IRON COUNTY ORDINANCE NO. 2010-11

AN ORDINANCE OF IRON COUNTY, UTAH, AMENDING THE COUNTY ZONING ORDINANCE BY ADOPTING A NEW CHAPTER KNOWN AS "GEOLOGIC CONDITION REPORTING".

WHEREAS, the Environmental Element of the Iron County General Plan (Adopted 1995), includes the following goals and policies:

Goal EN 1: "Minimize damage and hazards resulting from seismic activity, unstable soils, flooding conditions, and other geologic hazards".

Policy EN 1.3: "Review development proposals located in or immediately adjacent to areas of soil instability, liquefaction areas, and steep slopes to provide geotechnical studies, determine if a significant constraint exists relative to these various issues and to determine appropriate land use and structural design.

Policy EN 1.6: "Develop hillside grading standards, by ordinance, to minimize the hazards of erosion and slope failure."

WHEREAS, Iron County has drafted an ordinance to implement these stated general plan goal and policies. The ordinance identifies geologic study areas in areas of the county that may be susceptible to surface faulting, mass wasting (landslide, rock fall, and debris flow), liquefaction, land subsidence, and earth fissures; and, requires that within these study areas, investigation and reporting be conducted for new development and construction. Where it is verified that a geologic hazard exists, the ordinance establishes minimum standards of safety for development to occur; and

WHEREAS, geologic information and scientific methods have greatly improved over the past few decades, which provides information that was not previously available, but which can be used to protect the public health, safety, and general welfare in the future; and

WHEREAS, protecting the public health, safety and general welfare of those in Iron County is the preeminent duty of land use regulation. If a person is involved in a geological disaster their life, health, and material possessions are in danger; and

WHEREAS, the level of danger can be increased greatly by actions that inappropriately disturb a geologically hazardous area—whether the actions are intentional or not. Likewise, the level of danger can often be greatly reduced if the geological hazard is recognized and appropriately addressed through mitigation actions; and

WHEREAS, geological disasters destroy structures and other improvements, and present a significant risk to life and property. The cost of dealing with a geological disaster is typically much greater than the cost of preventing or avoiding it; and

WHEREAS, the process of identifying and mitigating geological hazards protects the investments of property owners, lenders, future property owners, and the citizens of Iron County; and

WHEREAS, qualified professionals have the knowledge and expertise to identify geologic hazards and identify mitigation methods and actions to minimize the danger associated with those hazards; and

WHEREAS, Iron County desires to minimize the potential of geologic hazards adversely affecting public health, safety, and property; and

WHEREAS, Iron County finds it prudent that decisions relating to geologic hazards be based on unbiased, professional, scientific and engineering information provided by those with the proper licensing and expertise in the matter; and

WHEREAS, Iron County has received comments from geologists and geotechnical engineers that a geologic investigation and reporting ordinance is needed in Iron County. Iron County is not unique in the types of geologic hazards that are present, as these same hazards exist in varying degrees throughout most of the western states and Colorado plateau region; and

WHEREAS, after receiving and discussing the draft ordinance at their May 6, 2010 meeting the Iron County Planning Commission held a properly advertised public hearing on the draft ordinance at their June 3, 2010 meeting, and further accepted comments at their July 1, 2010 meeting. Changes to the draft were made at both the June and July meetings to improve the document and address concerns, after which the Planning commission voted unanimously to pass the ordinance on to the County Commission for approval; and

WHEREAS, the County Commission held a public hearing on July 26, 2010, at which time several concerns were expressed, as stated in the meeting minutes; and

WHEREAS, at the August 6, 2010 meeting, the County Commission decided to have a third-party review committee take a technical look at the document and public comments, and to make recommendations for improvement as needed. The committee held seven meetings, each about two hours long, between September 8, 2010 and November 4, 2010, where several good discussions occurred and changes to the document were recommended, drafted, and incorporated by the committee. The committee believes the document is now ready for adoption; and

WHEREAS, the recommended version of the document was presented to the County Commission at their November 8, 2010 meeting, along with a summary of the eighteen changes made by the committee; and

WHEREAS, a public hearing was held at the December 13, 2010 County Commission meeting on the version of the ordinance recommended by the review committee; and

WHEREAS, Iron County finds that the criteria of Section 17.12.060 Iron County Code, pertaining to amendments to development regulations, have been properly considered, as presented in the staff report for this proposal; and

WHEREAS, Iron County finds that the proposed ordinance, in its current version, sets forth a scientific, professionally recommended, and reasonable pathway for determining how to safely build or develop in identified geologically hazardous areas; and

WHEREAS, after considering public comments, staff recommendations, and the document itself, the County Commission concludes that the geologic amendments to the zoning ordinance are an appropriate exercise of its police powers to protect the health, safety, and general welfare of the public, and are necessary for the reasons stated above.

NOW THEREFORE, THE COUNTY LEGISLATIVE BODY OF IRON COUNTY, UTAH ORDAINS AS FOLLOWS:

SECTION 1. ADOPTION.

The attached chapter titled "CHAPTER 17.59 GEOLOGIC CONDITION REPORTING" and identified as "Exhibit A" is hereby adopted in full, along with the geologic information contained on the maps titled "Iron County Ground Water" and "Iron County Earth Fissures" referenced therein.

SECTION 2: SEVERABILITY.

Should any portion of this ordinance be found for any reason to be unconstitutional, unlawful, or otherwise void or unenforceable, the balance of the ordinance shall be severable therefrom, and shall survive such declaration, remaining in full force and effect.

SECTION 3: REPEALER.

All acts, resolutions, and regulations of Iron County in conflict with this Ordinance or not consistent with this ordinance are hereby repealed as of the effective date of this ordinance to the extent of such conflict or inconsistency. This repealer shall not be construed so as to revive any resolution, act, or regulation, or part thereof, heretofore repealed.

SECTION 4: EFFECTIVE DATE:

This ordinance shall become effective immediately after the required publication thereof, as set forth in Utah Code § 17-53-208.

PASSED AND ADOPTED BY THE BOARD OF COUNTY COMMISSIONERS OF IRON COUNTY, UTAH this 20th day of December, 2010.

COUNTY OF IRON COUNTY CLERK STATE OF UTAH

BOARD OF COUNTY COMMISSIONERS
IRON COUNTY, UTAH

By: Wayne A. Smith

Wayne A. Smith, Chair

ATTEST: David I Yardley

David I. Yardley,
County Clerk

VOTING:

Wayne A. Smith	Nay
Alma L. Adams	Aye
Lois L. Bulloch	Aye

"Exhibit A"

Chapter 17.59

GEOLOGIC CONDITION REPORTING

Sections:

17.59.010 Purposes
17.59.020 Definitions
17.59.030 General Provisions
17.59.040 Responsibility for Geologic and Geotechnical Studies and Reports
17.59.050 Standards of Safety
17.59.060 Scoping Meeting
17.59.070 Geologic and Geotechnical Reports
17.59.080 Optional Process for Single-Family Residences, Accessory Development, and Excavation/Grading Activities in Geologic Study Areas.
17.59.090 Review of Geologic and Geotechnical Reports
17.59.100 Compliance with the Recommendations of the Geologic/ Geotechnical Report and Conditions of the Development Authorization
17.59.110 Appeals
17.59.115 Exceptions
17.59.120 Fees
17.59.130 Warning and Disclaimer
17.59.140 Conflicting Regulations
17.59.150 Iron County Geologic-Hazard Acknowledgment
17.59.160 References

