Preliminary Drainage Report
Home Place Ranch – Filing 1

Project Name:	Home Place Ranch
Project Location:	Monument, CO
Project Number:	171006
Date:	February 8, 2019

HR Green, Inc.
5619 DTC Parkway, Suite 1150
Greenwood Village, CO 80111
Phone: (720) 602-4999

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Certification:
This report and plan for the preliminary drainage design of Home Place Ranch was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Monument_Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Monument does not and will not assume liability for drainage facilities designed by others.

SIGNATURE: _____

Registered Professional Engineer State of Colorado No.

(Affix Seal)

Preliminary Drainage Report – Home Place Ranch Filing 1
Monument, CO

I. Narrative

A. General Project Description

Site Location: The Home Place Ranch development is located between Higby Road and Baptist Road east of both Interstate 25 and Jackson Creek Parkway at the north end of Gleneagle Drive. More specifically the project is located in portions of the south half of Section 19 and the Northwest quarter of Section 30 T11S, R66W of the 6th P.M. in El Paso County, Colorado. The project is also partially located in portions of the southeast quarter of Section 24 and the Northeast Quarter of Section 25 T11S, R67W of the 6th P.M. in El Paso County, Colorado.

Site Description: The site is currently generally undeveloped land with residential development to the south and southwest, however the northeast corner of the property contains and existing gravel road and two farmsteads. The site is bisected by Jackson Creek. The project will be divided into at least two filings. This report only addresses Filing 1, which is located south of Jackson Creek. The vicinity of Jackson Creek has a NRCS soil classification of Alamosa loam (Hydrologic Group D) while the balance of the site is of Hydrologic Group B made up of Kettle gravelly loamy sand, Kettle-Rock outcrop, Peyton-Pring complex, Pring course sandy loam, Tomah-Crowfoot loamy sand and Tomah-Crowfoot complex.

Existing Drainage Facilities: Within Filing 1 the north portion surface drains to Jackson Creek while the southern portion drains to a 48" sewer entering residential development to the south which ultimately is also tributary to Jackson Creek. There are wetlands associated with Jackson Creek. The Filing 1 development will remain outside the limits of the wetlands.

Proposed Project Description: The proposed project consists of residential development including associated streets and Amenity Center over 98 acres of land. The balance of the subject property will either remain undeveloped open space or will be contained in future filing(s).

Flood Hazard / Drainage Studies Relevant to this Site: The project is not located in floodplain. A FIRM map is included. A Wetland delineation has been performed and resulting wetland limits are shown on the engineering plans.

B. Historic Drainage System

Overall Major and Sub-Basin Description: The project is within the Jackson Creek watershed.

Drainage Patterns Through Property: Within Filing 1 the north portion surface drains to Jackson Creek while the southern portion drains to a 48" sewer entering residential development to the south.

Outfalls Downstream of Property: The northern portion of Filing 1 flows to Jackson Creek which outflows west from the southwest corner of the property. The southern portion outlets to a 48" sewer entering residential development to the south near the southwest corner of the property, which ultimately is also tributary to Jackson Creek.

C. Proposed (Developed) Drainage System

General Concept: Areas that are currently directly tributary to Jackson Creek will be collected along the northern cul-de-sac roadway and the fire trail between them to be drained to a detention basin on the west end of the phase where it will be detained with a controlled release to Jackson Creek. The existing watersheds included are North, Northwest, North center Northeast and Cul-de-sac, all composing the proposed watershed "N" (North). Back yards along the north edge of the development cannot be captured along the steep slope in the area. The area will be allowed to run off undetained and the flows directed to the north basin will be over restricted to maintain the overall allowable release rate. The areas currently tributary to the 48" sewer (South and Mid existing watersheds) will be collected along Sanctuary Rim Drive and the open channel to a detention basin south of Sanctuary Rim Drive on the west end of the development where it will discharge to the existing 48" sewer. The proposed watershed is labeled "S" (South). This preliminary report focuses on the sizing of the required detention basins and open channels. Detailed design of sewers and detention outlet will be performed at final engineering.

The improvements shown in filing 1 are anticipated to occur over six phases. The detention ponds will be constructed as dictated by the phased developed flows. Temporary routing of stormwater through undeveloped area may be required to route developed flows to the detention ponds.

Criteria: For this preliminary report the required volumes for the north and south detention basins were determined using the Urban Drainage and Flood Control District (UDFCD) detention design spreadsheet (UD-Detention), including rainfall amounts from the NOAA Atlas 14, Volume 8, Version 2 for Monument, Colorado. For the open channel along the south property line the peak flow was calculated using the UDFCD Peak Runoff Prediction spreadsheet UD-Rational. The channel size was verified using Flowmaster (i.e. a Mannings Equation calculator) with an added 1' of freeboard provided for the channel depth. Due the large slope across the site (5.7%), flows will exceed stable velocity for an unprotected non-cohesive soil. Stability will be achieved through use of Turf Reinforcement Mat (TRM), step pools, rip-rap, swale meandering, or other means of a bio-engineered stabilization method.

Runoff: The site will drain via curb and gutter, storm sewer and open channel to two different stormwater detention basins which will discharge to Jackson Creek and to the 48" sewer respectively.

Stormwater Quality Facilities: Detention basin volumes were determined for Full Spectrum Detention to provide the required water quality capture volume. Tributary watershed areas and volume requirements are summarized in Table 2.

Streets: Streets will be drained by curb and gutter. Storm sewer will be provided and sized to ensure ROW flow depths remain below maximum allowable depth.

Open Channel Flow: The southern portion of the development will be collected in an open channel along the southern property line. The watershed area is summarized in Table 3. The peak 100-year flow rate including offsite tributary area is 176 cfs.

Storm Sewers and Culverts: Storm sewer inlet and pipes will be designed at final engineering.

D. Right of Way Requirements

Right of Way will be dedicated for the proposed roadways. Easements will be provided for the proposed open channel and detention basins.

E. Analysis of Upstream and Downstream Effect

Upstream: There will be no effect on any drainage upstream of this development.

Downstream: Flow rates will be controlled by detention to be at or below existing flow rates. Erosion rates or stream velocity for any site downstream will not be impacted. The only change to the stormwater leaving this development will be an improvement in water quality as provided by the proposed detention basins.

F. Conclusions

The proposed project is in conformance with the drainage requirements of Monument Colorado, incorporating the design standards of Colorado Springs and UDFCD. There is no floodplain subject to FEMA regulations on the property.

The site generally flows east to west and is divided between outlets to Jackson Creek and to a 48" sewer. Flows to both outlets will be controlled for flow rate and water quality by proposed detention basins.

G. List of References

City of Colorado Springs – Drainage Criteria Manual, May 2014
Urban Storm Drainage Criteria Manual, Urban Drainage Flood Control District, January 2016

