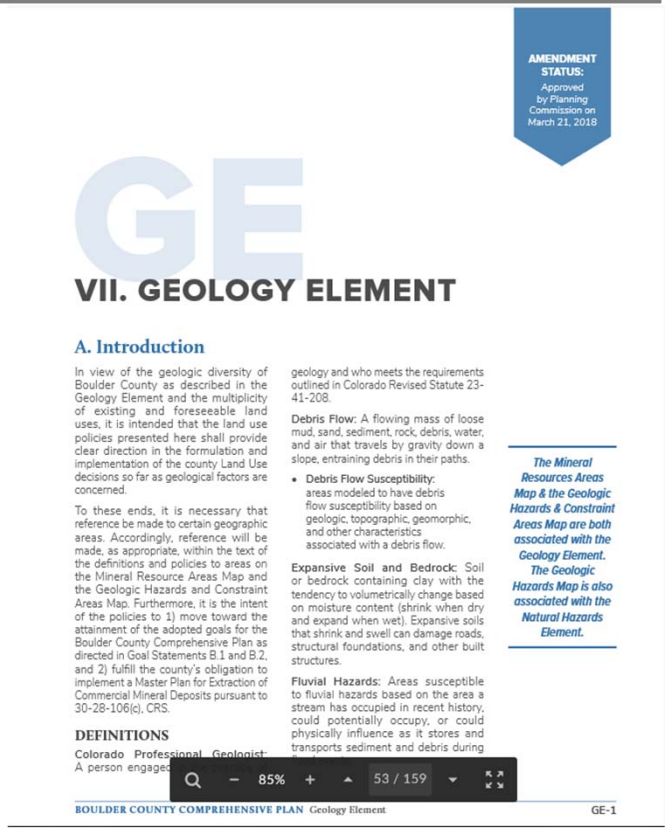
BCCP-20-0001:
Boulder County Comprehensive Plan
Geology Element Update

Planning Commission
February 19, 2020

Agenda

1. Staff presentation
2. Questions for staff
3. Public comment
4. Planning Commission discussion and decision



AMENDMENT STATUS: Approved by Planning Commission on March 21, 2018

GE

VII. GEOLOGY ELEMENT

A. Introduction

In view of the geologic diversity of Boulder County as described in the Geology Element and the multiplicity of existing and foreseeable land uses, it is intended that the land use policies presented here shall provide clear direction in the formulation and implementation of the county Land Use decisions so far as geological factors are concerned.

To these ends, it is necessary that reference be made to certain geographic areas. Accordingly, reference will be made, as appropriate, within the text of the definitions and policies to areas on the Mineral Resource Areas Map and the Geologic Hazards and Constraint Areas Map. Furthermore, it is the intent of the policies to 1) move toward the attainment of the adopted goals for the Boulder County Comprehensive Plan as directed in Goal Statements B.1 and B.2, and 2) fulfill the county's obligation to implement a Master Plan for Extraction of Commercial Mineral Deposits pursuant to 30-28-106(c), CRS.

DEFINITIONS

Colorado Professional Geologist: A person engaged

geology and who meets the requirements outlined in Colorado Revised Statute 23-41-208.

Debris Flow: A flowing mass of loose mud, sand, sediment, rock, debris, water, and air that travels by gravity down a slope, entraining debris in their paths.

- **Debris Flow Susceptibility:** areas modeled to have debris flow susceptibility based on geologic, topographic, geomorphic, and other characteristics associated with a debris flow.

Expansive Soil and Bedrock: Soil or bedrock containing clay with the tendency to volumetrically change based on moisture content (shrink when dry and expand when wet). Expansive soils that shrink and swell can damage roads, structural foundations, and other built structures.

Fluvial Hazards: Areas susceptible to fluvial hazards based on the area a stream has occupied in recent history, could potentially occupy, or could physically influence as it stores and transports sediment and debris during

The Mineral Resources Areas Map & the Geologic Hazards & Constraint Areas Map are both associated with the Geology Element. The Geologic Hazards Map is also associated with the Natural Hazards Element.

