

**Final Drainage Report
Falcon Eye Care
Woodmen Hills Filing No. 12
El Paso County, Colorado**

Prepared for:
T- Bone Construction
Colorado Springs, Colorado 80911

Prepared by:

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Kiowa Project No. 20034

May 10, 2021

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STATEMENTS AND APPROVALS

ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Kiowa Engineering Corporation, 1684 South 21st Street, Colorado Springs, Colorado 80904

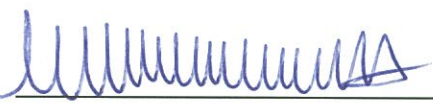

Todd Cartwright PE #33365

For and on Behalf of Kiowa Engineering Corporation

Date

DEVELOPER'S STATEMENT:

I, the Developer, have read and will comply with all of the requirements specified in this drainage report and plan.

By: 

5-11-2021
Date

Print Name: Michael R Thibault

Address: 1310 Ford street

Colorado Springs, Colorado

80915

EL PASO COUNTY:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 & 2, El Paso County Engineering Criteria Manual, and Land Development Code, as amended.

Jennifer Irvine, P.E. Date

El Paso County Engineer/ECM Administrator

Conditions:

I. GENERAL LOCATION AND DESCRIPTION

Falcon Eye Care is located at 7615 McLaughlin Road or as platted Lot 4 of Woodmen Hills Filing No. 7H to be replatted as Lot 1, Woodmen Hills Filing 12. The property will be developed as commercial located in the Falcon area of El Paso County. The property is located east of McLaughlin Road, north of Midnight Road, south of Greenough Road and west of Safeway. Located in the southeast quarter of Section 6, Township 13 south, Range 64 west of the 6th P.M., El Paso County, Colorado

The site contains 1.63 acres of improved but undeveloped land. A vicinity map of the site is shown on Figure 1 included in the Appendix. The site is not within any designated floodplain as indicated on FEMA panel 08041C0553G.

The existing vegetative cover within the development is in poor to fair condition with minimal grasses throughout the site. The site is relatively flat drainage to the south east at approximately 2%. Soils within the subject site are classified to be within Hydrologic Soils Group A as shown in the El Paso County Soils Survey. For the purposes of computing the existing and proposed hydrology for the site, Hydrologic Soil Group A was used.

II. MAJOR DRAINAGE BASINS AND SUBBASINS

The site lies within the Falcon drainage basin. The vicinity has existing storm drainpipes that collect surface flows and discharge to detention pond 4 as defined on the Phase III Preliminary and Filing 7 Final Drainage and Erosions Control Report for Woodmen Hills Subdivision, dated December 23, 1998 completed by URS Greiner Woodward Clyde, see also references after report conclusion. Pond 4 is located to the east in between the adjacent Safeway and Highway 24. The Falcon DBPS dated September 2015 does not make and changes or public improvement that deviate from the MDDP.

The Woodmen Hills Filing 7 drainage report has runoff calculations based on a fully developed lot used to size pond 4. We are not proposing any changes to the drainage pattern or flow. The site drains into the Black Squirrel Creek Basin. This site is a portion on Basin 33 in the Filing 7 report. Basin 33 runoff drains to pond 4. Pond 4 is sized for 1199 acres of developed area. With 233 and 686 CFS flowing in the pond in the 5 and 100-year storms respectively. Excerpts from the Filing 7 report are included in Appendix D

The subject property limits are shown on Flood Insurance Rate Map (FIRM) 08041C0553G with effective dates of December 7, 2018 that are included in the Appendix. The FIRMs also show that the property to be developed with buildable lots is located outside of the FEMA regulated floodplain in an unshaded Zone X area, which is described as "Area of Minimal Flood Hazard."

There are no drainage facilities impacting the site.

III. DRAINAGE DESIGN CRITERIA

Hydrologic and hydraulic calculations for the site were performed using the methods outlined in the *El Paso County Drainage Criteria Manual*. Topography for the site was compiled using a one-foot contour interval and is presented on the Drainage Plan.

The hydrologic calculations were made for the historic and developed site conditions. The Drainage Plan presents the drainage patterns for the site, including the sub-basins. The peak flow rates for the sub-basins were estimated using the Rational Method. The 5-year (Minor Storm) and 100-year (Major Storm) recurrence intervals were determined. The one-hour rainfall depth was determined from Table 6-2 of the *Drainage Criteria Manual*. These depths are shown in the runoff calculations spreadsheet.

The peak flow data generated using the rational method was used to verify street capacities and to size inlets and storm sewers within the subdivision. The drainage basin area, time of concentration, and rainfall intensity were determined for each of the sub-basins within the property.

The onsite soils were assumed to be Hydrologic Soil Group A, based on the *Soil Survey* and the result of earth-moving operations. For existing conditions, runoff coefficients were determined using a land use of pasture/meadow. The land use for the proposed development will be Commercial.

IV. DRAINAGE FACILITY DESIGN

All necessary drainage facilities were installed with the construction of Woodmen Hills Filing 7 pond 4. No new storm drain or detention pond facilities are needed.

An on-site tour of Pond 4 with El Paso County Staff, Woodmen Hills Metropolitan District (WHMD), T-Bone Construction and Kiowa Engineering identified some potential maintenance issues with the water quality outlet system in Pond 4. At that time Woodmen Hills Metro District committed to maintaining the water quality outlet system in Pond 4. The riser pipe and the outlet pipe were evaluated. Eventually after some standing water was pumped out at the outlet it was determined that the outlet pipe was clear and draining properly. The riser pipe was considered to be in disrepair. WHMD has committed to replacing the riser pipe with a new pipe that meets the original design parameters.