Exhibit A Typical Geologic-Hazard Review Process—Flowchart

17.59.010 Purposes. This chapter applies to the development of all lands in unincorporated Iron County that are known or suspected to contain one or more of the geologic hazards herein regulated. Such areas are known as geologic study areas. Where a proposed development activity is located within a geologic study area, an investigation is required. Property mapped as being within a geologic study area may or may not contain a geologic hazard—such

determination will be the result of the investigation process required herein. This chapter and the regulations and restrictions contained herein are adopted and enacted for the following purposes:

A. To minimize the potential of geologic hazards adversely affecting public and private property, safety, and health.

B. To identify and to educate all development professionals, landowners, and potential purchasers of the presence and risks of geologic hazards—including the hazards of surface-fault rupture, mass wasting (landslide, rock fall, and debris flow), liquefaction, land subsidence, and earth fissures; and to establish minimum standards and methods for evaluating these hazards when development is proposed in these areas. This stated purpose does not absolve a developer or potential purchaser from the responsibility to conduct their own due diligence and research.

C. To ensure that decisions relating to geologic hazards are based on unbiased professional, scientific and engineering information provided by those with the proper licensing and expertise in the matter;

17.59.020 Definitions.

The following words and phrases, as used in this chapter, mean:

Acceptable and Reasonable Risk: A level of risk at which it is expected that there will be no loss of life or significant injury to occupants, no release of hazardous or toxic substances, and no more than minimal structural damage (i.e. physically and economically reasonable to repair) to infrastructure, critical facilities, or to structures designed for human occupancy, in the event that the anticipated geologic hazard were to occur.

Activity Class of a fault: The level of activity of a surface fault based on the time of most recent movement. Holocene activity class means movement of a fault that has broken the ground surface in approximately the past 10,000 years (11,700 cal yr B.P.); Late Quaternary activity class means movement of a fault that has broken the ground surface in approximately the past 130,000 years; and, Quaternary activity class means movement of a fault that has broken the ground surface in approximately the past 2.6 million years.

Alluvial Fan: A fan-shaped deposit formed by deposition from a stream as it exits the mountains, slows, and spreads onto the flatter plain.

Alluvial-Fan Surface, Active is an alluvial-fan surface where the fan building processes of flooding, debris flow, sediment deposition, and erosion are active or potentially active during storm or snowmelt events. Active portions of the fan have generally shallow stream channels, often braiding into several channels that distribute alluvium broadly across the fan surface. Active alluvial-fan surfaces receiving periodic sedimentation are typically rough (numerous boulders and cobbles at the surface) and support sparse vegetation.

Alluvial-Fan Surface, Inactive is an alluvial-fan surface where the fan building processes are no longer active. Inactive fan surfaces are stable and usually marked by well-developed soil and plant succession. Stream channels are generally single strand, incised below the inactive fan surface, and associated with a flat low floodplain terrace. Floods along channels on inactive alluvial-fan surfaces behave as normal riverine floods.

Buildable Area: That portion of a site, lot, or parcel that otherwise is entitled to contain the proposed improvement (e.g. complies with zoning and building setbacks); and, either will not be impacted by a geologic hazard, or has all identified geologic hazards mitigated to an acceptable and reasonable risk. Any mitigation necessary to deem a geologically hazardous area as "buildable" must be based on an approved geologic-hazard report and engineered methods. Contrast to "Non-buildable area".

Critical Facilities: Buildings, infrastructure, and other structures that represent a substantial hazard to human life in the event of failure, or which are designated as "essential facilities". Critical facilities include, but are not limited to Occupancy Category III or IV structures, as defined in the International Building Code (IBC, table 1604.5, p. 307; International Code Council, 2009).

Debris Flow: A fast-moving slurry of rock, soil, organic material, and water transported down a channel and onto an alluvial fan. The term as used in this ordinance includes the sedimentation flows and processes technically classified as debris flows (>60% sediment), hyperconcentrated flows (20-60% sediment), and stream flows (<20% sediment) which are associated with debris-flow and hyperconcentrated-flow hazards. Stream-flow hazards that are not associated with debris-flow or hyperconcentrated-flow hazards are not included in this definition, but are regulated through the flood damage prevention ordinance (Chapter 15.12 I.C.C.) and drainage regulations (e.g. Section 17.40.020 I.C.C.).

Development: For purposes of this chapter, development includes the installation and construction of roads, utility lines/conveyances, subdivision improvements, buildings, structures, and physical improvements accessory to any of these uses.

Earth Fissure: A linear tension crack in the ground that extends upward from the ground-water table and is a direct result of land subsidence caused by ground-water depletion. The surface expression of earth fissures may range from less than a yard to several miles long and from less than half an inch to tens of feet wide. Earth fissures change runoff/flood patterns, break buried pipes and utilities, cause infrastructure to collapse, provide a direct conduit to the groundwater table for contaminants, and may pose a life-safety hazard. Earth fissures can quickly erode into sinkholes/gullies when washed out by surface runoff, and some, such as the Enoch-graben-west fissure, can experience vertical offset.

Engineering Geologist: A Utah-licensed geologist, who, through education, training, and experience practices in the field of engineering geology. The term "Geologist" as used in this chapter, specifically refers to an Engineering Geologist qualified to study the specific geologic hazard(s) identified. For purposes of this ordinance, the engineering geologist in principal charge of the investigation shall have a minimum of five years of experience in a responsible position in the field of engineering geology either in Utah or in a state with similar geologic hazards.

Engineering Geology: The application of the geologic sciences to engineering practice for the purpose of assuring that the geologic factors affecting the location, design, construction, operation and maintenance of engineering works are recognized and adequately provided for in the interest of the public health, safety and welfare.

Essential Facilities: A subset of "Critical Facilities", essential facilities include the infrastructure and facilities intended to remain operational in the event of an adverse geologic event or natural disaster. They include, but are not limited to, those uses listed under Occupancy Category IV in Table 1604.5 of the International Building Code.

Fault: A fracture in the earth's crust forming a boundary between rock or soil masses that have moved relative to each other, due to tectonic forces. When the fracture extends to the earth's surface, it is known as a surface-fault rupture, or fault trace.

Fault Setback: An area on either side of a fault within which critical facilities and structures designed for human occupancy are not permitted.

Fault Scarp: A steep slope or cliff formed by movement along a fault.

Fault Trace, or Surface-Fault Rupture: The intersection of a fault plane with the ground surface, often present as a fault scarp, or detected as a lineament.

Fault Zone: A corridor of variable width along one or more fault traces, within which deformation has occurred.

Geologic Evaluation: The review of a geologic study area to determine the hazard potential relative to the proposed development, and to verify the need for geologic studies and reports. Geologic Evaluations are performed by engineering geologists, or geotechnical engineers with input from engineering geologists, as specified in 17.59.040.

Geologic Hazard: Includes surface-fault rupture, mass wasting (landslides, rock falls, debris flows), liquefaction, land subsidence, earth fissures and other geologic processes that present a significant risk to life or property. This chapter regulates those geologic hazards determined most likely to occur in Iron County, with the exception of earthquake ground shaking, flooding not associated with alluvial fans, and problem soils. Ground shaking, although related to and considered in the evaluation of several of the other geologic hazards, is regulated primarily for its impacts to buildings and structures through the seismic requirements of the building code. Flooding is primarily addressed through the Iron County Flood Damage Prevention Ordinance. Regulations pertaining to development in areas of problem soils are found in the subdivision and building codes, and are not duplicated in this chapter.

