



FINAL DRAINAGE REPORT FOR ZINDORF — MCDANIEL'S SUBDIVISION

PCD FILE NO. MS-22-006



PREPARED BY

Richard Gallegos, P.E.
RESPEC
121 S. Tejon St., Suite 1110
Colorado Springs, CO 80903

PREPARED FOR

Greg Zindorf
Z Investments LLC
PO Box 50005
Colorado Springs, CO

January 2022





ENGINEER'S STATEMENT

This report and plan for the drainage design of Zindorf - McDaniels Subdivision, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan 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 understand that El Paso County does not, and will not, assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

1/3/2023

Richard Gallegos, P.E.

Date

Registered Professional Engineer State of Colorado No. 36247



DEVELOPER'S STATEMENT

Greg Zindorf hereby certifies that the drainage facilities for the Zindorf - McDaniels Subdivision shall be constructed according to the design presented in this report. I understand that El Paso County does not, and will not, assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to El Paso County; and cannot, on behalf of the Zindorf - McDaniels Road guarantee that final drainage design review will absolve Greg Zindorf and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

GREG ZINDORF

12-20-2022

Authorized Signature

Date

Greg Zindorf

Printed Name

Owner

Address: PO Box 50005

Title

Colorado Springs, CO

EL PASO COUNTY STATEMENT

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.

Joshua Palmer, P.E.

Date

County Engineer/ECM Administrator



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1.0 PURPOSE

This drainage report is for the design of Zindorf – McDaniels Subdivision (McDaniels Tract). The site is located at 22755 McDaniels Road, Calhan CO in eastern El Paso County. See Vicinity Map in the Appendix below for reference. It is further described as the Northeast One-Quarter of the Northeast One-Quarter of Section 11, Township 14 South, Range 63 West of the 6th P.M.

This site is located in the Ellicott Consolidation – CHBS1200 Drainage Basin. Work will include subdividing the 39.7-acre site into four residential lots. An existing home will remain, and the driveway will be reconstructed. On the other three lots, home pads and gravel driveways will be constructed.

2.0 SOIL CONDITIONS

According to the El Paso County Area Soil Survey, the soil on the site is classified as follows:

SOIL #	SOIL TYPE	HYDROLOGIC CLASSIFICATION
19	Columbine Gravelly Sandy Loam	A
28	Ellicot Loamy Coarse Sand	A
95	Truckton Loamy Sand	A

The Columbine soil can be described as having a very high permeability, very low surface runoff, and slight hazard of erosion. The Ellicot soil also can be described as very low surface runoff and slight erosion hazard. The Truckton soil includes a moderate hazard of erosion and low water surface runoff. The soil classification used for this study is 'A'. See Soils Map below in the Appendix for reference.

3.0 DRAINAGE CRITERIA

The methodology utilized for this report is in accordance with the *El Paso County Drainage Criteria Manual*. The Rational Method for computation of runoff was used.

Q = cia Where
Q = maximum rate of runoff in cubic feet per second
c = runoff coefficient representing drainage area characteristics
i = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established
a = drainage basin size in acres

The storm recurrence intervals used for this study were the 5-year storm and the 100-year storm. ManningSolver Version 1.019 was used in this analysis to calculate the Manning's normal depth within the proposed swale.



Please clarify if 1.03 acres of land has been disturbed and how (i.e. grading, stockpiling, existing home & driveway). Is there active work taking place on the parcel?

4.0 EXISTING DRAINAGE CONDITIONS

The overall site consists of 39.7 acres, of this area only approximately 1.03 acres are currently disturbed. An existing gravel driveway is located off of McDaniels Road within the site to service an existing home. The areas of the site not covered by gravel road or the residential home are covered with short grass pastures. These undeveloped areas include slopes that range from 0.5% to 2.4%. The overall existing site is approximately 2.1% impervious. See Existing Drainage Map in Appendix for reference.

Flows from Sub-basins EX1 through EX3 and OS1 through OS3 are tributary to the Ellicot Consolidated Drainage Basin (CHBS1200).

Sub-basin OS1 contains 8.67 acres and drains southeast into Subbasin EX2. It produces flows of 1.1 cfs for the 5-year storm and 8.2 cfs for the 100-year storm. These flows sheetflow and continue towards the FEMA 100-year floodway in the middle of the site.

Sub-basin OS2 contains 0.49 acres and drain southwest into the Haegler Ranch floodway that runs through the middle of the site. It produces flows of 0.1 cfs for the 5-year storm and 1.0 cfs for the 100-year storm. These flows sheetflow to the southwest.

Sub-basin OS3 contains 1.02 acres and drains the east along McDaniels Road. It contains half of McDaniels Road that drains south into the ditch. It produces flows of 0.5 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

Sub-basin EX1 contains 1.06 acres and drains due southwest. It produces flows of 0.2 cubic feet per second (cfs) for the 5-year storm and 1.4 cfs for the 100-year storm. These flows are directed to the southerly direction.

Sub-basin EX2 contains 14.59 acres and drains southeast into the Haeglar Ranch floodway in the middle of the site. It produces flows of 1.8 cfs for the 5-year storm and 14.0 cfs for the 100-year storm. These flows sheetflow to the southeast.

Sub-basin EX3 contains 22.89 acres and sheetflows to the southwest into the Haegler Ranch floodway in the middle of the site. It produces flows of 3.5 cfs for the 5-year storm and 22.8 cfs for the 100-year storm. These flows will combine with flows from Sub-basin EX2, Sub-basin EX3, Sub-basin OS1, Sub-basin OS2, and Sub-basin OS3 to produce total flows of 7.1 cfs for the 5-year storm and 48.0 cfs for the 100-year storm at Design Point 1. FEMA Zone 'A' 100-year floodplain flows entering the site are approximately 1,900 cfs.