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Staff Presentation Overview

- Background
- March 21, 2018 Planning Commission Meeting Recap
- Overview of Proposed Changes
- Referral Feedback
- Recommendation

Background

- Existing element and hazard mapping last updated in 1984 and 1978 respectively and necessitated revisions based on the most up to date science
- 2013 post flood grant funding utilized to develop updated geologic hazard and constraint mapping
- Revised mapping will assist with identifying and addressing critical geologic hazards in the county

Background

- Updated mapping developed in 2017 by Cesare, Inc. and TerraCognito GIS Services, Inc.
- Initial geologic study report and mapping presented to Planning Commission in 2018
- Mapping refined based on feedback from Planning Commission, peer review, and the Colorado Geologic Survey
- Policy language updated in Geology Element to reflect mapping changes

March 21, 2018 Planning Commission Meeting Recap

Staff presented the hazard and constraint mapping overview completed by geotechnical consultants in 2017, including:

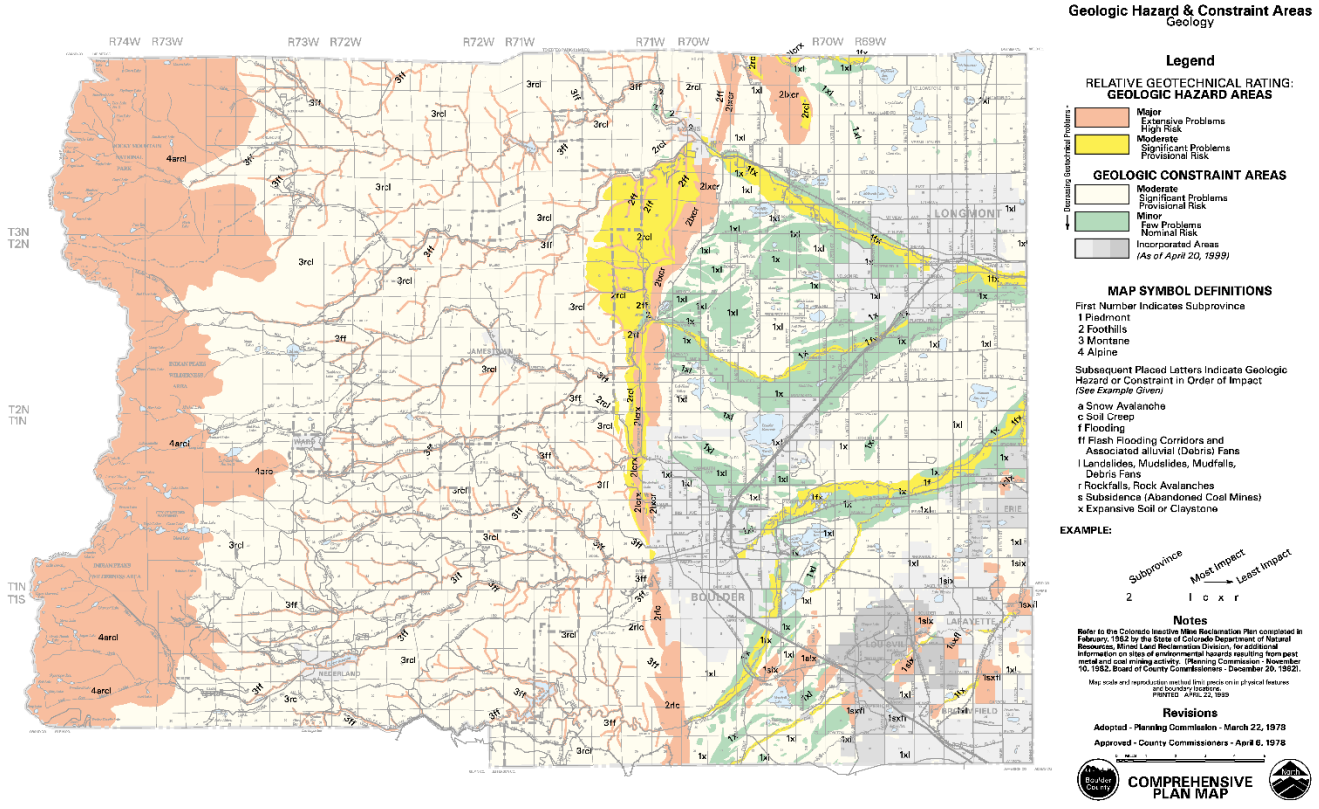
- Updated maps with incorporated existing geologic hazard data
- New GIS datasets developed to include wider range of geologic characteristics
- Map package updated by Cesare, Inc. to reflect these changes
- Composite map created (Plate 9 Boulder County Geologic Hazards Map)

