

## **Engineering Comments provided by Ayres Associates**

It is recommended that the developer obtains written confirmation of availability of 9 water taps from the water provider, the Town of Grand Lake.

It is recommended that the developer obtains written confirmation of availability of Sewer, Gas, and Electric utilities from provider(s) for 9 lots.

**Preliminary Plat** The purpose of this preliminary review is to check the proposed development against the design standards and improvement requirements stated herein.

County Road 663 will be the primary access point for the subdivision and will be a publicly maintained. Paving requirements are waived per the Town and the Annexation Agreement. A 20-ft ROW dedication for CR 663 was addressed in the Annexation Agreement. Emergency access is addressed through 90' diameter turn-around at the dead end of the road. Secondary access is not feasible for this development due to terrain and existing access from West Portal Road. It is recommended that the Town request a paved apron be installed at the intersection of West Portal Road and CR 663 to protect the edge of the paved portion of West Portal Road from damage.

12-9-10-H-7 Lots that show slopes greater than 20% will require a geotechnical analysis prior to building permit issuance. This includes Lots 1, 2, 4, 5, 6, and 8. It is recommended that Lots 7 and 9 have geotechnical analysis to assess the slope stability for steep slopes that exist immediately adjacent to the proposed building envelopes. Engineering recommends all lots associated with the development are required to obtain geotechnical analysis by a Colorado Licensed PE to address slope stabilities and suitable building sites and footprints for the individual lots.

12-9-10-I-3 Lot 8 is proposed to be transferred to the Town of Grand Lake, please provide statement of compliance with 12-10-3 as outlined in 12-9-2-D-2-a-4.

12-9-10-H-8-b A landscaping plan shall be submitted which shall indicate the treatment and materials used for all open spaces of the development. Any amount of common or public open space may be left in its natural state except where landscaping plans are required as long as the recreational needs of the residents of the development and the general public are being met in the opinion of the Planning Commission. If the sequence of construction of various portions of the Final Development Plan is to occur in stages, then the open space and/or recreational facilities shall be developed in proportion to the number of dwelling units intended to be developed during any given stage of construction.

12-9-10-H-5 Storm Drainage and Flood Plain Standards.

(a) Complete drainage systems for the entire development area shall be designed by a professional engineer, licensed in the State of Colorado and qualified to perform such work and shall be shown graphically. All **existing drainage features** which are to be incorporated in the design shall be so identified. If the Final Plat is to be presented in sections, a general drainage plan for the entire area shall be presented with the first section and appropriate development stages for the drainage system for each section shall be indicated.

*12-9-10-H-6. Drainage Regulations and Standards.*

(a) The storm drainage and run-off system is to be designed for sufficient capacity to carry historical flow *plus* the increased run-off from all areas in its developed state; all drainage construction areas are to be re-landscaped.

The Development may not divert historical incoming flows to adjacent properties nor create drainage flows in addition to historical flows to adjacent properties. All buildings will be provided with exterior drainage of run-off water from roofs, decks and snow storage areas in such a way so as not to increase run-off from historic flows onto adjacent properties or live streams.

At full build out, the proposed development will cause increased imperviousness and runoff associated with the minor and major storm events. Storm drainage facilities, i.e. a detention basin, may be required to control release of flows from the subdivision consistent with the historical release rates of the pre-development condition.

(b)(2) The developer shall show evidence and plans to ensure that the proposed development will not result in degradation of streams. This condition shall apply both to the proposed development activities as well as the ultimate use of the land. No direct discharges to a creek, stream or river are allowed.

Drainage Narrative needs to address the increased runoff associated with the planned development. Sizing the roadside swale for conveyance of the increased runoff will need to address the 100-yr discharge calculated for the proposed condition. Please provide hydraulic analysis indicating the current swale is sufficient or if additional modifications will need to be designed. This should be supported by topographic/survey investigation of the existing swale and shown on the plat as existing drainage infrastructure. The drainage plan shall result in a theoretical zero increase over historical levels in run-off volumes and velocities as a result of the development.

(i) The drainage plan shall include techniques and measures to prevent erosion on the site as well as into any lakes and streams during construction.

(ii)The drainage plan is to avoid point source drains from the development without design of catchment basins or other suitable means to reduce pollution and sedimentation of streams and lakes in the Grand Lake area.

(iii)All proposed surface-drainage structures shall be indicated and all appropriate designs, details and dimensions necessary to clearly explain proposed construction materials and elevations shall be included in the drainage plans.

(iv)The drainage system shall be designed to consider the drainage basin as a whole and shall accommodate not only runoff from the development area but also, where applicable, the system shall be designed to accommodate the runoff from those areas adjacent to and "upstream" from the development itself, as well as its effects on lands downstream.

(3) Drainage and erosion control structures shall be required to direct and control the flow of all permanent and seasonal water courses. Such structures shall be designed by a registered professional engineer with proficiency in the fields of hydrology hydraulics, and soils engineering. Further, such structures shall be designed to prevent heavy sedimentation within or erosion or overtopping of channels, or damage to the structure.



