MEMORANDUM

DATE: March 25, 2021

TO: Danika Carlson
US Department of Agriculture, Forest Service
Klamath National Forest, Salmon/Scott River Ranger District
11263 North Hwy 3
Fort Jones, CA 96032

FROM: Jim Falls
Engineering Geologist
California Geological Survey

SUBJECT: ENGINEERING GEOLOGIC REVIEW OF PROPOSED RIVER COMPLEX 4,710 ACRE RISK REDUCTION PROJECT, SISKIYOU COUNTY, CALIFORNIA

Introduction:

The California Geological Survey (CGS) provides this engineering geologic review of the proposed River Complex Risk Reduction Project in response to a request for comment on the project by Luis Palacios, District Ranger, Klamath National Forest, Salmon/Scott River Ranger District, in a letter dated March 2, 2022. We conducted an office review of the plan with related documentation and evaluated aerial imagery dating back to 1993.

Based on our review, we understand that this is primarily a project designed to reduce the amount of future dead and down fuel loading within areas that burned at high severity; improve conditions along access routes, strategic ridgetop features, and adjacent private property for future fire management; to accelerate the re-establishment of conifers within large patches of high severity fire; and to promote scientific research to increase knowledge regarding fire effects and post-fire management and recovery activities. This proposal treats about 4,710 acres within the 15,900-acre total project boundary. This proposal includes treatment in the Haypress and Summer Fire areas of the River Complex but does not include the Cronan Fire area.

Project objectives are defined and described in several documents which include: The Forest Plan, Aquatic Conservation Strategy goals, Visual Quality Objectives, and various other cited documents that cover forestry operations and erosion control treatments.

Figures 1a and b (Site Location and Regional Geologic Map) show the general location of the proposed project areas. The Project is split into two operational areas: the Boulder/Bolivar Portion to the northeast near the town of Callahan, and the Taylor Creek Portion to the southwest near the town of Cecilville. Ground-based equipment is proposed to harvest fire-injured or fire-killed trees that are 14-inches in diameter or greater. Treatments for stand improvement are aimed at increased diameter and future fire resiliency. Access for the proposed management activities will be provided by the existing National Forest Transportation System. Temporary roads are primarily existing and short sections may undergo some modification based on site needs during implementation of the project. No temporary roads are proposed for riparian reserves.

References:

Irwin, W.P., 1994, Geologic Map of the Klamath Mountains, California and Oregon, U.S. Geological Survey, Miscellaneous Investigations Series Map I-2148, 1 sheet, scale 1:500,000.

NRCS, 2021, online Web Soil Survey accessed June 2021: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Parsons, A., Robichaud, P.R., Lewis, S.A., Napper, C., and Clark, J.T.; 2010, Field Guide for Mapping Post-Fire Soil Burn Severity, General Technical Report RMRS-GTR-243, Fort Collins: US Department of Agriculture, Forest service, Rocky Mountain Research Station, 49pp.

Wagner, D.L., and Saucedo, G. J., 1987, Geologic map of the Weed Quadrangle: California Department of Conservation, Division of Mines and Geology, Regional Geologic Map Series, Map No. 4A (geology), 4 sheets, scale 1:250,000.

Imagery Reviewed

Google Earth imagery, 1993, 1998, 2004, 2006, 2009, 2010, 2012, 2014 and 2019, accessed March 2022 through Google Earth Pro.

Geologic Conditions:

Regional geologic mapping by Wagner and Saucedo (1987) shows the Taylor Creek portion of the project largely underlain by diorite and granite of the Deadman Peak Pluton (Mzd and Mzg), and phyllitic quartzite of the Stuart Fork Formation (MzPzs) (Figure 1a, Regional Geologic Map, Southwest). Small areas of Salmon Hornblende Schist (Pzs) underlie the southwest part of the drainage. The.