WATER QUALITY METHODOLOGY (4-STEP PROCESS):

STEP 1: RUNOFF REDUCTION PRACTICES

New construction will utilize existing and proposed grassed areas as buffers, allowing sediment to drop out of the storm runoff and helping to reduce runoff. The existing grassed swales along the north side of the site shall remain.

STEP 2: IMPLEMENT BMP'S THAT SLOWLY RELEASE THE WATER QUALITY CAPTURE VOLUME

Detention Pond 4 is existing and will not be modified. The existing 4.65-acre feet of WQCV in Pond 4 will be used. When pond 4 was designed it accounted for the impervious area of this site.

STEP 3: STABILIZE DRAINAGEWAYS

Drainage ways are existing and will not be modified. The site drains east to the existing curb and gutter behind the retail center including Safeway. This concrete curb and gutter has capacity for the site runoff. The runoff in this curb and gutter drains to an inlet located near the northwest corner of the Safeway.

STEP 4: IMPLEMENT SITE SPECIFIC & SOURCE CONTROL BMP'S

There are no potential sources of contaminants that could be introduced to the County's MS4 that will not be controlled by temporary construction BMPs. Maintenance and sweeping of parking areas is recommended to limit sediment transport to new inlets, pipes and detention areas. Construction BMPs in the form of vehicle tracking control, concrete washout area, inlet protection, rock socks, and silt fences will be utilized during construction activities to protect receiving waters.

The Following is a description of the drainage sub-basins:

V. OFF SITE DRAINAGE PATTERNS

There are no off-site flows entering the site. The uphill sides of the site have curb and gutter preventing off site flows from entering the site. The adjacent streets also include an inlet taking in flows in the street.

VI. HISTORIC DRAINAGE PATTERNS

Basin H1

1.63 acres of graded undeveloped land. Graded to approximately 2%. The 5 and 100-year runoff are 1 and 2 CFS respectively. The runoff on site flows south east overland in sheet flow and curb & gutter to a five type R inlet behind the shopping center to the south. This inlet has a 30" RCP storm sewer that conveys the flows south east to pond 4. This inlet and storm sewer were sized for these flows in the previously mentioned filing 7 drainage report. These flows and additional runoff information are included in appendix B.

VII. DEVELOPED DRAINAGE PATTERNS

Basin D1

1.63 acres of graded commercial land. Graded to approximately 1-2%. The 5 and 100-year runoff are 7 and 12 CFS respectively. The runoff on site flows south east overland in sheet flow and curb & gutter to a five type R inlet behind the shopping center to the south. This inlet has a 30" RCP storm sewer that conveys the flows south east to pond 4. This inlet and storm sewer were sized for these flows in the previously mentioned filing 7 drainage report. These flows and additional runoff information are included in appendix B.

The 1.63 acre Basin D1 is 60% of the area of the 2.7 acre filing 7 basin 33b. From the rational calcs in this report for Basin D1 and the Filing 7 FDR Basin 33b the 5 year flow is 57% of the 33b and the 100 year flow is 56% of the Basin 33b flows. This indicates that the D1 flows are less than the 33b flows by approximately 3-4%. This indicates a decrease in runoff from the Filing 7 report.

VIII. WATER QUALITY

Storm water quality measures are required by the County in Volume 2 of the County's Drainage Criteria Manual. The water quality measures to be instituted for the development will include:

1. Existing water quality treatment and storage within the detention basin 4.
2. The 4.65 acre feet of WQCV in the 33 acre feet Pond 4 includes a water quality orifice plate and a micropool outlet structure. This pond is sized for the development of the site.

IX. COST OF PROPOSED DRAINAGE FACILITIES

There are no proposed drainage facilities therefore there are no drainage facilities costs.

X. DRAINAGE AND BRIDGE FEES

The site is platted land. Drainage fees were not paid when Filing 7 was recorded. Drainage fees will be due for Filing 12.

Lot 1 is 67% impervious. Lot 2 is 20% impervious. The total site is 43% impervious. Well below the design imperviousness. These percent impervious calculations are shown in Appendix B. For future reference, 85% impervious fees were calculated. If lot 2 is 0.78 acres of 100% impervious and 0.05 acres of landscaping the weighted total would only be 83% impervious.

For theoretical calculations 85% impervious of 1.63 acres is 1.39 acres of impervious per the Filing 7 FDR.

Type of Fee 2021	Impervious Acres	Drainage Fee / Acre (2019)	Fee:
Drainage Fee	1.39	\$ 31,885	\$ 44,320.15
Pond Facility Fee	1.39	\$ 4,380	\$ 6,088.20
Total Fees	1.39	\$ 36,265	\$ 50,408.35

The site is currently 43% impervious resulting in 0.70 acres of impervious.

Type of Fee 2021	Impervious Acres	Drainage Fee / Acre (2019)	Fee:
Drainage Fee	0.70	\$ 31,885	\$ 22,319.50
Pond Facility Fee	0.70	\$ 4,380	\$ 3,066.00
Total Fees	0.70	\$ 36,265	\$ 25,385.50

Conclusions

The Falcon Eye Care will be a commercial subdivision covering approximately 1.63 acres. The site will use existing infrastructure to handle runoff to include the existing storm drain system and detention pond 4. The site will not adversely impact or deteriorate improvements or natural drainageways downstream of the property.