The total flow leaving the site at Design Point 1 (DP1) is 7.1 cfs for the 5-year storm and 48.0 cfs for the 100-year storm. The estimated runoff amounts produced for the project under Existing Conditions are shown in Table 1 below.

TABLE 1 – EXISTING CONDITIONS		
Sub-basin	Q ₅ (CFS)	Q ₁₀₀ (CFS)
EX1	0.2	1.4
EX2	1.8	14.0
EX3	3.5	22.8
OS1	1.1	8.2
OS2	0.1	1.0
OS3	0.5	1.5
DP1 (EX2 + EX3 + OS1 + OS2 + OS3)	7.1	48.0

5.0 DEVELOPED DRAINAGE CONDITIONS

Although the overall site consists of 39.7 acre only approximately 1.37 acres will be disturbed. The site will be subdivided into four separate lots with three house and gravel driveway being constructed on the four lots. The existing house will remain and the gravel driveway will be reconstructed. See Proposed Conditions Map below in Appendix for reference.

The overall drainage pattern will remain the same as existing conditions with developed flows directed to the same locations as described in the Existing Conditions Section. Proposed site imperviousness is 2.8%, versus 2.1% in the existing conditions.

Sub-basin OS1 contains 8.67 acres and drains southeast into Subbasin PP2. It produces flows of 1.1 cfs for the 5-year storm and 8.2 cfs for the 100-year storm. These flows continue towards the FEMA 100-year floodway in the middle of the site.

Sub-basin OS2 contains 0.49 acres and drain southwest into the Haegler Ranch floodway that runs through the middle of the site. It produces flows of 0.1 cfs for the 5-year storm and 1.0 cfs for the 100-year storm. These flows sheetflow to the southwest and will combine with flows from Design Point 1, described above.

Sub-basin OS3 contains 1.02 acres and drains the east along McDaniels Road. It contains half of McDaniels Road that drains south into the ditch. It produces flows of 0.5 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

Sub-basin PP1 contains 1.06 acres and drains due southwest. It produces flows of 0.2 cfs for the 5-year storm and 1.4 cfs for the 100-year storm. These flows sheetflow in a southerly direction.



Sub-basin PP2 contains 14.59 acres and drains southeast into the Haeglar Ranch floodway in the middle of the site. It produces flows of 1.8 cfs for the 5-year storm and 14.0 cfs for the 100-year storm. These flows sheetflow to the southeast.

Sub-basin PP3 contains 22.89 acres and sheetflows to the southwest into the Haeglar Ranch floodway in the middle of the site. It produces flows of 3.9 cfs for the 5-year storm and 22.9 cfs for the 100-year storm. These flows will combine with flows from Sub-basin PP2, Sub-basin PP3, Sub-basin OS1, Sub-basin OS2, and Sub-basin OS3 to produce total flows of 7.5 cfs for the 5-year storm and 48.0 cfs for the 100-year storm at Design Point 1.

All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

The total flow leaving the site under Developed Conditions at Design Point 1 (DP1) is 7.5 cfs for the 5-year storm and 48.0 cfs for the 100-year storm. The estimated runoff amounts produced for the project for Developed Conditions are shown in Table 2 below.

Please elaborate on the ultimate outfall for design point 1. Discuss where the runoff for design point 1 flows towards and if mitigation is required or why not.

TABLE 2 - DEVELOPED CONDITIONS		
	Q ₅ (CFS)	Q ₁₀₀ (CFS)
	0.2	1.4
	1.8	14.0
	3.9	22.9
OS1	1.1	8.2
OS2	0.1	1.0
OS3	0.5	1.5
DP1 (PP2 + PP3 + OS1 + OS2 + OS3)	7.5	48.0

6.0 WATER QUALITY

The total disturbance for this development will be 1.37 acres. According to the El Paso County Engineering Criteria Manual (ECM), "The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7". Furthermore, in El Paso County ECM Appendix I.7, 1.B, a "Large Lot Single Family Site" is excluded from the requirements defined in Section 1.7. Since this site will be divided in single-family residential lots greater than 2.5 acres in size per dwelling and having a total lot imperviousness of less than 10 percent, the site can be excluded from water quality control measure requirements.

Although permanent stormwater quality control measures and ESQCP are not required. Each site is still responsible for providing the appropriate temporary control measures (i.e. silt fence, VTC, etc). Please revise statement.



7.0 EROSION CONTROL PLAN

The site construction consists of four single family residential lots, which includes four houses and gravel driveways that all occupy greater than 2.5 acres in size per dwelling and a total lot imperviousness of less than 10 percent. With single family residential lots greater than 2.5 acres in size and less than 10 percent imperviousness, the site is excluded from erosion control requirements.

8.0 FLOODPLAIN STATEMENT

Portions of the site are within the designated FEMA 100-year floodplain and designated FEMA 100-year floodway as designated on Map No. 08041C0810G and Map No. 08041C0807G, both dated December 7th, 2018. A large portion of the site consists of a FEMA Flood Zone 'AE'. A small portion on the north end of the site is considered a FEMA Flood Zone 'A'.

No development will occur within the FEMA 100-year floodplain and the FEMA 100-year floodway. There is currently not an approved drainage basin planning study for the Ellicott Consolidated (CHBS1200) Drainage Basin. For this reason, drainageway improvements and channel stabilization requirements have not been identified for the drainageway shown in the Drainage Maps below. No improvements are proposed for this drainageway as a result.

9.0 DRAINAGE BASIN FEES

The proposed development is located within the Ellicott Consolidated Drainage Basin.