Diorite plutonic rocks of the Craggy Peak pluton (Mzd) dominate the east half of the Boulder/Bolivar portion of the Project (Figure 1a, Regional Geologic Map, Northeast) and partially serpentinized Trinity Peridotite (Op) under most of the west half. Relatively small areas west beyond the South Fork of the Scott River are underlain by Abrams Mica Schist (Pza) and the Salmon Hornblende Schist (Pzs). Quaternary glacial deposits are mapped along the South Fork of the Scott River and southwest of Craggy Peak. The plutonic rocks in both portions of the project are considered to have been emplaced after accretion and amalgamation of the Klamath terranes (Irwin, 1994)

NRCS mapping (NRCS, 2022) shows a variety of soil types that closely match the parent material in the two portions of the Project. The Gerle, Gilligan-Chawanakee, Gilligan-Holland, and Teewinot-Endlich families have developed on residuum weathered from diorite. They make up approximately 40% of the Boulder/Bolivar portion and are generally a gravelly fine sandy loam (GM-GC), sandy loam (SM), and extremely gravelly loam (GM), respectively. Nanny family soils have developed on the abundant glacial till in the western half of this part of the plan. They are seen as very gravelly sandy loam (GM/SM).

Tangle and Deadfall soil families underlie the western third of the Boulder/Bolivar and have developed on material weathered from the underlying serpentinite/peridotite. They are seen as very gravelly sandy loam (GM/SM). There is a potential for naturally

occurring asbestos to be present in soils in this part of the Boulder/Bolivar portion because of the presence of serpentinized peridotite in the ultramafic bedrock present there.

Gerle, Gilligan-Chawanakee, Gilligan-Holland, and Rogue-Jayar families have developed on residuum weathered from diorite and granite in the east half of the Taylor Creek portion of the project. They make up nearly 40% of the Taylor Creek watershed and are generally sandy loam to loamy sand (ML-SM) to sandy loam (SM), respectively. Nanny family soils have developed on the glacial till deposited in this part of the plan. They is seen as very gravelly sandy loam (GM/SM).

Clallam-Holland and Deadwood-Clallam families are found in the west half of the Taylor Creek area and make up approximately 30% of the soils in the watershed. They are described as very gravelly loam (ML-GM) developed on residuum weathered from phyllitic quartzite. The remaining soil types in the watershed are generally gravelly to sandy loams (GM-ML) depending on the parent material. The soil associations are consistent with the mapped bedrock in the region.

General Observations

The project area is within the burned area of the 2021 River Complex Fire. Figure 2a (Soil Burn Severity, River Complex) shows the Soil Burn Severity (SBS) map for the River Complex wildfire in the project area. The SBS map shows that the southwestern, Boulder/Bolivar portion of the project area burned at predominantly at moderate to high SBS with very low to low SBS along the northern and eastern perimeter of the management unit. It should be noted that postfire increases in erosion, peak flows and debris flow potential are most affected by moderate to high soil burn severity and will experience the largest postfire response for three to five years following the River Complex wildfire.

The River Complex wildfire has increased erosion, rockfall, debris flow, and flood hazards within and downstream of the burned area. The US Geological Survey (USGS) Post-Wildfire Debris Flow Model provides an estimate of the probability of debris flow initiation and the volume of generated debris for a given rainfall intensity (Staley et al., 2017; Gartner et al., 2014). Figure 2b (USGS Post-Wildfire Debris Flow Model) shows the USGS rainfall intensities for modeled basins in the River Complex Fire. The map provides the 15-minute duration rainfall intensity needed to place a modeled basin at a 50% probability of debris flow initiation. The USGS debris flow model output is not generally considered calibrated to Northern California conditions because the dataset used for the USGS debris flow model comes from southern California and Western US Interior states, however, the model can be used to show relative sensitivity of individual basins. It is apparent from the model the River Complex Fire contains several potentially sensitive basins in the Boulder/Bolivar management unit that drain to Taylor Creek and the Salmon River in the west-central portion of the Boulder/Bolivar management unit.

Post-fire geologic hazards will be present in the project area whether the landscape is managed post-fire or not. Project managers should consider operations and any road grading activities on and approaching road crossings within the proposed management area. Extra consideration should be given on basins that drain to public access roads, residences, critical resources, and critical infrastructure. Standard Best Management Practices are generally adequate to ensure existing post-wildfire hazards are not exacerbated by road grading activities.

