INNOVATIVE DESIGN. **CLASSIC RESULTS.**

DRAINAGE LETTER FOR FLYING HORSE NORTH GOLF MAINTENANCE FACILITY

SEPTEMBER 2019

Prepared for:
PRI #2 LLC
6385 CORPORATE DRIVE SUITE 200
COLORADO SPRINGS CO 80919
(719) 592-9333

Prepared by:
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(719) 785-0790

Job no. 1096.11
PCD File No. PPR-1934

DRAINAGE LETTER
FLYING HORSE NORTH - GOLF MAINTENANCE FACILITY

DRAINAGE REPORT STATEMENT

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 applicable 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.

COLORADO REGISTERED PROFESSIONAL ENGINEER MARC A. WHORTON 37155

10/15/19

Marc A. Whorton, P.E. Colorado P.E. #37155 — Date

OWNER/DEVELOPER'S STATEMENT:

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

Business Name: PRI #2 LLC

By:

Title: V-P

Address: 6385 Corporate Drive, Suite 200

Colorado Springs, CO 80919

EL PASO COUNTY:

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

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Approved
by Elizabeth Nijkamp
El Paso County Planning and Community Development
on behalf of Jennifer Irvine, County Engineer, ECM Administrator
10/23/2019 4:06:43 PM

Conditions:

CLASSIC CONSULTING ENGINEERS & SURVEYORS

PURPOSE

The purpose of this Drainage Letter is to describe the site specific drainage design for the Flying Horse North Golf Maintenance Facility. This letter is submitted in conjunction with the Golf Maintenance Facility Site Development Plan. Reference Final Drainage Report for Flying Horse North Filing No. 1, approved September 2018.

GENERAL DESCRIPTION

The Golf Maintenance Facility was planned within Tract L, Flying Horse North Filing No. 1. The total acreage of this tract is 84.66 acres and includes 6 holes for the golf course, the driving range, golf course lake as well as the maintenance facility. The maintenance facility area only uses approximately 3 acres of this tract. The maintenance facility site is located in the east portion of section 36, township 11 south, range 66 west of the sixth principal meridian. The site is bounded on the north by Old Stagecoach Road, to the south and east by the Golf Course and to the west by the 2.5 acre residential lot within Flying Horse North Filing No. 1. A site specific PUD plan showing this use was previously approved in the Fall of 2016 along with the more recent overlot grading and erosion control plan for Flying Horse North Filing No. 1, approved September 2018.

The average soil condition reflects Hydrologic Group "B" (Brussett Loam, Elbeth Sandy Loam, Kettle Gravelly Loamy Sand, Peyton Sandy Loam, Peyton Pring Complex, Pring Course Sandy Loam, and Tomah-Crowfoot Loamy Sand) as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see map in Appendix).

EXISTING DRAINAGE CONDITIONS

As described in the Final Drainage Report for Flying Horse North Filing No. 1, this specific site is contained within Basin CC-4B of the East Cherry Creek Drainage Basin. This basin was shown with a total acreage of 8.1 acres, with the west half of the basin being 2.5 acre residential lots and the east half being the golf maintenance area. The basin naturally sheets flows in an easterly direction with natural vegetation (grassland with sparse pine trees throughout) across the residential lots and previously overlotted, partially revegetated ground within the maintenance site. Side road ditches now currently exist along both Allen Ranch Road and Old Stagecoach Road. These ditches are partially revegetated with erosion control matting in place. The site was planned to continue to sheet flow in an easterly direction towards a private storm pipe at the east end of the site.

PROPOSED DRAINAGE CONDITIONS

Basin OS-1 (Q_2 = 3 cfs Q_5 = 4 cfs, Q_{100} = 9 cfs) represents off-site sideroad ditch flows from the adjacent public roadways and a portion of the two adjacent residential lots. These flows then travel as sideroad ditch flows in an easterly direction along the south side of Old Stagecoach Road where a proposed 24" RCP driveway culvert will convey the flows into Basin A. (See Appendix for culvert design)

Basin OS-2 (Q_2 = 0.3 cfs Q_5 = 1 cfs, Q_{100} = 4 cfs) represents sheet flows from the two adjacent residential lots. These sheet flows will continue to enter the maintenance facility property along the west property line, be routed around the proposed building, combine with Basin A and then travel towards Design Point 1.

