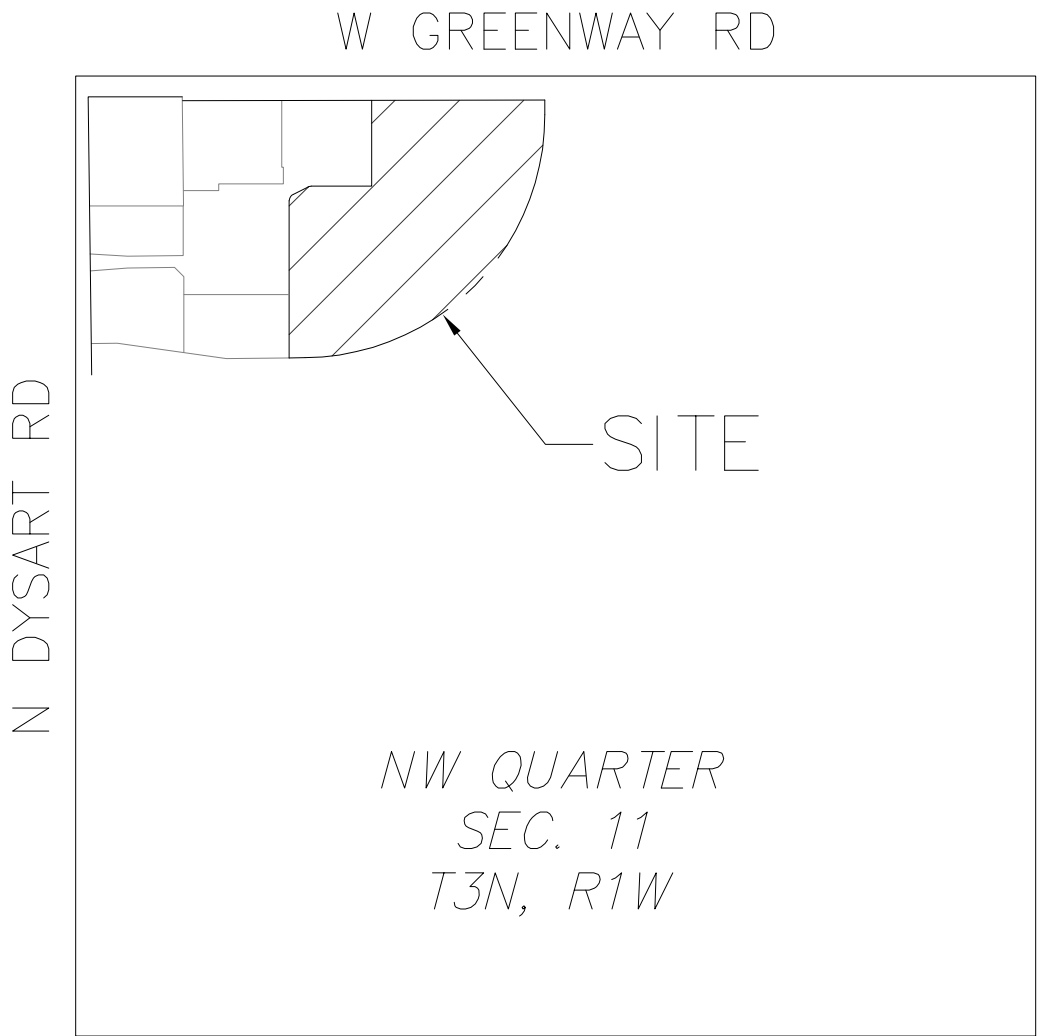
Sewer Design parameters applied for this project for City of El Mirage design standards Wastewater Systems:

Design Standards:

- Base design flow = 180 Gallons per unit per day
- Peak Flow – assume 3.4 persons per unit
= Q Peak = Per City of El Mirage Waste Water Plan Table 4-10 = 2.53
- Minimum Pipe Size of sewer main = 6 inches Dia.
- Maximum and minimum mean Velocity = 8.0 fps and 2.1 fps respectively.