March 21, 2018 Planning Commission Meeting Recap

Next steps presented during the meeting that are now complete:

- Quality control and peer review
- Incorporate updated landslide inventory, landslide susceptibility, debris flow and rockfall susceptibility
- Integrate mapping as part of BCCP

Existing BCCP Geologic Hazard Map - 1978



Geologic Hazard & Constraint Areas
Geology

Legend

RELATIVE GEOTECHNICAL RATING:
GEOLOGIC HAZARD AREAS

Major
Extensive Problems
High Risk

Moderate
Significant Problems
Provisional Risk

← Decreasing Geotechnical Problems →

GEOLOGIC CONSTRAINT AREAS

Moderate
Significant Problems
Provisional Risk

Minor
Few Problems
Nominal Risk

Incorporated Areas
(As of April 20, 1999)

MAP SYMBOL DEFINITIONS

First Number Indicates Subprovince
1 Piedmont
2 Foothills
3 Montane
4 Alpine

Subsequent Placed Letters Indicate Geologic Hazard or Constraint in Order of Impact
(See Example Given)

a Snow Avalanche
c Soil Creep
f Flooding
ff Flash Flooding Corridors and Associated alluvial (Debris) Fans
l Landslides, Mudslides, Mudfalls, Debris Fans
r Rockfalls, Rock Avalanches
s Subsidence (Abandoned Coal Mines)
x Expansive Soil or Claystone

EXAMPLE:

Subprovince — Most Impact → Least Impact
2 l c x r

Notes

Refer to the Colorado Inactive Mine Reclamation Plan completed in February, 1982 by the State of Colorado Department of Natural Resources, Mined Land Reclamation Division, for additional information on sites of environmental hazards resulting from past metal and coal mining activity. (Planning Commission - November 10, 1982. Board of County Commissioners - December 20, 1982).

Map scale and reproduction method limit precision in physical features and boundary locations.
PRINTED: APRIL 22, 1999

