DRAINAGE LETTER REPORT

for

NATIONAL MILL DOG RESCUE – BUILDING ADDITION
5335 JD JOHNSON ROAD, PEYTON, CO 80831

Prepared for:

Hammers Construction, Inc.
1141 Woolsey Heights
Colorado Springs, CO 80915

Please revise the title of the report to Final Drainage Report

July 30, 2019

Prepared by:

19 E. Willamette Ave.
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 071901

Add PCD File No. PPR1937

DRAINAGE 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 master plan of the drainage basin. I accept responsibility for liability caused by negligent acts, errors or omissions on my part in preparing this report.

_____

John P. Schwab, P.E. #29891

Developer's Statement:

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

By:

_____

Date

El Paso County's Statement

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

_____

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

Conditions:

Per aerial photos from the County GIS, there has been on going land disturbance since 2008, which would make this development a larger common plan of development. Water quality would still not be required as this site meets one of the exclusions listed in the revised ECM section I.7.1B (see I.7.1.B.5). Please use that and any others as your reasoning for not providing water quality.

I. INTRODUCTION

A. Property Location and Description

National Mill Dog Rescue is planning to construct a 3,000 square-foot building addition to the existing canine rescue and veterinary clinic at 5325 J.D. Johnson Road in eastern El Paso County. The National Mill Dog Rescue property is an unplatted 160-acre parcel (El Paso County Assessor's Parcel No. 33000-00-172) located at the southeast corner of J.D. Johnson Road and Garrett Road. The property is described as the Northwest Quarter of Section 22, Township 13S, Range 63W of the 6th P.M., El Paso County, Colorado.

The site is zoned Agricultural (A-35). The site adjoins unplatted agricultural and rural residential properties on all sides, and the main channel of Black Squirrel Creek flows southeasterly across the north side of the property.

The proposed Site Development Plan consists of a new 3,000 square-foot addition on the northeast side of the existing clinic building, along with associated gravel parking and site improvements. Access will continue to be provided by the existing private access drive connection to J.D. Johnson Road along the west boundary of the site.

The total disturbed area associated with this project is approximately 0.7 acres, which includes both the currently proposed building addition and previous site disturbance during construction of building improvements in 2017. Since the disturbed area is less than one acre and this project is not part of a larger common plan of development, no stormwater detention or water quality facilities are required.

B. Scope

In support of the Site Development Plan submittal to El Paso County, this report is intended to meet the requirements of a Drainage Letter Report in accordance with El Paso County drainage criteria. This report will provide a summary of site drainage issues impacting the proposed development. The report is based on the guidelines and criteria presented in the City of Colorado Springs and El Paso County "Drainage Criteria Manual."

C. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual, Volumes 1 and 2," revised May, 2014.

El Paso County "Engineering Criteria Manual," December 13, 2016.

FEMA, Flood Insurance Rate Map (FIRM) Number 08041C0590G, December 7, 2018.

II. EXISTING AND PROPOSED DRAINAGE CONDITIONS

Please state if the impact to the adjacent property is negligible.

As shown on the enclosed Historic Drainage Plan (Sheet EX1), the site has been delineated as a single on-site drainage basin flowing southeasterly across the property. The existing site topography within Basin A generally slopes downward to the southeast with grades in the range of 1-2 percent.

According to the Natural Resources Conservation Service (NRCS) Soil Survey for this site, on-site soils in the developed part of the site are comprised of "Truckton sandy loam" soils, and these somewhat excessively drained soils are classified as hydrologic soils group "A" (high infiltration rate; see Appendix A). The soils along the Black Squirrel Creek channel are comprised of "Ellicott loamy coarse sand" soils, which are also classified as hydrologic soils group "A."

Historic Basin A sheet flows southeasterly towards Design Point #1 at the southeast corner of the site, ultimately flowing southeasterly to the main channel of Black Squirrel Creek. Historic peak flows at Design Point #1 are calculated as $Q_5 = 16.7$ cfs and $Q_{100} = 122.6$ cfs

As shown on the enclosed Drainage Plans (Figures EX1 and D1), the developed site is limited to a small area in the northwest part of the overall 160-acre property. The existing site development within Basin A consists of several building structures with gravel access drives and parking areas. With the existing site development and proposed building addition, developed peak flows at Design Point #1 are calculated as $Q_5 = 17.6$ cfs and $Q_{100} = 123.9$ cfs, representing a negligible developed drainage impact in comparison to the flow in the main channel of Black Squirrel Creek. Vegetated buffer strips will be maintained between the developed area of the site and the existing drainage channel, and the contractor will be required to implement standard best management practices for erosion control during construction.