April 9, 2026

Town of Grand Lake  
Grand County, Colorado

**RE: Preliminary Drainage Analysis  
Ruger Subdivision  
Part of Gov't Lot 3  
section 5, Township 3 North  
Range 75 West of the 6<sup>th</sup> PM  
2N Project No. 26003**

Dear Engineering,

This letter serves to address the stormwater drainage impact of the proposed Ruger Subdivision. The 5-acre site is located on either side of County Road 663 and north of West Portal Road. The subject parcel is Part of section 5, Township 3 North Range 75 West of the 6<sup>th</sup> PM, Town of Grand Lake, Grand County, Colorado. A Vicinity Map is included in Appendix A.

Creek cannot be the outfall under the developed condition.

#### Existing Drainage Characteristics

The area was divided into two existing drainage basins that convey runoff from north to south across steep natural terrain. The existing basins EX-1 have an area of 5.54 acres with composite imperviousness of 5.3% and basin EX-2 has an area of 10.70 acres with composite imperviousness of 11.3%. These basins drain to design points 1 and 2, which are near to West Portal Road and continue offsite to North Inlet Creek. This creek serves as the receiving water body for the site's historic drainage before eventually entering Grand Lake. The drainage patterns were delineated using publicly available contour data.

The existing property is composed of prominent rocky outcroppings, native grasses, and existing county road 663. The soil types present onsite are 23.7% Scout cobbly sandy loam [6-15% slopes], 76.3% Scout cobbly sandy loam [15-65% slopes], as designated by the Natural Resources Conservation Services (see Appendix A). The site is within Hydrologic Group A. Soil classified as Hydraulic Group A exhibits a high rate of infiltration when thoroughly wet. The site is located within a Zone X flood hazard area shown on the FEMA Map titled "National Flood Hazard Layer FIRMette", located in Grand County, Colorado and Incorporated Areas, Community 080280, Panel 0314, Map Number 08049C0314C, Dated January 2, 2008." (See Appendix A). Zone X areas are areas unmapped with an area of minimal flood hazard.

Provide precipitation values and cite source used for calculations



Runoff from the existing drainage basins was calculated using the Rational Method to determine runoff for the 100-year storm since the basins are smaller than 90-acres as recommended by Mile High Flood District.

### Proposed Development and Drainage Characteristics

The proposed development for the site includes subdividing the property into nine lots, with eight of them being approximately 0.45-acre single family residential parcels and one with 0.88-acre parcel. Lots will be accessed from County Road 663 and West Portal Road.

Provide values used to determine % impervious

Proposed flow calculations were performed using the Rational Method to calculate the additional runoff generated from the development of driveways and buildings, since the basins are smaller than 90-acres as recommended by Mile High Flood District. The proposed basins PR-1 has an area of 5.54 acres with composite imperviousness of 9.0% and Basin PR-2 has an area of 10.70 acres with composite imperviousness of 17.0%. The proposed basin delineation for this study is consistent with the existing basin delineation; the proposed basins drain to design points 1 and 2. Refer to the attached Existing and Proposed Drainage Plans included in the Appendix.

Below is a summary table comparing the existing and proposed basin runoff flows in the 10-yr and 100-yr storm event using the criteria discussed above and below. Runoff calculations can be found in Appendix B.

Basin	Design Point	Existing Q <sub>10-yr</sub>	Existing Q <sub>100-yr</sub>	Proposed Q <sub>10-yr</sub>	Proposed Q <sub>100-yr</sub>
EX-1/PR-1	DP 1	0.24	2.68	0.55	3.22
EX-2/PR-2	DP 2	1.25	6.01	2.10	7.46

A small portion of the property is located offsite. This area has been disregarded from the analysis. The site to be developed consists of nine lots with each having the building of 2100 SF area, a garage of 528 SF area and driveways.

Please clarify or remove reference to off-site property.

### Existing Road-side Ditch

If required, the ditch will be regraded or improved to carry the major storm. Driveway Culvert has been sized to carry the major storm. A 15" CMP will pass the proposed major flow. Based on the provided hydraulic analysis, the 15-inch CMP driveway culvert possesses sufficient capacity to convey the 100-year peak design flow of 7.46 cfs without overtopping the driveway surface. The Corrugate Metal Pipe is appropriate for this site's shallow cover requirements under the driveway.

driveway culverts should be called out on the plat as required for proper drainage, 15" CMP

Conclusion

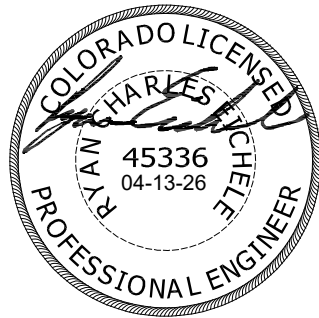
In conclusion, the proposed buildings and driveways for the site have been designed to ensure all stormwater runoff is directed away from the structures and toward the existing drainage system.

Thank you for taking the time to review this letter. If you have any questions or require additional information, please let us know.