Review 1 comment:

Please also discuss/provide analysis of the floodplain. What are the conditions of the channel? are improvements required to stabilize the drainageway? etc. Per DCMV1 1.4.2 "Developers in and along the drainage way are required to implement the proper measures to maintain or create stable characteristics of the drainageway. The principal objective is to limit excessive erosion in and along the channel....."

Review 2: Unresolved. Please provide discussion and analysis of the floodplain. Identify conditions, characteristics, pictures, hydraulic analysis of the drainageway.

Please see PCD project file MS224 drainage report (link provided of similar project) for an example of what is expected. Please be sure to identify any improvements that may be needed and provide any necessary construction drawings.

<https://epcdevplanreview.com/Public/ProjectDetails/174808>

ed Drainage Basin.

Drainage Basin.

to engineer's estimate of



The existing conditions section states 1.07 acres of land has been disturbed. Please verify total land disturbance and update accordingly.

For this 39.7-acre site, the site will be divided into four separate lots. The existing gravel driveway will be removed and reconstructed, while the 1850 sf house will remain. Three additional home pads and gravel driveways will be constructed on the other lots. The total anticipated disturbance of the site will be 1.37 acres. Construction will occur within drainage sub-basin PP3. The development increases total routed flows exiting the site at Design Point 1 (DP1) from 7.1 cfs to 7.5 cfs for the 5-year storm, while the 100-year storm flow remains unchanged at 48.0 cfs. This is a 5.6% increase for the 5-year storm. These increases do not warrant the need for detention. All developed flows will continue to flow along existing drainage patterns. All areas disturbed by construction will be repaired, and erosion control measures will be installed during construction of the proposed site.

Unresolved Review 1 Comment:
Please provide a statement confirming the proposed development will not adversely impact adjacent and downstream properties.

Municipal Code Corporation (2018). *Engineering Criteria Manual of El Paso County, Colorado (ECM)*

Municipal Code Corporation (2018). *Drainage Criteria Manual of El Paso County, Colorado (DPM)*

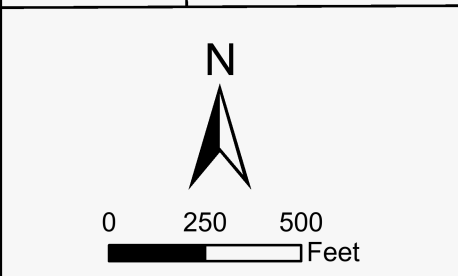
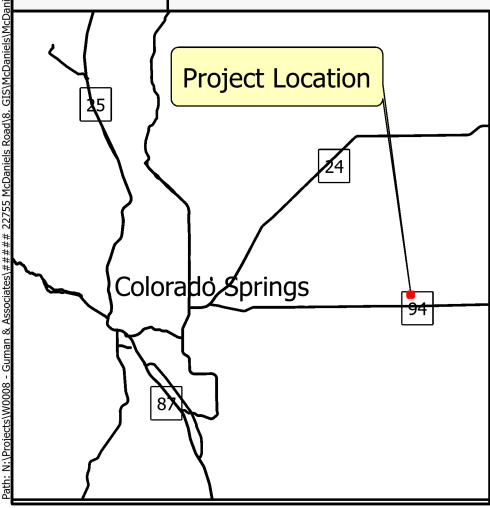
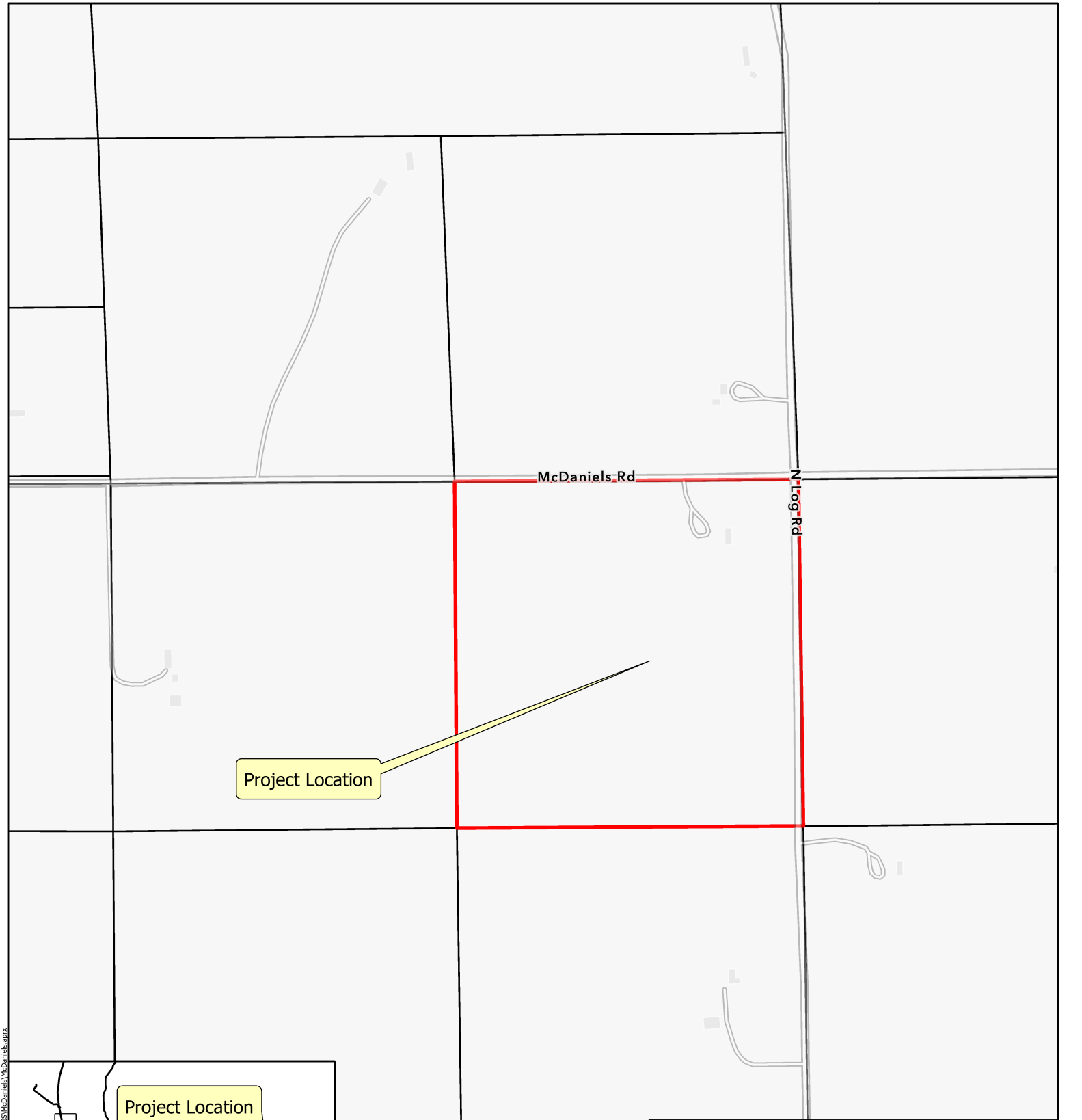
USDA, NRCS. Soil Survey of El Paso County Area, Colorado.