Geologically Hazardous Area: An area that because of its susceptibility to a geologic hazard is not suitable for the siting of structures designed for human occupancy or critical facilities, consistent with public health or safety concerns, unless the hazard is mitigated to an acceptable and reasonable level.

Geologic Study Area: A potential geologically hazardous area, within which geologic-hazard investigations are required prior to development.

Geologist: (See "Engineering Geologist".)

Geotechnical Engineer: A professional, Utah-licensed engineer who, through education, training and experience, is competent in the field of geotechnical engineering. For purposes of this ordinance, the geotechnical engineer shall have either: (1) A graduate degree in civil engineering, with an emphasis in geotechnical engineering; or a B.S. degree in civil engineering with twelve semester hours of post B.S. credit in geotechnical engineering, or course content closely related to evaluation of geologic hazards, from an accredited college or university; or,

(2) Five full years of experience in a responsible position in the field of geotechnical engineering in Utah, or in a state with similar geologic hazards and regulatory environment, and experience demonstrating the engineer's knowledge and application of appropriate techniques in participating in geologic hazards studies.

Geotechnical Engineering: The investigation and engineering evaluation of earth materials including soil, rock, and man-made materials and their interaction with earth retention systems, foundations, and other civil engineering works. The practice involves the fields of soil mechanics, rock mechanics, and earth sciences and requires knowledge of engineering laws, formulas, construction techniques, and performance evaluation of engineering.

Governing Body: The Iron County legislative body, or a designee of the Iron County legislative body.

Hazard Mitigation: An action taken to avoid, minimize, or compensate for the risk to human life and public and private property from identified hazards.

Hydrocompaction: Where the ground subsides due to unconsolidated soils becoming saturated with water and losing their structural strength (soil bonds being dissolved by water), and the ground compacting under the weight above.

Land Subsidence: The elevation of the ground surface being lowered due to changing soil and/or ground-water conditions. Land subsidence occurs in portions of Iron County, like many areas of the arid southwest, due to ground-water extraction exceeding the rate of recharge. The pumping and resulting removal of ground water from the pore spaces of the valley-fill alluvium (unconsolidated gravel, sand, silt, and clay), reduces pore-water pressure and allows the drained alluvium to compress and the ground surface to subside. Compaction within the aquifer appears to occur primarily in the silt and clay layers and is commonly expressed as permanent land subsidence, which reduces aquifer capacity and may result in the development of earth fissures.

Land Use Authority: The person, board, commission, agency, or other body designated by the local legislative body to act upon a land use application.

Landslide: The downslope movement of a mass of soil, surficial deposits, or bedrock. It may include a continuum of geologic processes such as landslides, earth-flows, debris flows, debris avalanches, and rock falls.

Liquefaction: A process by which certain water-saturated soils (typically sand) lose bearing strength because of earthquake-related ground shaking and subsequent increase of groundwater pore pressure. Liquefaction may induce ground failure, including lateral spreads and flow-type landslides.

Iron County: The Iron County Engineer, Iron County Planner, Iron County Zoning Administrator, Iron County Building Official, Iron County Administrator, County Commission, Land Use Authority, or other Iron County employee or designee.

Non-Buildable Area, Due to Geologic Hazard: An area that contains a geologic hazard that presents an unreasonable and unacceptable risk, such that the siting of structures designed for human occupancy, critical facilities, and other specified development improvements are prohibited in that area through the authority of this ordinance. Contrast to "buildable area".

Problem Soil and Rock: Geologic materials having characteristics that make them susceptible to volumetric changes, collapse, hydrocompaction, subsidence, or other engineering geologic problems.

Reviewing Official: The Building Official if related to a building permit, and the Land Use Authority if related to a land use application.

Rock Fall: A rock, or mass of rocks, that has detached from a cliff or other steep slope and moves down a slope by falling, rolling, sliding, toppling, or bouncing.

Setback, Geologic Hazard: An area subject to risk from a geologic hazard, within which construction of critical facilities and structures designed for human occupancy are not permitted.

Slope Stability: The resistance of a natural or artificial slope or other inclined surface to failure from landslide; technically the ratio of resisting forces to the ratio of driving forces. Slope stability is expressed as a "factor of safety". Slope stability is to be assessed under both static and dynamic (earthquake-induced) conditions.

Structure Designed for Human Occupancy: Any building or structure containing a habitable space, or classified as an "Assembly", "Business", "Educational", "Factory and Industrial", "Institutional", "Mercantile", or "Residential" occupancy classification under the adopted International Building Code.

Subsidence: The lowering or sinking of the ground due to physical changes in the underlying soil. Subsidence is a geologic hazard in Iron County primarily due to hydrocompaction and ground-water withdrawal in excess of recharge.

Surface Faulting: The propagation of an earthquake-generated fault rupture to the ground surface, which displaces the surface and forms a scarp.

Talus: Accumulated rock fragments lying at the base of a cliff or a steep rocky slope.

17.59.030 General Provisions

A. Geologic Study Areas.

This chapter applies to the development of all lands in unincorporated Iron County that are known or suspected to contain one or more of the geologic hazards herein regulated. Such areas are known as geologic study areas. Where a proposed development activity is located within a geologic study area, an investigation and report of the hazard(s) is required.

The following methods shall be used to determine whether a proposed development is within a geologic study area. In the event there is a known or readily apparent geologic hazard in the area of a proposed development that is not shown on a geologic hazard map, the geologic hazard nevertheless exists and the area shall be considered a geologic study area as if it were mapped.

1. Surface-fault ruptures: The "Quaternary Fault and Fold Database of the United States", published by the U.S. Geological Survey, is to be used as the primary source of fault information for Iron County. The fault locations, fault activity classes (geologic age), and other supplementary information contained therein shall be the standard upon which a surface-fault-rupture study must be based, unless more detailed and accurate scientific information becomes available.

Areas along Holocene activity class faults constitute surface-fault-rupture study areas for all critical facilities, subdivisions, and structures designed for human occupancy. Areas along Late Quaternary activity class faults constitute surface-fault-rupture study areas for all critical facilities and subdivisions of more than four lots. Faults of the Quaternary activity class constitute surface-fault-rupture study areas for critical facilities only. If the activity class of a Quaternary fault is not specified, it shall be considered to be of the Holocene activity class, unless scientific data demonstrates otherwise. Fault zones with multiple fault traces shall be considered to be the activity class of the most recent fault trace.

For well-defined surface faults, the surface-fault-rupture geologic study area extends 500 feet on the downthrown side of the fault and 250 feet on the upthrown side of the fault, except when 250 feet does not extend to the top of the scarp, in which case the study area on the upthrown side shall extend to 500 feet. Where multiple faults exist within a fault zone, the study area is to include all land between the faults, as well as the specified 500-foot and 250-foot adjacent areas. Distances are measured horizontally from the surface fault.

For a buried or approximately located fault (dotted or dashed line on fault map), the study area extends 1,000 feet to each side of the mapped location of the fault.