Sincerely,

2N CIVIL, LLC

Ryan Eichele, P.E.  
Project Manager



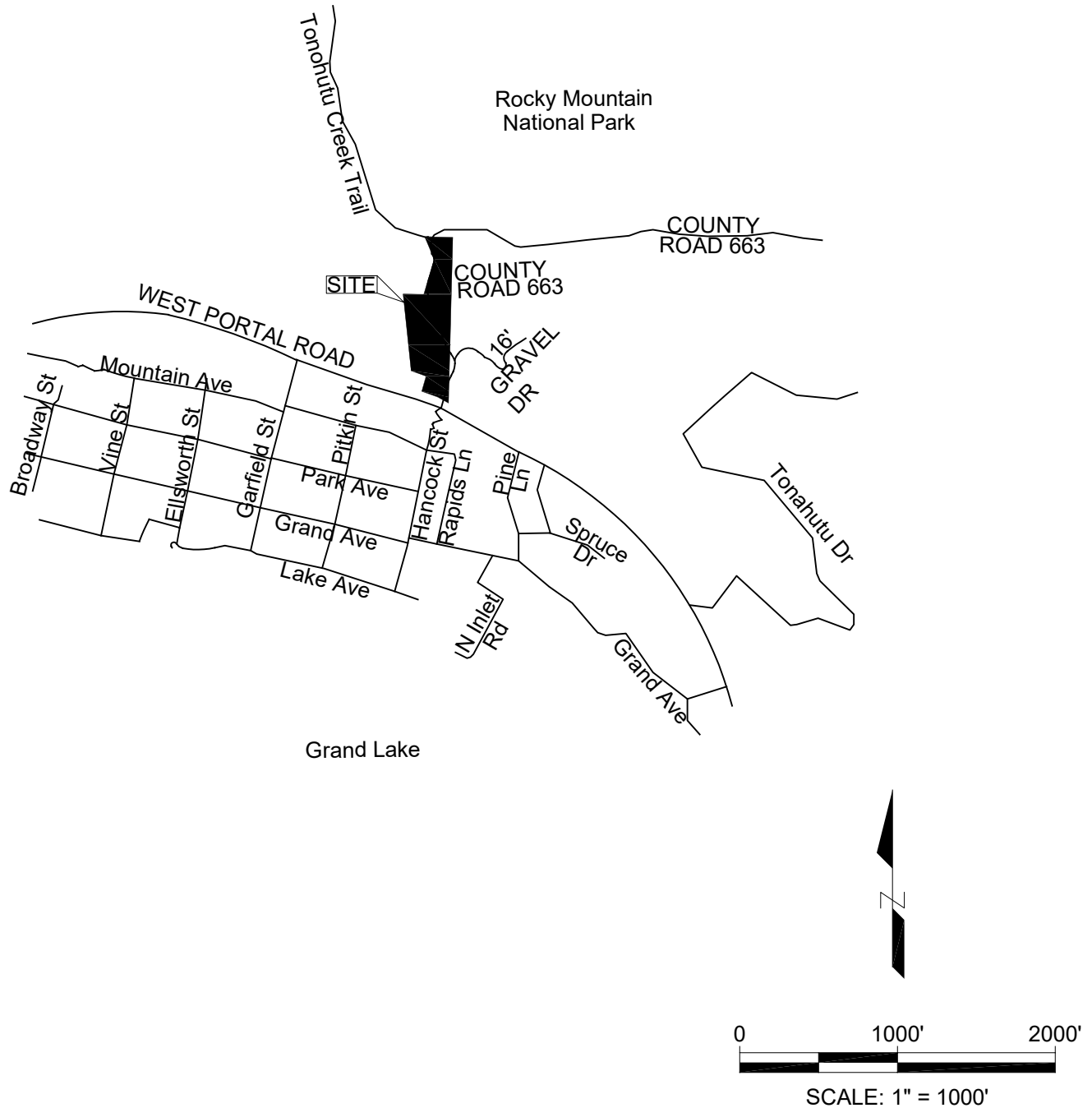
Developed flows are greater than historical flows. This may require additional design of the storm water system required to protect downstream properties and water quality for N Inlet Creek and Grand Lake

Enc.

APPENDIX A

Vicinity Map  
Soils Map  
FEMA Map

# VICINITY MAP



Project Number: 26003

J:\Projects\26\26003\3rd Party\Vicinity Map.dwg

## 2N Civil, LLC

6 Inverness Ct. E., Suite 125  
Englewood, CO 80112

Phone 303-925-0544 Fax 303-925-0547  
www.2NCivil.com

## VICINITY MAP RUGER SUBDIVISION

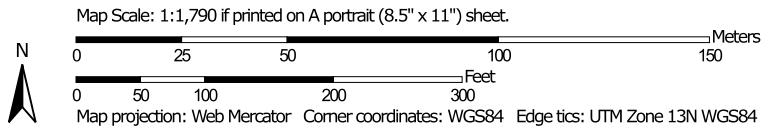
Drawn By: DR  
Checked By: RCE  
Revisions:



Hydrologic Soil Group—Grand County Area, Colorado  
(ruger subdivision)




Soil Map may not be valid at this scale.