Please include discussion of how runoff from developed areas will flow over a great amount of pasture/open space areas that would encourage infiltration etc. before exiting the property.

Hydrologic calculations for the site are detailed in the attached spreadsheets (Appendix A), and peak flows are identified on Figure EX1 (Appendix A).

III. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls. The Four Step Process has been implemented as follows in the planning of this project:

<u>Step 1: Employ Runoff Reduction Practices</u>

- Minimize Impacts: The proposed site development consists of a 3,000 square-foot building addition on a 160-acre property. The minimal increase in impervious area will have a negligible developed drainage impact.

See comment on page 1 and revise accordingly.

Step 2: Stabilize Drainageways

- No direct impacts are proposed to the existing Black Squirrel Creek channel flowing across the north side of the property. Vegetated buffer strips will be maintained between the developed site area and the existing channel.

Step 3: Provide Water Quality Capture Volume (WQCV)

- WQCV BMPs are not required for this site since the disturbed areas is less than one acre and the project site is not part of a larger common plan of development.

Step 4: Consider Need for Industrial and Commercial BMPs

- The Owner shall maintain proper housekeeping practices and spill containment procedures.

IV. FLOODPLAIN IMPACTS

Floodplain limits in vicinity of this site are delineated in the applicable Flood Insurance Rate Map, FIRM Panel No. 08041C0590G dated December 7, 2018 (FIRM exhibit enclosed in Appendix A). While the 100-year floodplain along Black Squirrel Creek flows southeasterly across the north side of the property, the developed part of the site is not impacted by the delineated 100-year FEMA floodplain.

V. STORMWATER DETENTION AND WATER QUALITY

The total disturbed area associated with this project is approximately 0.7 acres. Since the disturbed area is less than one acre and the project site is not part of a larger common plan of development, no stormwater detention or water quality facilities are required.

VI. DRAINAGE BASIN FEES

The site lies entirely within the Hook and Line Ranch Drainage Basin. There is no subdivision platting proposed, and according to the published table of "El Paso County Drainage Basin Fees," this basin is not subject to drainage or bridge fees. As such, no drainage or bridge fees are required.

Per the county GIS this property is in the Hook and Line Ranch and Geick Ranch Drainage Basins. Please revise.