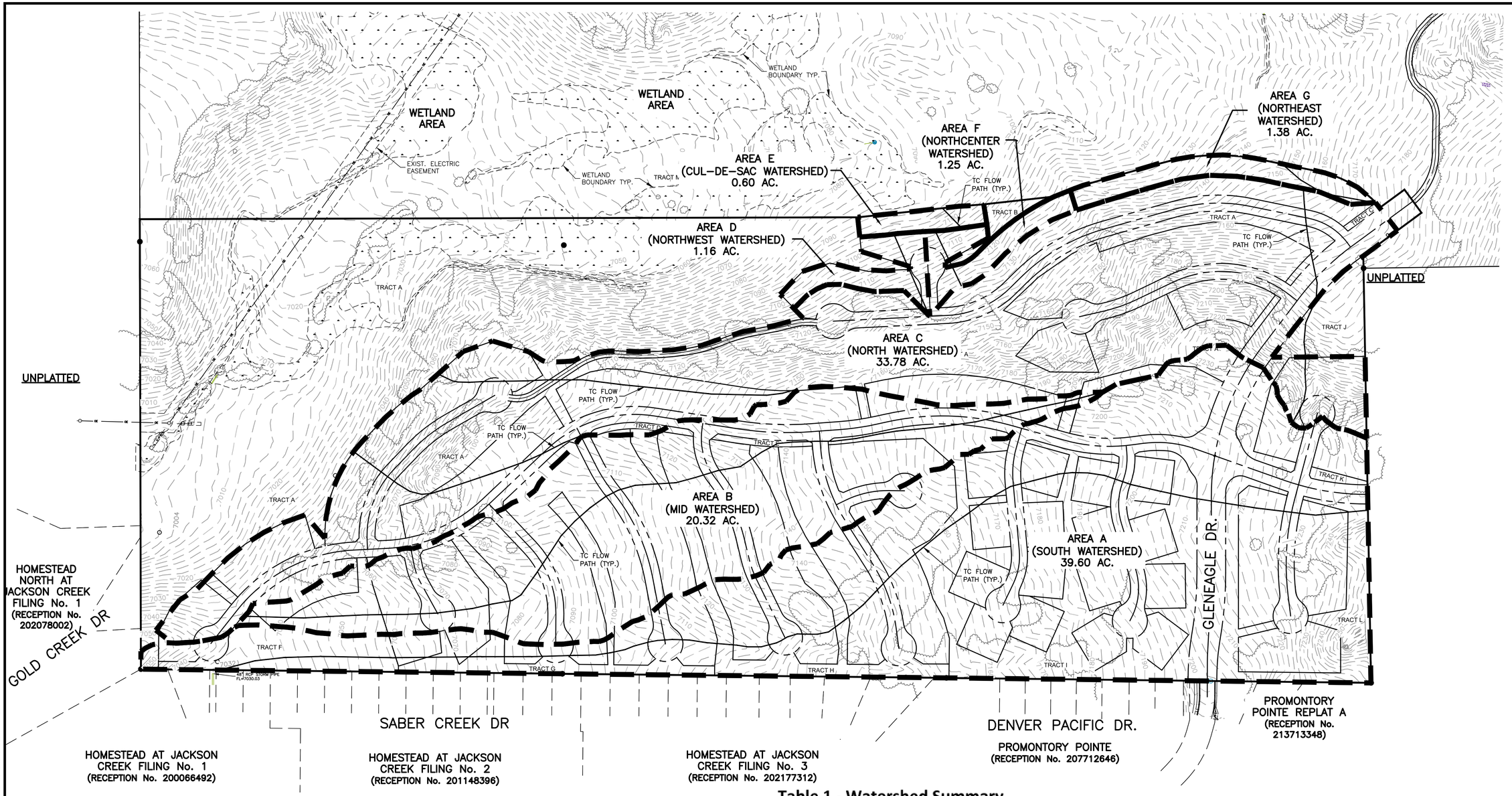

Table 1 - Watershed Summary

		Total Area	Soil Area D	Soil Area B
A	South	39.60		39.60
B	Middle	20.32		20.32
C	North	33.78	5.49	28.29
D	Northwest	1.00	0.85	0.15
E	Culdesac	0.37	0.37	0.00
F	North Central	1.18	0.63	0.54
G	Northeast	1.38	1.38	0.00
D thru G	Undetained	3.93	3.24	0.69
	Total	97.63		
H	Offsite-Northeast (bypass)	11.49		
I	Offsite-Southeast (wooded)	15.06		15.06

0 75 150

PRELIMINARY NOT FOR CONSTRUCTION

NO.	DATE	BY	REVISION DESCRIPTION

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HOME PLACE RANCH
GOODWIN KNIGHT
MONUMENT, COLORADO
CIVIL
EXISTING WATERSHED MAP

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

DRAWN BY: MRJ
APPROVED: GP/PS
JOB DATE: 7/03/18
JOB NO: 171006

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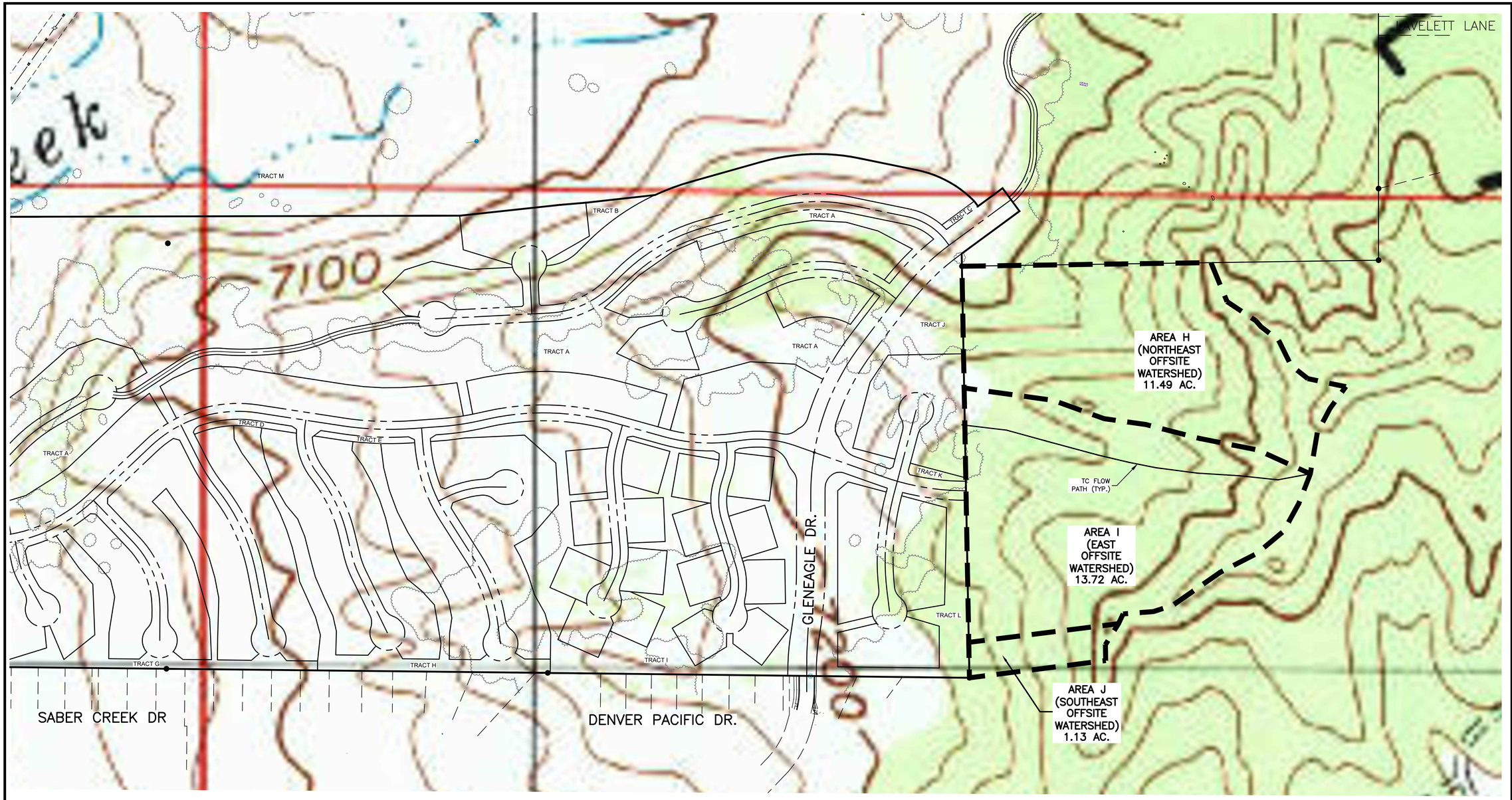
Xrefs: 171006-xV-Survey; 171006-xC-Dsgn; xgl-1-24x36-dv01; 171006-xC-Reservoir; 171006-xC-Offsite-Base; 17-237