Haegler Ranch Drainage Basin Planning Study, URS Corporation, Dated May 2009.



APPENDIX A

MAPS



Prepared by:



121 S. TEJON ST., SUITE 1110
 COLORADO SPRINGS, CO 80903
 WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

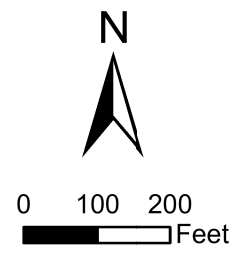
VICINITY MAP

Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Path: N:\Projects\W0008 - Guman & Associates\### - 22755 McDaniels Road\8_GIS\McDaniels\McDaniels.aprx



Map Unit Symbol	Map Unit Name	Rating
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A
28	Ellicot loamy coarse sand, 0 to 5 percent slopes	A
95	Truckton loamy sand, 1 to 9 percent slopes	A



Prepared by:



121 S. TEJON ST., SUITE 1110
 COLORADO SPRINGS, CO 80903
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22755 McDaniels Road

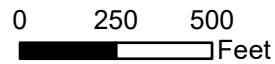
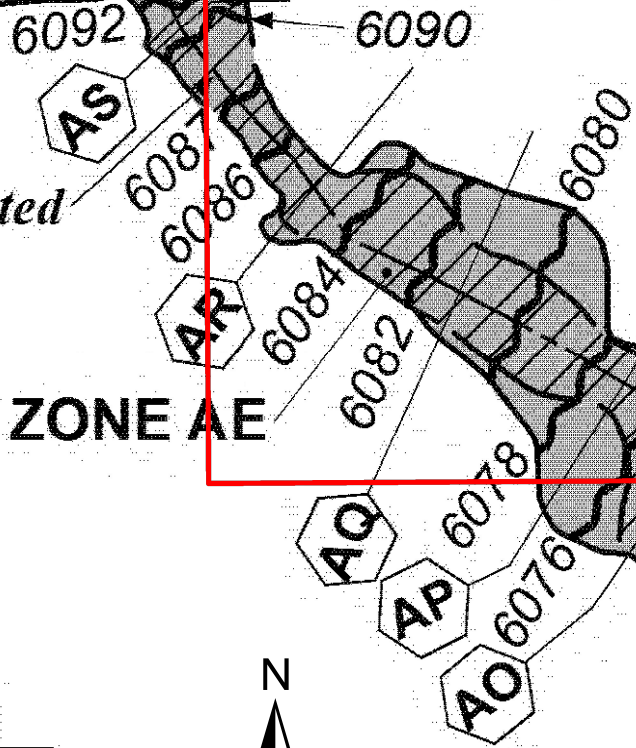
SOILS MAP

Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar

Path: \\Projects\W0008 - Guman & Associates\### 22755 McDaniels Road\6. GIS\McDaniels\McDaniels.aprx

Ellicott Consolidated

ZONE AE



11

NFP PANEL 0810G

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

PANEL 810 OF 1300
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:			
COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	8008	810	8

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
 08041C0810G

MAP REVISED
 DECEMBER 7, 2018

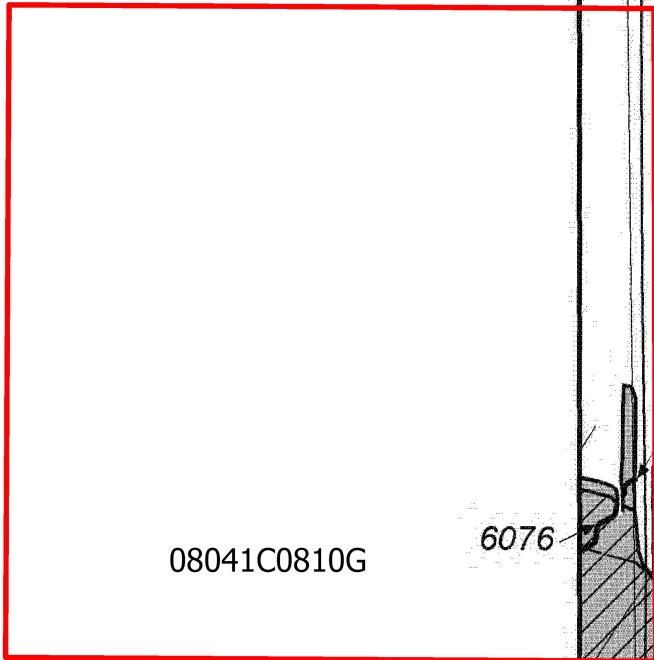
Federal Emergency Management Agency

Prepared by:

121 S. TEJON ST., SUITE 1110
 COLORADO SPRINGS, CO 80903
 WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

FIRM MAP



08041C0810G

6076

6076



Ellicott Consolidated

6072



ZONE AE

6068

6064

6064

6062

11



6062



LOG RD

6058



6056

1370000 FT

38° 50' 37.50"

104° 24' 22.00"



0 250 500 Feet

Prepared by:



RESPEC

121 S. TEJON ST., SUITE 1110
COLORADO SPRINGS, CO 80903
WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

FIRM MAP

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

PANEL 807 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
EL PASO COUNTY 0807E 807 G

Notice to User: The Map Number shown below should be used when locating this product. The Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
08041C0807G
MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency





APPENDIX B

CALCULATIONS



McDaniels Subdivision									
C FACTOR CALCULATION SHEET									
EXISTING CONDITIONS									
RUNOFF COEFFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	5 YR	100 YR					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					
EXISTING CONDITIONS									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
EX1	1.06	1.06	0.00	0.00	0.00	0.08	0.35		0.00
EX2	14.59	14.59	0.00	0.00	0.00	0.08	0.35		0.00
EX3	22.86	21.83	0.98	0.00	0.05	0.10	0.37		3.63
OS1	8.67	8.67	0.00	0.00	0.00	0.08	0.35		0.00
OS2	0.49	0.49	0.00	0.00	0.00	0.08	0.35		0.00
OS3	1.02	0.60	0.42	0.00	0.00	0.29	0.49		32.94
Site Percent Impervious		2.11							

DEVELOPED CONDITIONS									
RUNOFF COEFFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	5 YR	100 YR					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					
Developed Conditions									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
PP1	1.06	1.06	0.00	0.00	0.00	0.08	0.35	0.00	
PP2	14.59	14.59	0.00	0.00	0.00	0.08	0.35	0.00	
PP3	22.86	21.49	1.16	0.00	0.21	0.11	0.37	4.89	
Total	38.51	37.14	1.16	0.00	0.21	TOTAL SITE IMPERVIOUSNESS		2.90	
OS1	8.67	8.67	0.00	0.00	0.00	0.08	0.35	0.00	
OS2	0.49	0.49	0.00	0.00	0.00	0.08	0.35	0.00	
OS3	1.02	0.60	0.42	0.00	0.00	0.29	0.49	32.94	
Site Percent Impervious		2.83							



APPENDIX C

DESIGN CHARTS



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													
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													
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													
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													
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													
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													
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