## 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: Grand County Area, Colorado  
 Survey Area Data: Version 19, Aug 29, 2025

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

Date(s) aerial images were photographed: Aug 29, 2023—Sep 8, 2023

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
75	Scout cobbly sandy loam, 6 to 15 percent slopes	A	1.6	23.7%
76	Scout cobbly sandy loam, 15 to 65 percent slopes	A	5.0	76.3%
<b>Totals for Area of Interest</b>			<b>6.6</b>	<b>100.0%</b>

### 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*



**NOTES TO USERS**

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

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

**Coastal Base Flood Elevations** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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

NGS Information Services  
NOAA, NNGS12  
National Geodetic Survey  
SSMC-3, #9202  
1315 East-West Highway  
Silver Spring, MD 20910-3282

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

**Base map** information shown on this FIRM was provided in digital format by the United States Department of Agriculture/ Service Center Agencies; produced from Digital Orthophoto Quadrangles at a scale of 1:12,000, dated 2005 or later as a part of the National Agricultural Imagery Program.

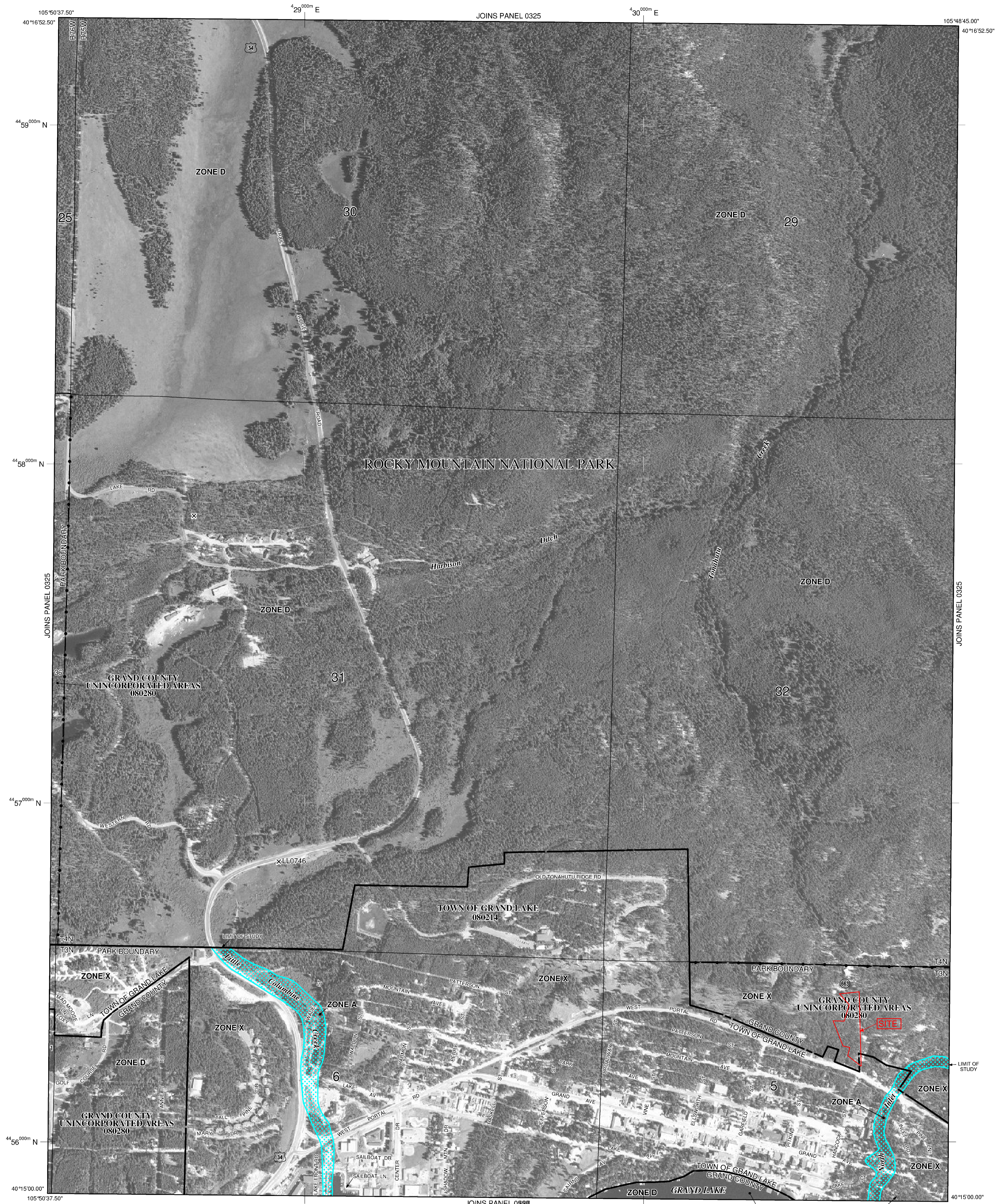
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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

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

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

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



**LEGEND**

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

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

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

**FLOODWAY AREAS IN ZONE AE**

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

**OTHER FLOOD AREAS**

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS** Areas determined to be outside the 0.2% annual chance floodplain. Areas in which flood hazards are undetermined, but possible.