XI. REFERENCES

- 1) Phase III Preliminary and Filing 7 Final Drainage and Erosions Control Report for Woodmen Hills Subdivision, prepared by URS Greiner Woodward Clyde, dated December 23, 1998.
- 2) Master Development Drainage Plan for Woodmen Hills Subdivision, prepared by URS Greiner, dated October 7, 1998.
- 3) El Paso County Drainage Criteria Manual Volume 1, dated July 2014.
- 4) El Paso County Drainage Criteria Manual Volume 2, dated July 2014.
- 5) El Paso County Engineering Criteria Manual, dated July 2019.
- 6) Custom Soil Resource Report for El Paso County Area, Colorado, prepared by United States Department of Agriculture, Natural Resources Conservation Service, dated September 16, 2020.
- 7) National Flood Insurance Hazard layer FIRMette portion of panel 08041C0553G, Federal Emergency Management Agency, Effective Date 12/7/2018.
- 8) Falcon Drainage Basin Planning Study, prepared by Matrix Design Group, dated September 2015.

APPENDIX A

Figure 1: Vicinity Map

Figure 2: Soils Map

Figure 3: FEMA Flood Insurance Rate Map



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **El Paso County Area, Colorado**



Figure 2

September 16, 2020

Custom Soil Resource Report Soil Map



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	0.2	13.2%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	1.4	86.8%
Totals for Area of Interest		1.7	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

8—**Blakeland loamy sand**, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits
derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water capacity: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
***Hydrologic Soil Group:* A**
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit: 1 percent

Custom Soil Resource Report

Landform: Depressions

Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p

Elevation: 6,500 to 7,300 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 125 to 145 days

Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent

Minor components: 3 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Fans, flood plains, fan terraces

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam

C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: R049XB215CO - Gravelly Foothill

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales

Hydric soil rating: Yes

National Flood Hazard Layer FIRMette

104°36'30"W 38°56'44"N



Legend

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

SPECIAL FLOOD HAZARD AREAS

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

OTHER AREAS OF FLOOD HAZARD

OTHER AREAS

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

GENERAL STRUCTURES

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

Cross Sections with 1% Annual Chance

Water Surface Elevation
Coastal Transect

Base Flood Elevation Line (BFE)
Limit of Study

Jurisdiction Boundary
Coastal Transect Baseline
Profile Baseline
Hydrographic Feature

OTHER FEATURES

Digital Data Available
No Digital Data Available
Unmapped

MAP PANELS



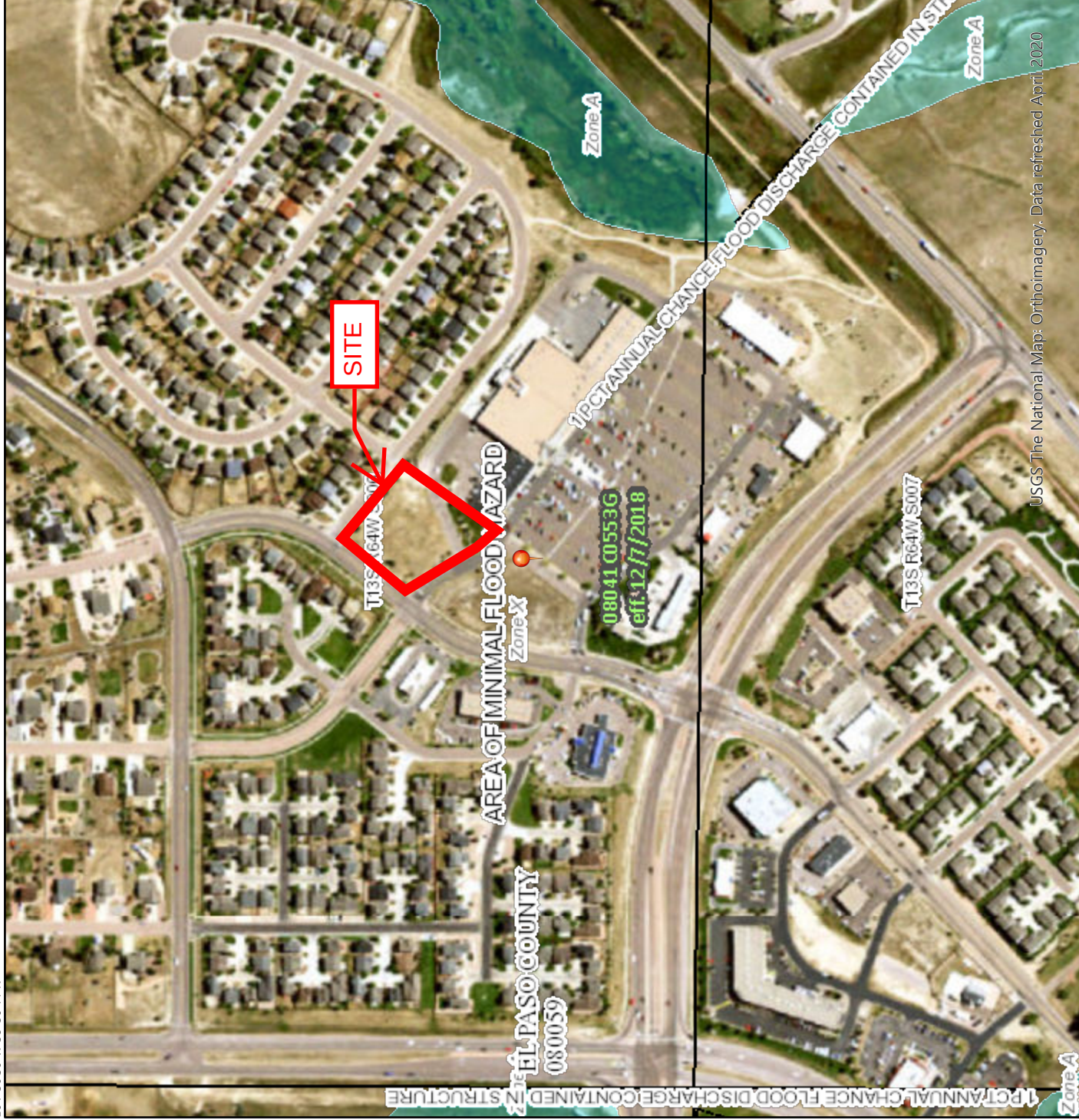
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/16/2020 at 8:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 3