General Recommendations:

- Consider the erosion potential and minimize grading activities within areas underlain by sandy soils derived from weathered granite, diorite, and glacial till as a means of minimizing possible erosion problems and subsequent adverse impacts to aquatic resources.
- Road watercourse crossings downslope of the project area that lead to residential developments and public access roads should be evaluated and upgraded as needed to pass expected flows.
- Consider mitigations for grading activities in areas with potential for generating airborne naturally occurring asbestos.

Summary:

The Project proposes operations to salvage timber from a recent wildfire, protect and enhance habitat, and reduce the potential for future wildfire using a combination of ground fuels treatment, stand improvement, and specific re-forestation protocols.

Based on our desk review, regional geologic mapping, and field observations made, the proposed operations appear to be reasonable, and the California Geological Survey supports the project objectives. Please feel free to contact us if you have questions or need additional information.

Original signed by:

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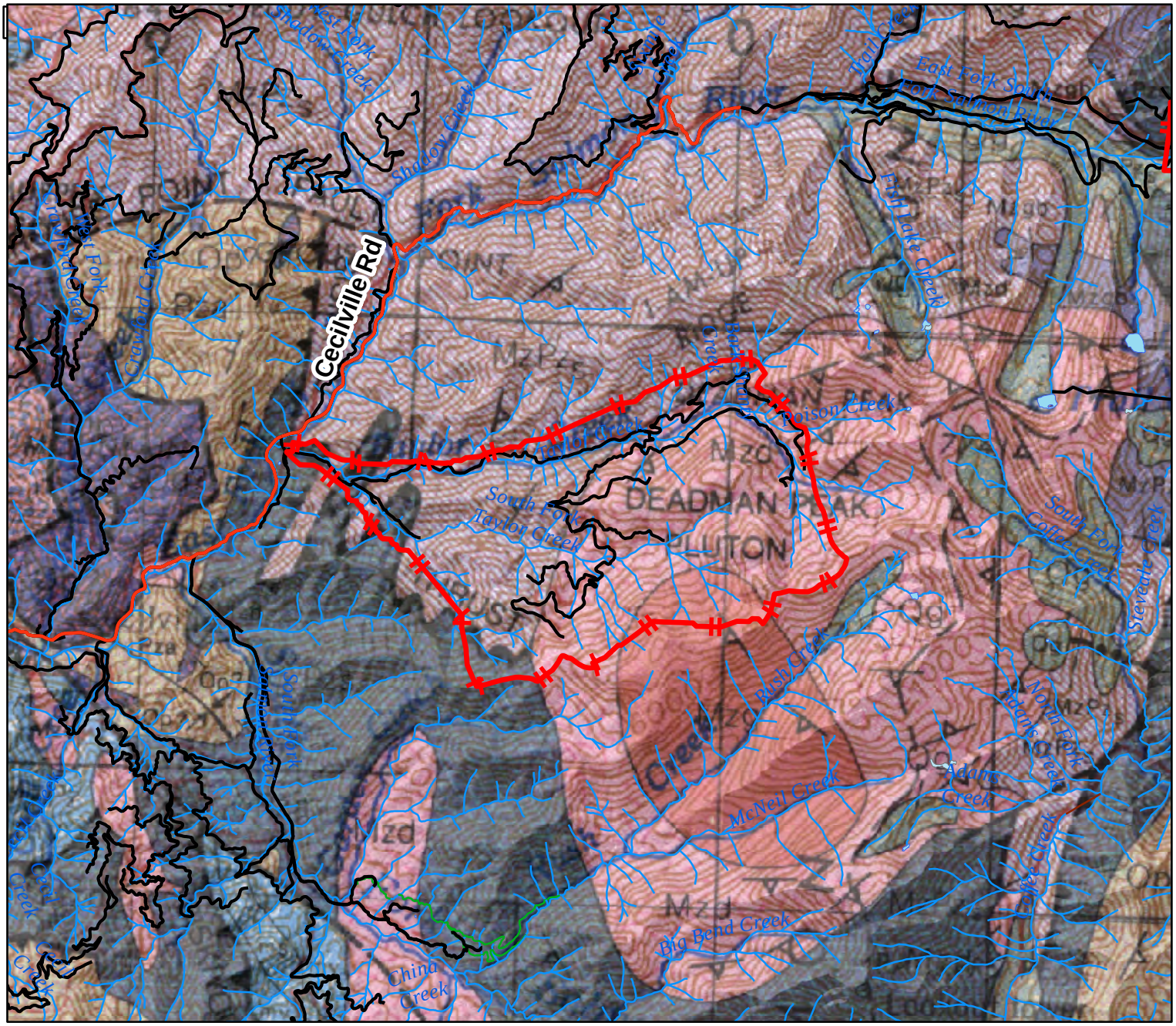
Attachments:
Figure 1a: Regional Geologic Map, Southwest
Figure 1b: Regional Geologic Map, Northeast
Figure 1c: Map Symbol Explanation
Figure 2a: Soil Burn Severity, River Complex
Figure 2b: USGS Post-Wildfire Debris Flow Model