Revisions

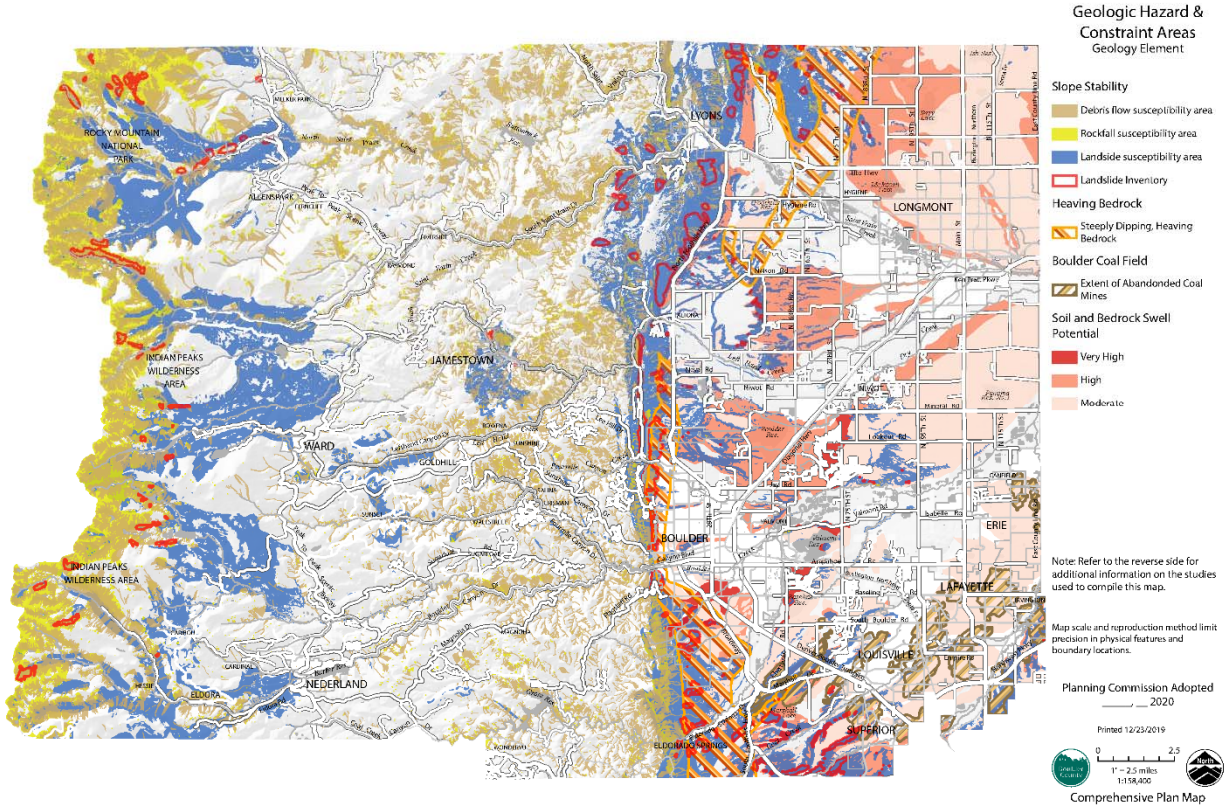
Adopted - Planning Commission - March 22, 1978

Approved - County Commissioners - April 6, 1978

Boulder County COMPREHENSIVE PLAN MAP North

Geologic Hazard & Constraint Areas

Updated Geologic Hazard Map



Overview of Proposed Changes

1. **Definitions**
2. **Geologic Hazard and Constraints – Guidelines Table and Map**
3. **Policy Changes**
   - **GE 1.01:** Development in Geologic Hazard and Constraint Areas
     - Removal of out of date language reference to Major Hazard Areas
   - **GE 1.02:** Transfer of Development Rights and Development Credits for Properties with Limited Development Potential
     - Removal of out of date language reference to Major Hazard Areas

Overview of Proposed Changes

3. **Policy Changes**
   - **GE 1.03:** Intensive Uses in Geologic Constraint Areas
     - Removed to be consistent with updated mapping
   - **GE 1.05:** Evaluation of Geologic Hazards and Constraints in Unincorporated Areas
   - **Sidebars** for clarification as necessary

Proposed Changes to Definitions

Colorado Professional Geologist:

- A person engaged in the practice of geology and who meets the requirements outlined in Colorado Revised Statute 23-41-208.

Proposed Changes to Definitions

Debris Flow:

- A flowing mass of loose mud, sand sediment, rock, debris, water, and air that travels by gravity down a slope, entraining debris in their paths.

Debris Flow Susceptibility:

- Areas modeled to have debris flow susceptibility based on geologic, topographic, geomorphic, and other characteristics associated with debris flow.

Proposed Changes to Definitions

Expansive Soil and Bedrock:

- Soil or bedrock containing clay with the tendency to volumetrically change based on moisture content (shrink when dry and expand when wet). Expansive soils that shrink and swell can damage roads, structural foundations, and other built structure.

Fluvial Hazards:

- Areas susceptible to fluvial hazards based on the area a stream has occupied in recent history, could potentially occupy, or could physically influence as it stores and transports sediment and debris during flood events.

Proposed Changes to Definitions

Geologic Constraint:

- A geologic condition which can cause intolerable damage to structures, but does not present a significant threat to health, life, or limb.

Proposed Changes to Definitions

Geologic Hazard:

- **A geologic condition or geologic process which presents a threat to health, life, limb or property.** Geologic Hazard Areas are shown on the Geologic Hazards Map as areas where geologic conditions have been either documented, approximated or determined susceptible through modeling. Depending on the geologic hazard(s) present, these areas are associated with nominal to extensive geotechnical issues with the potential to cause intolerable damage to structures and a variable level of risk related to construction or land use purposes.