NO.	DATE	BY	REVISION DESCRIPTION

HRGreen.com
HRGreen

HOME PLACE RANCH
GOODWIN KNIGHT
MONUMENT, COLORADO
CIVIL
EXISTING OFFSITE WATERSHED MAP

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

NORTH
0 75 150

PRELIMINARY NOT FOR CONSTRUCTION

DRAWN BY:	MRJ
APPROVED:	GP/PS
JOB DATE:	2/08/19
JOB NO:	171006

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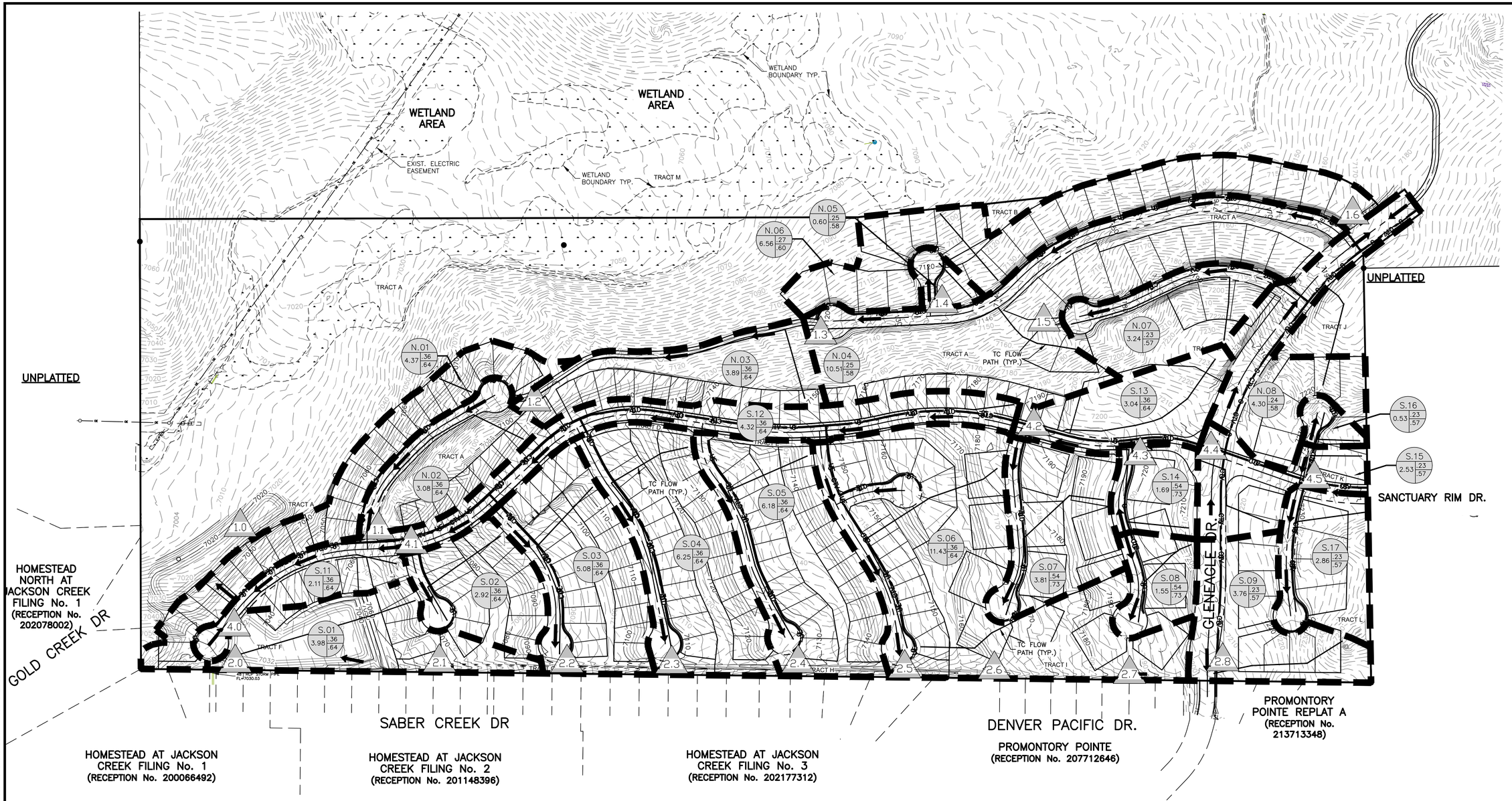
Xrefs: 171006-xV-Survey; 171006-xC-Dsgn; xgt-1-24x36-dv01; 171006-xC-Reservoir; 171006-xC-Offsite-Base; 171006-xV-USGS-MAP; 17-237



FLOW SUMMARY TABLE						
DESIGN POINT	BASIN LABEL	AREA (ACRES)	DIRECT Q_2 (CFS)	ROUTED Q_2 (CFS)	DIRECT Q_{100} (CFS)	ROUTED Q_{100} (CFS)
1.6	N.08	4.30	1.5	1.5	11.3	11.3
1.5	N.07	3.24	1.6	1.6	12.3	12.3
1.4	N.05	0.60	0.3	0.3	2.2	2.2
1.3	N.04	18.65	5.4	6.3	41.6	49.1
1.2	N.03	22.54	2.6	8.4	14.2	60.4
1.1	N.02	25.62	2.6	10.1	13.9	69.3
1.0	N.01	29.99	3.9	12.5	21.1	82.0

DESIGN POINT	BASIN LABEL	AREA (ACRES)	DIRECT Q_2 (CFS)	ROUTED Q_2 (CFS)	DIRECT Q_{100} (CFS)	ROUTED Q_{100} (CFS)
4.5		3.39	0.0	1.4	0.0	10.4
4.4	S.15	5.92	1.2	2.4	9.1	18.2
4.3	S.14	7.61	1.8	4.0	7.4	24.9
4.2	S.13	10.65	2.4	6.0	12.9	35.4
4.1	S.12	14.97	2.9	8.7	15.5	50.3
4.0	S.11	17.08	1.8	10.1	9.7	57.6
2.8	S.09	18.82	1.8	1.8	13.8	11.5
2.7	S.08	20.37	2.0	3.6	8.1	16.5
2.6	S.07	24.18	4.5	8.1	18.1	28.8
2.5	S.06	35.61	10.2	16.9	54.7	60.8
2.4	S.05	41.79	3.9	17.9	21.2	78.2
2.3	S.04	48.04	4.1	21.9	22.0	95.7
2.2	S.03	53.12	3.4	25.2	18.3	110.0
2.1	S.02	56.04	2.1	27.0	11.3	118.2
2.0	S.01	77.10	2.8	39.6	15.2	176.1

PROJECT LEGEND:

- BASIN BOUNDARY
- Tc FLOW PATH
- INDICATES PROPOSED RIGHT-OF-WAY LINE
- INDICATES PROPOSED CENTERLINE
- INDICATES FLOW ARROW
- X.X — DESIGN POINT
- X.XX — BASIN ID
- XX.XX — BASIN AREA (ACRES)
- XX — C (5-YR)
- XX — C (100-YR)

NORTH

0 75 150

PRELIMINARY NOT FOR CONSTRUCTION

NO.	DATE	BY	REVISION DESCRIPTION
1.	02/15/19	MRJ	PER REVIEW COMMENTS

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HOME PLACE RANCH
GOODWIN KNIGHT
MONUMENT, COLORADO
CIVIL
PROPOSED DRAINAGE PLAN

BAR IS ONE INCH ON OFFICIAL DRAWINGS
0 1"
IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY

DRAWN BY: MRJ
APPROVED: GP/PS
JOB DATE: 2/08/19
JOB NO: 171006

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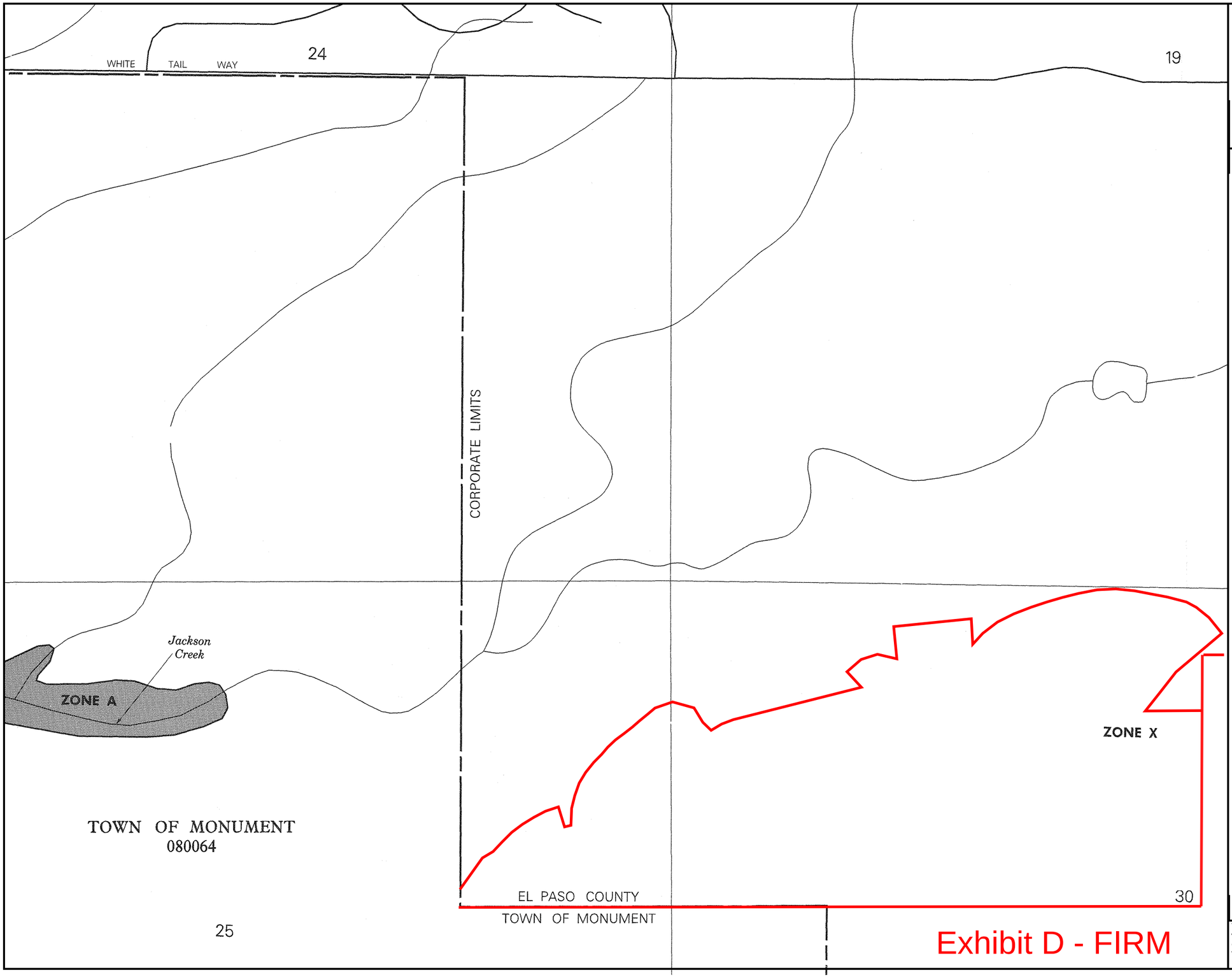
Xrefs: 171006-xV-Survey; 171006-xC-Dsgn; xgt-1-24x36-dv01; 171006-xC-Reservoir; 171006-xC-Offsite-Base; 171006-OVERALL_GRADING_PLAN; 17-237