Basin A (Q_2 = 5 cfs Q_5 = 7 cfs, Q_{100} = 14 cfs) represents the main portion of the maintenance facility site including the proposed building, shed and gravel maneuvering area. These on-site sheet flows travel in a northeasterly direction towards Design Point 1.

Design Point 1 (Q_5 = 9 cfs, Q_{100} = 22 cfs) represents the total combined flows from all four described basins. This developed flow will be completely accepted by a private 30" RCP storm stub constructed along with the Golf Course and routed directly into the irrigation reservoir (Pond 13) further to the east. As described in the approved Final Drainage Report for Flying Horse North Filing No. 1, these flows were accounted for in the design of this facility and treated prior to being released from the Flying Horse North property.

DRAINAGE CRITERIA

Hydrologic calculations were performed using the City of Colorado Springs/El Paso County Drainage Criteria Manual, revised in November 1991 and October 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014. The IDF curves from Figure 6-5 of the City of Colorado Springs/El Paso County DCM was used to estimate storm water runoff anticipated from design storms for the 2 year, 5 year and 100 year recurrence interval. (See Appendix)

FLOODPLAIN STATEMENT

No portion of the Maintenance Facility Site is located within a floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 08041C0315G effective date, December 7, 2018 (See Appendix).

DRAINAGE AND BRIDGE FEES

The East Cherry Creek Basin does not currently have a Drainage Basin Fee. Also, this specific maintenance facility site, located within Tract L, Flying Horse North Filing No. 1 was previously platted and all applicable fees were paid at that time.

SUMMARY

The proposed maintenance facility development remains consistent with the previously approved Flying Horse North Filing No. 1 Final Drainage Report. All developed flows were previously accounted for along with all stormwater quality requirements being handled in Pond 13 constructed with Filing 1. The proposed development will not adversely impact surrounding properties.

PREPARED BY:

Classic Consulting Engineers & Surveyors, LLC

Marc A. Whorton, P.E.
Project Manager

Maw/109611/reports/109611PDR Letter.doc

CLASSIC CONSULTING ENGINEERS & SURVEYORS

REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual, as revised in November 1991 and 1994 with County adopted Chapter 6 and Section 3.2.1 of Chapter 13 of the City of Colorado Springs/El Paso County Drainage Criteria Manual as revised in May 2014.

2. "Master Development Drainage Plan for Flying Horse North", Classic Consulting, dated September 2016.

3. "Preliminary Drainage Report for Flying Horse North (Golf Course Grading and Private Access Roads)", Classic Consulting, dated September 2016.

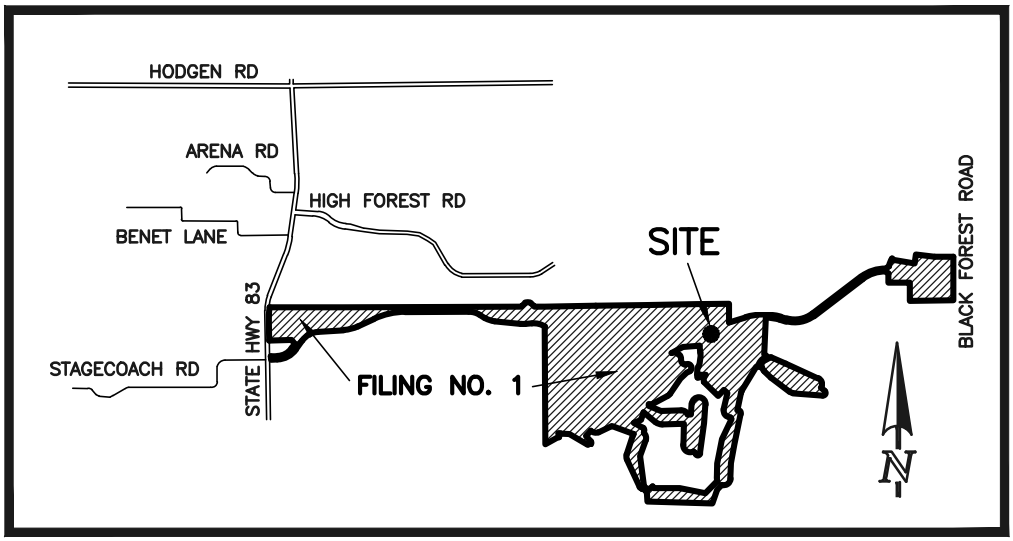
4. "Final Drainage Report for Flying Horse North Filing No. 1", Classic Consulting, dated September 2018.