A calculation for average daily flow and peak hour flow was done for each major branch of the sewer system within the proposed development (see appendix for supporting calculations). Peak flows were calculated at the downstream most point for each sewer line. Based upon the results of the analysis, each branch is capable of meeting its peak discharge. All sewer lines meet the City design criteria and have sufficient capacity to meet peak hour flows.

APPENDIX A
SUPPORTING CALCULATIONS



BFH GROUP 3707 E. SOUTHERN AVENUE MESA, ARIZONA, 85206 PHONE: 480.734.1446	VICINITY MAP	
	"OAKRIDGE FARMS" EL MIRAGE, ARIZONA <small>JOB #: 201910030</small>	<small>FIGURE</small> 1

**EXISTING FIRE FLOW RESULTS
WATER DEMAND COMPUTATION**



Flow Test Summary

Project Name: EJFT 20078
Project Address: 12945 Greenway Rd, El Mirage, AZ 85335
Date of Flow Test: 2020-03-03
Time of Flow Test: 8:00 AM
Data Reliable Until: 2020-09-01
Conducted By: Cesar Reyna & Austin Gourley (EJ Flow Tests) 602.999.7637
Witnessed By: Darrell Tirpak (El Mirage FD) 623.583.7968
City Forces Contacted: El Mirage FD (623.583.7968)

Raw Flow Test Data

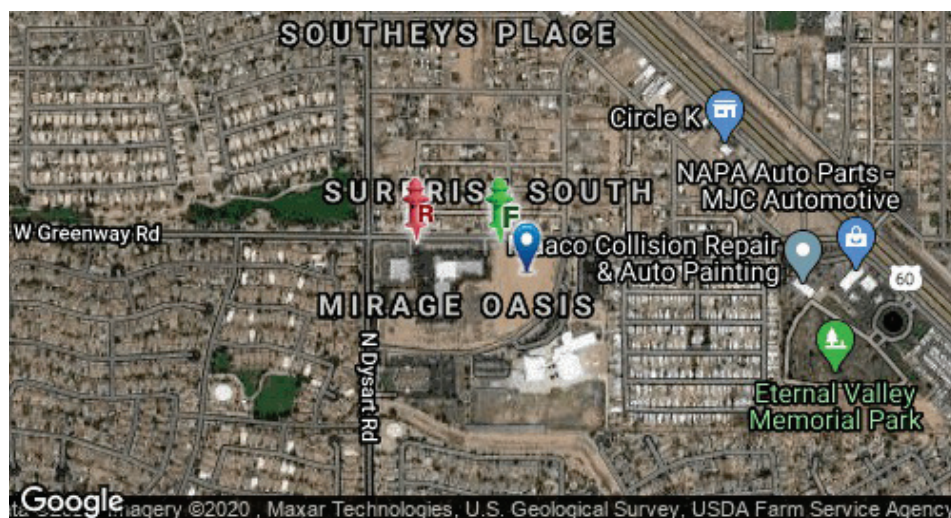
Static Pressure: 54.0 PSI
Residual Pressure: 44.0 PSI
Flowing GPM: 1,574
GPM @ 20 PSI: 3,048

Data with a 10 % Safety Factor

Static Pressure: 48.6 PSI
Residual Pressure: 38.6 PSI
Flowing GPM: 1,574
GPM @ 20 PSI: 2,776

Hydrant F₁

Pitot Pressure (1): 21 PSI
Coefficient of Discharge (1): 0.9
Hydrant Orifice Diameter (1): 2.5 inches
Pitot Pressure (2): 23 PSI
Coefficient of Discharge (2): 0.9
Hydrant Orifice Diameter (2): 2.5 inches



Project Site

Static-Residual Hydrant

Flow Hydrant

Distance Between F₁ and R
573 ft (measured linearly)