**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**

**OTHERWISE PROTECTED AREAS (OPAs)**

- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

Base Flood Elevation line and value; elevation in feet\* (EL 987)  
Base Flood Elevation value where uniform within zone; elevation in feet\*

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

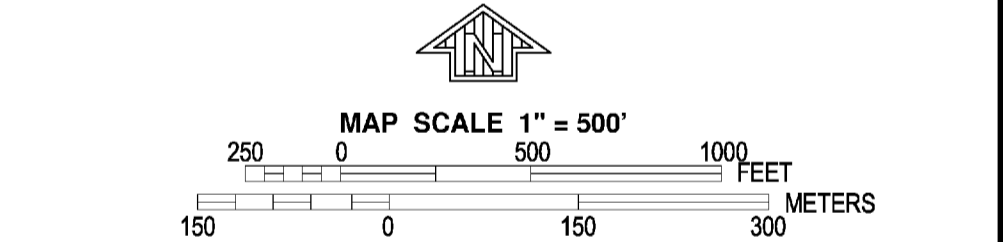
- (A)-(A) Cross section line
- (2)-(2) Transect line
- 97°07'30".3222307° Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 42°75'00"N 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 M 5000-foot grid ticks: New York State Plane coordinate system, east zone (FIPSZONE 3101), Transverse Mercator
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES  
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP  
January 2, 2008  
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-438-6620.



**PANEL 0314C**

**FIRM  
FLOOD INSURANCE RATE MAP  
GRAND COUNTY,  
COLORADO  
AND INCORPORATED AREAS**

**PANEL 314 OF 1200**  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GRAND COUNTY	080280	0314	C
GRAND LAKE, TOWN OF	080214	0314	C

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  
08049C0314C**

**EFFECTIVE DATE  
JANUARY 2, 2008**

Federal Emergency Management Agency

Calculation of Peak Runoff using Rational Method

Designer: DR  
 Company: 2N CIVIL  
 Date: 4/10/2026  
 Project: RUGER SUBDIVISION  
 Location: GRAND COUNTY, CO

MHFD-Rational, Version 3.00 (August 2025)

Cells of this color are for required user-input  
 Cells of this color are for optional override values

$$t_1 = \frac{0.395(1.1 - C_2)\sqrt{L_1}}{S^{0.33}}$$

Computed  $t_c = t_1 + t_2$

$$t_1 = \frac{L_1}{60K\sqrt{S_1}} = \frac{L_1}{60V_1}$$

Regional  $t_c = (26 - 17i) + \frac{L_1}{60(141 + 9)\sqrt{S_1}}$

$t_c$  minimum = 5 (urban)  
 $t_c$  minimum = 10 (non-urban)

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

Calculation of Peak Runoff using Rational Method

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

WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	
1-hour rainfall depth, P1 (in) =	0.60	0.52	0.67	0.82	1.06	1.27	1.51	2.17

Rainfall Intensity Equation Coefficients =  $I(\text{in/hr}) = \frac{a + P_1}{(b + t_c)^c}$

a	b	c
28.50	10.00	0.786

$Q(\text{cfs}) = CIA$

Provide input for area, soil type, and imperviousness on the Runoff Coeffs worksheet.

Subcatchment Name	Area (ac)	NRCS Hydrologic Soil Group(s)	Imperviousness	Runoff Coefficient, C								Overland (Initial) Flow Time					Channelized (Travel) Flow Time					Time of Concentration				Rainfall Intensity, I (in/hr)								Peak Flow, Q (cfs)								
				WQE & 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	Overland Flow Length L <sub>1</sub> (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Overland Flow Slope S <sub>1</sub> (ft/ft)	Overland Flow Time t <sub>1</sub> (min)	Channelized Flow Length L <sub>1</sub> (ft)	U/S Elevation (ft) (Optional)	D/S Elevation (ft) (Optional)	Channelized Flow Slope S <sub>1</sub> (ft/ft)	NRCS Conveyance Factor K	Channelized Flow Velocity V <sub>1</sub> (ft/sec)	Channelized Flow Time t <sub>1</sub> (min)	Computed t <sub>c</sub> (min)	Regional t <sub>c</sub> (min)	Selected t <sub>c</sub> (min)	(Optional) Override t <sub>c</sub> (min)	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	WQE	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
EX-1	5.54	A	5.3%	0.02	0.02	0.02	0.03	0.07	0.15	0.29	300.00	8566.53	8522.86	0.146	13.93	713.61	8522.86	8437.36	0.120	10	3.46	3.44	17.37	28.62	17.37		1.27	1.10	1.42	1.73	2.24	2.68	3.19	4.59	0.14	0.12	0.17	0.24	0.41	1.05	2.68	7.33
EX-2	10.70	A	11.3%	0.07	0.07	0.08	0.09	0.12	0.20	0.33	300.00	8654.00	8602.19	0.173	12.56	1715.81	8602.19	8438.30	0.096	10	3.09	9.25	21.81	32.82	21.81		1.13	0.98	1.26	1.53	1.99	2.39	2.84	4.08	0.83	0.72	0.97	1.25	1.83	3.10	6.01	14.26
PR-1	5.54	A	9.0%	0.05	0.05	0.06	0.07	0.10	0.18	0.31	300.00	8566.53	8522.86	0.146	13.52	713.61	8522.86	8437.36	0.120	10	3.46	3.44	16.96	27.83	16.96		1.28	1.11	1.43	1.75	2.27	2.72	3.23	4.64	0.36	0.24	0.43	0.55	0.83	1.53	3.22	8.01
PR-2	10.70	A	17.0%	0.12	0.12	0.13	0.14	0.17	0.24	0.36	300.00	8654.00	8602.19	0.173	11.95	1715.81	8602.19	8438.30	0.096	10	3.09	9.25	21.20	31.25	21.20		1.14	0.99	1.28	1.56	2.02	2.42	2.88	4.14	1.43	1.24	1.66	2.10	2.95	4.40	7.46	16.10

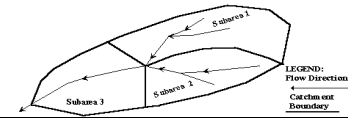
Increased runoff in minor and major storm event. How will this be addressed?