5. "Urban Storm Drainage Criteria Manual Volume 1, 2 & 3" Urban Drainage and Flood Control District, dated January 2016.

APPENDIX

VICINITY MAP

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS



VICINITY MAP

SOILS MAP (WEB SOIL SURVEY)

Map Scale: 1:4,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
26	Elbeth sandy loam, 8 to 15 percent slopes	0.0	0.0%
66	Peyton sandy loam, 1 to 5 percent slopes	8.7	8.6%
67	Peyton sandy loam, 5 to 9 percent slopes	49.6	48.9%
68	Peyton-Pring complex, 3 to 8 percent slopes	43.1	42.5%
Totals for Area of Interest		**101.4**	**100.0%**

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d
Elevation: 6,800 to 7,600 feet
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 115 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Sandy Divide (R049BY216CO)
Hydric soil rating: No

F.E.M.A. MAP

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

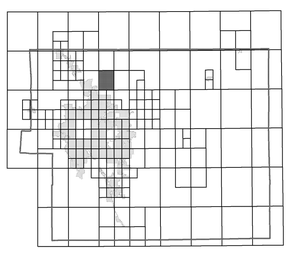
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

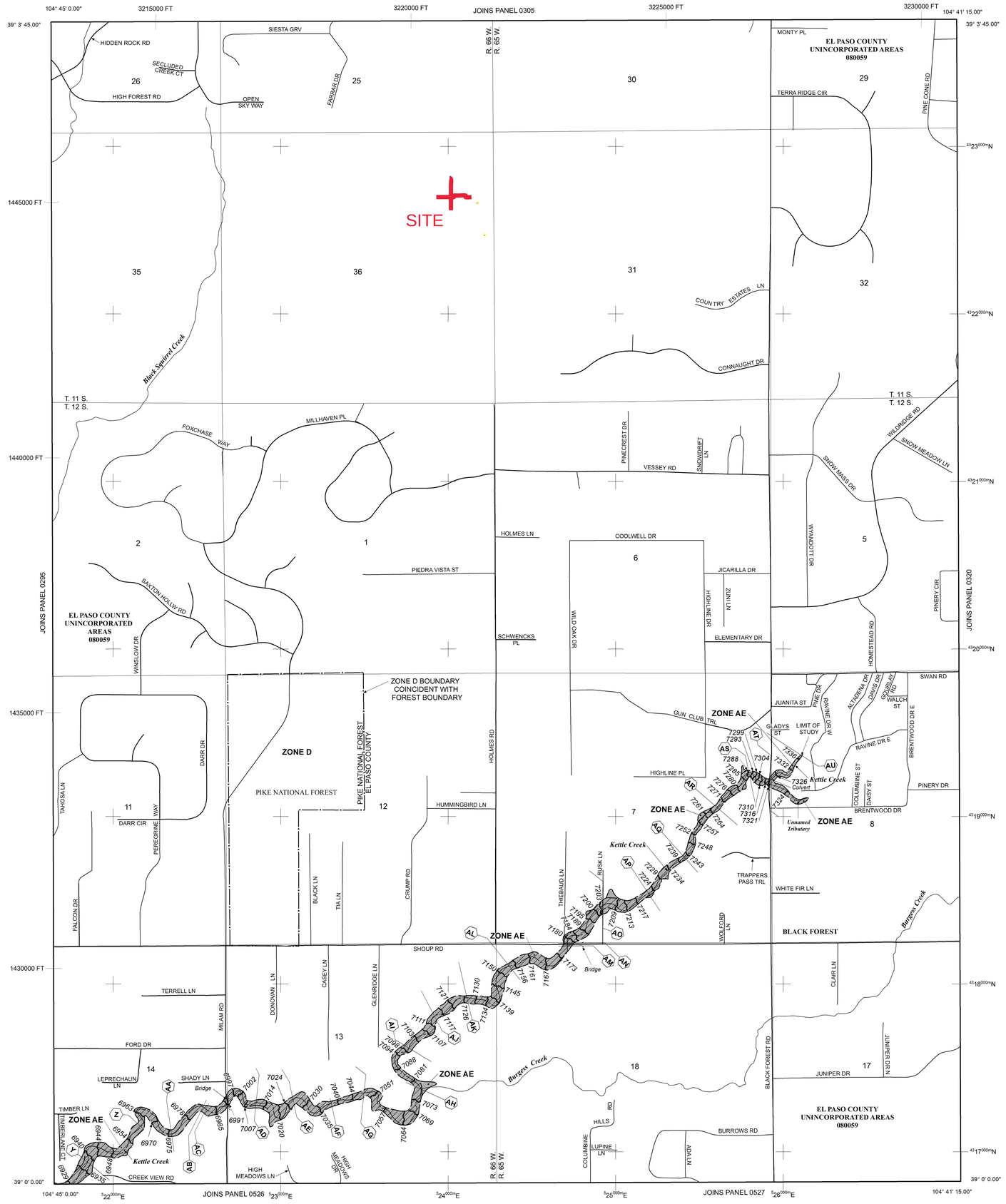
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	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.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D Boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 - - - - - 23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0315G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 315 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0315	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0315G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