Static-Residual Elevation
1167 ft (above sea level)

Flow Hydrant (F₁) Elevation
1164 ft (above sea level)

Elevation & distance values are approximate

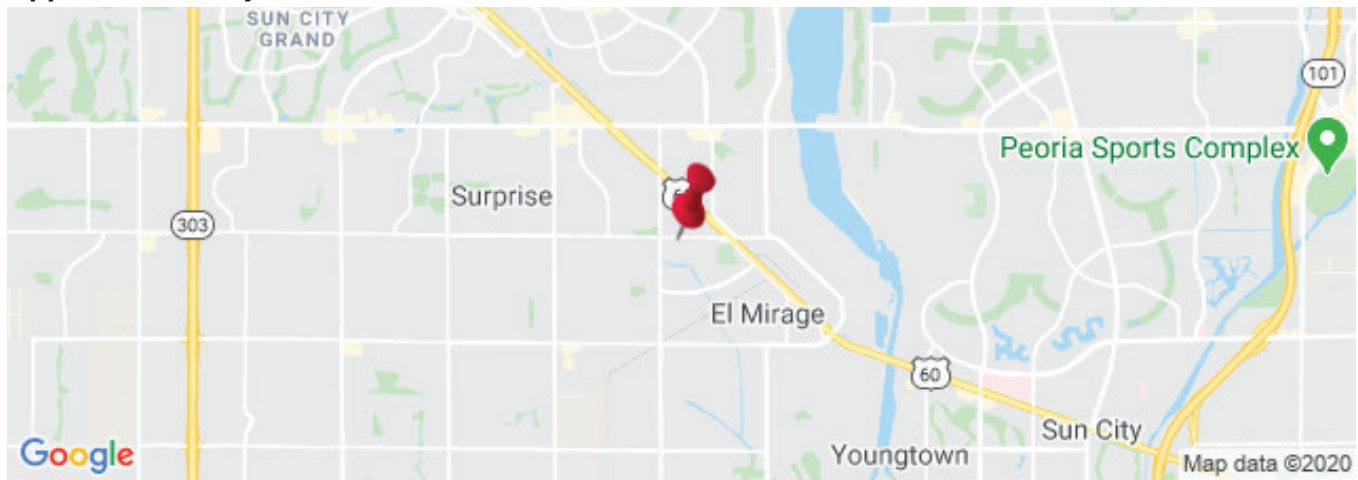
Static-Residual Hydrant



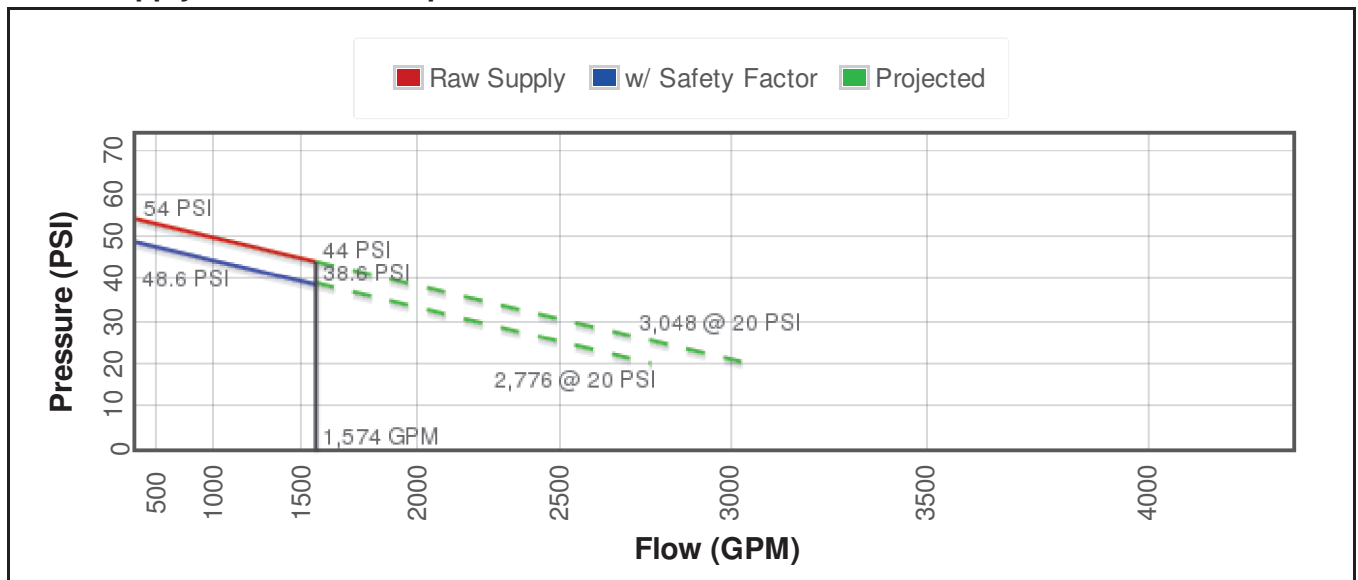
Flow Hydrant (only hydrant F1 shown for clarity)