USGS The National Map: Orthoimagery. Data refreshed April 2020

104°35'52"W 38°56'16"N

Feet

1:6,000

2,000

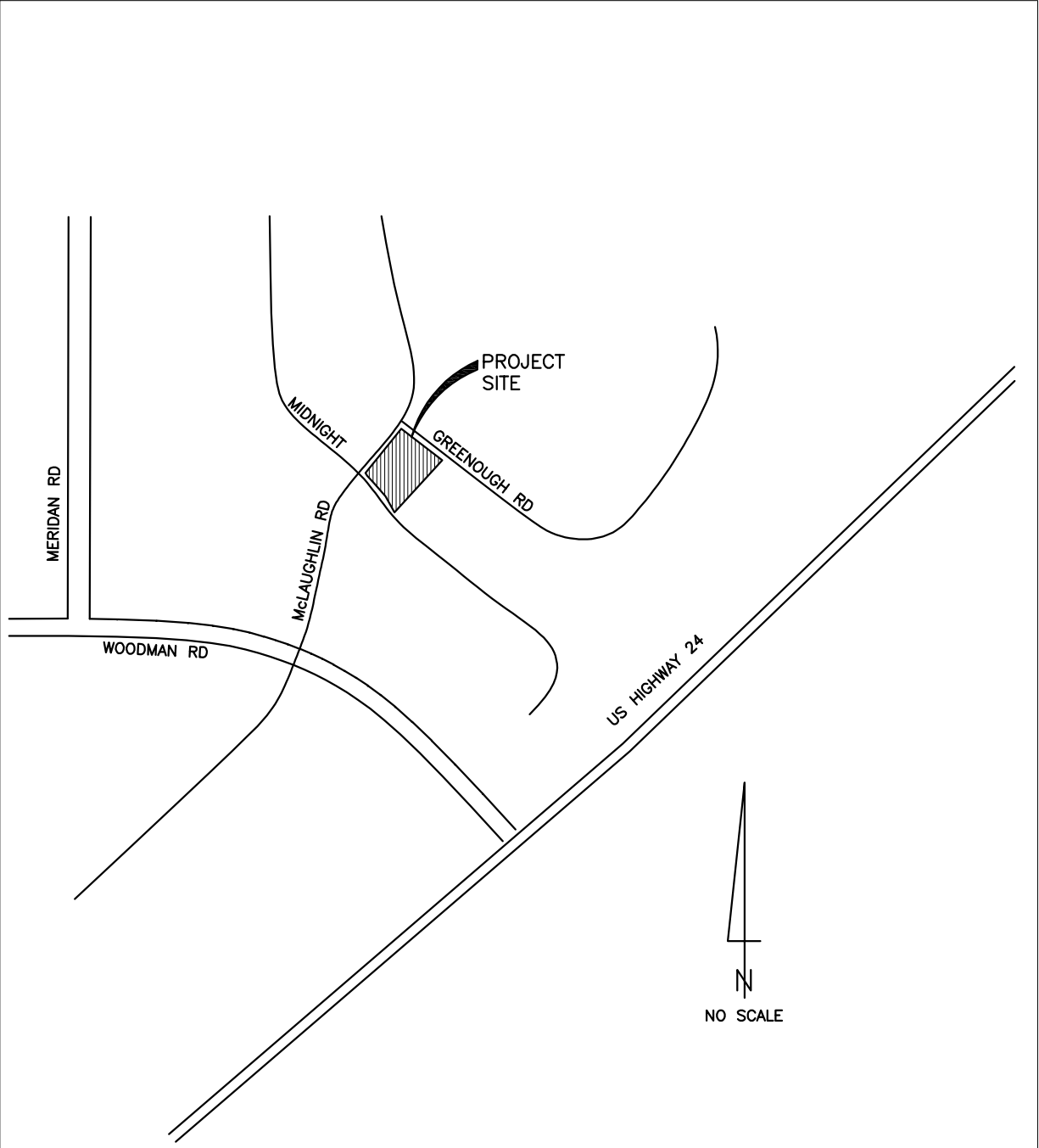
1,500

1,000

500

250

0



VICINITY MAP

Figure 1

APPENDIX B
Hydrologic Calculations

Falcon Eye Care - Woodmen Hills Filing 7, Lot 4
Final Drairage Report
Area Runoff Coefficient Summary - EXISTING

BASIN	TOTAL AREA		DEVELOPED		UNDEVELOPED		WEIGHTED	
	(SF)	(Acres)	AREA	C₅	C₁₀₀	AREA	C₅	C₁₀₀
H-1	71,334	1.6	0.0	0.90	0.90	1.6	0.15	0.20
			0.0	0.90	0.90	0.0	#DIV/0!	#DIV/0!