Figure 6-25. Estimate of Average Concentrated Shallow Flow

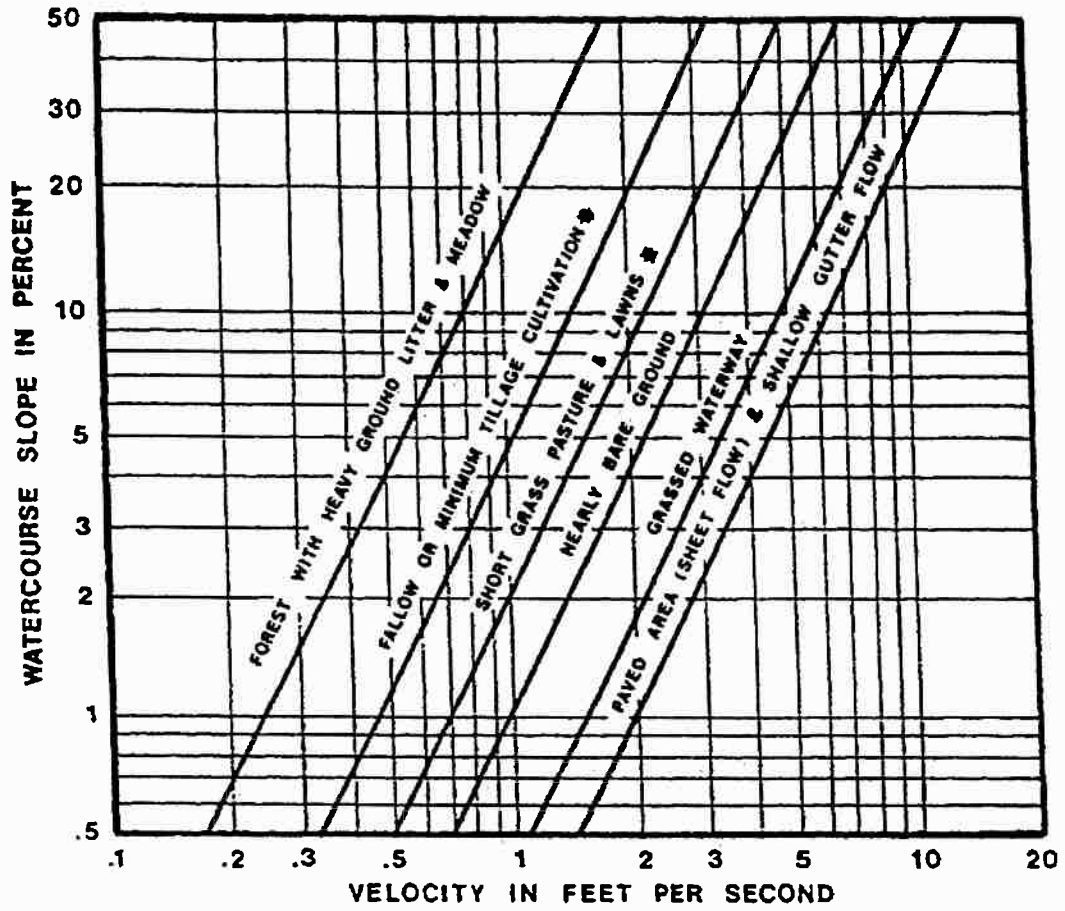
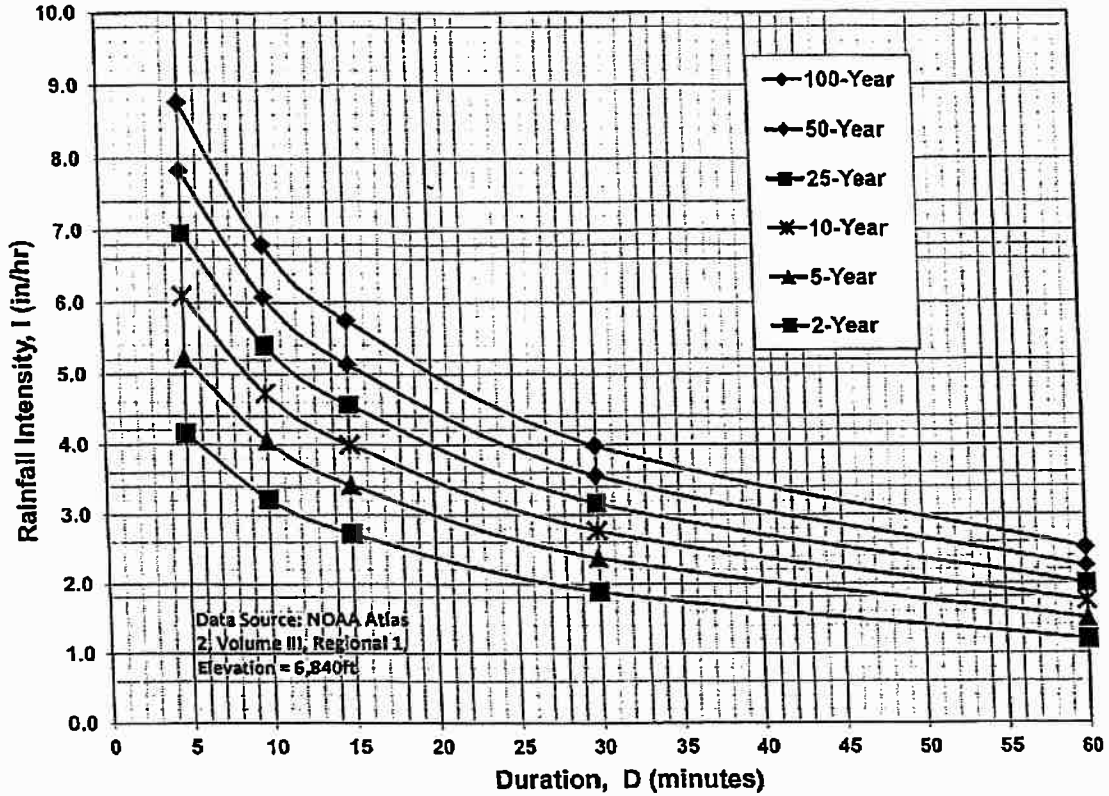


Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

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

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

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

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

$$I_5 = -1.50 \ln(D) + 7.583$$

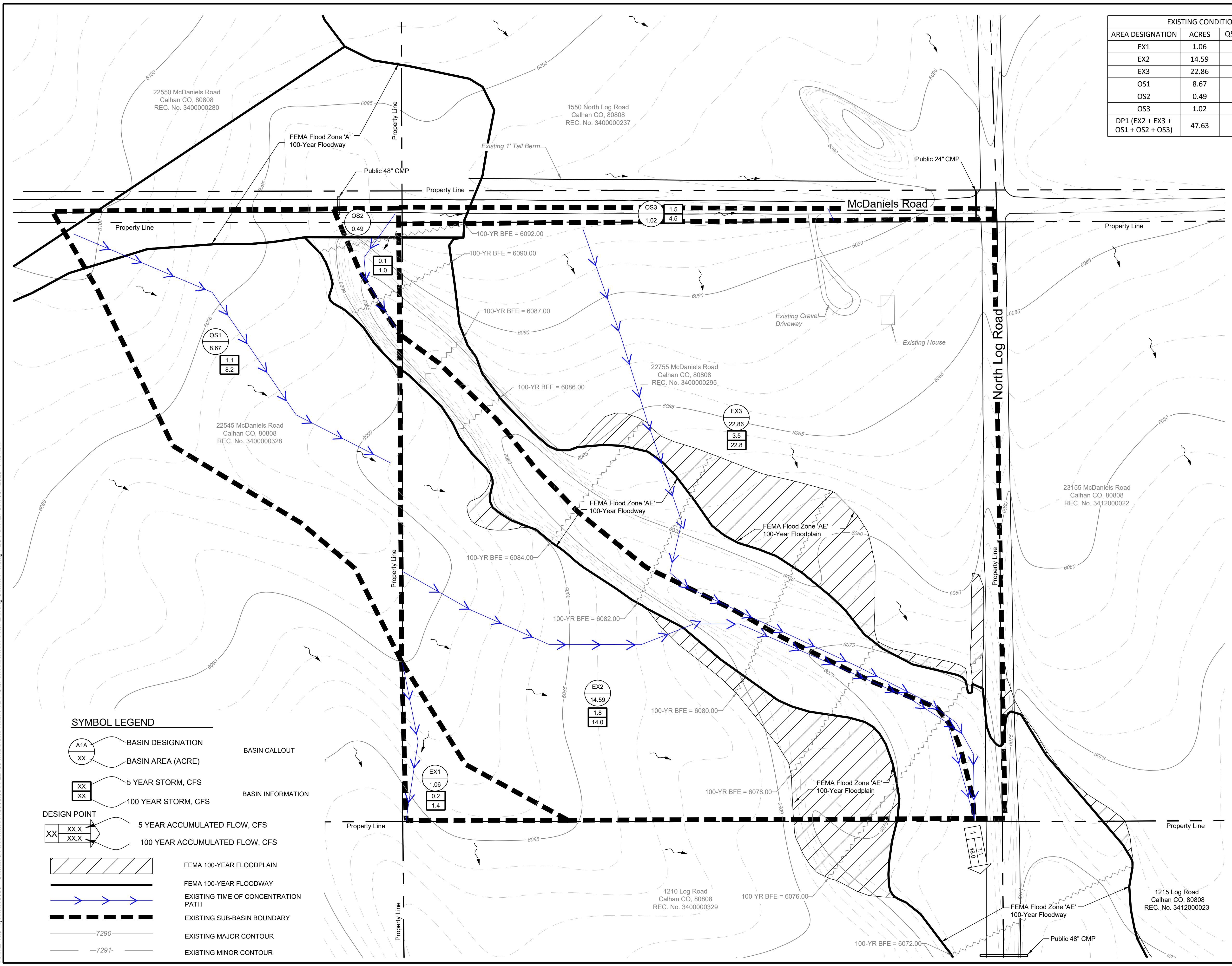
$$I_2 = -1.19 \ln(D) + 6.035$$

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



BACK POCKET

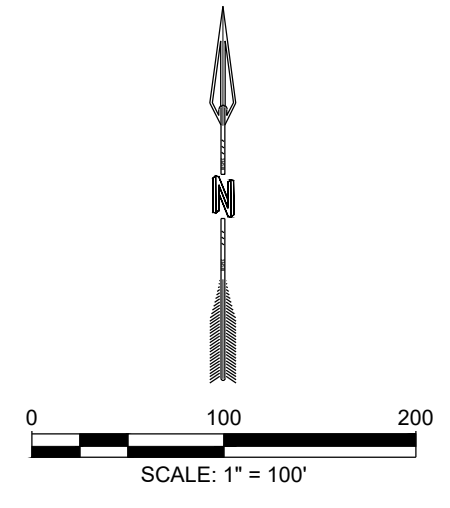
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EXISTING CONDITIONS			
AREA DESIGNATION	ACRES	Q5 (CFS)	Q100 (CFS)
EX1	1.06	0.2	1.4
EX2	14.59	1.8	14.0
EX3	22.86	3.5	22.8
OS1	8.67	1.1	8.2
OS2	0.49	0.1	1.0
OS3	1.02	1.5	4.5
DP1 (EX2 + EX3 + OS1 + OS2 + OS3)	47.63	7.1	48.0

NOTE: ALL ELEVATIONS IN NAVD88

- SYMBOL LEGEND**
- A1A BASIN DESIGNATION
 - XX BASIN AREA (ACRE)
 - XX 5 YEAR STORM, CFS
 - XX 100 YEAR STORM, CFS
 - XX 5 YEAR ACCUMULATED FLOW, CFS
 - XX 100 YEAR ACCUMULATED FLOW, CFS
 - FEMA 100-YEAR FLOODPLAIN
 - FEMA 100-YEAR FLOODWAY
 - EXISTING TIME OF CONCENTRATION PATH
 - EXISTING SUB-BASIN BOUNDARY
 - EXISTING MAJOR CONTOUR
 - EXISTING MINOR CONTOUR



<p>DESIGNED CTD DRAWN RGG CHECKED RGG DATE 1.03.2023</p>	<p>REVISION</p>
<p>RESPEC COMMUNITY DESIGN SOLUTIONS 17 SOUTH PEARSON STREET SUITE 1110 CALHAN CO, CALHAN, SD 57520 WWW.RESPEC.COM PHONE (605) 896-5212</p>	
<p>STAMP</p>	
<p>PRELIMINARY NOT FOR CONSTRUCTION 1/2023</p> <p>THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED</p>	
<p>811 Know what's below. Call before you dig.</p>	
<p>PROJECT NAME: Zindorf - McDaniels Subdivision</p>	
<p>SHEET TITLE: Existing Conditions</p>	
<p>SUBMITTED FOR: Greg Zindorf</p>	
<p>SHEET NUMBER: 1 OF 2</p>	

PROPOSED CONDITIONS			
AREA DESIGNATION	ACRES	Q5 (CFS)	Q100 (CFS)
PP1	1.06	0.2	1.4
PP2	14.59	1.8	14.0
PP3	22.86	3.9	22.9
OS1	8.67	1.1	8.2
OS2	0.49	0.1	1.0
OS3	1.02	1.5	4.5
DP1 (PP2 + PP3 + OS1 + OS2 + OS3)	47.63	7.5	48.0

DESIGNED CTD		DRAWN CTD		CHECKED RGG		DATE 1.03.2023	
DESIGNED CTD		DRAWN CTD		CHECKED RGG		DATE	1.03.2023

STAMP

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Know what's below.
Call before you dig.