Approximate Project Site



Water Supply Curve N^{1.85} Graph



APPENDIX "A"
WATER DEMAND COMPUTATION
OAKRIDGE FARMS

Junction #	Number of Units	Population	Avg Daily Demand (gpd)	Avg Daily Flow (gpm)	Maximum Daily Flow (gpm)	Peak Hourly Flow (gpm)	Peak + Fireflow (gpm)
5	86	292.4	20640	14.33	24.37	41.42	
7	108	367.2	25920	18.00	30.60	52.02	
4							1500.00

194

659.6

**EPANET BASE DEMAND
AVERAGE DAILY**

```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                *
*                               Analysis for Pipe Networks                  *
*                               Version 2.0                                *
*****

```

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	125.00	54.16	0.00
4	0.00	125.00	54.16	0.00
5	14.33	125.00	54.16	0.00
6	0.00	125.00	54.16	0.00
7	18.00	125.00	54.16	0.00
8	0.00	125.00	54.16	0.00
9	0.00	125.00	54.16	0.00
10	0.00	125.00	54.16	0.00
11	0.00	125.00	54.16	0.00
1	-15.96	125.00	0.00	0.00 Reservoir
2	-16.37	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	15.96	0.10	0.01	Open
2	0.43	0.00	0.00	Open
3	0.43	0.00	0.00	Open
4	0.43	0.00	0.00	Open
5	0.17	0.00	0.00	Open
6	0.17	0.00	0.00	Open
7	0.17	0.00	0.00	Open
8	0.26	0.00	0.00	Open
9	-13.90	0.09	0.01	Open
10	2.47	0.02	0.00	Open
11	2.47	0.02	0.00	Open
12	-16.37	0.10	0.01	Open

**EPANET BASE DEMAND
MAX DAILY**

```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                 *
*****

```

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	125.00	54.16	0.00
4	0.00	125.00	54.16	0.00
5	24.37	125.00	54.16	0.00
6	0.00	125.00	54.16	0.00
7	30.60	125.00	54.16	0.00
8	0.00	125.00	54.16	0.00
9	0.00	125.00	54.16	0.00
10	0.00	125.00	54.16	0.00
11	0.00	125.00	54.16	0.00
1	-27.14	125.00	0.00	0.00 Reservoir
2	-27.83	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	27.14	0.17	0.02	Open
2	0.73	0.00	0.00	Open
3	0.73	0.00	0.00	Open
4	0.73	0.00	0.00	Open
5	0.28	0.00	0.00	Open
6	0.28	0.00	0.00	Open
7	0.28	0.00	0.00	Open
8	0.45	0.00	0.00	Open
9	-23.64	0.15	0.02	Open
10	4.19	0.03	0.00	Open
11	4.19	0.03	0.00	Open
12	-27.83	0.18	0.02	Open