HYDROLOGIC / HYDRAULIC CALCULATIONS

CLASSIC SM
CONSULTING
ENGINEERS & SURVEYORS

JOB NAME: *FLYING HORSE NORTH GOLF MAINTENANCE FACILITY*
JOB NUMBER: *1096.11*
DATE: *09/09/19*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		IMPERVIOUS AREA / STREETS				LANDSCAPE/DEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	**CA(2)**	**CA(5)**	**CA(100)**
OS-1	3.10	1.20	0.89	0.90	0.96	1.90	0.07	0.16	0.41	0.39	0.45	0.62	**1.20**	**1.38**	**1.93**
OS-2	1.90	0.00	0.89	0.90	0.96	1.90	0.07	0.16	0.41	0.07	0.16	0.41	**0.13**	**0.30**	**0.78**
A	2.80	0.00	0.89	0.90	0.96	2.80	0.57	0.59	0.70	0.57	0.59	0.70	**1.60**	**1.65**	**1.96**

JOB NAME:	*FLYING HORSE NORTH GOLF MAINTENANCE FACILITY*
JOB NUMBER:	*1096.11*
DATE:	*09/09/19*
CALC'D BY:	*MAW*

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$

$$V = C_v S_w^{0.5}$$

Tc=L/V

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

$$t_c = \frac{L}{180} + 10$$

*For buried riprap, select C_v value based on type of vegetative cover.

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

BASIN	WEIGHTED CA(2)	WEIGHTED CA(5)	WEIGHTED CA(100)	OVERLAND C(5)	OVERLAND Length (ft)	OVERLAND Height (ft)	OVERLAND Tc (min)	STREET / CHANNEL FLOW Length (ft)	STREET / CHANNEL FLOW Slope (%)	STREET / CHANNEL FLOW Velocity (fps)	STREET / CHANNEL FLOW Tc (min)	Tc TOTAL (min)	INTENSITY I(2) (in/hr)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(2) (cfs)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
OS-1	1.20	1.38	1.93	0.16	300	10	19.8	550	4.0%	2.0	4.6	24.3	2.24	2.79	4.69	3	**4**	**9**
OS-2	0.13	0.30	0.78	0.16	300	10.5	19.4					19.4	2.50	3.13	5.26	0.3	**1**	**4**
A	1.60	1.65	1.96	0.59	50	2	4.1	500	2.5%	1.6	5.3	9.4	3.37	4.22	7.09	5	**7**	**14**

JOB NAME: *FLYING HORSE NORTH GOLF MAINTENANCE FACILITY*
JOB NUMBER: *1096.11*
DATE: *09/09/19*
CALCULATED BY: *MAW*

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity		Flow		Inlet Size
					I(5)	I(100)	Q(5)	Q(100)	
1	OS-1, OS-2 & A	3.34	4.67	24.6	2.78	4.66	9	22	30" CULVERT

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Sep 11 2019

24 in. RCP Driveway Culvert

Invert Elev Dn (ft)	=	7556.00
Pipe Length (ft)	=	65.00
Slope (%)	=	3.08
Invert Elev Up (ft)	=	7558.00
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