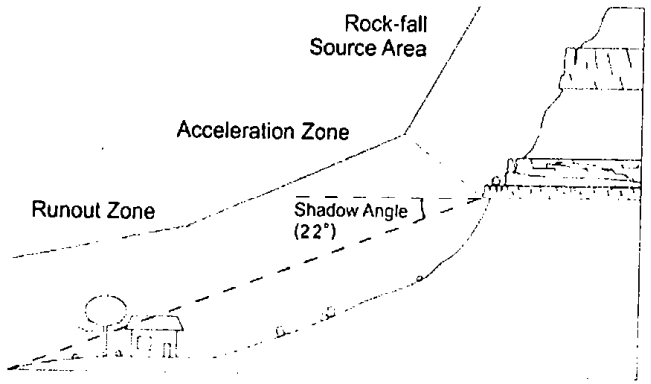
2. Landslide/Slope Instability: As stated, in *Guidelines for Evaluating Landslide Hazards in Utah, UGS Circular 92, 1996*, "Landslide hazards involve both natural and development-induced variables". For this reason, landslide geologic study areas include both areas that are hazardous in their natural state (i.e. landslides and landslide susceptible slopes) and areas that may become hazardous if development does not properly consider the geologic limitations of the site (e.g. steep slopes). Specifically, geologic study areas for landslide/slope instability hazards include:

a. Until more detailed geologic maps are available and adopted by resolution, all lands identified as "Deep or unclassified landslides"; "Shallow landslides"; "Lateral spread and/or flow failures"; "Landslides undifferentiated from talus and/or colluvial deposits"; and, "Landslides and/or landslides undifferentiated from talus, colluvial, rock fall, glacial, and soil-creep deposits", on Utah Geologic Survey Map 246DM (Elliott and Harty, 2010), or any update thereto; and,

b. All slopes that may be affected or created by the proposed development, which meet any of the following:
   - I. cut and/or fill slopes steeper than, or equal to, 2 horizontal to 1 vertical.
   - ii. natural slopes steeper than or equal to 4 horizontal to 1 vertical.
   - iii. natural and cut slopes with potentially adverse geologic conditions (e.g. bedding, foliation, or other structural features that are potentially adverse to the stability of the slope).
   - iv. natural and cut slopes that include a geologic hazard such as a landslide, irrespective of the slope height or slope gradient.
   - v. buttresses and stability fills.

3. Rock Fall: Rock-fall geologic study areas are not mapped in Iron County at this time, but include locations at the base of rock and talus slopes that are susceptible to rock fall—evidence

of past rock falls being the primary indicator. A 22-degree shadow angle, extending from the base of the rock-fall source area, as depicted in the following diagram, shall be used to define the extent of a rock-fall geologic study area. (Note: shadow angle is dependent on the type of rock involved, and the rock-fall hazard area determined by the geologist may be more or less than that captured by the 22-degree shadow angle used to define the study area. However, 22 degrees is relatively conservative, and is deemed sufficient to capture most rock-fall hazard situations.)



A rock-fall geologic study area consists of three components: (1) a rock source, in general defined by bedrock geologic units that exhibit relatively consistent patterns of rock-fall susceptibility throughout the study area, (2) an acceleration zone, where rock-fall debris detached

from the source gain momentum as it travels downslope—this zone often includes a talus slope, which becomes less apparent with decreasing relative hazard and is typically absent where the hazard is low, and finally (3) a runout zone (rock-fall shadow zone), which includes gentler slopes where boulders have rolled or bounced beyond the base of the acceleration zone. (Source of diagram and above paragraph: *Geologic Hazards and Adverse Construction Conditions, St. George—Hurricane Metropolitan Area, Washington County, Utah,* by Lund, Knudsen, Vice, and Shaw, 2008. UGS Special Study 127).

4. Debris flows: The FEMA Flood Insurance Rate Maps for Iron County identify the 100-year floodplains that are on active alluvial fans *(see definition)*, through the use of the labels "*(Alluvial Fan Flooding)*" and "*(Alluvial Flooding)*". The alluvial fans of Braffits Creek and Summit Creek are currently the only alluvial fans in the County with these labels. Fiddler's Canyon has had debris flow basins and channel improvements such that debris-flow flooding is expected to be maintained within the mapped 100-year floodplain. Therefore, for the Braffits Creek, Summit Creek, and Fiddler's Canyon alluvial fans, debris-flow study areas include the 100-year floodplains identified on the FEMA Flood Insurance Rate Maps, and only those areas.

There are also active alluvial fans within the county that have not been mapped by FEMA. Until more detailed mapping is available and adopted by resolution, the information found on the 30-minute by 60-minute geologic maps of the Utah Geological Survey (the Interim Cedar City and Draft Panguitch 30'x60' Quadrangles, as referenced in 17.59.160) is to be used to identify debris-flow study areas outside of the Braffits Creek, Summit Creek, and Fiddler's Canyon alluvial fans. Outside of these three areas, if a property is within one of the following geologic units and within two miles of the mouth of the canyon/ravine that feeds the alluvial fan, it is within a debris-flow study area. The included geologic units are Qal, Qafl, Qaf2, Qatl, Qat2, Qapl, Qap2, QTap3, and QTaf3. The mouth of the canyon/ravine is where the erosional process of the stream has historically transitioned into a depositional process to form the alluvial fan, and does not extend above the geologic units herein listed.

5. Liquefaction: Liquefaction geologic study areas include areas with unconsolidated Quaternary geologic units of stream and terrace alluvium, alluvial deposits, eolian deposits, or colluvial deposits, which contain ground water within fifty (50) feet of the surface. Generally these are the areas at the lower elevations of the Cedar, Parowan, and Beryl valleys. Until more detailed mapping is available and adopted by resolution, the generalized map "Iron County Ground Water", produced by Iron County GIS, shall be the reference document for identifying liquefaction geologic study areas.

Liquefaction study areas require the preparation of a geologic report for the development of critical facilities, utility lines/conveyances, commercial and industrial structures, attached housing, and proposed subdivisions.

An individual geologic report is not required for the construction of a single-family detached house or structure accessory thereto. However, for sites within a liquefaction study area, a geotechnical engineer shall consider liquefaction potential in any geotechnical report required by section 15.06.020, Iron County Code.

6. Land Subsidence and Earth Fissures: An area approximately 116 square miles in size has been identified by the Utah Geological Survey in Cedar Valley where land subsidence resulting from groundwater mining has occurred. A similar area of subsided ground area about 100 square miles in size has been identified in Escalante Valley near Beryl Junction (Lund and others, 2005). Land subsidence in both areas has resulted in the formation of earth fissures. The earth fissures are in the Escalante Valley in the area of Beryl Junction (Lund and others, 2005); in the Cedar Valley in locations north and west of Quichapa Lake, and within and north of Enoch City; and, in the Parowan Valley near the southwest end of the Little Salt Lake playa (DuRoss, 2004). Other earth fissures are likely to be discovered as the hazard is further investigated. The Utah Geological Survey has completed a study on the matter for parts of the Cedar Valley under a contract with the Central Iron County Water Conservancy District (Knudsen and others, Sept. 2010, Investigation of Land Subsidence and Earth Fissures in Cedar Valley, Iron County, Utah: Utah Geological Survey, 114 p.), and plans to conduct further investigations and analysis. Those investigations and analysis are expected to lead to greater understanding of land subsidence and earth fissure hazards, their risk to certain areas of the County, and identification of defined geologic study areas for land subsidence and earth-fissure hazards.