**EPANET BASE DEMAND
PEAK HOURLY**

```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                 *
*****

```

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	125.00	54.16	0.00
4	0.00	125.00	54.16	0.00
5	41.42	125.00	54.16	0.00
6	0.00	125.00	54.16	0.00
7	52.02	125.00	54.16	0.00
8	0.00	125.00	54.16	0.00
9	0.00	125.00	54.16	0.00
10	0.00	125.00	54.16	0.00
11	0.00	125.00	54.16	0.00
1	-46.13	125.00	0.00	0.00 Reservoir
2	-47.31	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	46.13	0.29	0.05	Open
2	1.24	0.01	0.00	Open
3	1.24	0.01	0.00	Open
4	1.24	0.01	0.00	Open
5	0.48	0.00	0.00	Open
6	0.48	0.00	0.00	Open
7	0.48	0.00	0.00	Open
8	0.76	0.00	0.00	Open
9	-40.18	0.26	0.04	Open
10	7.13	0.05	0.00	Open
11	7.13	0.05	0.00	Open
12	-47.31	0.30	0.06	Open

**EPANET FIRE DEMAND
AVERAGE DAILY**

```

*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                 *
*****

```

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	123.10	53.34	0.00
4	1500.00	120.46	52.19	0.00
5	14.33	123.52	53.52	0.00
6	0.00	124.29	53.85	0.00
7	18.00	124.54	53.96	0.00
8	0.00	124.48	53.94	0.00
9	0.00	123.94	53.70	0.00
10	0.00	123.32	53.44	0.00
11	0.00	124.08	53.76	0.00
1	-562.20	125.00	0.00	0.00 Reservoir
2	-970.13	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	562.20	3.59	5.48	Open
2	356.63	2.28	2.36	Open
3	356.63	2.28	2.36	Open
4	356.63	2.28	2.36	Open
5	520.90	3.32	4.76	Open
6	520.90	3.32	4.76	Open
7	-979.10	6.25	15.31	Open
8	-164.28	1.05	0.56	Open
9	-1157.70	7.39	20.88	Open
10	-187.58	1.20	0.72	Open
11	-187.58	1.20	0.72	Open
12	-970.13	6.19	15.05	Open

**EPANET FIRE DEMAND
MAX DAILY**

 * E P A N E T *
 * Hydraulic and Water Quality *
 * Analysis for Pipe Networks *
 * Version 2.0 *

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	123.07	53.33	0.00
4	1500.00	120.43	52.18	0.00
5	24.37	123.49	53.51	0.00
6	0.00	124.27	53.85	0.00
7	30.60	124.52	53.95	0.00
8	0.00	124.46	53.93	0.00
9	0.00	123.92	53.69	0.00
10	0.00	123.30	53.43	0.00
11	0.00	124.06	53.76	0.00
1	-575.02	125.00	0.00	0.00 Reservoir
2	-979.95	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	575.02	3.67	5.71	Open
2	357.36	2.28	2.37	Open
3	357.36	2.28	2.37	Open
4	357.36	2.28	2.37	Open
5	520.99	3.33	4.76	Open
6	520.99	3.33	4.76	Open
7	-979.01	6.25	15.31	Open
8	-163.63	1.04	0.56	Open
9	-1167.01	7.45	21.20	Open
10	-187.06	1.19	0.71	Open
11	-187.06	1.19	0.71	Open
12	-979.95	6.25	15.34	Open

EPANET FIRE DEMAND
PEAK HOURLY

```
*****
*                               E P A N E T                               *
*                               Hydraulic and Water Quality                 *
*                               Analysis for Pipe Networks                   *
*                               Version 2.0                                *
*****
```

Input File: 201910040EPA.net

Link - Node Table:

Link ID	Start Node	End Node	Length ft	Diameter in
1	1	7	84	8
2	7	8	24	8
3	8	9	231	8
4	9	10	260	8
5	10	3	48	8
6	3	4	555	8
7	4	5	200	8
8	10	5	344	8
9	5	11	27	8
10	11	6	287	8
11	6	7	351	8
12	11	2	61	8

Node Results:

Node ID	Demand GPM	Head ft	Pressure psi	Quality
3	0.00	123.03	53.31	0.00
4	1500.00	120.39	52.16	0.00
5	41.42	123.45	53.49	0.00
6	0.00	124.24	53.83	0.00
7	52.02	124.49	53.94	0.00
8	0.00	124.43	53.91	0.00
9	0.00	123.88	53.68	0.00
10	0.00	123.26	53.41	0.00
11	0.00	124.03	53.74	0.00
1	-596.73	125.00	0.00	0.00 Reservoir
2	-996.71	125.00	0.00	0.00 Reservoir



Link Results:

Link ID	Flow GPM	Velocity fps	Unit Headloss ft/Kft	Status
1	596.73	3.81	6.12	Open
2	358.60	2.29	2.38	Open
3	358.60	2.29	2.38	Open
4	358.60	2.29	2.38	Open
5	521.14	3.33	4.76	Open
6	521.14	3.33	4.76	Open
7	-978.86	6.25	15.31	Open
8	-162.54	1.04	0.55	Open
9	-1182.82	7.55	21.73	Open
10	-186.11	1.19	0.71	Open
11	-186.11	1.19	0.71	Open
12	-996.71	6.36	15.83	Open

SEWER DEMAND COMPUTATION

APPENDIX A - OAKRIDGE FARMS

**TABLE 1
MAXIMUM / MINIMUM PIPE CAPACITY ANALYSIS**

APPENDIX A	LINE SIZE	AREA (FT ²)	PERIMETER (FT)	R _H	SLOPE (FT./FT.)	CAPACITY (CFS)	CAPACITY (CFS) AT (d/D=0.50)	VELOCITY
Standard	8" LINE	0.349	2.094	0.167	0.0033	0.696	0.348	2.0

Minimum Line Slope
8" = 0.0033 ft./ft.

**TABLE 2
PEAK FLOWS VS. PIPE CAPACITY ANALYSIS**

PIPE (MH# - MH#)	LINE SIZE (IN.)	# OF UNITS	POPULATION	SEWER DESIGN FLOW PER APPLICABLE UNIT (GPD)	AVE. DAILY FLOW (GPD)	PEAKING FACTOR	PEAK FLOW (CFS)	CAPACITY (CFS)	CAPACITY (CFS) AT (d/D=0.50)
EXMH#1	8	194	660	180	34920	2.53	0.137	0.696	0.348