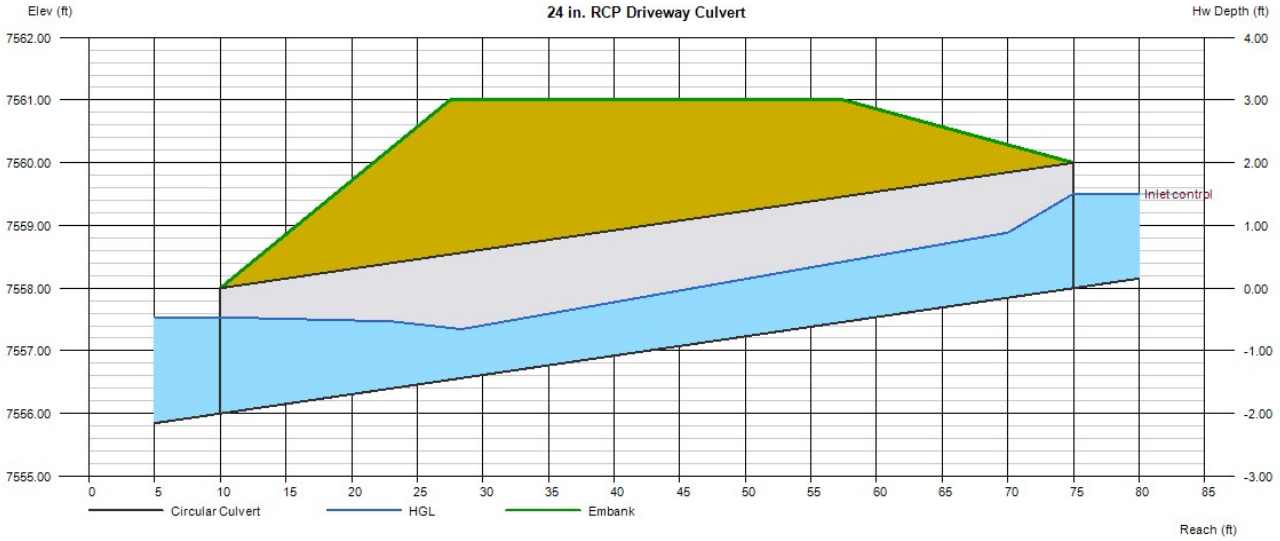
Top Elevation (ft)	=	7561.00
Top Width (ft)	=	30.00
Crest Width (ft)	=	50.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	9.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	9.00
Qpipe (cfs)	=	9.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.48
Veloc Up (ft/s)	=	5.26
HGL Dn (ft)	=	7557.54
HGL Up (ft)	=	7559.07
Hw Elev (ft)	=	7559.51
Hw/D (ft)	=	0.75
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Wednesday, Sep 11 2019

30 in. Private RCP Storm

Invert Elev Dn (ft)	=	7522.00
Pipe Length (ft)	=	412.00
Slope (%)	=	4.61
Invert Elev Up (ft)	=	7541.00
Rise (in)	=	30.0
Shape	=	Circular
Span (in)	=	30.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

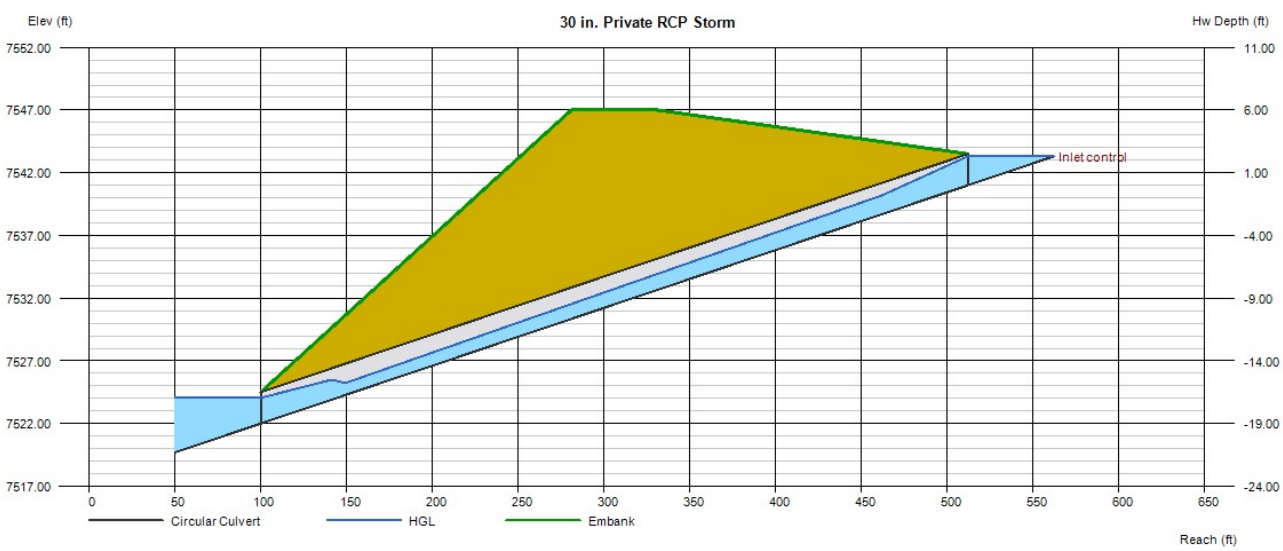
Top Elevation (ft)	=	7547.00
Top Width (ft)	=	50.00
Crest Width (ft)	=	150.00