River Complex Risk Reduction Project

contact, approx. located

contact, certain

Scarp

anticline, approx. located

anticline, certain

syncline, approx. located

syncline, certain

fault, approx. located

fault, certain

grad. contact

photo lineament

s.s. fault, approx. located

s.s. fault, certain

thrust fault, approx. located

thrust fault, certain

Dipbed

Dipbed-approx

Dipfault

Dipfrac

Dipover

Dipvert

Dipvrtfrac

Horiz-bed

N

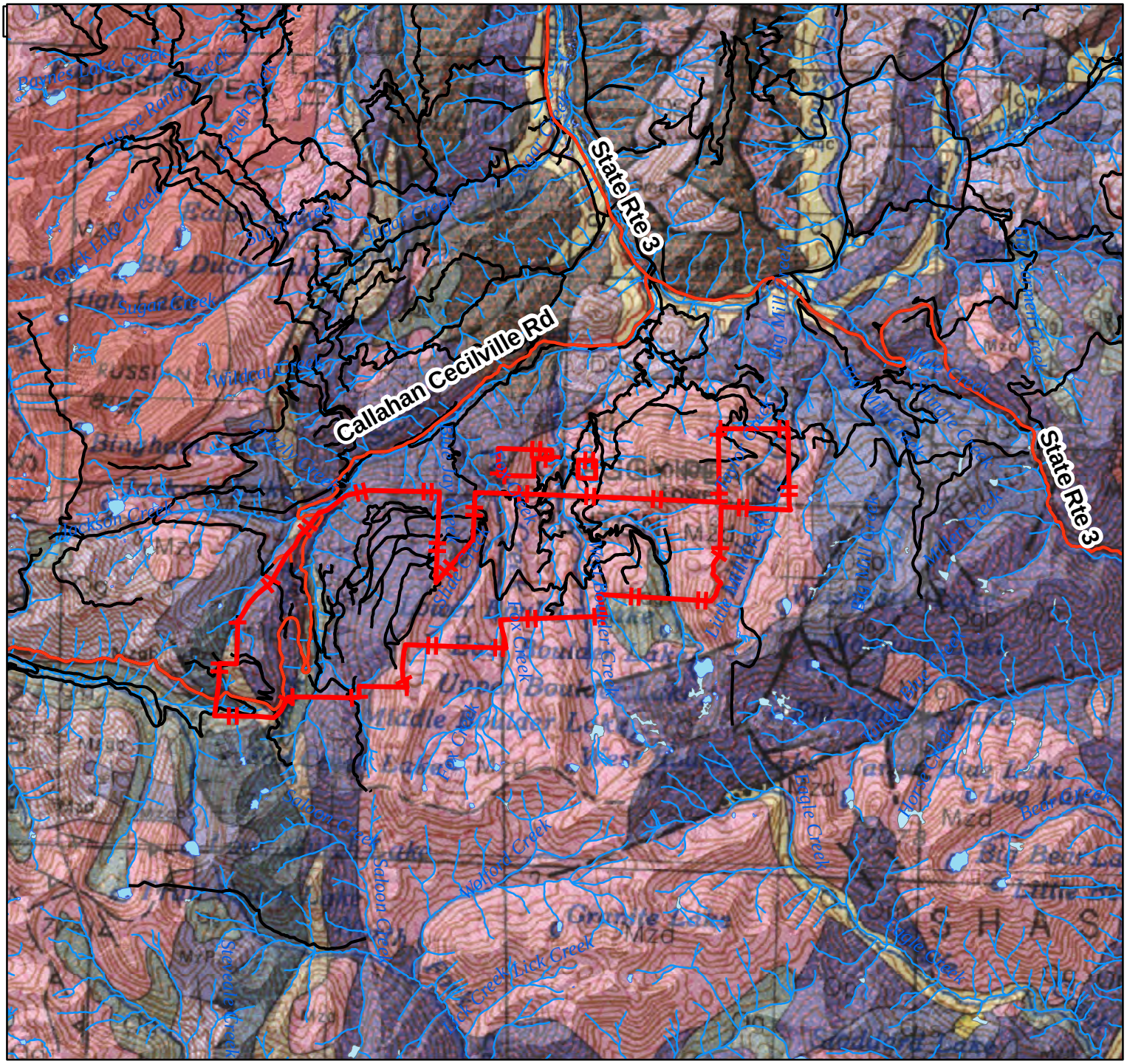
contour interval 100 feet

6,000 3,000 0 6,000 Feet

see Figure 1b for geologic units

modified from Wagner and Saucedo, 1987

Date: 3/22/2022	**Regional Geologic Map, Southwest** **To Accompany Engineering Geologic Evaluation** **River Complex Risk Reduction Project**	**Figure:** **1a**
Scale: 1:100,000		
Approved by: jao/jnf		



SOUTHWEST (FIgure 1a)

Mzg: Mesozoic granitic rocks
Mzd: Mesozoic dioritic rocks
MzPzs: Mesozoic - Paleozoic Stuart Fork Formation
Pzs: Paleozoic Salmon Hornblende Schist

NORTHEAST (FIgure 1b)

Qg: Quaternary glacial deposits
Mzd: Mesozoic dioriic rocks
Op: Ordovician Trinity peridodite
Pza: Paleozoic Abrams Mica Schist
Pzs: Paleozoic Salmon Hornblende Schist

N

contour interval 100 feet

6,000 3,000 0 6,000 Feet

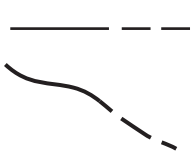
see Figure 1a for key

modified from Wagner and Saucedo, 1987

Date: 3/22/2022	**Regional Geologic Map, Northeast** **To Accompany Engineering Geologic Evaluation** **River Complex Risk Reduction Project**	**Figure:** **1b**
Scale: 1:125,000		
Approved by: jao/jnf		