$CAPACITY = (1.49/n) * AREA * R_H^{2/3} * SLOPE^{1/2}$

n = 0.013

Peaking Factor is based on upstream population: P=

Where P =

$VELOCITY = (1.49/n) * R_H^{2/3} * SLOPE^{1/2}$

n = 0.013

660

Number of Units x 3.4

NOTE: DESIGN FLOW = PER CITY OF EL MIRAGE DESIGN AND DEVELOPMENT STANDARDS MANUAL

APPENDIX A - OAKRIDGE FARMS

MANHOLE	MH INVERT (IN)	MH INVERT (OUT)	RIM	DEPTH (')	DOWNSTREAM MH	UPSTREAM MH	LENGTH (')	PIPE DIAM (")	SLOPE		DEPTH > 3.0'	Full Velocity (fps)	Velocity < 8 fps for PVC
EXMH1	1156.87	1156.87	1163.2	5.69		MH#2	81.00	8.00	0.33	0.0033	OK	2.0	OK
MH#2	1157.14	1157.34	1163.9	6.06	EXMH1	MH#3	46.00	8.00	0.33	0.0033	OK	2.0	OK
MH#3	1157.49	1157.69	1164.1	5.92	MH#2	MH#4	196.00	8.00	0.33	0.0033	OK	2.0	OK
MH#4	1158.14	1158.34	1165.0	6.16	MH#2	MH#5	140.00	8.00	0.33	0.0033	OK	2.0	OK
MH#5	1158.80	1159.00	1165.9	6.40	MH#4	MH#6	373.00	8.00	0.33	0.0033	OK	2.0	OK
MH#6	1160.03	1160.23	1164.6	3.91	MH#5	MH#7	171.00	8.00	0.33	0.0033	OK	2.0	OK
MH#7	1160.79	1160.79	1165.1	3.61	MH#6			8.00	0.33	0.0033	OK	2.0	OK
MH#3	1157.49	1157.69	1164.1	5.92		MH#10	210.00	8.00	0.33	0.0033	OK	2.0	OK
MH#10	1158.38	1158.48	1166.7	7.65	MH#3	MH#11	117.00	8.00	0.33	0.0033	OK	2.0	OK
MH#11	1158.86	1159.06	1163.3	3.74	MH#10	MH#12	151.00	8.00	0.33	0.0033	OK	2.0	OK
MH#12	1159.56	1159.66	1163.6	3.36	MH#11	MH#13	78.00	8.00	0.33	0.0033	OK	2.0	OK
MH#13	1159.92	1159.92	1164.0	3.45	MH#12			8.00	0.33	0.0033	OK	2.0	OK
MH#5	1158.80	1159.00	1165.9	6.40		MH#8	209.00	8.00	0.33	0.0033	OK	2.0	OK
MH#8	1159.69	1159.89	1165.8	5.40	MH#5	MH#9	298.00	8.00	0.33	0.0033	OK	2.0	OK
MH#9	1160.87	1160.87	1165.5	3.92	MH#8			8.00	0.33	0.0033	OK	2.0	OK

FIDELITY NATIONAL TITLE

WHEN RECORDED RETURN TO:

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br.

Marc D. Blonstein, Esq.
Berens Blonstein PLC
7033 East Greenway Pkwy., Suite 210
Scottsdale, Arizona 85254

55001839 1 of 2

SPECIAL WARRANTY DEED

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, **IIP Oasis, LLC**, an Arizona limited liability company (“Grantor”), hereby grants, sells and conveys to **FIG Oakridge Farms, LLC**, a Utah limited liability company (“Grantee”), the real property located in Maricopa County, Arizona and described on Exhibit “A” attached hereto and incorporated herein by this reference (the “Land”), together with Grantor’s interest in (a) all buildings, structures, and improvements located thereon; (b) all development rights and credits, air rights, water, water rights, and water stock relating thereto; (c) all right, title, and interest of Grantor in and to all strips and gores, streets, alleys, easements, rights-of-way, public ways, or other rights appurtenant, adjacent, or connected thereto; (d) all right, title and interest of Grantor in and to any reciprocal easement agreements, declarations of covenants, conditions and restrictions, development agreements, impact fee credit agreements, line extension agreements, utility reimbursement agreements, buy-in agreements and similar agreements; (e) minerals, oil, gas, and other hydrocarbon substances therein, thereunder, or that may be produced therefrom; and (f) any other rights, privileges, appurtenances, hereditaments, easements, reversions, and remainders pertaining thereto or used in connection therewith.

SUBJECT TO all matters of record.

Grantor binds itself and its successors, heirs, legatees and personal representatives to warrant and defend title to the Land and Improvements as against the acts of Grantor and none other.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK. SIGNATURE FOLLOWS]

Exhibit "A" to Special Warranty Deed

Legal Description of the Land

Lot 6, Mirage Oasis, according to the plat recorded in Book 976 of Maps, page 17 and Certificate of Correction recorded in Recording No. 2008-0226969, records of Maricopa County, Arizona.

Unofficial Document