Determination of Runoff Coefficients for Rational Method

MHFD-Rational, Version 3.00 (August 2025)

Designer: DR  
 Company: 2N CIVIL  
 Date: 4/10/2026  
 Project: RUGER SUBDIVISION  
 Location: GRAND COUNTY, CO

Cells of this color are for required user-input  
 Cells of this color are for optional override values



Provide subcatchment names on the Rational Calcs worksheet to open up the table below.

Subcatchment Name	# of Subareas	Area (ac)	NRCS Hydrologic Soil Group	Percent Imperviousness				Runoff Coefficient, C										Comments						
				Imperviousness Source	Imperviousness Category	Calculated Imperviousness	(Optional) Override Imperviousness	WQE & 2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr	(Optional) Override Runoff Coefficient, C	WQE & 2-yr	5-yr		10-yr	25-yr	50-yr	100-yr	500-yr	
EX-1	2	5.54	A	Land Use	Open Space, Undisturbed Native Grasses	5%	5.3%	0.02	0.02	0.02	0.03	0.07	0.15	0.29	0.02	0.02	0.02	0.03	0.07	0.15	0.29			
				Surface Type	Roofs	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
EX-2	3	10.70	A	Land Use	Open Space, Undisturbed Native Grasses	5%	11.3%	0.02	0.02	0.02	0.03	0.07	0.15	0.29	0.07	0.07	0.08	0.09	0.12	0.20	0.33			
				Surface Type	Gravel - High Traffic Areas	80%		0.63	0.65	0.66	0.69	0.71	0.73	0.77										
				Surface Type	Roofs	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
				Surface Type	Concrete Driveways and Walks	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
PR-1	3	5.54	A	Land Use	Open Space, Undisturbed Native Grasses	5%	9.0%	0.02	0.02	0.02	0.03	0.07	0.15	0.29	0.05	0.05	0.06	0.07	0.10	0.18	0.31			
				Surface Type	Roofs	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
				Surface Type	Concrete Driveways and Walks	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
				Surface Type	Gravel - High Traffic Areas	80%		0.63	0.65	0.66	0.69	0.71	0.73	0.77										
PR-2	4	10.70	A	Land Use	Open Space, Undisturbed Native Grasses	5%	17.0%	0.02	0.02	0.02	0.03	0.07	0.15	0.29	0.12	0.12	0.13	0.14	0.17	0.24	0.36			
				Surface Type	Roofs	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
				Surface Type	Concrete Driveways and Walks	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										
				Surface Type	Gravel - High Traffic Areas	80%		0.63	0.65	0.66	0.69	0.71	0.73	0.77										
				Surface Type	Concrete Driveways and Walks	95%		0.79	0.81	0.82	0.83	0.84	0.85	0.87										