VII. SUMMARY

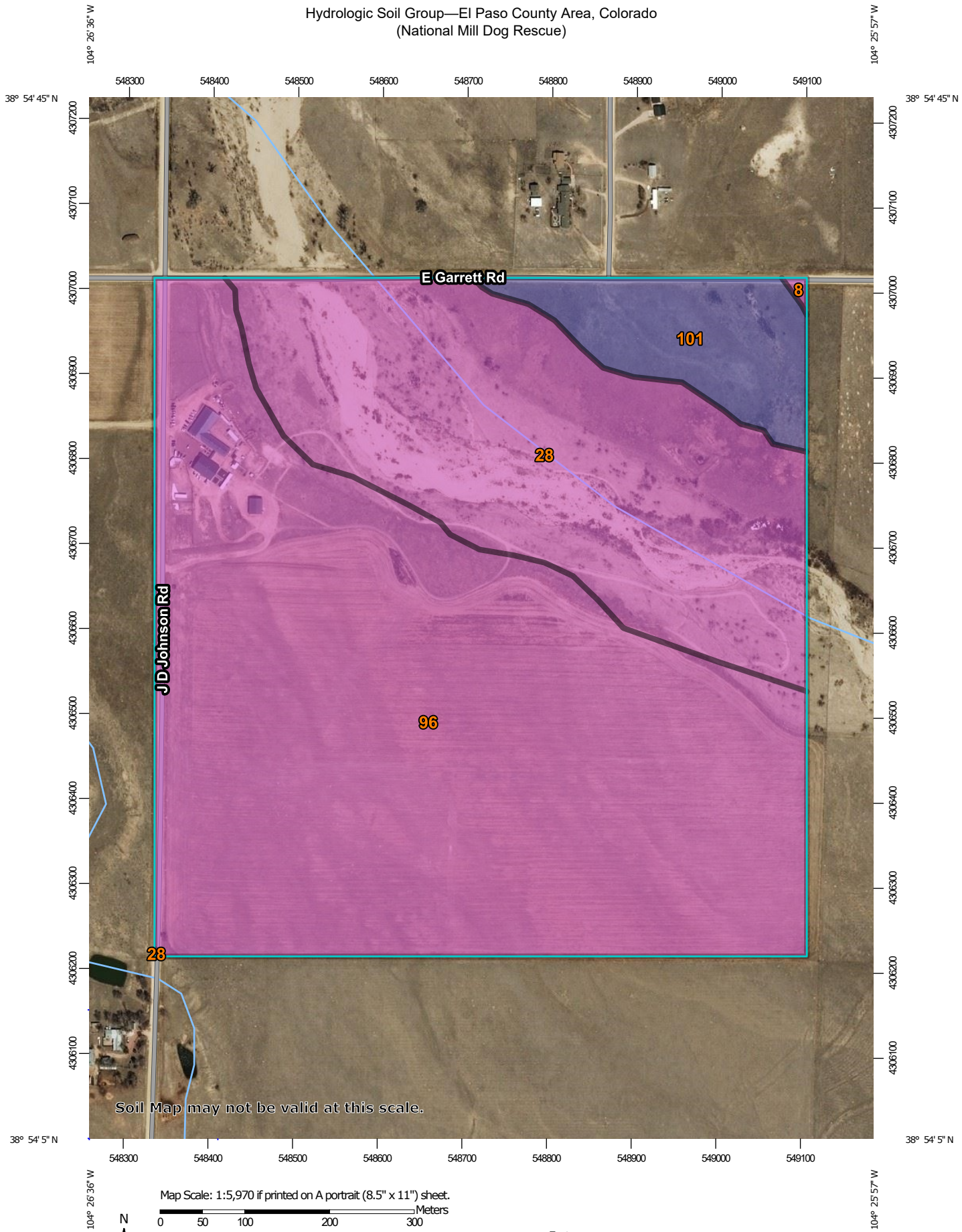
The developed drainage patterns associated with the proposed National Mill Dog Rescue Building Addition project at 5325 J.D. Johnson Road will remain generally consistent with historic conditions. The proposed site improvements will involve less than one acre of site disturbance and the project is not part of a larger common plan of development, so there is no requirement for permanent stormwater quality measures or stormwater detention. The minimal increase in developed flow is negligible in comparison to the flow in the Black Squirrel Creek channel. Construction and maintenance of proper site drainage and erosion control practices will ensure that the proposed development has no significant adverse drainage impact on downstream or surrounding areas.

This implies that there is an adverse drainage impact. Revise the statement accordingly or indicate what the adverse impacts are even if the are not significant.

APPENDIX A

DRAINAGE CALCULATIONS & EXHIBITS

Hydrologic Soil Group—El Paso County Area, Colorado
(National Mill Dog Rescue)



Map Scale: 1:5,970 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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

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 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	0.2	0.1%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	A	44.6	29.2%
96	Truckton sandy loam, 0 to 3 percent slopes	A	97.3	63.8%
101	Ustic Torrifluvents, loamy	B	10.5	6.9%
Totals for Area of Interest			**152.6**	**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 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis--Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