Proposed Changes to Definitions

Intensive Uses (Relocated):

- Those land uses which include any structures used for supporting or sheltering any human use or occupancy; and/or facilities or improvements which tend to attract congregations of people.

Landslide:

- An outward or downward movement of a mass of soil and rock, containing a distinct rupture surface or zone of weakness which separates and distinguishes the slide materials from more stable underlying material.

Proposed Changes to Definitions

Landslide Inventory:

- Documented landslides, published landslides and landslides identified using high resolution LiDAR terrain surface.

Landslide Susceptibility:

- Areas modeled to have landslide susceptibility based on geologic, topographic, geomorphic, and other characteristics associated with slope instability.

Proposed Changes to Definitions

Rockfall:

- Rapid free-fall of large masses of rock or individual rocks of variable sizes and composition which bounce, slide, or roll downslope. Rockfalls can occur where a rockfall source (exposed bedrock cliffs, unconsolidated material containing boulders) overlies a steep slope.

Rockfall Susceptibility:

- Areas modeled to have rockfall susceptibility based on rock outcrops and source zones, topographic, and other characteristics associated with rockfall.

Proposed Changes to Definitions

Steeply Dipping Heaving Bedrock:

- A geologic hazard condition where the presence of steeply dipping bedrock layers with high swell potential can result in severe differential heaving of bedrock and damaging levels of movement of foundations, roads, subsurface utilities, concrete flatwork, and other built structures.

Subsidence:

- Collapse of the ground surface over subsurface voids or settlement over native, low density soils. Subsidence can occur suddenly or slowly over a long period of time.

Proposed Changes to Definitions

Undermined Area:

- An area underlain by coal mine workings, with the potential for subsidence of the ground surface due to collapse of underground mine voids. Holes, cracks, troughs, sags, and other subsidence features can develop suddenly or gradually over many years as subsurface material shifts and falls downward into the abandoned mine area.

Proposed Changes to Definitions

The following terms were removed from the Definitions section:

- Major Hazard Area
- Moderate Hazard Area
- Moderate Constraint Area
- Minor Constraint Area

Proposed Changes to Land Use Guidelines

Figure GE-1. Review & Approval Guidelines for Properties with Geologic Hazards and/or Constraints[1]

GEOLOGIC HAZARD OR CONSTRAINT	LAND USE GUIDELINES	RECOMMENDED SITE-SPECIFIC STUDY		
		Geotechnical	*Geologic Hazard*	*Subsidence*
Landslide	Developable subject to results of recommended site-specific study completed by a qualified professional. Development should be guided away from areas with landslide susceptibility. The impact of landslides on foundations, slope stability, grading plans, retaining walls, septic drain fields, and other proposed structures should be carefully studied by a qualified professional.	✓	✓	
Debris Flow	Developable subject to results of recommended site-specific study completed by a qualified professional. Development should be guided away from areas with debris flow susceptibility. Where avoidance is not possible, mitigation options must be presented which adequately manage and reduce the hazard and which do not adversely impact or increase the hazard on neighboring properties.	✓	✓	
Rockfall	Developable subject to results of recommended site-specific study completed by a qualified professional. Development should be guided away from areas with rockfall susceptibility. In the cases where proposed development cannot avoid the hazard, rockfall mitigation options must be presented which will adequately reduce the hazard and which do not adversely impact or increase the rockfall hazard on neighboring properties.	✓	✓	

Proposed Changes to Land Use Guidelines

Figure GE-1. Review & Approval Guidelines for Properties with Geologic Hazards and/or Constraints[1]