For the purpose of this ordinance, earth-fissure study areas include all lands on basin-fill deposits (not bedrock) within known subsiding areas and that are within one-half mile of an earth fissure that has been verified by the Utah Geological Survey. Iron County shall maintain a map of such fissures, updating it as additional fissures are discovered.

Earth-fissure study areas require the preparation of a geologic report for the development of critical facilities, utility lines/conveyances that are pressurized or carry liquids, commercial and industrial structures, residential dwellings, and proposed subdivisions.

Proposed development in areas of land subsidence located outside of earth-fissure study areas does not require the preparation of a geologic report for the construction of a single-family dwelling or structures accessory thereto, but otherwise a geologic report is required for

development of precisely-leveled, long base-line infrastructure (e.g. sewer mains, pipelines, and canals) and proposals that are heavily dependent thereon (e.g. small-lot subdivisions and large wastewater generators). In such cases, the situation shall be evaluated for the impact of ongoing subsidence on the proposed infrastructure.

B. Geologic/Geotechnical Report Required with Permit Application.

Where a proposed development activity is located within a geologic study area and the activity requires a land use or building permit from Iron County, an engineering geologic report (geologic report) or geotechnical report shall be submitted with the permit application, as specified in this chapter. A permit application for development in a geologic study area shall not be considered complete for review without the required report.

When grading, filling or excavation activities are proposed in a Landslide/Slope Instability geologic study area; and, the project is not otherwise subject to geologic review through a land use or building permit; and, the amount of grading, filling or excavation for the project will exceed thirty (30) cubic yards, and/or exceed a two-foot cut or fill, the property owner shall obtain a Geologic Hazard Development Authorization-Optional Process, by following the procedures outlined in section 17.59.080 of this chapter, prior to commencing the grading, filling or excavation activities. Provided, if the project proponent can demonstrate to the building official that the grading, filling or excavation activity is not likely to increase the danger of the geologic hazard to any property, or that the activity cannot be regulated due to a state or federal preemption, the County shall exempt the grading, filling or excavation activity from this requirement. Examples of potentially exempt actions include vested mining activities, most agricultural and road maintenance activities, and flood channel maintenance. Additional exempt actions are listed in 17.59.030(E).

If a geologic or geotechnical report was recently completed for an area that includes the subject property, and the report addresses the applicable geologic hazard(s) and contemplated development activity, an additional report is likely not required. In such case, the previous report shall be reviewed for adequacy and applicable recommendations by the professional that prepared it, and a summary thereof submitted with the permit application. If the previous report is not adequate, then a new report, or supplement to the previous report, shall be submitted.

C. Buildable Areas and Safe Access.

Every lot, parcel, or tract that is to be developed must have a buildable area, as defined herein, that is of sufficient area and dimensions for the intended use(s). Any area determined to be non-buildable due to the presence of a geologic hazard shall be identified in sufficient detail by the geologic professional (geologist or geotechnical engineer, depending on type of hazard) so as to

provide regulatory guidance to the County, landowner, and developer. The boundary between a buildable and non-buildable area shall be identified by the geologic profcssional on a scalable map and in the field (e.g. ground staked). If the proposed action is a subdivision, the boundary and non-buildable area(s) shall be identified on the plat map.

In addition, every lot, parcel or tract that is to be created in a geologically hazardous area must have a buildable area that is accessible from the nearest existing public road via a route that complies with all adopted construction and dimensional standards (e.g. county construction standards and Wildland-Urban Interface Code) and is geologically safe (no more than an acceptable and reasonable risk, as defined in this chapter), as determined by the land use authority.

Any mitigation necessary to provide a buildable area or acceptable and reasonable access must be completed at such time and in such manner as specified in the accepted professional report; provided, all mitigation must be completed prior to acceptance of the development (e.g. final plat sign-off, certificate of occupancy).

The County may require notice of the geologic hazards, completed geological/geotechnical reports, and any accompanying restrictions, to be placed on plat maps or other recorded documents.

D. Minimum Requirements.

The standards set forth in this chapter are minimum requirements. The more complex the geologic conditions, the more potentially complex the evaluation and recommendations of the hazard report. More complex projects may require more detailed and in-depth evaluations than the minimum standards outlined herein to accomplish the stated purposes of this ordinance. The requirements of this chapter shall not supersede other, more stringent requirements that may be required by other codes or regulatory agencies.

E. Exemptions

The following actions are exempt from the provisions of this chapter:

a. The maintenance and repair of existing public utility lines, public utility structures, and communication facilities;

b. Any renovation or remodel of an existing residential building or structure that does not enlarge its footprint, increase square-footage by more than ten percent, or change its occupancy classification under the building code.

c. Any building or structure of 600 square feet or less that is not designed for human occupancy, not classified as a critical facility, and which will not increase the geologic-hazard risk to other properties if an adverse geological event were to occur. This determination shall be made by the reviewing official with jurisdiction over the development action. The reviewing official may require a statement from a qualified professional indicating that the proposal meets the conditions of this exemption. Examples may include some, but not all, residential accessory buildings, utility structures, agricultural storage structures, signs, etc.

F. No Geologic Hazard Found/Map Corrections

When a geologic study area is indicated by a map referenced by this chapter, and it is agreed upon by the applicant's geological consultant (geologist or geotechnical engineer) and the County that based on geologic information the hazard feature does not exist, further geologic review is not required and the map shall be corrected to remove the subject property from the geologic study area. Such map corrections shall be noted in a file and accompanied by the geologic information made to justify the change.

17.59.040 Responsibility for Geologic and Geotechnical Studies and Reports

A. Studies of geologic hazards often involve both geology and geotechnical engineering. Geologic studies shall be performed under the direct supervision of a Utah-licensed geologist who by training and experience is qualified to study the specific geologic hazard(s) identified. Geotechnical engineering studies shall be performed under the direct supervision of a Utah licensed professional geotechnical engineer. Specifically, this shall mean that the applicable professionals to study each of the geologic hazards shall be as follows:

1. Landslide/Slope Instability studies: In the case of Landslide/Slope Instability hazards, an engineering geologist shall provide appropriate input to the geotechnical engineer with respect to the potential impact of the geology, stratigraphy, and hydrologic conditions on the stability of the slope. The shear strength and other geotechnical earth material properties shall be evaluated by the geotechnical engineer. Qualified engineering geologists and geotechnical engineers may assess and quantitatively evaluate slope stability. However, the geotechnical engineer shall perform all design stability calculations. Ground motion parameters for use in seismic stability analysis may be provided by either the engineering geologist or geotechnical engineer.

2. Debris-flow studies: Geologic evaluations of debris-flow hazards must be performed by a qualified engineering geologist. A qualified geotechnical engineer must sign and seal all studies that include engineering design of mitigation measures.

3. Surface-Fault-Rupture studies: Surface-fault-rupture hazard studies are to be performed by a qualified engineering geologist.

4. Rock-Fall studies: Geologic evaluations of rock-fall hazards must be performed by a qualified engineering geologist. A qualified geotechnical engineer must sign and seal all studies that include engineering design of mitigation measures.

5. Liquefaction studies: The investigation of liquefaction hazard is an interdisciplinary practice. The site investigation report must be prepared by a qualified geotechnical engineer, competent in the field of seismic hazard evaluation and mitigation.