APPROXIMATE SCALE IN FEET

500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 279 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

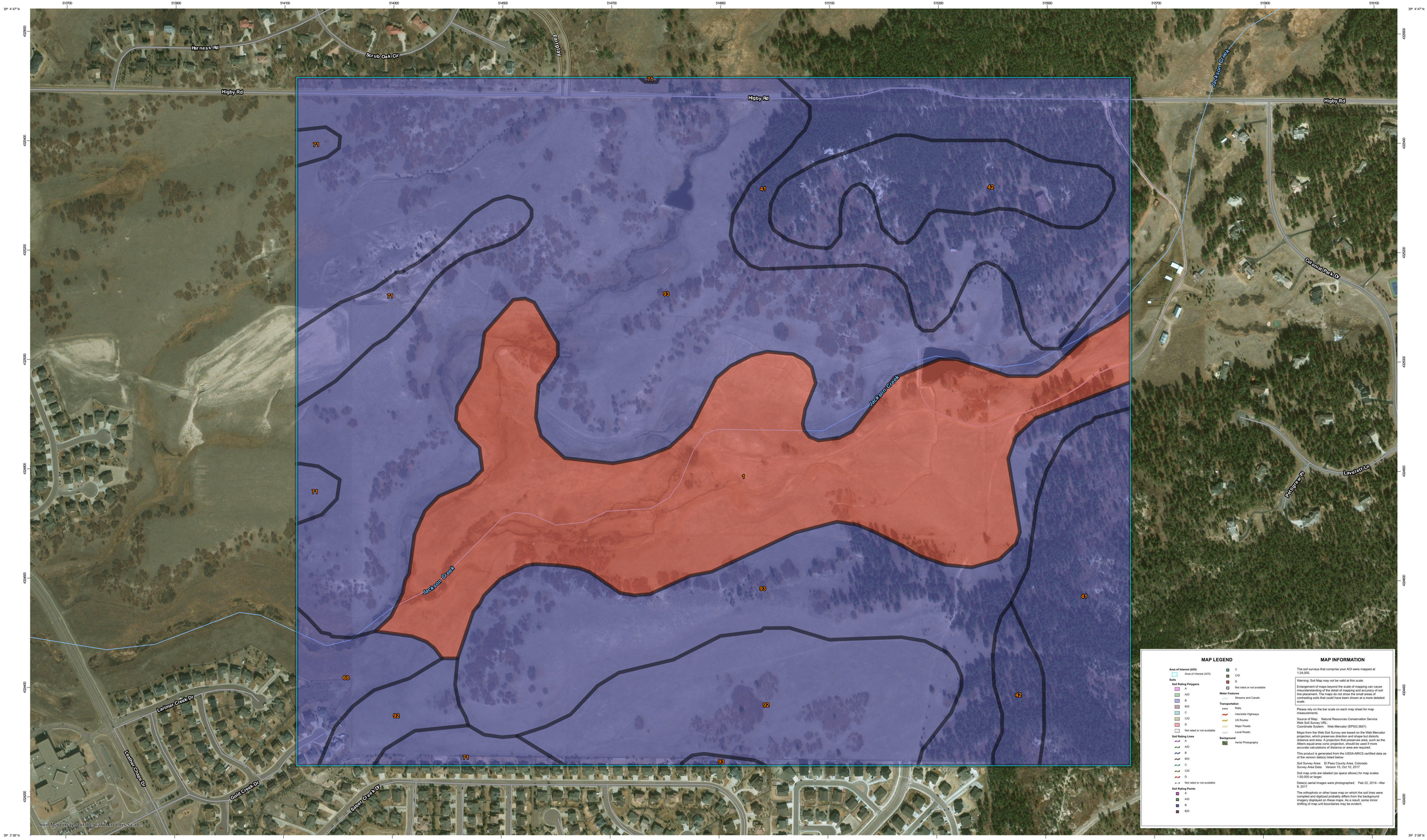
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0279	F
MONUMENT, TOWN OF	080064	0279	F

MAP NUMBER
08041C0279 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

Exhibit D - FIRM



MAP LEGEND

- Area of Interest (AOI)
  - Area of Interest (AOI)
- Soils
  - Soil Rating Polygons: A, A/D, B, B/D, C, C/D, D, Not rated or not available
  - Soil Rating Lines: A, A/D, B, B/D, C, C/D, D, Not rated or not available
  - Soil Rating Points: A, A/D, B, B/D, C, C/D, D, Not rated or not available
- 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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Feb 22, 2014—Mar 9, 2017

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 Scale: 1:3,130 if printed on D landscape (34" x 22") sheet.

N

0 45 90 180 270 Meters

0 150 300 600 900 Feet

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

Exhibit E - NRCS Soils

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

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

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Alamosa loam, 1 to 3 percent slopes	D	89.9	18.8%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	72.1	15.1%
42	Kettle-Rock outcrop complex	B	24.7	5.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	8.7	1.8%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	16.9	3.5%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	43.6	9.1%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	221.6	46.4%
Totals for Area of Interest			**477.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 1 - Watershed Summary

		Total Area	Soil Area D	Soil Area B
A	South	39.60		39.60
B	Middle	20.32		20.32
C	North	33.78	5.49	28.29
D	Northwest	1.00	0.85	0.15
E	Culdesac	0.37	0.37	0.00
F	North Central	1.18	0.63	0.54
G	Northeast	1.38	1.38	0.00
D thru G	Undetained	3.93	3.24	0.69
	Total	97.63		
H	Offsite-Northeast (bypass)	11.49		11.49
I	Offsite-East (wooded)	13.72		13.72
J	Offsite-Southeast (wooded)	1.13		1.13

Table 2 - Detention Summary

Watersheds	S (South)	N (North)
Total Watershed Area (Acres) =	62.04	36.55
Total Watershed Length (ft)=	3775	3865
Average Watershed Slope (%) =	5.0%	4.0%
Weighted Watershed Imperviousness =	45%	35%
Percentage Hydrologic Group A =	0%	0%
Percentage Hydrologic Group B =	100%	69%
Percentage Hydrologic Group C =	0%	31%
Desired WQCV Drain Time (min) =	40	40
Required Detention Volumes (acre-ft)		
WQCV	1.00	0.50
10-Year	3.43	1.59
100-Year	5.38	2.65