GEOLOGIC HAZARD OR CONSTRAINT	LAND USE GUIDELINES	RECOMMENDED SITE-SPECIFIC STUDY		
		Geotechnical	*Geologic Hazard*	*Subsidence*
Expansive Soil and Bedrock	Developable subject to results of recommended site-specific study completed by a qualified professional. Design of foundations must be appropriate to address the swell potential of the subsurface materials.	✓		
Steeply Dipping Heaving Bedrock	Developable subject to results of recommended site-specific study completed by a qualified professional. It must be demonstrated that steeply dipping heaving bedrock hazard does not exist at the site, or if it does exist, present adequate mitigation methodologies.	✓	✓	
Undermined Area	Areas identified to be undermined by abandoned coal mines should be considered for non-structural land use, unless it can be demonstrated that the subsidence hazard does not exist for the proposed development. In the event a proposed structure is sited within or near an undermined area, the site should be considered developable subject to the results of the site-specific subsidence study.	✓	✓	✓

Proposed Changes to Policies

GE 1.01 Development in Geologic Hazard and Constraint Areas

The county strongly discourages development in Geologic Hazard areas and only allows development in these areas when adequate mitigation can be demonstrated. The county refers to the guidelines and recommendations for studies presented in Table 1 ("Review and Approval Guidelines for Properties with Geologic Hazards and/or Constraints") when reviewing proposals for development on properties possessing the geologic hazards and constraints listed and described in the table. A geologic hazard study should be required and performed by a Colorado Professional Geologist for sites with the conditions listed here, and development approval should be subject to the applicant completing the recommendations provided in the completed study:

- Documented landslide, debris flow or rockfall deposit or event.
- Landslide hazard susceptibility.
- Debris flow hazard susceptibility.
- Rockfall susceptibility.
- Steeply Dipping Heaving Bedrock mapped extents within property boundaries.
- Undermined Area mapped extents within or near property boundaries.

Proposed Changes to Policies

GE 1.02 Transfer of Development Rights and Development Credits for Properties with Limited Development Potential

The county will consider a property's geologic hazards, and the limitations those hazards place on a property's development potential, when assessing a property's eligibility as a transferable development rights (TDR) sending site, or for creating bonus development credits.

Proposed Changes to Policies

(Removed) ~~GE 1.03 Intensive Uses in Geologic Constraint Areas~~

~~Where in the public interest it may be desirable to permit intensive uses, the county shall direct such uses toward Geologic Constraint Areas rather than toward Geologic Hazard Areas.~~

Proposed Changes to Policies

GE 1.05 Evaluation of Geologic Hazards and Constraints in Unincorporated Areas

The county shall require the evaluation of all geologic hazards and constraints as appropriate to reflect conditions that may change following natural disasters. Such evaluations shall be conducted by a Colorado Professional Geologist with knowledge and experience with the geology and geologic hazard conditions of Boulder County. Such evaluations should incorporate analytical methods representing current, generally accepted, professional principles and practice.

Referral Feedback

External public and internal agency referral: January 29 – February 12

- Majority of respondents had ‘no conflicts’
- Minor comments received suggesting changes to sidebar comments for Regulating Open Mining and Aggregate Resource Areas
- Minor comments received providing suggestions for language clarifications
- Internal comments received regarding definition of fluvial hazards
- Additional review may be needed by external agencies during development review

Referral Feedback

No conflict/no comment:

- Mountain View Fire Protection District
- Larimer County
- CO Division of Water Resources
- Louisville Fire Department
- United Power, Inc.
- Fairways Metropolitan District
- Colorado Department of Transportation
- U.S. Department of Agriculture
- *Town of Erie*
- *Mile High Flood District*
- *Goose Haven Homeowner's Association*
- *Lazy 7 Estates Homeowner's Association*
- *Longmont Fire Department*
- *Eldorado Canyon State Park*
- *Gunbarrel Green Homeowner's Association*
- *Gaynor Lake Homeowner's Association*

Substantive comments:

- Longmont Fire Protection District
- Longmont Planning Division
- Xcel Energy
- *Left Hand Water District*
- *County Floodplain*
- *Colorado Geological Survey*
- *Nova Investments*

Note: Italicized responses received after the staff report was distributed

Recommendation

Staff requests that Planning Commission approve the proposed updates to the Geology element of the Boulder County Comprehensive Plan as proposed in the staff report as part of Docket BCCP-20-0001.

Thank you