Explanation

Geologic Units



Geologic contact, dashed where approximately located

Fault - dashed where appx., dotted where concealed

Quaternary

Qg – glacial deposits

Mesozoic

Mzg - granitic plutonic rocks

Mzd – dioritic plutonic rocks

Western Jurassic Belt

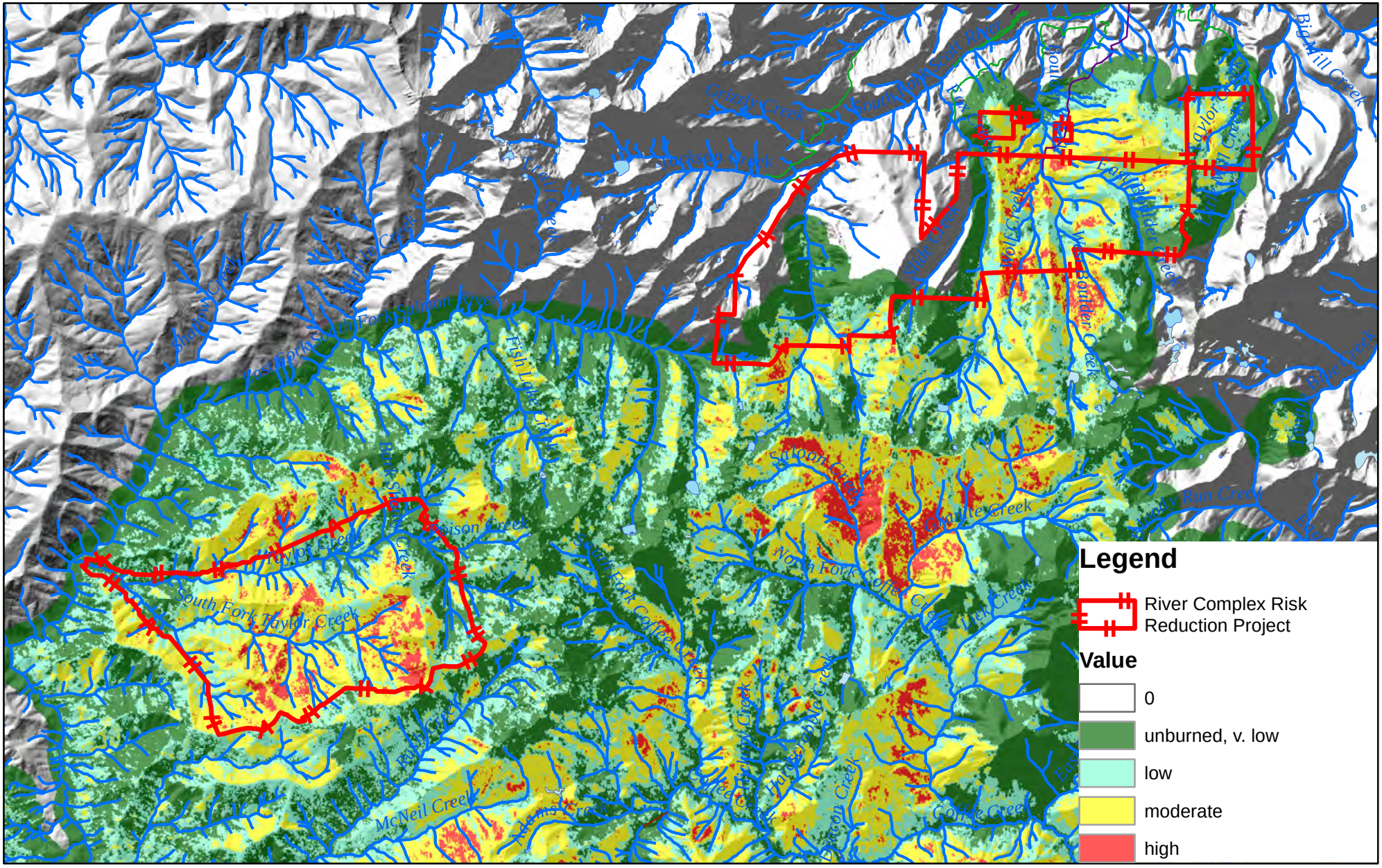
Jg – Galice Formation (marine slate, metagraywacke and greenstone)

Western Paleozoic and Triassic Belt

MzPzs – undifferentiated Mesozioc and Paleozoic rocks

Pzs – metasedimentary rocks

Date: 3-9-22 Scale: none Approved By: CGS	Map Symbol Explanation To Accompany Engineering Geologic Review of River Risk Reduction Project	Figure: 1c



modified from USGS, 2022: https://burnseverity.cr.usgs.gov/

N

7,500 3,750 0 7,500 Feet

Date:	3/10/2022
Scale:	1:125,000
Approved by:	jao/jnf

Soil Burn Severity, River Complex
To Accompany Engineering Geologic Evaluation
River Complex Risk Reduction Project