Percent Impervious Calculations

North Basin ID	Basin Area	% Imp.	Weighted % Imp.	Lot Size
N.01	4.37	45.0	5.4	0.25 acres or less
N.02	3.08	45.0	3.8	0.25 acres or less
N.03	3.89	45.0	4.8	0.25 acres or less
N.04	10.51	30.0	8.6	0.25 to 0.75 acres
N.05	0.60	30.0	0.5	0.25 to 0.75 acres
N.06	6.56	30.0	5.4	0.25 to 0.75 acres
N.07	3.24	30.0	2.7	0.25 to 0.75 acres
N.08	4.30	30.0	3.5	0.25 to 0.75 acres
TOTAL WATERSHED AREA (Acres)	**36.55**	**TOTAL % IMP.**	**34.7**	

South Basin ID	Basin Area	% Imp.	Weighted % Imp.	Lot Size
S.01	3.98	45.0	2.9	0.25 acres or less
S.02	2.92	45.0	2.1	0.25 acres or less
S.03	5.08	45.0	3.7	0.25 acres or less
S.04	6.25	45.0	4.5	0.25 acres or less
S.05	6.18	45.0	4.5	0.25 acres or less
S.06	11.43	45.0	8.3	0.25 acres or less
S.07	3.81	65.0	4.0	Townhomes
S.08	1.55	65.0	1.6	Townhomes
S.09	3.76	30.0	1.8	0.25 to 0.75 acres
S.11	2.11	45.0	1.5	0.25 acres or less
S.12	4.32	45.0	3.1	0.25 acres or less
S.13	3.04	45.0	2.2	0.25 acres or less
S.14	1.69	65.0	1.8	Townhomes
S.15	2.53	30.0	1.2	0.25 to 0.75 acres
S.16	0.53	30.0	0.3	0.25 to 0.75 acres
S.17	2.86	30.0	1.4	0.25 to 0.75 acres
TOTAL WATERSHED AREA (Acres)	**62.04**	**TOTAL % IMP.**	**44.9**	

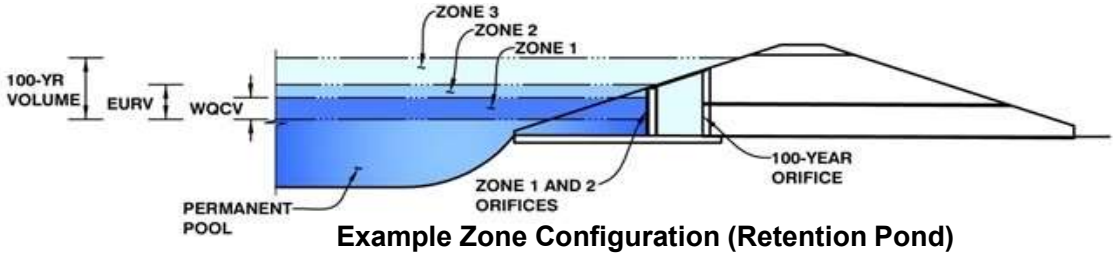
Table 3 - Flow Summary						
DESIGN POINT	BASIN LABEL	AREA (ACRES)	DIRECT Q_2 (CFS)	ROUTED Q_2 (CFS)	DIRECT Q_{100} (CFS)	ROUTED Q_{100} (CFS)
1.6	N.08	4.30	1.5	1.5	11.3	11.3
1.5	N.07	3.24	1.6	1.6	12.3	12.3
1.4	N.05	0.60	0.3	0.3	2.2	2.2
1.3	N.04	18.65	5.4	6.3	41.6	49.1
1.2	N.03	22.54	2.6	8.4	14.2	60.4
1.1	N.02	25.62	2.6	10.1	13.9	69.3
1.0	N.01	29.99	3.9	12.5	21.1	82.0
4.5		3.39	0.0	1.4	0.0	10.4
4.4	S.15	5.92	1.2	2.4	9.1	18.2
4.3	S.14	7.61	1.8	4.0	7.4	24.9
4.2	S.13	10.65	2.4	6.0	12.9	35.4
4.1	S.12	14.97	2.9	8.7	15.5	50.3
4.0	S.11	17.08	1.8	10.1	9.7	57.6
2.8	S.09	18.82	1.8	1.8	13.8	11.5
2.7	S.08	20.37	2.0	3.6	8.1	16.5
2.6	S.07	24.18	4.5	8.1	18.1	28.8
2.5	S.06	35.61	10.2	16.9	54.7	60.8
2.4	S.05	41.79	3.9	17.9	21.2	78.2
2.3	S.04	48.04	4.1	21.9	22.0	95.7
2.2	S.03	53.12	3.4	25.2	18.3	110.0
2.1	S.02	56.04	2.1	27.0	11.3	118.2
2.0	S.01	77.10	2.8	39.6	15.2	176.1

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Home Place Ranch Filing 1 - Preliminary

Basin ID: N (NORTH)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	36.55	acres
Watershed Length =	3,865	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	34.70%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	69.0%	percent
Percentage Hydrologic Soil Groups C/D =	31.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.504	acre-feet
Excess Urban Runoff Volume (EURV) =	1.270	acre-feet
2-yr Runoff Volume (P1 = 0.91 in.) =	0.795	acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	1.223	acre-feet
10-yr Runoff Volume (P1 = 1.46 in.) =	1.837	acre-feet
25-yr Runoff Volume (P1 = 1.85 in.) =	3.176	acre-feet
50-yr Runoff Volume (P1 = 2.17 in.) =	4.121	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	5.358	acre-feet
500-yr Runoff Volume (P1 = 3.42 in.) =	8.188	acre-feet
Approximate 2-yr Detention Volume =	0.744	acre-feet
Approximate 5-yr Detention Volume =	1.150	acre-feet
Approximate 10-yr Detention Volume =	1.585	acre-feet
Approximate 25-yr Detention Volume =	1.985	acre-feet
Approximate 50-yr Detention Volume =	2.171	acre-feet
Approximate 100-yr Detention Volume =	2.645	acre-feet

Note: L / W Ratio > 8

L / W Ratio = 9.4

Optional User Override 1-hr Precipitation

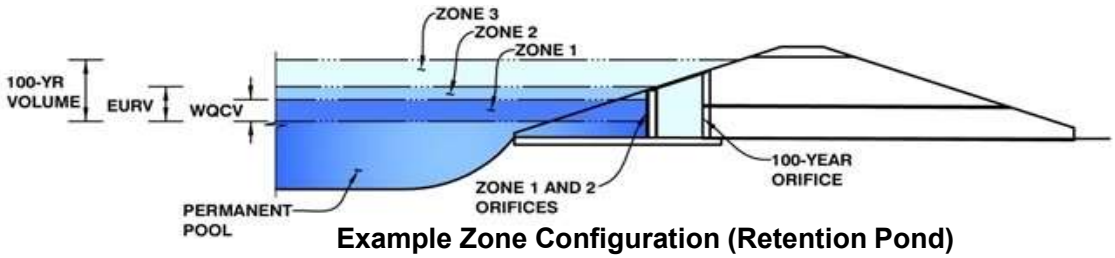
0.91	inches
1.20	inches
1.46	inches
1.85	inches
2.17	inches
2.52	inches
3.42	inches

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Home Place Ranch Filing 1 - Preliminary

Basin ID: S (South)



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	65.12	acres
Watershed Length =	3,326	ft
Watershed Slope =	0.062	ft/ft
Watershed Imperviousness =	45.10%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	1.048	acre-feet
Excess Urban Runoff Volume (EURV) =	3.114	acre-feet
2-yr Runoff Volume (P1 = 0.91 in.) =	1.900	acre-feet
5-yr Runoff Volume (P1 = 1.2 in.) =	2.738	acre-feet
10-yr Runoff Volume (P1 = 1.46 in.) =	3.949	acre-feet
25-yr Runoff Volume (P1 = 1.85 in.) =	6.314	acre-feet
50-yr Runoff Volume (P1 = 2.17 in.) =	7.963	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	10.133	acre-feet
500-yr Runoff Volume (P1 = 3.42 in.) =	15.197	acre-feet
Approximate 2-yr Detention Volume =	1.777	acre-feet
Approximate 5-yr Detention Volume =	2.571	acre-feet
Approximate 10-yr Detention Volume =	3.612	acre-feet
Approximate 25-yr Detention Volume =	4.423	acre-feet
Approximate 50-yr Detention Volume =	4.830	acre-feet
Approximate 100-yr Detention Volume =	5.659	acre-feet

Optional User Override 1-hr Precipitation

0.91	inches
1.20	inches
1.46	inches
1.85	inches
2.17	inches
2.52	inches
3.42	inches

Calculation of Peak Runoff using Rational Method

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 2/10/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado

Version 2.00 released May 2017

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

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

$$t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t}$$

Computed $t_c = t_i + t_t$

Regional $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$

$t_{minimum}$= 5 (urban)
$t_{minimum}$= 10 (non-urban)

Selected $t_c = \max\{t_{minimum}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$

Select UDFCD location for NOAA Atlas 14 Rainfall Depths from the pulldown list OR enter your own depths obtained from the NOAA website (click this link)

1-hour rainfall depth, P1 (in) =	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
	0.91					2.52	

Rainfall Intensity Equation Coefficients =	a	b	c
	28.50	10.00	0.786

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

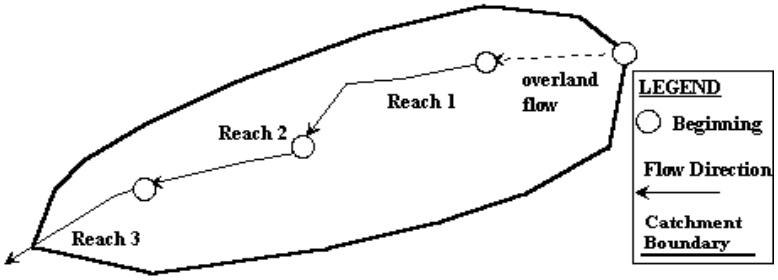
$$Q(cfs) = CIA$$

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C							Overland (Initial) Flow Time					Channelized (Travel) Flow Time							Time of Concentration			Rainfall Intensity, I (in/hr)							Peak Flow, Q (cfs)						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L_i (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S_i (ft/ft)	Overland Flow Time t_i (min)	Channelized Flow Length L_t (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V_t (ft/sec)	Channelized Flow Time t_t (min)	Computed t_c (min)	Regional t_c (min)	Selected t_c (min)	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.01	4.37	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	110.00	7064.00	7052.00	0.109	6.37	400.00	7052.00	7012.00	0.100	20	6.32	1.05	7.43	19.73	7.43	2.74					7.60		3.94					21.09	
N.02	3.08	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	180.00	7108.00	7080.00	0.156	7.25	415.00	7080.00	7064.00	0.039	20	3.93	1.76	9.01	20.65	9.01	2.56					7.09		2.59					13.88	
N.03	3.89	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	300.00	7148.00	7116.00	0.107	10.60	850.00	7116.00	7092.00	0.028	20	3.36	4.22	14.82	23.86	14.82	2.08					5.75		2.65					14.22	
N.04	10.51	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	225.00	7212.00	7144.00	0.302	7.64	600.00	7144.00	7116.00	0.047	20	4.32	2.31	9.95	24.41	9.95	2.47					6.83		5.30					40.59	
				0.21	0.25	0.32	0.45	0.51	0.58	0.66					7.50								9.81										5.40					41.57	
N.05	0.60	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	280.00	7132.00	7098.00	0.121	11.51	150.00			0.030	20	3.46	0.72	12.24	21.99	12.24	2.27					6.27		0.28					2.13	
				0.21	0.25	0.32	0.45	0.51	0.58	0.66					11.29								12.01										0.28					2.18	
N.06	6.56	D	30.0	0.22	0.28	0.35	0.49	0.54	0.61	0.68	280.00	7132.00	7094.00	0.136	10.48																								
				0.21	0.27	0.35	0.48	0.54	0.60	0.68					10.56										10.56	2.41					6.67		3.39					26.31	
N.07	3.24	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	200.00	7234.00	7194.00	0.200	8.25	525.00	7194.00	7172.00	0.042	20	4.09	2.14	10.39	24.14	10.39	2.42					6.71		1.61					12.30	
N.08	4.30	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	300.00	7220.00	7192.00	0.093	13.00	2140.00			0.030	20	3.46	10.30	23.30	36.50	23.30	1.65					4.57		1.45					11.11	
				0.21	0.24	0.31	0.45	0.51	0.58	0.66					12.81								23.10										1.47					11.32	
S.02	2.92	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	300.00	7096.00	7072.00	0.080	11.66	150.00	7072.00	7071.00	0.007	20	1.63	1.53	13.19	20.35	13.19	2.19					6.07		2.10					11.26	
S.03	5.08	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	260.00	7112.00	7094.00	0.069	11.38	350.00	7094.00	7092.00	0.006	20	1.51	3.86	15.24	23.39	15.24	2.05					5.68		3.42					18.32	
S.04	6.25	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	270.00	7138.00	7112.00	0.096	10.40	570.00	7112.00	7108.00	0.007	20	1.68	5.67	16.07	25.76	16.07	2.00					5.53		4.10					21.97	
S.05	6.18	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	270.00	7149.00	7132.00	0.063	11.97	520.00	7132.00	7128.00	0.008	20	1.75	4.94	16.91	24.81	16.91	1.95					5.40		3.96					21.20	
S.06	11.43	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	300.00	7182.00	6966.00	0.455	6.57	250.00	6966.00	7166.00	0.040	20	4.00	1.04	7.61	19.71	7.61	2.72					7.53		10.21					54.70	
S.07	3.81	B	65.0	0.50	0.54	0.58	0.66	0.69	0.73	0.77	300.00	7196.00	7176.00	0.067	9.43	425.00	7176.00	7166.00	0.040	20	4.00	1.77	11.20	16.91	11.20	2.35					6.51		4.52					18.07	
S.08	1.55	B	65.0	0.50	0.54	0.58	0.66	0.69	0.73	0.77	200.00	7210.00	7196.00	0.070	7.57	300.00	7196.00	7190.00	0.048	20	4.38	1.14	8.71	16.21	8.71	2.59					7.18		2.03					8.11	
S.09	3.76	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	300.00	7250.00	7206.00	0.147	11.20	50.00	7206.00	7205.00	0.286	20	10.70	0.08	11.28	21.02	11.28	2.35					6.49		1.80					13.81	
S.11	2.11	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	125.00	7074.00	7060.00	0.112	6.74	450.00	7060.00	7038.00	0.049	20	4.42	1.70	8.43	20.57	8.43	2.63					7.27		1.82					9.74	
S.12	4.32	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	130.00	7188.00	7180.00	0.062	8.37	2000.00	7180.00	7070.00	0.055	20	4.69	7.11	15.48	27.64	15.48	2.04					5.64		2.89					15.47	
S.13	3.04	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70	300.00	7232.00	7192.00	0.133	9.85	150.00	7192.00	7186.00	0.040	20	4.00	0.63	10.48	19.17	10.48	2.42					6.69		2.41					12.93	
S.14	1.69	B	65.0	0.50	0.54	0.58	0.66	0.69	0.73	0.77	200.00	7210.00	7200.00	0.050	8.46	425.00	7200.00	7198.00	0.005	20	1.37	5.16	13.62	20.65	13.62	2.16					5.98		1.84					7.36	
S.15	2.53	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	150.00	7226.00	7216.00	0.067	10.27	340.00	7216.00	7210.00	0.030	20	3.46	1.64	11.91	23.38	11.91	2.29					6.35		1.19					9.08	
S.16	0.53	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	130.00	7244.00	7230.00	0.108	8.16	180.00	7230.00	7228.00	0.022	20	2.98	1.01	9.17	22.42	9.17	2.55					7.05		0.28					2.11	
S.17	2.86	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65	220.00	7244.00	7230.00	0.064	12.63	560.00	7230.00	7226.00	0.013	20	2.31	4.04	16.67	27.02	16.67	1.96					5.44		1.15					8.79	
OS	1.13	B	0.0	0.00	0.00	0.06	0.25	0.33	0.43	0.54	430.00			0.120	18.14				0.560	15	11.22																		
																									18.14	1.88					5.21		0.00					2.51	

Reach-Weighted Time of Concentration Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name	Percent Imperviousness (%)
North Pond	33

OVERLAND FLOW

Reach ID	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	5-yr Runoff Coefficient, C_5	Overland Flow Time t_i (min)
N.08	300.00	0.093	0.24	12.88
Weighted Totals	**300.00**	**0.093**	**Total t_i (min)**	**12.88**