Calculated by: TAC
Date: 9/15/2020
Checked by: _____

Falcon Eye Care - Woodmen Hills Filing 7, Lot 4

Final Drairage Report

Area Runoff Coefficient Summary - PROPOSED

BASIN	TOTAL AREA		DEVELOPED			UNDEVELOPED			WEIGHTED	
	(SF)	(Acres)	AREA (Acres)	C ₅	C ₁₀₀	AREA (Acres)	C ₅	C ₁₀₀	C ₅	C ₁₀₀
D-1	71,334	1.6	1.6	0.90	0.90	0.0	0.15	0.20	0.90	0.90

Percent Impervious - PROPOSED

BASIN	TOTAL AREA		Roofs & Paving		Landscaped		Weighted
	(SF)	(Acres)	AREA (Acres)		AREA (Acres)		
D-1	71,334	1.63	0.69	0.95	0.94	0.05	0.43
Lot 1	34,796	0.80	0.55	0.95	0.25	0.05	0.67
Lot 2	36,519	0.84	0.14	0.95	0.70	0.05	0.20
85%	71,334	1.63	1.33	1.00	0.30	0.05	0.83

Calculated by: TAC
 Date: 9/15/2020
 Checked by:

Falcon Eye Care - Woodmen Hills Filing 7, Lot 4
Final Drainage Report
Area Drainage Summary - EXISTING

		WEIGHTED		OVERLAND				STREET / CHANNEL FLOW				T _i	CA		INTENSITY		TOTAL FLOW	
BASIN	AREA TOTAL (Acres)	C ₅	C ₁₀₀	C ₅	Length (ft)	Height (ft)	T _C (min)	Grass/ Paved	Length (ft)	Slope (%)	Velocity (fps)	T _i (min)	CA ₅	CA ₁₀₀	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)
		* For Cuts See Runoff Summary																
H-1	1.6	0.15	0.20	0.15	100	2	14.1	Grass	300	2.0%	1.3	3.8	0.24	0.33	3.2	5.4	0.8	1.8
							0.0					0.0						
							0.0					0.0						
							0.0					0.0						
				0.15			#DIV/0!					#VALUES			#DIV/0!	#DIV/0!		
							0.0					0.0						
							0.0					0.0						

Calculated by: TAC
Date: 9/15/2020
Checked by:

Falcon Eye Care - Woodmen Hills Filing 7, Lot 4

Final Drairage Report

Area Drainage Summary - PROPOSED

BASIN	AREA TOTAL (Acres)	WEIGHTED		OVERLAND				STREET / CHANNEL FLOW					T _i	CA		INTENSITY		TOTAL FLOW	
		C ₅	C ₁₀₀	C ₅	Length (ft)	Height (ft)	T _C (min)	Grass/ Paved	Length (ft)	Slope (%)	Velocity (fps)	T _i (min)		CA ₅	CA ₁₀₀	I ₅ (in/hr)	I ₁₀₀ (in/hr)	Q ₅ (c.f.s.)	Q ₁₀₀ (c.f.s.)
* For C ₁₀₀ See Runoff Summary																			
D-1	1.6	0.90	0.90	0.15	10	1	3.3 0.0 0.0	Paved	360	1.0%	1.4	4.3 0.0 0.0	1.47 1.47	1.47	4.5 7.9			6.54 11.57	
33b From F7	2.7																11.55	20.67	

D-1 5 of 33 60%

57% 56%

APPENDIX C
Existing and Proposed Drainage Plans

NOTES:
1) ALL ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE INDICATED.
2) ADD 6800 TO SPOT ELEVATIONS.

LEGEND

CS RUNOFF

2.2 cfs
4.3 cfs

5-YEAR RUNOFF
100-YEAR RUNOFF

DIRECTIONAL FLOW ARROW

DRAINAGE BASIN BOUNDARY

DRAINAGE EASEMENT (UTILITY)