Calculations

Qmin (cfs)	=	0.00
Qmax (cfs)	=	22.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	22.00
Qpipe (cfs)	=	22.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.11
Veloc Up (ft/s)	=	6.66
HGL Dn (ft)	=	7524.05
HGL Up (ft)	=	7542.59
Hw Elev (ft)	=	7543.32
Hw/D (ft)	=	0.93
Flow Regime	=	Inlet Control



DRAINAGE MAP

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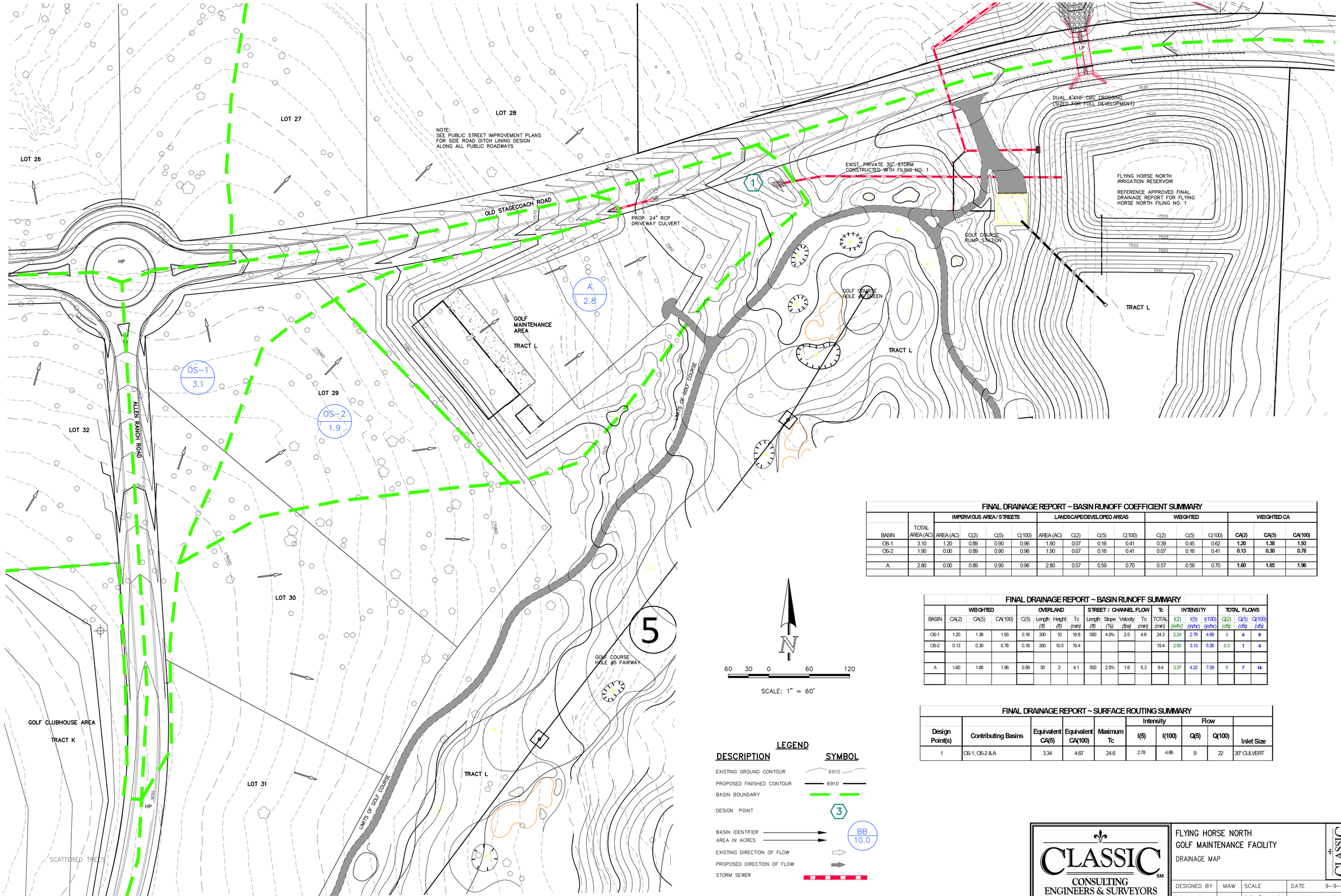