# Culvert Report

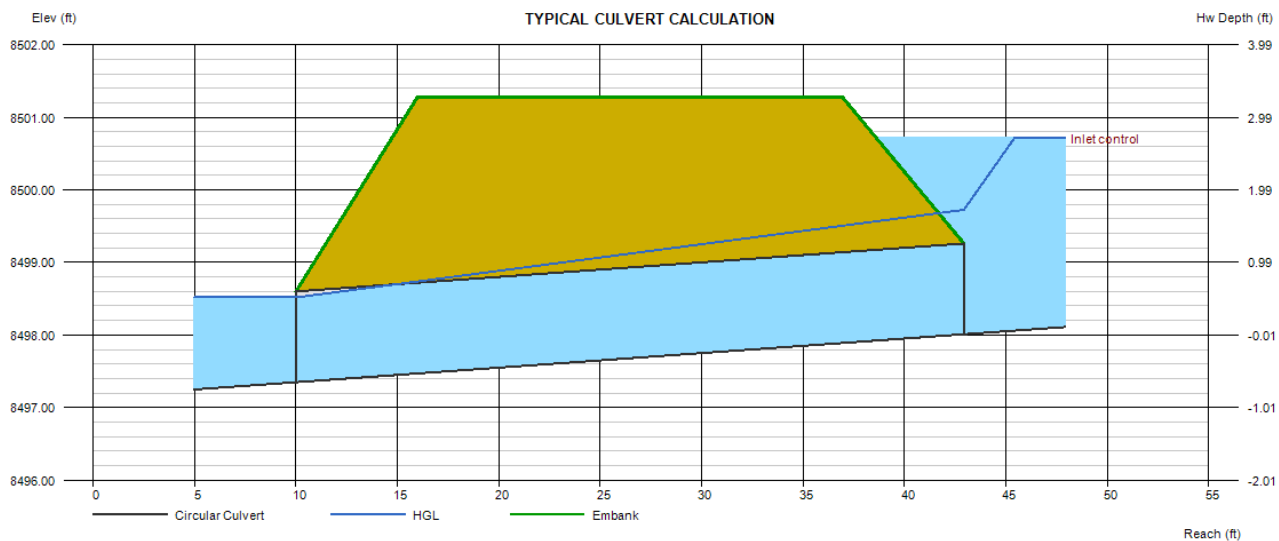
## TYPICAL CULVERT CALCULATION

Invert Elev Dn (ft)	= 8497.35
Pipe Length (ft)	= 32.93
Slope (%)	= 2.00
Invert Elev Up (ft)	= 8498.01
Rise (in)	= 15.0
Shape	= Circular
Span (in)	= 15.0
No. Barrels	= 1
n-Value	= 0.022
Culvert Type	= Circular Corrugate Metal Pipe
Culvert Entrance	= Projecting
Coeff. K,M,c,Y,k	= 0.034, 1.5, 0.0553, 0.54, 0.9

<b>Embankment</b>	
Top Elevation (ft)	= 8501.28
Top Width (ft)	= 20.93
Crest Width (ft)	= 10.00

<b>Calculations</b>	
Qmin (cfs)	= 7.46
Qmax (cfs)	= 7.46
Tailwater Elev (ft)	= (dc+D)/2

<b>Highlighted</b>	
Qtotal (cfs)	= 7.46
Qpipe (cfs)	= 7.46
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.25
Veloc Up (ft/s)	= 6.08
HGL Dn (ft)	= 8498.52
HGL Up (ft)	= 8499.73
Hw Elev (ft)	= 8500.72
Hw/D (ft)	= 2.16
Flow Regime	= Inlet Control



# RUGER SUBDIVISION

## EXISTING DRAINAGE MAP



Provide the TOC flow path used for Rational Method calcs

**DRAINAGE LEGEND**

BASIN NAME  
 10 YR RUNOFF COEFFICIENT  
 100 YR RUNOFF COEFFICIENT  
 BASIN AREA

BASIN DESIGN POINT

EXISTING BASIN LIMIT

FLOW DIRECTION

Design Point	Area (ac)	Contributing		Q <sub>100</sub> (cfs)
		Basins	Q <sub>10</sub> (cfs)	
1	5.54	EX-1	0.24	2.68
2	10.70	EX-2	1.25	6.01

**NOT FOR CONSTRUCTION**

PREPARED FOR:  
CLIENT  
ADDRESS LINE 1  
ADDRESS LINE 2

**EXISTING DRAINAGE MAP**  
TYPE OF SUBMITTAL  
RUGER SUBDIVISION  
LOCATION

BY: DATE:

REVISIONS:  
1.

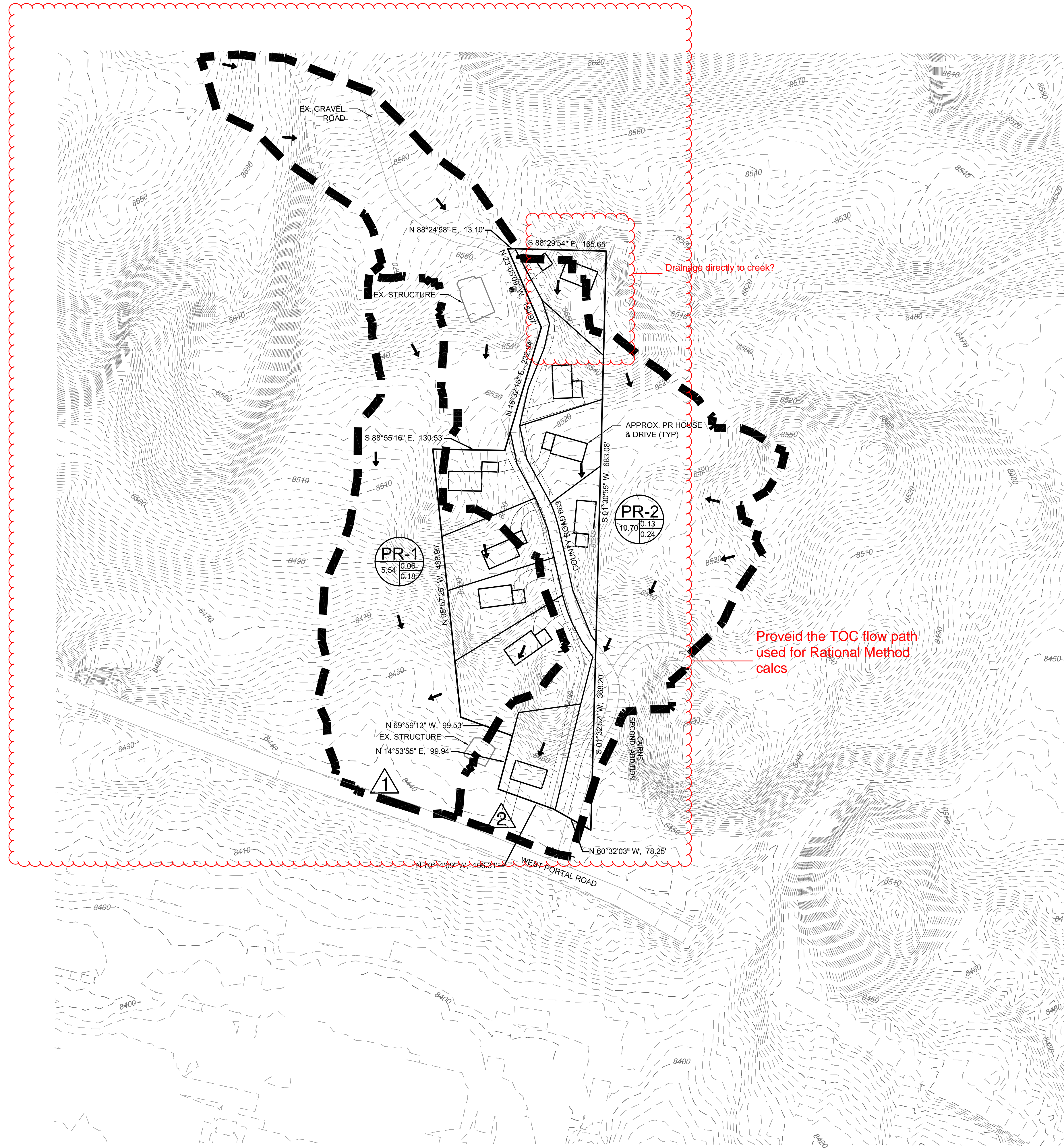
PROJECT NUMBER: 26003  
ISSUED DATE: 04-13-26  
DESIGNED BY: DR  
REVIEWED BY: RCE