C-4

DRAINAGE BASIN DESIGNATION

2.67 AC

0.31 0.50 C100 RUNOFF

DESIGN POINT

TIME OF CONCENTRATION PATH

HYDRAULIC STRUCTURE IDENTIFIER

STORM SEWER IDENTIFIER

PROPOSED STORM SEWER PIPE

PROPOSED STORM SEWER MANHOLE

PROPOSED STORM DRAINAGE CURB INLET

EXISTING CONTOURS

PROPOSED CONTOURS

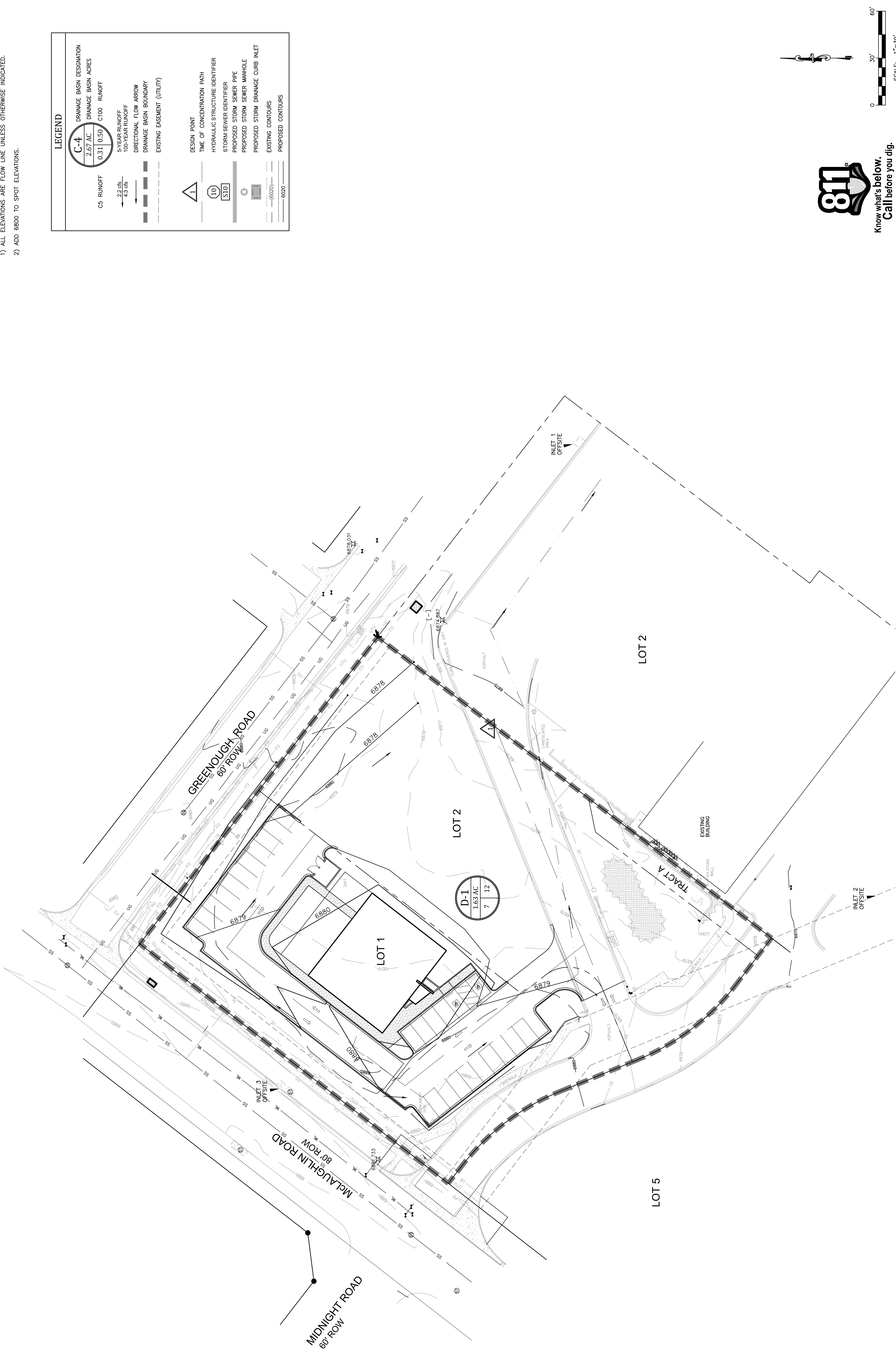
The map displays a residential area with several lots and roads. A prominent drainage basin, labeled 'H-1', is shown with a circular symbol indicating its area (1.63 AC) and runoff rates (0.8 and 1.8). The basin is situated between 'LOT 1' and 'LOT 2'. To the left, 'GREENOUGH ROAD' runs diagonally, with a '60' ROW' (Right of Way) line. Below it, 'McLAUGHLIN ROAD' also runs diagonally, with a '60' ROW' line. 'LOT 5' is located to the right of 'LOT 2'. 'TRACT A' is labeled near an 'EXISTING BUILDING' and a 'STONE WALL'. 'INLET 1 OFFSITE' and 'INLET 2 OFFSITE' are marked with arrows. The map includes various symbols for drainage basins, easements, and roads, as defined in the legend. Elevation points are scattered throughout the map, with some labeled '6800'.

811

Know what's below.
Call before you dig.

0 30' 60'

SCALE: 1"=30'



NOTES:

- 1) ALL ELEVATIONS ARE FLOW LINE UNLESS OTHERWISE INDICATED.
- 2) ADD 6800 TO SPOT ELEVATIONS.