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

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

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

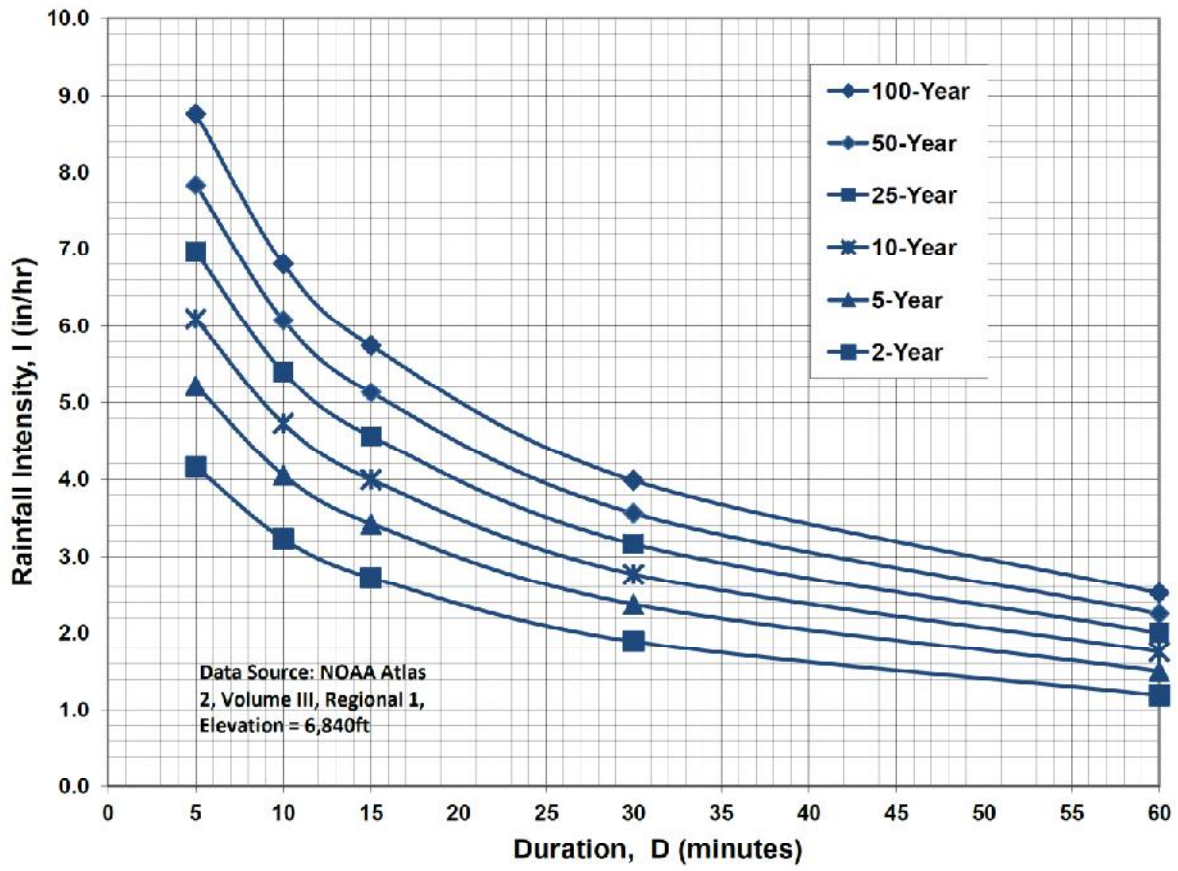
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$I_{100} = -2.52 \ln(D) + 12.735$

$I_{50} = -2.25 \ln(D) + 11.375$

$I_{25} = -2.00 \ln(D) + 10.111$

$I_{10} = -1.75 \ln(D) + 8.847$

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

Note: Values calculated by equations may not precisely duplicate values read from figure.

NATIONAL MILL DOG RESCUE
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	160	0.5	BUILDING / ASPHALT	0.9	0.5	GRAVEL	0.59	159.0	MEADOW	0.08	0.084

100-YEAR C VALUES

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
A	160	0.5	BUILDING / ASPHALT	0.96	0.5	GRAVEL	0.7	159.0	MEADOW	0.35	0.353

IMPERVIOUS AREAS

BASIN	TOTAL AREA (AC)	(AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	(AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
A	160	0.5	BUILDING / ASPHALT	100	0.5	GRAVEL	80	159.0	MEADOW	0	0.563