CHANNELIZED FLOW

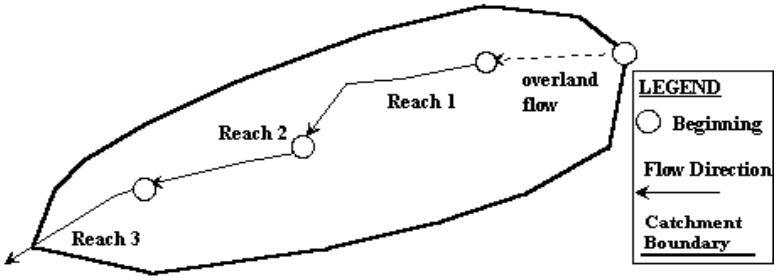
Reach ID	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Time t_t (min)
N.08	1900.00	0.030	20	9.14
N.03	850.00	0.028	20	4.23
N.02	415.00	0.039	20	1.75
N.01	400.00	0.100	20	1.05
Weighted Totals	**3565.00**	**0.038**	**Total t_t (min)**	**16.18**

Computed t_c (min)	**29.06**
Regional t_c (min)	**42.64**
Selected t_c (min)	**29.06**

Reach-Weighted Time of Concentration Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name	Percent Imperviousness (%)
South Pond	45

OVERLAND FLOW

Reach ID	Overland Flow Length L_i (ft)	Overland Flow Slope S_i (ft/ft)	5-yr Runoff Coefficient, C_5	Overland Flow Time t_i (min)
S.15	150.00	0.067	0.23	10.27
Weighted Totals	**150.00**	**0.067**	**Total t_i (min)**	**10.27**

CHANNELIZED FLOW

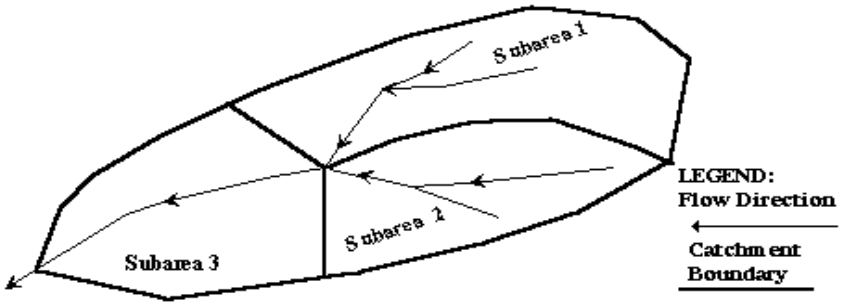
Reach ID	Channelized Flow Length L_t (ft)	Channelized Flow Slope S_t (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Time t_t (min)
S.15	200.00	0.030	20	0.96
S.14	200.00	0.050	20	0.75
S.13	150.00	0.040	20	0.63
S.12	2500.00	0.055	20	8.88
S.11	575.00	0.049	20	2.16
Weighted Totals	**3625.00**	**0.052**	**Total t_t (min)**	**13.38**

Computed t_c (min)	**23.65**
Regional t_c (min)	**35.70**
Selected t_c (min)	**23.65**

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name
N.03

Cells of this color are for required user-input
Cells of this color are for optional override values
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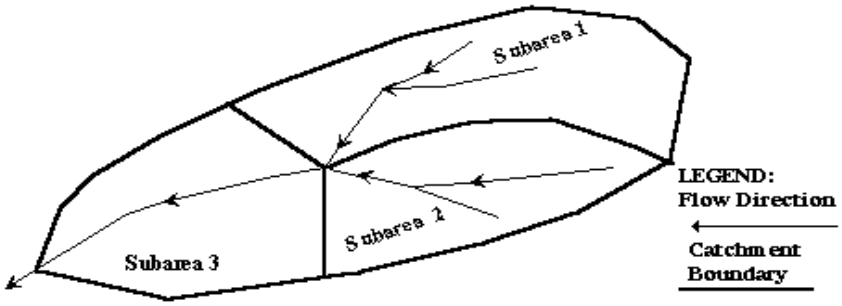
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.03.01	4.29	B	45.0	0.33	0.36	0.42	0.53	0.58	0.64	0.70
N.03.02	0.08	D	45.0	0.34	0.40	0.46	0.57	0.62	0.67	0.73
Total Area (ac)	4.37		Area-Weighted C	0.33	0.36	0.42	0.53	0.58	0.64	0.70
			Area-Weighted Override C	0.33	0.36	0.42	0.53	0.58	0.64	0.70

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name
N.04

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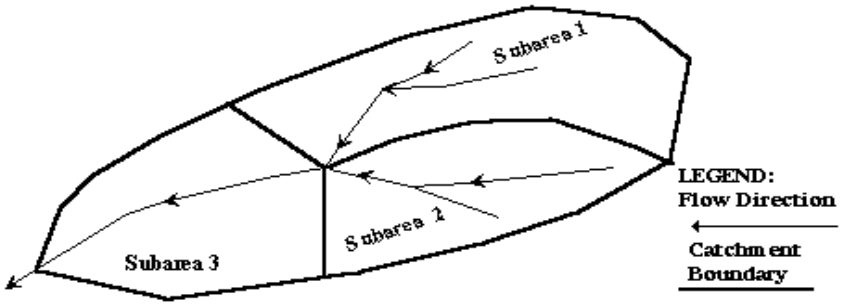
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.04.01	7.03	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65
N.04.02	3.48	D	30.0	0.22	0.28	0.35	0.49	0.54	0.61	0.68
Total Area (ac)	10.51		Area-Weighted C	0.21	0.25	0.32	0.45	0.51	0.58	0.66
			Area-Weighted Override C	0.21	0.25	0.32	0.45	0.51	0.58	0.66

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name
N.05

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

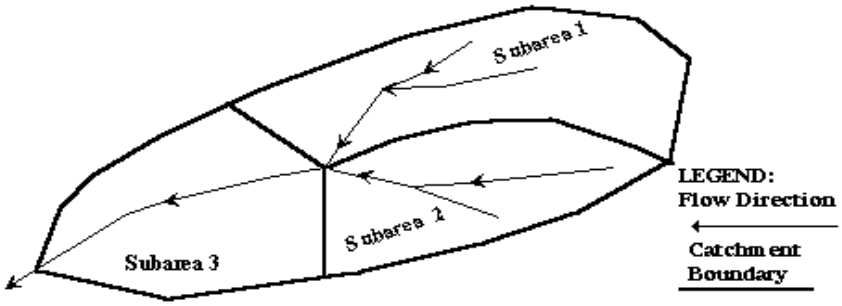
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.05.01	0.21	D	30.0	0.22	0.28	0.35	0.49	0.54	0.61	0.68
N.05.02	0.39	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65
Total Area (ac)	0.60		Area-Weighted C	0.21	0.25	0.32	0.45	0.51	0.58	0.66
			Area-Weighted Override C	0.21	0.25	0.32	0.45	0.51	0.58	0.66

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name
N.06

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

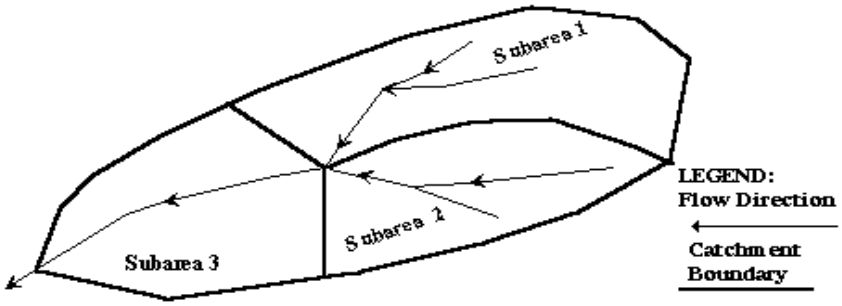
See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.06.01	5.71	D	30.0	0.22	0.28	0.35	0.49	0.54	0.61	0.68
N.06.02	0.85	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65
Total Area (ac)	6.56		Area-Weighted C	0.21	0.27	0.35	0.48	0.54	0.60	0.68
			Area-Weighted Override C	0.21	0.27	0.35	0.48	0.54	0.60	0.68

Area-Weighted Runoff Coefficient Calculations

Version 2.00 released May 2017

Designer: Celeste S. Jain
Company: HR Green, Inc.
Date: 1/31/2019
Project: Home Place Ranch Filing 1 - Preliminary
Location: Monument, Colorado



Subcatchment Name
N.08

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

See sheet "Design Info" for imperviousness-based runoff coefficient values.