**EXISTING DRAINAGE MAP**

J:\Project\26003\Drawings\EX-BASIN MAP.dwg 4/13/2026

# RUGER SUBDIVISION

## PROPOSED DRAINAGE MAP



**DRAINAGE LEGEND**

BASIN NAME  
 PR-1  
 0.0 ac  
 .00 RUNOFF COEFFICIENT

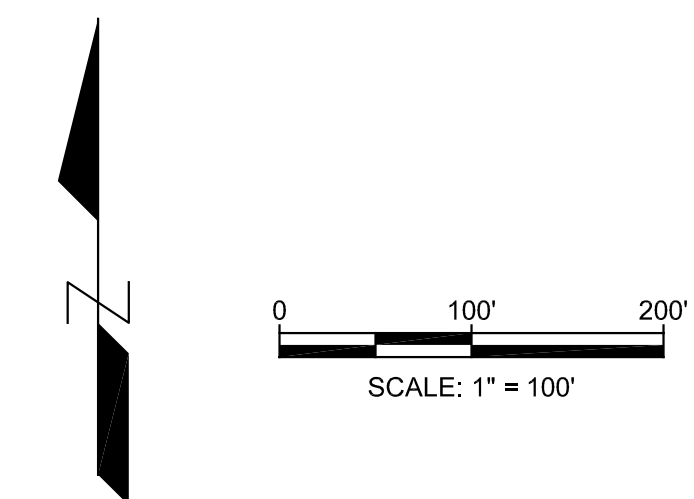
BASIN AREA  
 1  
 .00 RUNOFF COEFFICIENT

BASIN DESIGN POINT  
 1

PROPOSED BASIN LIMIT

FLOW DIRECTION

Design Point	Area (ac)	Contributing	
		Basins	Q <sub>100</sub> (cfs)
1	5.54	PR-1	0.55
2	10.70	PR-2	2.10
			3.22
			7.46



**NOT FOR CONSTRUCTION**

PREPARED FOR:  
CLIENT  
ADDRESS LINE 1  
ADDRESS LINE 2

**PROPOSED DRAINAGE MAP**  
TYPE OF SUBMITTAL  
RUGER SUBDIVISION  
LOCATION

BY: DATE:

REVISIONS:  
1.

PROJECT NUMBER: 26003  
ISSUED DATE: 04-13-26  
DESIGNED BY: DR  
REVIEWED BY: RCE

**PROPOSED DRAINAGE MAP**



# RUGER SUBDIVISION

## SLOPE ANALYSIS

PART OF GOVT LOT 3 SECTION 5, TOWNSHIP 3 NORTH, RANGE 75 WEST OF THE 6TH P.M.



**NOT FOR  
CONSTRUCTION**

PREPARED FOR:  
MICHAEL RUGER  
5160 REDWOOD DRIVE  
LITTLETON, CO

**SLOPE ANALYSIS**  
RUGER SUBDIVISION  
GRAND LAKE, CO

BY: DATE:

REVISIONS:

1. 26003  
2. 04-13-2026  
3. CVP  
4. RCE

PROJECT NUMBER:  
ISSUED DATE:  
DESIGNED BY:  
REVIEWED BY:

**SLOPE  
ANALYSIS**



Add lot numbers to exhibit.

Lots 1, 2, 4, 5, 6, and 8 will need geotechnical analysis prior to building permit issuance for residential structures.

**LEGEND**

NO HATCH

- SLOPES 0%-20%
- SLOPES 21%-30%
- SLOPES 31%-40%
- SLOPES 40%+

SLOPES 0%-20%  
SLOPES 21%-30%  
SLOPES 31%-40%  
SLOPES 40%+