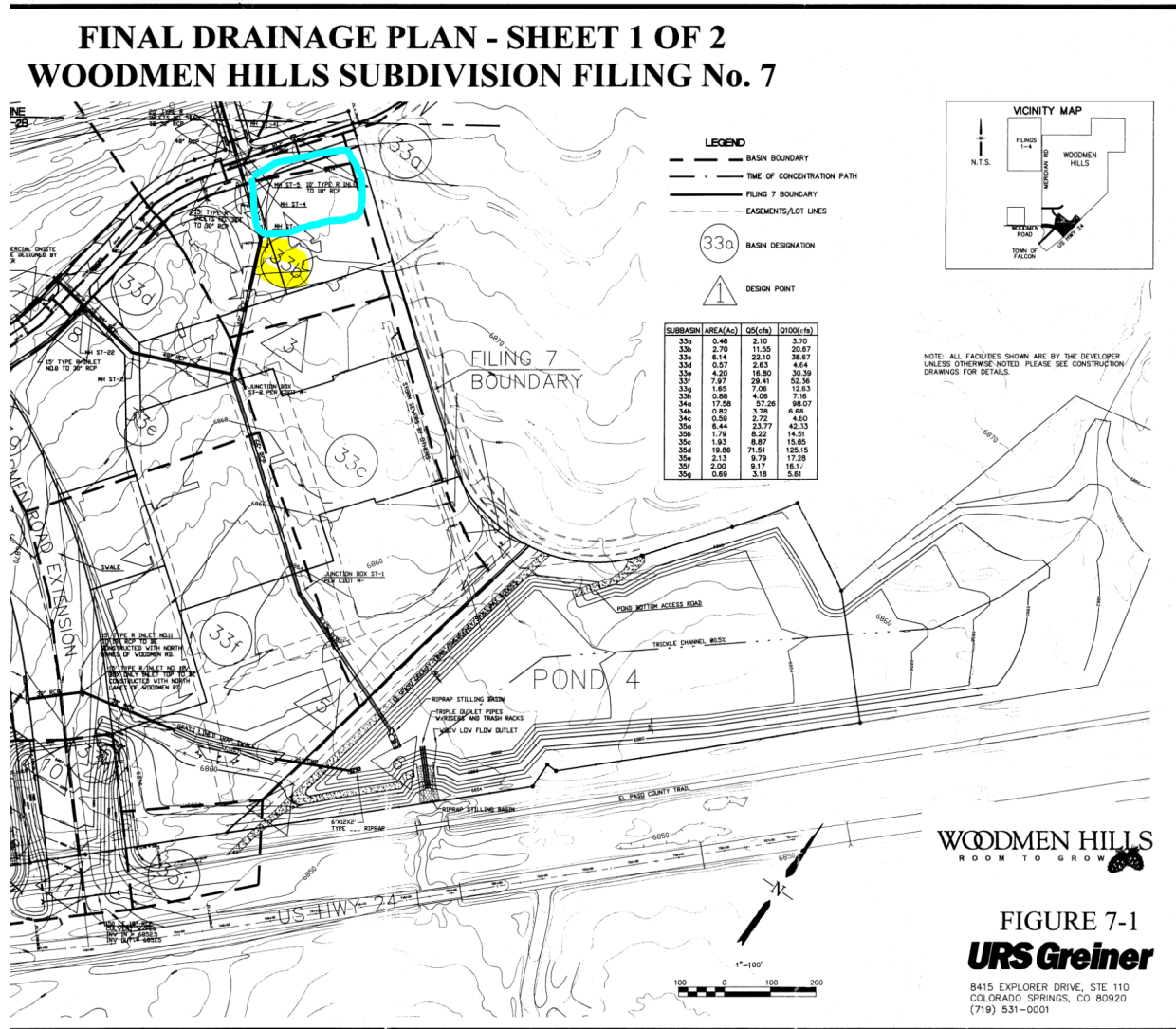
**Know what's below.
Call before you dig.**

APPENDIX D

Previous report calculations and excerpts

Filing 7 FDR Basin Map Figure 7-1

Site is north half of basin 33b



Filing 7 FDR Page 7 – Basin 33b Description

Subbasins 33b, 33c, 33e, and 33f are on-site within the Safeway commercial area. 5-year and 100-year design flows for subbasin 33b are 11.55 cfs and 20.67 cfs; for subbasin 33c, 22.10 cfs and 38.67 cfs; for subbasin 33e, 16.8 cfs and 30.39 cfs; for subbasin 33f, 29.41 cfs and 52.36 cfs. The site engineer has designed the parking lot inlets to capture and convey these flows to the storm sewer trunk line and their design has been submitted for your information under a separate cover.

Filing 7 FDR Page 8 – Pond 4 Description

Detention Pond #4 at Hwy 24 will have 33 Ac-ft of storage to the emergency spillway crest. 4.65 Ac-ft of storage is required for the WQCV, to an elevation of approximately 6852.84 ft. The WQCV outlet structure consists of a single 18-inch CMP "riser" with 1 row of 2-inch orifice openings (10 openings per row) at elevation 6851.0. The outlet will be packed in 4-inch rock to help prevent clogging of the orifice openings. The design discharge rate from the WQCV outlet is 1.4 cfs, which will drain the WQCV in approximately 40 hours. The discharge pipe from the WQCV outlet will be a 12" CMP at 0.5%, discharging to the stilling basin. The remainder of the outlet structure consists of three 36-inch riser pipes with trash racks designed to control peak outflows from the 2-year, 5-year and 100-year storms. The risers are at elevations 6854.0, 6854.5 and 6855.0. The outlet pipes are at a minimum slope of 3.0%, discharging to the stilling basin. Detention Pond design calculations follow in Appendix E.

Filing 7 FDR – Basin 33 Curve Number

WOODMEN HILLS PHASE III / FILING 7, URSG Project No. 6742238
DEVELOPMENT OF HEC-1 DATA - MAIN CHANNEL SUBBASINS
PROPOSED / DEVELOPED CONDITIONS

BASIN DATA - CURVE NUMBERS

BASIN	TOTAL AREA (Ac)	Residential Lots (Acreage)			Open Space	School / Park	Town Center (Comm)	Road	Avg CN
		1 Ac	1/2 Ac	1/4 Ac					
		64	69	75	61	68	92	98	
MAIN CHANNEL									
1	236.80								60
17A	283.75								62
19	178.15								66
20	69.79	42.50	14.16		9.20			3.93	64
21	61.94	28.10	16.44		14.20			3.20	65
22	49.33		27.15		16.53	4.50		1.15	67
23	35.47		28.26			6.50		0.71	69
24	31.62		29.69					1.93	71
25	25.00		12.71		11.48			0.81	66
26	40.82		39.24					1.58	70
27	18.69			12.49	5.62			0.58	72
28	39.34		36.61					2.73	71
29	38.52			35.88				2.64	77
30	30.02		24.96				3.65	1.41	73
31	32.99		25.71		5.96			1.32	69
32	24.38						20.73	3.65	93
33	37.34				10.31		22.16	4.87	84
34	6.85						4.73	2.12	94
43	33.98								62
44	102.42		87.35			5		10.07	72