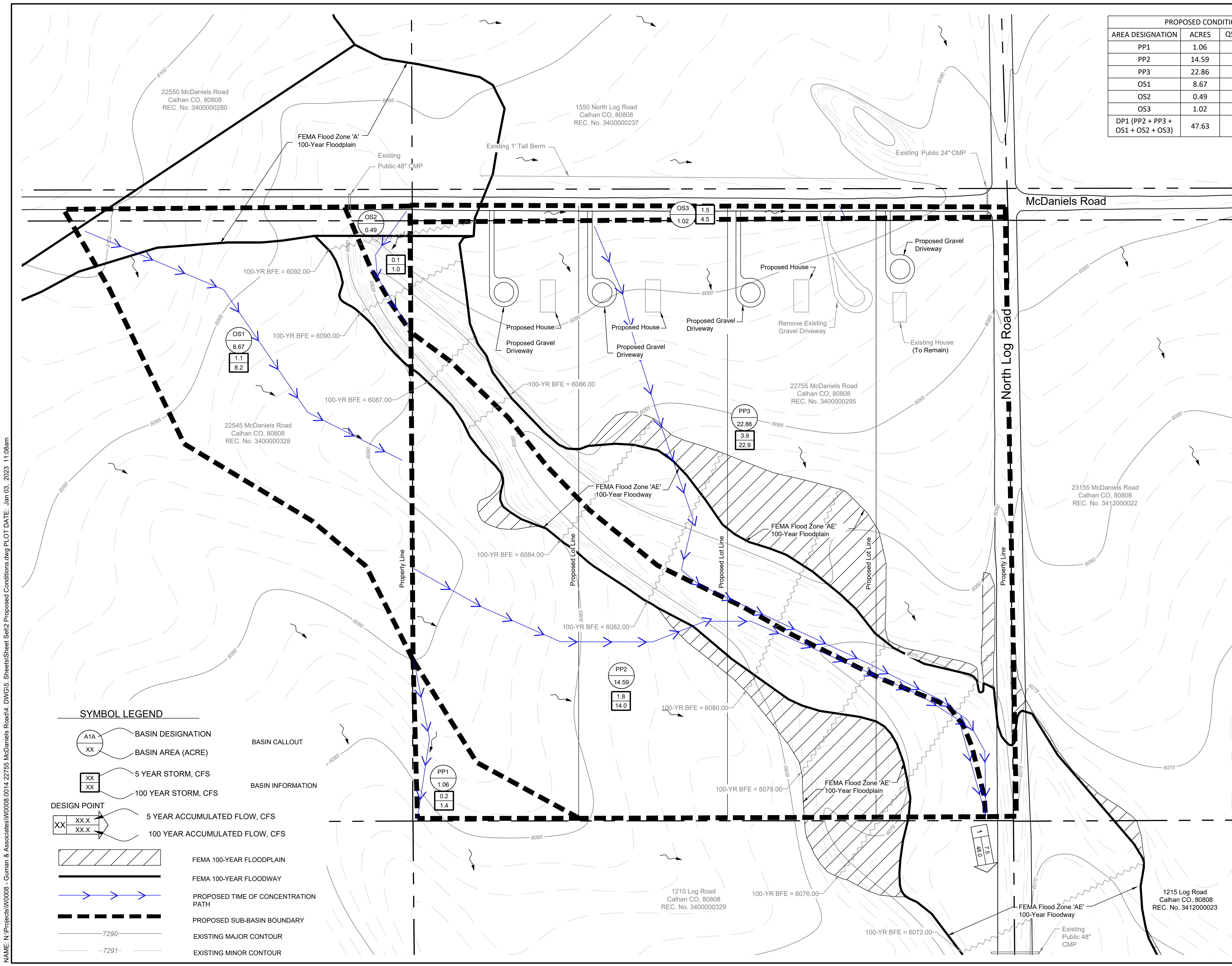
PROJECT NAME:
Zindorf - McDaniels Subdivision

SHEET TITLE:
Proposed Conditions

SUBMITTED FOR:
Greg Zindorf

SHEET NUMBER:
2 OF 2

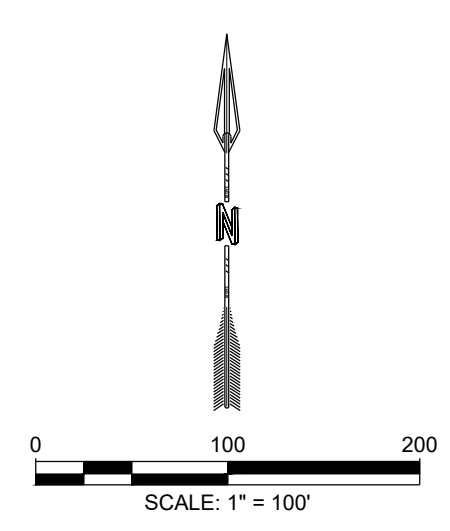
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NOTE: ALL ELEVATIONS IN NAVD88

SYMBOL LEGEND

	BASIN DESIGNATION		BASIN CALLOUT
	BASIN AREA (ACRE)		BASIN INFORMATION
	5 YEAR STORM, CFS		100 YEAR STORM, CFS
	5 YEAR ACCUMULATED FLOW, CFS		100 YEAR ACCUMULATED FLOW, CFS
	FEMA 100-YEAR FLOODPLAIN		FEMA 100-YEAR FLOODWAY
	PROPOSED TIME OF CONCENTRATION PATH		PROPOSED SUB-BASIN BOUNDARY
	EXISTING MAJOR CONTOUR		EXISTING MINOR CONTOUR



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