Because of the differing expertise and abilities of engineering geologists and geotechnical engineers, the scope of the site investigation report for a project may require that both types of professionals prepare and review the report, each practicing in the area of their expertise. Involvement of both a qualified engineering geologist and geotechnical engineer is intended to provide greater assurance that the hazard is properly identified, assessed, and mitigated.

Liquefaction-hazard analyses are the responsibility of the geotechnical engineer, although the engineering geologist should be involved in the application of screening criteria (verifying conditions are suitable for liquefaction) and the general geologic site evaluation to map the likely extent of liquefiable deposits and shallow ground water. Engineering properties of earth material shall be evaluated by the geotechnical engineer. The performance of a quantitative liquefaction-hazard analysis resulting in a numerical factor of safety and quantitative assessment of settlement and liquefaction-induced permanent ground displacement shall be performed by geotechnical engineers. The geotechnical engineers shall develop all mitigation and design recommendations. Ground motion parameters for use in quantitative liquefaction-hazard analyses may be provided by either the engineering geologist or geotechnical engineer.

6. Earth Fissure and Land Subsidence Studies: Earth-fissure and land-subsidence-hazard studies are to be performed by a qualified engineering geologist.

B. Type of Report Required. Studies required to be performed by a geologist shall include preparation of an engineering geologic report (geologic report), as specified in 17.59.070. In the case of a geologic hazard requiring review by a geotechnical engineer only (i.e. some liquefaction studies), an engineering geologic report is not required—a complete geotechnical report on the hazard is sufficient.

C. Qualifications of the Geologist.

The evaluation of geologic hazards is a specialized discipline within the practice of geology requiring technical expertise and knowledge of techniques not commonly used in other geologic

investigations. Therefore, geologic-hazard investigations involving geologic studies shall be conducted, signed, and sealed by a professional geologist, as defined in 17.59.020. Qualifications shall be provided to Iron County upon request. Inadequate credentials and applicable experience of the preparer shall be grounds for the County to reject any geologic study, report, statement, recommendation, inspection, or other work product.

D. Qualifications of the Geotechnical Engineer.

The geotechnical engineer shall meet the qualifications of a "geotechnical engineer", as defined in 17.59.020. Qualifications shall be provided to Iron County upon request. Inadequate credentials and applicable experience of the preparer shall be grounds for the County to reject any geologic study, report, statement, recommendation, inspection, or other work product.

17.59.050 Standards of Safety

Minimum standards of safety are hereby established for the following geologic hazards.

A. Landslide/Slope Instability:

Both of the following minimum factors of safety shall be demonstrated in Landslide/Slope Instability geologic study areas. The minimum slope-stability factors of safety are:

1. For static slope-stability analysis, a factor of safety of 1.5; provided, for existing landslides where measured residual-strength parameters and advanced computer modeling are used a factor of safety of 1.3 may be accepted.
2. For seismic slope-stability analysis, a factor of safety greater than 1.0.

The above factors of safety shall be based on an appropriate calculation method, such as those recommended in the following publication, or equivalent:

Blake, T.F., Hollingsworth, R.A., and Stewart, J.P., editors, 2008, *Recommended procedures for implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California*: Los Angeles, California, Southern California Earthquake Center, 110 p., 1 appendix.

The above publication is currently available on the "External Publication" page of the Utah Geological Survey website (http://geology.utah.gov/ghp/consultants/outside_pubs.htm).

B. Surface-Fault Rupture:

Minimum building setbacks from identified normal faults shall be based on the greater of the setbacks obtained from either the Salt Lake County fault setback calculation method, or the minimum distances from Table 1, as presented in UGS publication MP 03-6, *Guidelines for Evaluating Surface-Fault Rupture Hazards In Utah* (see page 4 for Table 1, and pages 8-9 for the Salt Lake County setback calculation method). Setbacks from other types of faults shall be based on the recommendation of the licensed professional geologist.

C. Debris Flow:

No development of structures designed for human occupancy or critical facilities shall be located on an active alluvial fan unless the debris-flow hazard to the site has been mitigated to an acceptable and reasonable risk level *(defined term)*, without increasing the hazard to other properties. The construction of a debris basin(s) sized to accommodate the calculated debris flow is the most common mitigation method. Refer to Giraud, R.E., 2005.

D. Liquefaction:

No development of essential facilities shall occur in any area determined to have a moderate, high, or very high risk of liquefaction, except when no other site in a lower risk area is suitable. The rating of the hazard shall be made by a qualified geotechnical engineer competent in the field of seismic-hazard evaluation and mitigation, and be based on a geologic study of the site. If construction of an essential facility will occur in an area with a moderate, high, or very high liquefaction risk, the geologic report shall be prepared by a geologist and geotechnical engineer.

In the case of proposed subdivisions, the County may require the following, or similar, construction methods to be utilized for single-family detached houses in areas thought to have a high or very high liquefaction risk. (Based on Building Code Policy of Newport Beach, CA)

- § Tie all pad footings with grade beams
- § Have the bottom of all footings be at least 24" below grade.
- § On continuous footings, install at least two #5 steel bars at the top and bottom.
- § Make floor slabs on grade at least 5" thick, and reinforce with #4 steel bars at 12" on center, midway into the depth of the slab.
- § Dowel the footing to the slab with #4 steel bars at 24" on center.
- § If the soil material is sand, mix the top five feet of soil with cement (2 sacks per cubic yard) and compact in place; or, replace soil to a depth of five feet with imported material approved by a soils engineer.
- § Provide a 12" thick structural mat foundation.
- § Post-tension the slab and foundation.
- § Do not utilize caissons or pile foundations.

E. Rock Fall:

No development of structures intended for human occupancy or critical facilities shall be located in a rock-fall hazard area unless the hazard is mitigated to an acceptable and reasonable

risk level.

F. Land Subsidence and Earth Fissure:

No development of structures designed for human occupancy or critical facilities shall be located within a specified distance from an existing fissure, or projection of an existing fissure, as recommended by the engineering geologist performing the study.

In-ground pressurized or fluid-carrying infrastructure serving the proposed project shall not cross an existing fissure, or projection of an existing fissure, unless constructed or retrofitted to withstand the hazard, and provisions are in place to resolve any problems, such as contamination of the ground water or explosion risk, if a break were to occur.

Mitigation of an active land subsidence hazard will follow the requirements of the geologic study regarding the specific conditions of the site.

17.59.060 Scoping Meeting

Depending on the complexity of the geologic condition(s) of an area, the investigation and review process may range from relatively straightforward to extremely complex. The more complex geologic hazards, such as large landslides, may involve several steps of review, including a geologic evaluation, preliminary geotechnical-engineering evaluations, detailed geotechnical-engineering evaluations, and peer review. Geologic hazards requiring review by a geologist are typically more complex than those reviewed by geotechnical engineers, and therefore shall be subject to the following requirements for scoping.

If a geologist plans to do less than a complete study of the geologic hazard area that may impact the development, they must provide justification and attend a scoping meeting as described below. If a full study is planned, the scoping meeting is optional. Informal discussions/updates outside the context of the scoping meeting are also encouraged.

Iron County will be represented in the scoping meeting by the County Engineer, Building Official, Zoning Administrator, and County Planner, which together form a committee to recommend to the applicant and reviewing official whether the proposed scope of work of the geological review is adequate to identify and characterize the risk of the hazard to the proposed development, and constitutes a professional standard of care. The decision of this committee as to the adequacy of the proposed scope of work is non-binding. Provided, when the building permit application, subdivision application, zoning request, or other land use action is before the reviewing official with the accompanying results of the study, the reviewing official will consider the geologic report presented, and whether the extent of the report followed the committee's recommendation. If the reviewing

official finds the extent of the geologic report inadequate, it is grounds for denial of the building permit, land use application, or other development authorization.