FINAL DRAINAGE REPORT ~ BASIN RUNOFF COEFFICIENT SUMMARY

		IMPERVIOUS AREA / STREETS				LANDSCAPE/DEVELOPED AREAS				WEIGHTED			WEIGHTED CA		
BASIN	TOTAL AREA (AC)	AREA (AC)	C(2)	C(5)	C(100)	AREA (AC)	C(2)	C(5)	C(100)	C(2)	C(5)	C(100)	CA(2)	CA(5)	CA(100)
OS-1	3.10	1.20	0.89	0.90	0.96	1.90	0.07	0.16	0.41	0.39	0.45	0.62	1.20	1.38	1.93
OS-2	1.90	0.00	0.89	0.90	0.96	1.90	0.07	0.16	0.41	0.07	0.16	0.41	0.13	0.30	0.78
A	2.80	0.00	0.89	0.90	0.96	2.80	0.57	0.59	0.70	0.57	0.59	0.70	1.60	1.65	1.96

FINAL DRAINAGE REPORT ~ BASIN RUNOFF SUMMARY

	WEIGHTED			OVERLAND				STREET / CHANNEL FLOW				Tc	INTENSITY			TOTAL FLOWS		
BASIN	CA(2)	CA(5)	CA(100)	C(5)	Length (ft)	Height (ft)	Tc (min)	Length (ft)	Slope (%)	Velocity (fps)	Tc (min)	TOTAL (min)	I(2) (in/hr)	I(5) (in/hr)	I(100) (in/hr)	Q(2) (cfs)	Q(5) (cfs)	Q(100) (cfs)
OS-1	1.20	1.38	1.93	0.16	300	10	19.8	550	4.0%	2.0	4.6	24.3	2.24	2.79	4.69	3	4	9
OS-2	0.13	0.30	0.78	0.16	300	10.5	19.4					19.4	2.50	3.13	5.26	0.3	1	4
A	1.60	1.65	1.96	0.59	50	2	4.1	500	2.5%	1.6	5.3	9.4	3.37	4.22	7.09	5	7	14

FINAL DRAINAGE REPORT ~ SURFACE ROUTING SUMMARY

Design Point(s)	Contributing Basins	Equivalent CA(5)	Equivalent CA(100)	Maximum Tc	Intensity I(5)	Intensity I(100)	Flow Q(5)	Flow Q(100)	Inlet Size
1	OS-1, OS-2 & A	3.34	4.67	24.6	2.78	4.66	9	22	30" CULVERT

LEGEND

DESCRIPTION	SYMBOL
EXISTING GROUND CONTOUR	6910
PROPOSED FINISHED CONTOUR	6910
BASIN BOUNDARY	
DESIGN POINT	3
BASIN IDENTIFIER / AREA IN ACRES	BB 10.0
EXISTING DIRECTION OF FLOW	
PROPOSED DIRECTION OF FLOW	
STORM SEWER	

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FLYING HORSE NORTH
GOLF MAINTENANCE FACILITY
DRAINAGE MAP

DESIGNED BY	MAW	SCALE		DATE	9-9-19
DRAWN BY	MAW	(H) 1"= 60'		SHEET	1 OF 1
CHECKED BY		(V) 1"= N/A		JOB NO.	1096.11