Filing 7 FDR – Basin 33b rational flows

WOODMEN HILLS FILING No 7 FINAL DRAINAGE REPORT
URS Greiner Project No. 6742238

SUMMARY OF RATIONAL ANALYSIS

SUBBASIN	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)	SUBBASIN	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)
32a	3.91	15.64	28.30	34a	17.58	57.26	98.07
32b	2.42	10.34	18.50	34b	0.82	3.78	6.68
32c	9.63	34.66	60.65	34c	0.59	2.72	4.80
33a	0.46	2.10	3.70	34d	1.36	6.24	11.01
33b	2.70	11.55	20.67	35a	6.44	23.77	42.33
33c	6.14	22.10	38.67	35b	1.79	8.22	14.51
33d	0.57	2.63	4.64	35c	1.93	8.87	15.65
33e	4.20	16.80	30.39	35d	19.86	71.51	125.15
33f	7.97	29.41	52.36	35e	2.13	9.79	17.28
33g	1.65	7.06	12.63	35f	2.00	9.17	16.17
33h	0.88	4.06	7.16	35g	0.69	3.18	5.61
33i	1.33	6.08	10.74	35h	0.62	2.84	5.02
DESIGN PT	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)	DESIGN PT	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)
1	15.95	57.43	100.50	9	1.52	6.96	12.28
2	16.41	59.07	103.38	10	5.16	19.75	35.55
3	19.11	64.33	110.08	11	3.02	13.85	24.44
4	42.05	128.66	221.38	12	4.34	17.39	31.46
5	61.32	176.59	292.49	13	8.23	30.38	54.10
6	61.32	176.59	292.49	14	10.17	37.51	66.79
7	18.17	59.19	101.38	15	30.03	104.60	181.09
8	18.74	61.06	104.57	16	1.98	9.08	16.03

Filing 7 FDR – Basin 33 HEC results

WOODMEN HILLS PHASE III / FILING 7

HEC-1 ANALYSIS OF MAIN CHANNEL: SUMMARY OF RESULTS

URSG PROJECT No. 6742238

7/11/98

REVISED: 12/18/98

BASIN	EXISTING: 7EX-xxx			DEVELOPED: 7FUC-xxx				
	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)	AREA (Ac)	Q ₂ (cfs)	Q ₅ (cfs)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
1	-			236.80	3	67	102	272
17A	283.75	22	201	283.75	4	29	58	200
19	66.79	49	234	66.79	12	49	82	234
20	57.56	9	75	69.79	4	20	35	104
21	45.59	8	67	61.94	5	21	36	99
22	80.97	6	52	49.33	6	20	32	85
23	14.90	9	78	35.47	5	14	21	54
24	6.94	2	15	31.62	7	17	26	62
25	21.61	1	9	25.00	3	10	16	46
26	18.57	3	25	40.82	8	21	32	78
27	48.97	2	21	18.69	8	17	24	52
28	28.49	5	44	39.34	8	20	30	74
29	6.69	3	28	38.52	21	41	55	114
30	69.88	1	9	30.02	9	21	30	68
31	19.56	7	62	32.99	5	15	23	60
32	59.18	3	28	24.38	46	64	77	120
33	178.15	7	66	37.34	37	61	78	140
34				6.85	14	19	23	35
43	33.98			33.98	2	10	17	51
44	62.76			102.42	25	59	87	206

DESIGN POINT	EXISTING: 7EX-xxx			DEVELOPED: 7FUC-xxx				
	AREA (Ac)	Q ₅ (cfs)	Q ₁₀₀ (cfs)	AREA (Ac)	Q ₂ (cfs)	Q ₅ (cfs)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
DP1				236.80	30	67	102	272
DP2 (EE)	283.75	22	201	520.55	32	95	154	459
E1 (Pond1 In)	341.31	25	226	590.33	33	99	161	503
P1 (Pond1 Out)	341.31	3	174	590.33	2	6	22	155
E2 (Pond2 In)	386.90	8	185	652.27	5	21	36	165
P2 (Pond2 Out)	386.90	0	41	652.27	1	5	6	59
T				136.40	25	63	97	249
FF (Pond3 In)	408.74	15	142	905.09	37	101	162	417
P3 (Pond3 Out)				905.09	6	18	35	144
F1	497.89	18	167	969.43	10	31	47	167
F2	497.89	19	175	1028.94	12	35	55	171
G1	148.62	9	88	87.39	49	84	111	220
GG (Pond4 In)	859.83	37	376	1199.05	122	233	321	686
P4 (Pond4 Out)	859.83			1199.05	11	34	69	270
HH	926.62	64	593	1265.84	13	49	91	396

WOODMEN HILLS

METROPOLITAN DISTRICT

May 6, 2021

Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

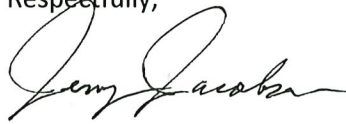
Re: Letter of Commitment to upgrade Water Quality Outlet on Pond 4

Dear Ms. Nijkamp,

This is a letter of commitment to replace the Water Quality Outlet Pipe on Pond 4. The current WQO will be replaced with a new pipe constructed according to the original plans. The work is scheduled for next week. Crews pumped water from the outlet of the Water Quality Pipe in order to check for flow through the WQP. It was determined that water flows through the WQP indicating the pipe is clear of obstructions. This was accomplished this morning.

If you have any questions, please contact me.

Respectfully,



Jerry Jacobson
General Manager
Woodmen Hills Metropolitan District