The scoping meeting is to be held after the geologist has performed a preliminary geologic evaluation. The purpose of the scoping meeting is for the applicant and their geologist to meet with Iron County representatives to evaluate the geologist's geologic evaluation and intended investigative approach. At this meeting, the applicant shall present a work plan that includes locations of anticipated geologic hazards and locations of proposed exploratory excavations, such as trenches, borings, and CPT soundings, which meet acceptable standards of practice, and specifications of this chapter. The investigation approach shall allow for flexibility due to unexpected site conditions. Field findings may require modifications to the work plan.

Iron County may acquire a qualified consultant to assist in the scoping determination, and charge the applicant for the cost of the consultant's services to the County.

17.59.070 Geologic and Geotechnical Reports

Except as provided in 17.59.080, any applicant requesting approval for development within a geologic study area shall submit to Iron County five paper copies and one electronic copy of a site-specific geologic report or site-specific geotechnical report, as appropriate, which relates specifically to the type of geologic hazard(s) present on the site. The report shall meet the submittal requirements of this chapter, and be reviewed accordingly.

Geologic reports shall follow the guidelines presented in *Guidelines for Preparing Engineering Geologic Reports in Utah* (Utah Section of the Association of Engineering Geologists [AEG], 1986, or as subsequently amended). As noted in the publication, all elements of the guidelines should be considered during the preparation and review of the geologic reports. The degree of detail and scale of site geologic mapping should appropriately reflect the geologic complexity of the site.

A. Geologic reports shall be site-specific and identify all known or suspected potential geologic hazards that may affect the subject property, whether previously identified or not.

B. All geologic reports shall include the professional's qualifications, and the professional's original signature and seal. Geologic reports co-prepared by a geotechnical engineer and geologist must include both professionals' qualifications, original signatures, and seals;

C. Geologic reports shall include the following items:

1. A geologic vicinity map, at an appropriate scale (typically 1:24,000) and with references, showing the general surface geology (landslides, alluvial fans, etc), bedrock geology where exposed, bedding attitudes, faults, other geologic structural features, and location of any geologic hazards;

2. A detailed site geologic map and geologic cross section(s), at a scale equal to or more detailed than 1 inch = 100 feet, to illustrate local geologic structure. The site geologic map shall include locations of trenches, test pits, borings, etc, and site-specific geologic mapping performed as part of the geologic-hazard investigation, including boundaries and features related to any geologic hazards, topography, and drainage. The site geologic map must show the location and boundaries of the property, geologic hazards, recommended setback distances from the hazards, and recommended locations for structures. Buildable and non-buildable areas shall be clearly identified;

3. Trench and test pit logs, when applicable, prepared in the field and presented in the geologic report at a scale equal to or more detailed than 1 inch = 5 feet;

4. Boring logs, when applicable, prepared with standard geologic and engineering nomenclature;

5. An evaluation of aerial photographs, oblique aerial photographs, and DEMs derived from detailed topography and/or LiDAR or InSAR for the potential presence of geologic hazards;

6. Listing of aerial photographs used, technical references with citations, and other supporting information, as applicable;

7. Information regarding historical ground water highs and lows must be indicated in the report. Any vegetation or surface features that indicate perennially wet conditions or surface creep shall be identified on the site geologic map and discussed in the report;

8. Conclusions and recommendations, clearly supported by adequate data included in the report, that summarize the characteristics of the geologic hazards, and that address the potential effects of the geologic conditions and geologic hazards on the proposed development and occupants thereof, particularly in terms of risk and potential damage;

9. Any specific recommendations for additional or more detailed studies;

10. An evaluation of whether or not mitigation measures are required, including an evaluation of multiple mitigation options, and a recommendation of which method(s) should be used. When identifying proper hazard-mitigation methods, the following shall be considered, with avoidance of the hazard as first priority. A combination of hazard-mitigation methods may be necessary:

a. Avoid the hazard (e.g. locate the development improvement outside of the geologically hazardous area, do not take any action that would create or increase the magnitude of a geologic hazard);

b. Minimize the hazard potential to an acceptable level by limiting the degree or magnitude of a development action;

c. Eliminate, or reduce the hazard to an acceptable level—utilize accepted engineering methods to remove, rehabilitate, repair, or restore the affected hazard area to a safe condition;

d. Adapt to the hazard by designing/engineering structures or improvements to survive a hazard event;

e. Avert the hazard by using structural devices to capture or direct a hazard occurrence to a designated location where it will do no harm (e.g. dams and levees).

11. Design or performance criteria for engineered mitigation measures, with all supporting calculations, analyses, modeling or other methods, and assumptions.

12. Final design plans and specifications for engineered mitigation signed and stamped by a qualified geotechnical, civil and/or structural engineer, as appropriate. (Note: If the geologic report is submitted with a land use application that is reviewed prior to the construction or building plans [e.g. preliminary plat or conditional use permit], the engineering level design and calculations of the improvement do not need to be submitted until after a land use approval is obtained and construction approval is requested. However, the methods must still be identified.);

13. A statement regarding the suitability of the site for the proposed development from a geologic-hazard perspective.

D. Hazard-specific report guidelines are available for surface fault rupture, landslide/slope stability, and debris flow hazards. The guidelines were developed by the Utah Geological Survey and are to be used as a supplement to the general report guidelines listed above. They are available on the UGS website (http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm).

1. Surface-Fault-Rupture reports shall contain the items listed in the "Report Guidelines" section of the following publication:

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, RLINK"http://ugspub.nr.utah.gov/publications/misc_pubs/MP-03-6Guidelines.pdf"Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey Miscellaneous Publication 03-6, 14 p.

2. Landslide/Slope Instability reports shall contain the items listed in the "Report Guidelines" section of the following publication:

Hylland, M.D., 1996, Guidelines for evaluating landslide hazards in Utah: Utah Geological Survey Circular 92, 16 p.

3. Debris Flows reports shall contain the items listed in the "Report Guidelines" section of the following publication:

Giraud, R.E., 2005, Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah: Utah Geological Survey Miscellaneous Publication 05-6, 16 p.

17.59.080 Optional Process for Single-Family Residences, Accessory Development, and Excavation/Grading Activities in Geologic Study Areas.

When all of the requirements of this section will be met, as determined by the Iron County Zoning Administrator, a complete geologic report, as outlined in section 17.59.070, need not be submitted; the scoping meeting specified in 17.59.060 is not required; and, the standards of safety specified in 17.59.050 do not need to be demonstrated. The statements, conclusions, recommendations, and other requirements outlined in this section will be sufficient for the purposes of this ordinance, provided they are based on an adequate study of the geologic hazard(s).

The Zoning Administrator is authorized to develop and utilize an application form for the process outlined in this section. The plans and documentation demonstrating compliance with this section shall be submitted for review to the Iron County Zoning Administrator with a non-refundable $100.00 review fee. Development authorization granted pursuant to this section constitutes a "Geologic-Hazard Development Authorization--Optional Process". Iron County shall keep a record of all such authorizations granted.