NATIONAL MILL DOG RESCUE
RATIONAL METHOD

HISTORIC FLOWS

					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR[7]	C 100-YEAR[7]	LENGTH (FT)	SLOPE (FT/FT)	Tco[1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS[2] VELOCITY (FT/S)	Tt[3] (MIN)	TOTAL Tc[4] (MIN)	TOTAL Tc[4] (MIN)	INTENSITY[5] 5-YR (IN/HR)	INTENSITY[5] 100-YR (IN/HR)	PEAK FLOW Q5[6] (CFS)	PEAK FLOW Q100[6] (CFS)
A	A	160.0	0.080	0.350	300	0.010	32.3	3000	15	0.01	1.50	33.3	65.7	65.7	1.31	2.19	16.72	122.61

DEVELOPED FLOWS

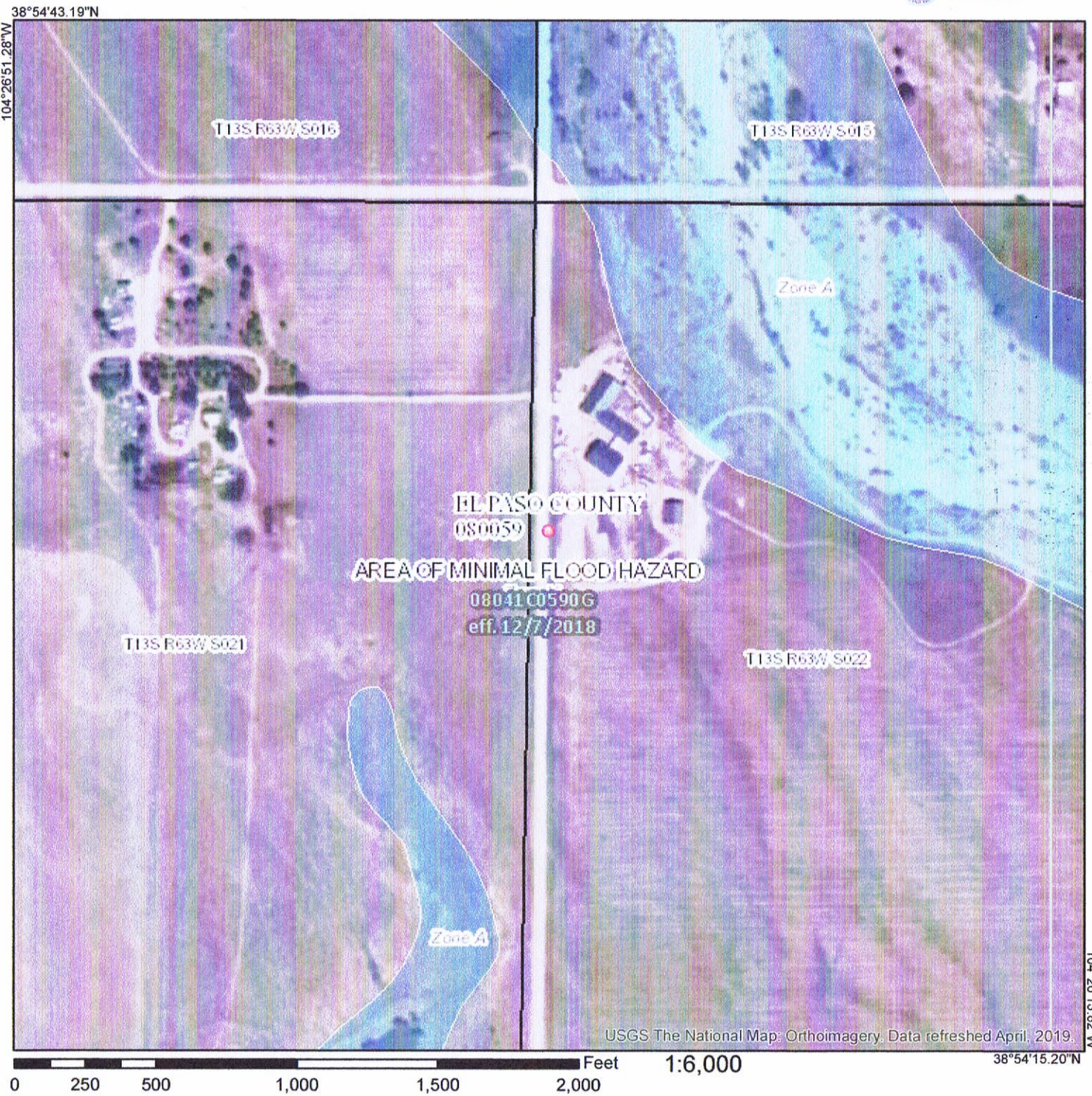
					Overland Flow			Channel flow										
BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR[7]	C 100-YEAR[7]	LENGTH (FT)	SLOPE (FT/FT)	Tco[1] (MIN)	CHANNEL LENGTH (FT)	CONVEYANCE COEFFICIENT C	SLOPE (FT/FT)	SCS[2] VELOCITY (FT/S)	Tt[3] (MIN)	TOTAL Tc[4] (MIN)	TOTAL Tc[4] (MIN)	INTENSITY[5] 5-YR (IN/HR)	INTENSITY[5] 100-YR (IN/HR)	PEAK FLOW Q5[6] (CFS)	PEAK FLOW Q100[6] (CFS)
A	A	160.0	0.084	0.353	300	0.010	32.2	3000	15	0.01	1.50	33.3	65.5	65.5	1.31	2.19	17.59	123.94