Figure:
2a

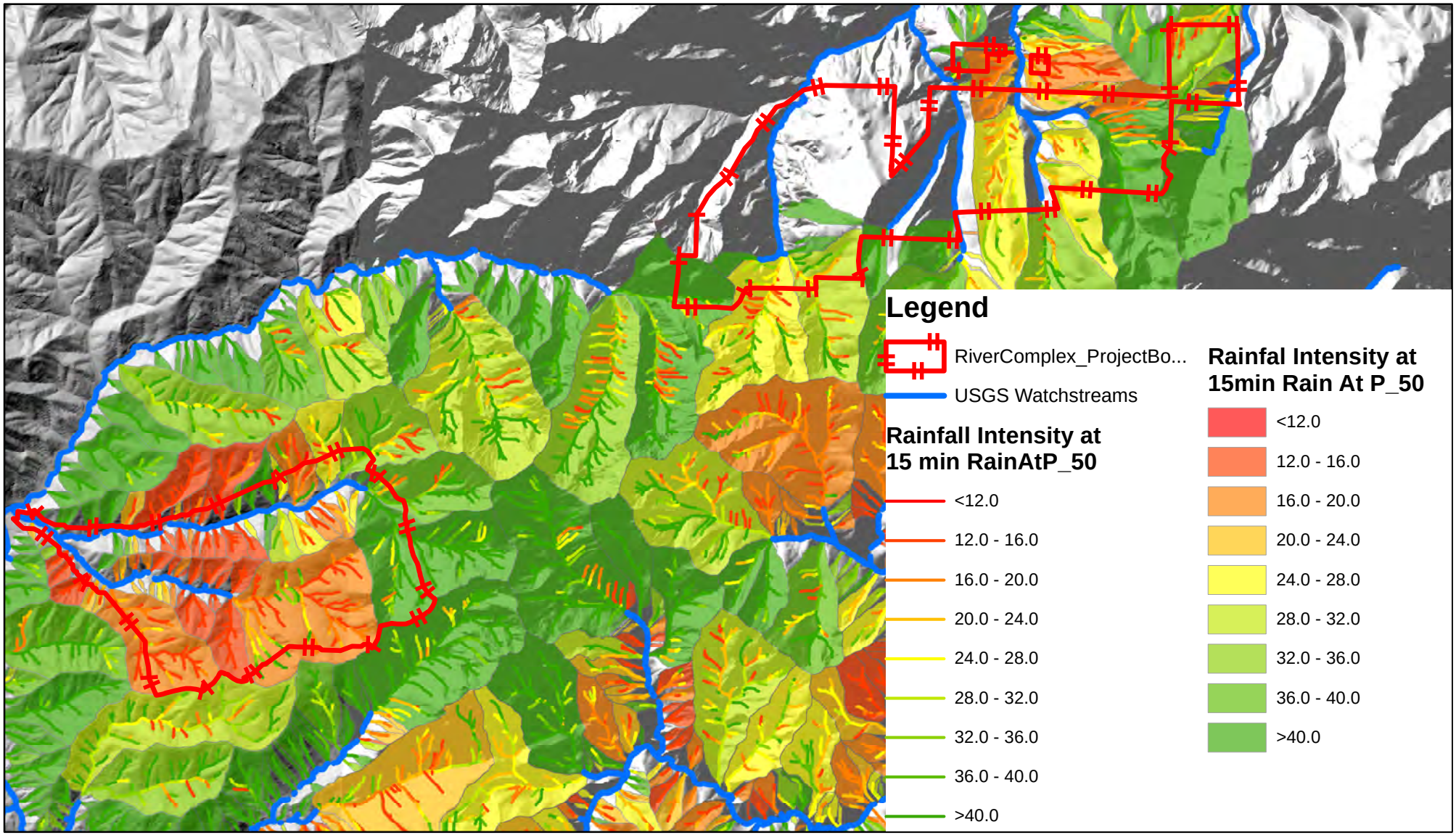


Figure shows rainfall intensity (mm/hr) at the 15-minute duration needed for 50% probability of debris flow iniitiation for indiividual basins and segments.

modified from USGS 2020, River Complex Fire

N

7,500 3,750 0 7,500 Feet

Date:	3/10/2022
Scale:	1:125,000
Approved by:	jao/jnf

USGS Post-Wildfire Debris Flow Model
To Accompany Engineering Geologic Evaluation
River Complex Risk Reduction Project

Figure:
2b