

**IV. B. 30. Geological Hazards and Constraints**

- a) Background. Colorado, by virtue of its proximity to the Rocky Mountains, is particularly prone to geologic hazards and constraints which could impact the development of certain Rural Development financed projects. Subsidence due to former underground mining activities, chemical expansion of soils due to hydrologic activities, and mudslides are some examples. These were determined to be “matters of state concern” by the Colorado legislature when it passed House Bill 1041 in 1974.



Rural Development personnel involved with loanmaking and property disposition activities should endeavor to identify potential geologic threats and consult the Rural Development State Architect for further guidance in dealing with such issues.

- b) Governing Regulations.
  - (1) Federal.
    - (A) Earthquake Hazards Reduction Act of 1977.
    - (B) U.S. Executive Order 11514, Protection and Enhancement of Environmental Quality.
    - (C) National Environmental Policy Act, 42 U.S.C. 4321.
    - (D) Title 7, Part 1b and 1c, Code of Federal Regulations, U.S. Department of Agriculture’s National Environmental Policy Act.



- (2) State.
  - (A) Senate Bill 35 (1972), C.R.S. 1973, 30-28-101, 110 (3)-(5), 133-137.
  - (B) House Bill 1529 (1973), C.R.S. 1973, 34-1-301, et seq.
  - (C) House Bill 1034 (1974), C.R.S. 1973, 29-20-101, et seq.
  - (D) House Bill 1041 (1974), C.R.S. 1973, 24-65.1-101, et seq.
- c) Policy. Rural Development should not provide financial assistance for any proposed action which would be subject to certain geological hazards, defined by the State of Colorado legislature in House Bill 1041 and in other state, county, or municipal legislation, regulations, and ordinances. Rural Development should also not provide financial assistance for any proposed action which would be subject to regulated geological constraints, unless the applicant can prove, to the satisfaction of Rural Development, that his or her proposal would not, directly or indirectly, cause death, injury, property damage, or environmental degradation, or would violate state or local laws or regulations.
- d) Classification. Following are geologic hazards and constraints which are considered to be “matters of state concern” under House Bill 1041. Geologic hazards are either natural or man-caused phenomenon which absolutely preclude construction of any type while geologic constraints are phenomenon which permit certain types of construction activities to occur, provided that these activities are properly planned and executed in such a manner that death, injury, property damage, or environmental degradation will not occur. The Rural Development State Architect or State Engineer, as appropriate, should be consulted if there are any questions regarding financing facilities in any of the following areas of concern:
  - (1) Avalanches (hazard): Avalanches are sudden, rapid movements of masses of snow which occur on established paths on relatively steep slopes. Avalanche conditions vary with the depth and condition of the snow, the temperature of the snow and ambient air, and the degree of slope. Construction must always be prohibited in avalanche paths.
  - (2) Landslides (hazard and constraint): Landslides are the outward movement of slopes composed of natural rock, soils, artificial fills, or combinations thereof and are the result of underlying unstable soil and rock conditions. Severity of landslides may be increased by man’s activities, such as excavating on the slope or toe of a landslide area, addition of material to the top of a landslide, or addition of moisture to a landslide mass, increasing the weight and decreasing the strength of the unstable material in the landslide. Landslides can be mitigated by changing the degree of slope, managing the drainage, or by using retaining structures.
  - (3) Rockfalls (hazard): Rockfalls are the falling of newly detached masses of rock from cliffs or down very steep slopes. Construction in rockfall areas should be avoided.



- (4) Mudflows and debris flows (hazard): These are movements of mud (water and fine-grained earth materials) or debris (water and large-grained, i.e., solid particles are larger than sand grains, materials) down a canyon or gulch. These can occur suddenly and without warning and they vary in size and intensity. Construction in areas of mudflows and debris flows should be avoided.
  - (5) Seismic effects (hazard and constraint): Earthquakes are caused by movements of rock masses along fault zones, i.e., rock masses which move relative to one another along a plane or zone. These movement create vibrational waves which are transmitted through the ground. Construction in such areas should conform to the latest edition of the National Earthquake Hazards Reduction Program's "Recommended Provisions for the Development of Seismic Regulations for New Building".
  - (6) Ground subsidence (hazard and constraint): This phenomenon is the sinking of the land over man-made or natural underground voids. It can occur suddenly or gradually over many years. Such subsidence occurs in Colorado most frequently over abandoned clay or coal mines. Subsidence can also occur where underground water has dissolved surface materials or has been withdrawn by wells. Finally, subsidence may be caused by collapsing soils. Construction over abandoned mines is risky if the exact location of the mines cannot be precisely determined. Construction in areas susceptible to collapse is acceptable provided the soils supporting such construction are precollapsed by wetting or are prevented from becoming wet or provided such underground voids are adequately structurally stabilized.
  - (7) Expansive soil and rock (constraint): Expansive soils or soft bedrock swell when wetted and shrink as they dry out and are, therefore, one of the most prevalent causes of damage to buildings and structures. Bentonite and Montmorillinite clays are examples of expansive soils. Buildings may be constructed on swelling soil and rock, however, if appropriate construction and maintenance activities are undertaken, but it must be recognized that property owners in such situations will be tied to long-term special grounds maintenance scenarios.
- e) Agency Jurisdiction. The Colorado Geological Survey (CGS) has been tasked with identifying and assessing the environmental risks of construction in areas of geological hazard. Information on geological hazards is provided by CGS to local governmental bodies such as counties and municipalities. The local governments are obliged to adopt appropriate regulations which effectively control development in areas of geological hazard.

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f) Location of Resource. The Colorado Geological Survey and individual local governments may be consulted in regard to local geological hazard areas and related local regulations.

g) Other References.

(1) Colorado Geological Survey. *“Subsidence Above Inactive Coal Mines: Information for the Homeowner”*

(Web-site)

[http://138.67.1.32/fs\\_home/tboyd/Coal/homeowner/](http://138.67.1.32/fs_home/tboyd/Coal/homeowner/)