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
I_5 = -1.5 * ln(Tc) + 7.583
I_{100} = -2.52 * ln(Tc) + 12.735
6) Q = CiA

National Flood Hazard Layer FIRMette

FEMA



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, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 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
- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard Zone

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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 7/25/2019 at 5:23:12 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.

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q5 (CFS)	Q100 (CFS)
1 (DEVELOPED)	17.6	123.9

N

400' 0 400' 800'

ORIGINAL SCALE: 1"=400' (24"x36" SHEET)
CONTOUR INTERVAL=20'

PROPOSED BUILDING ADDITION

Please also show flow arrows west of JD Johnson Road.

APPROXIMATE FEMA 100-YEAR FLOODPLAIN LIMITS PER FIRM PANEL 08041C0590G

SITE

A
160 AC.

PARCEL
#33000-114-172
160 AC.

1

GARRETT ROAD E.

JD JOHNSON ROAD

JONES ROAD

Springs

Windmill 6323

Windmill 6269

Windmill 6234

Well

Black Squirrel

6359 6340 6339 6336 6300 6261 6260

21 22

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO
80903
PH: 719-477-9429
FAX: 719-471-0766

NATIONAL MILL DOG RESCUE
5335 JD JOHNSON ROAD, PEYTON, CO 80831

No.	REVISION	BY	DATE

MASTER BASIN/ HISTORIC DRAINAGE PLAN

HORZ. SCALE: 1"=400'	DRAWN: BJJ
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED:	CHECKED: JPS
CREATED: 7/26/19	LAST MODIFIED: 7/30/19
PROJECT NO: 071901	MODIFIED BY: BJJ