Sub-Area ID	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness	Runoff Coefficient, C						
				2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
N.08.01	1.14	D	30.0	0.22	0.28	0.35	0.49	0.54	0.61	0.68
N.08.02	3.16	B	30.0	0.20	0.23	0.30	0.44	0.50	0.57	0.65
Total Area (ac)	4.30		Area-Weighted C	0.21	0.24	0.31	0.45	0.51	0.58	0.66
			Area-Weighted Override C	0.21	0.24	0.31	0.45	0.51	0.58	0.66

FLOW SUMMARY CALCULATIONS

HRGreen

Project #: 171006.00 | Location: City of Monument | By: C Jain
Project: Home Place Ranch - Filing 1 | Plan Date: | Checked:

RATIONAL METHOD PROCEDURE ~ 2-YEAR DEVELOPED (P1 = 0.91)

			DIRECT RUNOFF						TOTAL RUNOFF				
STRUCTURE	DESIGN POINT	BASIN	AREA (AC)	COEFF. (C)	Tc (MINUTES)	C*A	I (IN/HR)	Q (CFS)	SUM AREA (AC)	SUM Tc (MINUTES)	I (IN/HR)	SUM CA	TOTAL Q (CFS)
	1.6	N.08	4.30	0.21	23.3	0.89	1.64	**1.5**	4.30	23.3	1.64	0.89	**1.5**
	1.5	N.07	3.24	0.20	10.4	0.66	2.41	**1.6**	3.24	10.4	2.41	0.66	**1.6**
	1.4	N.05	0.60	0.21	12.2	0.13	2.25	**0.3**	0.60	12.2	2.25	0.13	**0.3**
	1.3	N.04	10.51	0.21	10.0	2.19	2.45	**5.4**	18.65	23.3	1.64	3.87	**6.3**
	1.2	N.03	3.89	0.33	14.8	1.28	2.07	**2.6**	22.54	23.3	1.64	5.15	**8.4**
	1.1	N.02	3.08	0.33	9.0	1.01	2.55	**2.6**	25.62	23.3	1.64	6.16	**10.1**
	1.0	N.01	4.37	0.33	7.4	1.43	2.73	**3.9**	29.99	23.3	1.64	7.59	**12.5**
		S.17	2.86	0.20	16.7	0.58	1.95	**1.1**	2.86	16.7	1.95	0.58	**1.1**
		S.16	0.53	0.20	9.2	0.11	2.53	**0.3**	0.53	9.2	2.53	0.11	**0.3**
	4.5								3.39	16.7	1.95	0.69	**1.4**
	4.4	S.15	2.53	0.20	11.9	0.52	2.28	**1.2**	5.92	16.7	1.95	1.21	**2.4**
	4.3	S.14	1.69	0.50	13.6	0.85	2.15	**1.8**	7.61	16.7	1.95	2.06	**4.0**
	4.2	S.13	3.04	0.33	10.5	1.00	2.40	**2.4**	10.65	16.7	1.95	3.06	**6.0**
	4.1	S.12	4.32	0.33	15.5	1.42	2.02	**2.9**	14.97	16.7	1.95	4.48	**8.7**
	4.0	S.11	2.11	0.33	8.4	0.69	2.61	**1.8**	17.08	16.7	1.95	5.17	**10.1**
		OS	1.13	0.00	24.7	0.00	1.59	**0.0**	1.13	24.7	1.59	0.00	**0.0**
	2.8	S.09	3.76	0.20	11.3	0.77	2.33	**1.8**	3.76	11.3	2.33	0.77	**1.8**
	2.7	S.08	1.55	0.50	8.7	0.78	2.58	**2.0**	5.31	11.3	2.33	1.55	**3.6**
	2.6	S.07	3.81	0.50	11.2	1.92	2.34	**4.5**	9.12	11.3	2.33	3.47	**8.1**
	2.5	S.06	11.43	0.33	7.6	3.75	2.71	**10.2**	20.55	11.3	2.33	7.23	**16.9**
	2.4	S.05	6.18	0.33	16.9	2.03	1.94	**3.9**	26.73	16.9	1.94	9.25	**17.9**
	2.3	S.04	6.25	0.33	16.1	2.05	1.99	**4.1**	32.98	16.9	1.94	11.31	**21.9**
	2.2	S.03	5.08	0.33	15.2	1.67	2.04	**3.4**	38.06	16.9	1.94	12.97	**25.2**
	2.1	S.02	2.92	0.33	13.2	0.96	2.18	**2.1**	40.98	16.9	1.94	13.93	**27.0**
	2.0	S.01	3.98	0.33	13.5	1.31	2.15	**2.8**	62.04	16.9	1.94	20.41	**39.6**

FORMULAS:
I=28.5*P1/(10+Tc)^0.786

FLOW SUMMARY CALCULATIONS

HRGreen

Project #: 171006.00 | Location: City of Monument | By: C Jain
Project: Home Place Ranch - Filing 1 | Plan Date: 2/8/2019 | Checked: 0

RATIONAL METHOD PROCEDURE ~ 100-YEAR DEVELOPED (P1 = 2.52)

			DIRECT RUNOFF						TOTAL RUNOFF				
STRUCTURE	DESIGN POINT	BASIN	AREA (AC)	COEFF. (C)	Tc (MINUTES)	C*A	I (IN/HR)	Q (CFS)	SUM AREA (AC)	SUM Tc (MINUTES)	I (IN/HR)	SUM CA	TOTAL Q (CFS)
	1.6	N.08	4.30	0.58	23.3	2.48	4.57	**11.3**	4.30	23.3	4.57	2.48	**11.3**
	1.5	N.07	3.24	0.57	10.4	1.83	6.71	**12.3**	3.24	10.4	6.71	1.83	**12.3**
	1.4	N.05	0.60	0.58	12.2	0.35	6.27	**2.2**	0.60	12.2	6.27	0.35	**2.2**
	1.3	N.04	10.51	0.58	10.0	6.09	6.83	**41.6**	18.65	23.3	4.57	10.75	**49.1**
	1.2	N.03	3.89	0.64	14.8	2.47	5.75	**14.2**	22.54	23.3	4.57	13.22	**60.4**
	1.1	N.02	3.08	0.64	9.0	1.96	7.09	**13.9**	25.62	23.3	4.57	15.17	**69.3**
	1.0	N.01	4.37	0.64	7.4	2.78	7.60	**21.1**	29.99	23.3	4.57	17.95	**82.0**
		S.17	2.86	0.57	16.7	1.62	5.44	**8.8**	2.86	16.7	5.44	1.62	**8.8**
		S.16	0.53	0.57	9.2	0.30	7.05	**2.1**	0.53	9.2	7.05	0.30	**2.1**
	4.5								3.39	16.7	5.44	1.92	**10.4**
	4.4	S.15	2.53	0.57	11.9	1.43	6.35	**9.1**	5.92	16.7	5.44	3.35	**18.2**
	4.3	S.14	1.69	0.73	13.6	1.23	5.98	**7.4**	7.61	16.7	5.44	4.58	**24.9**
	4.2	S.13	3.04	0.64	10.5	1.93	6.69	**12.9**	10.65	16.7	5.44	6.51	**35.4**
	4.1	S.12	4.32	0.64	15.5	2.74	5.64	**15.5**	14.97	16.7	5.44	9.25	**50.3**
	4.0	S.11	2.11	0.64	8.4	1.34	7.27	**9.7**	17.08	16.7	5.44	10.59	**57.6**
		OS	1.13	0.43	24.7	0.48	4.42	**2.1**	1.13	24.7	4.42	0.48	**2.1**
	2.8	S.09	3.76	0.57	11.3	2.13	6.49	**13.8**	4.89	24.7	4.42	2.61	**11.5**
	2.7	S.08	1.55	0.73	8.7	1.13	7.18	**8.1**	6.44	24.7	4.42	3.74	**16.5**
	2.6	S.07	3.81	0.73	11.2	2.77	6.51	**18.1**	10.25	24.7	4.42	6.51	**28.8**
	2.5	S.06	11.43	0.64	7.6	7.26	7.53	**54.7**	21.68	24.7	4.42	13.77	**60.8**
	2.4	S.05	6.18	0.64	16.9	3.93	5.40	**21.2**	27.86	24.7	4.42	17.70	**78.2**
	2.3	S.04	6.25	0.64	16.1	3.97	5.53	**22.0**	34.11	24.7	4.42	21.67	**95.7**
	2.2	S.03	5.08	0.64	15.2	3.23	5.68	**18.3**	39.19	24.7	4.42	24.90	**110.0**
	2.1	S.02	2.92	0.64	13.2	1.85	6.07	**11.3**	42.11	24.7	4.42	26.75	**118.2**
	2.0	S.01	3.98	0.64	13.5	2.53	6.00	**15.2**	63.17	24.7	4.42	39.87	**176.1**

FORMULAS:
$I=28.5*P1/(10+Tc)^{0.786}$