SHEET: EX1

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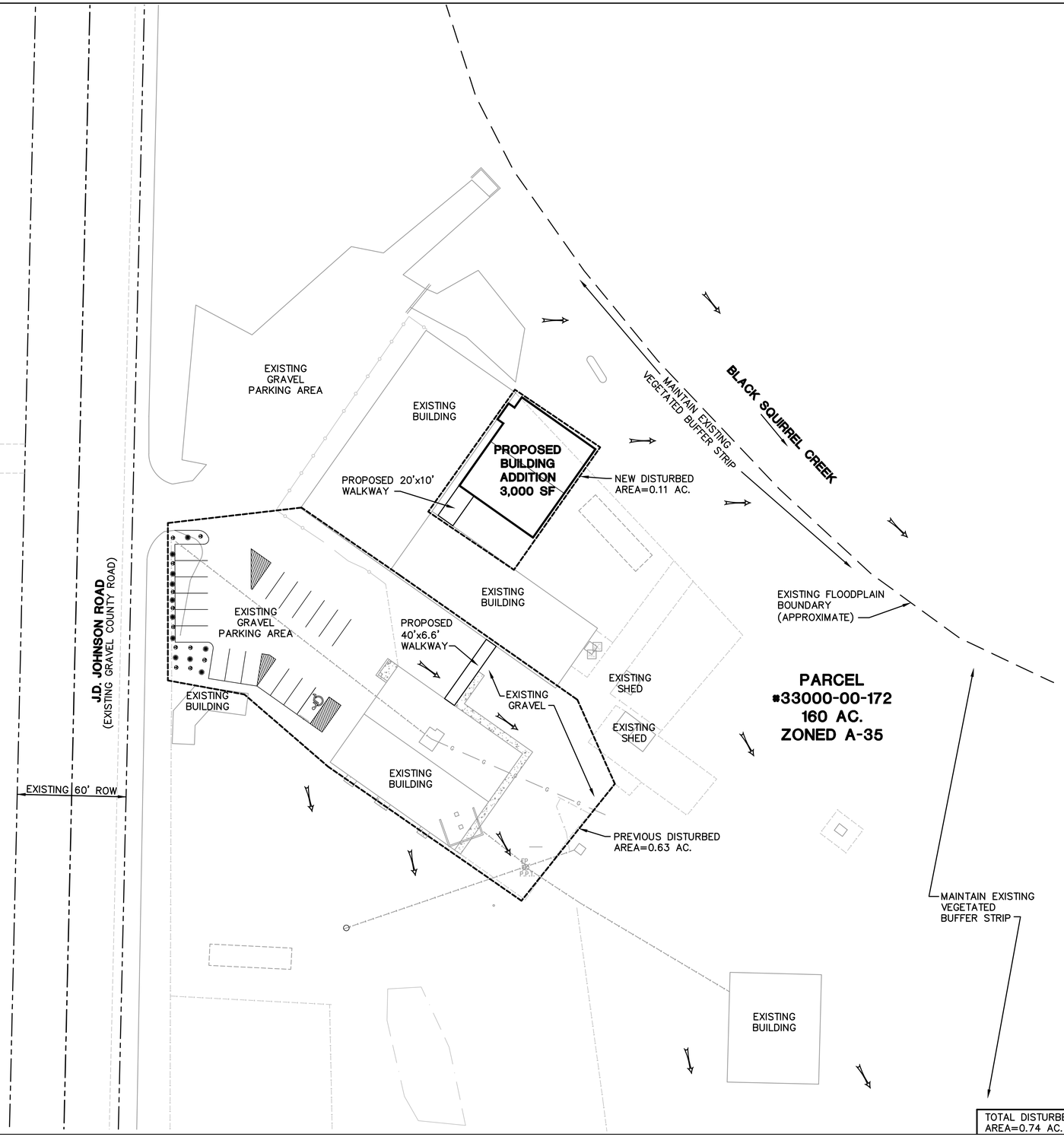
LEGEND

- FILING LIMITS
- DRAINAGE BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- 6520 EXISTING CONTOUR
- PROPOSED CULVERT
- FLOW DIRECTION ARROW
- FLOWLINE
- DESIGN POINT
- C14 / 23.71 Ac. — DEVELOPED BASIN DESIGNATION / BASIN AREA (ACRES)

FIFTEEN MILE RANCH, LLC
PARCEL
#33000-00-574
40 AC.
ZONED A-35



N

30' 0 15' 30' 60'

ORIGINAL SCALE: 1"=30' (24"x 36" SHEET)
CONTOUR INTERVAL = 1'

GENERAL DRAINAGE NOTES:

1. BUILDERS SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURES AND ACCOUNT FOR POTENTIAL CROSS-LOT DRAINAGE IMPACTS WITHIN SITE.

2. BUILDERS AND PROPERTY OWNERS SHALL IMPLEMENT & MAINTAIN EROSION CONTROL BEST MANAGEMENT PRACTICES FOR PROTECTION OF DOWNSTREAM PROPERTIES AND FACILITIES.

NATIONAL MILL DOG RESCUE
5335 JD JOHNSON ROAD, PEYTON, CO 80831

DEVELOPED DRAINAGE PLAN

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

HORZ. SCALE: 1"=30'	DRAWN: BJJ
VERT. SCALE: N/A	DESIGNED: JPS
SURVEYED: –	CHECKED: JPS
CREATED: 7/27/19	LAST MODIFIED: 7/30/19
PROJECT NO: 071901	MODIFIED BY: BJJ

SHEET: D1

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