A. The property must be a legal lot or parcel. The zoning administrator may request the applicant to provide the necessary deed(s) in order for him/her to make this determination.

B. The proposal must be for a single-family residence, development accessory to the single-family residence (e.g. driveway, swimming pool, retaining wall, well house), or excavation/grading activities not associated with any other land use or building permit review.

C. Provide a geotechnical report when required by §15.06.020(D), Iron County Code. Compliance with the recommended mitigation methods of the report (e.g. over-excavation, compaction, compaction testing, and drainage control), and with applicable building code soil bearing and foundation requirements, shall be demonstrated.

D. If located in a surface-fault, landslide/slope-instability, rock-fall, debris-flow, or earth-fissure geologic study area, a geologic evaluation of the site and surrounding area must be conducted by an engineering geologist (*see 17.59.040(C)*), to identify the presence or absence of any geologic hazards that may affect the property. A statement that is prepared, signed and sealed by the geologist must be provided, which contains the findings of the geological evaluation, any geologic mitigation needed, and identification of the suitable (geologically safe) location(s) on the lot for the proposed structure or improvement. Any mitigation of a geologic hazard that is recommended by the geologist must be implemented, including placement of the structure/improvement in a recommended location.

E. If located within a landslide/slope instability geologic study area, provide a signed and sealed statement from a qualified geotechnical engineer (*see 17.59.040(D)*), verifying that the slope stability of the proposed location of the structure or improvement will equal or exceed a 1.1 dynamic and 1.5 static factor of safety upon completion of the development provided, for existing landslides where measured residual-strength parameters and advanced computer modeling are used a static factor of safety of 1.3 is acceptable. The statement shall clearly identify any conditions or required mitigation methods necessary to provide such slope stability.

F. Provide a signed and sealed statement from a Utah licensed structural engineer, stating that he or she has reviewed the geologic/ geotechnical statement(s) and geotechnical report, and that he or she has designed the structure or improvement in accordance with the recommendations of such, to account for any identified geologic or geotechnical hazards in accordance with applicable International Building/Residential Code standards.

G. Provide written verification from the preparer(s) of the written statements requested in "D", "E", and "F" above of their liability insurance for professional errors and omissions in the amount of $1,000,000.00, or 125% of the market value of the improvement, whichever is greater. The insurance policy must be in effect on the date of issuance of the building permit or development authorization.

H. Any areas restricted from development due to the recommendation of the geologist or geotechnical engineer shall be clearly identified and staked in the field, and shall not be disturbed during construction.

I. The property owner(s) shall sign an acknowledgment that they are aware that the site is within a geologically hazardous area, that they have read the statements/reports required herein, and that they agree to abide by the recommendations thereof. The acknowledgment must be submitted with the building permit application.

J. Comply with all other applicable land use, building, and fire codes, including those pertaining to slope restrictions.

K. After issuance of the building or improvement permit and prior to footing placement, an excavation inspection report shall be submitted by the geologist or geotechnical engineer to the Building Official, which verifies that the proposed building or improvement is located in accordance with their recommendation. In addition, the Building Official may require, at any time prior to issuance of a certificate of occupancy, written verification from the geotechnical or structural engineer that the structure conforms to the recommendations of the reports and designs.

17.59.090 Review of Geologic and Geotechnical Reports

The following provisions apply to the review of geologic and geotechnical reports required by this chapter. They do not apply to the review of statements submitted pursuant to the requirements of 17.59.080(C thru F).

A. Iron County shall critically review any proposed development that requires preparation and review of a geologic or geotechnical report to determine the possible risks to the safety of persons, property and Iron County infrastructure from geologic hazards. The typical geologic hazard review process is illustrated through the flowchart found in Exhibit A, "Typical Geologic-Hazard Review Process".

B. Iron County shall critically review each geologic and geotechnical report and if necessary, require additional investigation and clarification. Iron County may request other experts to review the report and provide recommendations as to the adequacy of the report and proposed mitigation, the costs for which shall be incurred entirely by the applicant.

C. Iron County will complete each review in a reasonable period. Contingent on the geologic complexity of the project, reviews of geologic reports should be completed in 45 days. Review of geotechnical reports will typically take much less time.

D. All direct costs associated with the review of a geologic report shall be paid by the applicant, as set forth in section 17.59.120. Review of a geologic report is often an iterative process, and may require more than one review or field visit, depending on the quality of submittals, complexity of the proposal, etc.

E. Iron County shall retain a copy of each geologic/geotechnical report in the project file.

F. In reviewing the geologic/geotechnical report, Iron County shall determine whether the report complies with all of the following standards:

1. The report has been prepared by qualified professionals, as defined herein;

2. The report adequately defines the geologic hazard(s) and associated level of geologic risk to public or private property, safety, health, or welfare, whether off-site or on-site;

3. The report demonstrates that for the proposed development the identified geologic hazards can be mitigated to a level where the risk to human life and damage to property are reduced to an acceptable and reasonable level, in a manner which will not violate applicable federal, state, or local statutes, ordinances or regulations; or, the report recommends non-buildable areas where such cannot be demonstrated; and,

4. The geologist/geotechnical engineer has included with the geologic/geotechnical report a mitigation plan, as necessary, to reduce the risk from any geologic hazard regulated by this chapter to an acceptable and reasonable level. If ongoing maintenance or precautionary measures are necessary, the mitigation plan shall identify the proposed method for ensuring that such maintenance or precautionary measures are conducted. All acceptable mitigation methods must be reasonable and practical to implement and shall not require frequent, ongoing maintenance by the property owners.

G. Iron County may require the following to ensure that the purposes and standards of this chapter are met.

1. Require peer review to verify the work meets a professional standard of care, and/or to determine whether the mitigation measures recommended in the report are adequate. The qualifications required of the person(s) to conduct the peer review are the same as required to perform the study.

2. Based on the recommendations of the geologic report or peer review, impose specific mitigation requirements, require buildable and non-buildable areas to be delineated, limit slope grading, require disturbed areas to be revegetated, etc.

3. Prior to authorizing any development, ensure that the developer has reviewed and is committed to following the recommendations of the geologic/geotechnical report. If there are grading and construction plans for the development (e.g. subdivision proposals), the plans shall be signed and sealed by the licensed professional engineer and the geologist/geotechnical engineer that prepared the geologic/geotechnical report(s) to verify that their recommendations have been appropriately incorporated.

4. Dictate the installation of monitoring equipment and seasonal monitoring of surface and subsurface geologic conditions and groundwater levels;

5. Specify work windows or time schedules for completion of the mitigation and phasing of development.

6. Require grading plans, which shall include at least the following:

a. Maps of existing and proposed contours;

b. The existing and proposed slopes for each graded area;

c. The existing and proposed drainage patterns;

d. The location and depth of all proposed cuts and fills;

e. A description of the methods to be employed to achieve stabilization and compaction;

f. The location and capacities of proposed drainage structures and erosion control measures, based on maximum runoff for a 100-year storm;

g. The location of existing buildings or structures on or within 100 feet of the site, which could be affected by the proposed grading and construction;

h. A plan for the monitoring and documentation of testing, field inspections, and reporting to Iron County; and,

i. 24-hour contact information.

7. Require the submittal of as-built grading plans, which shall be prepared, signed and sealed by the licensed professional engineer and the geologist/ geotechnical engineer that prepared the geologic/geotechnical report(s) to verify that their recommendations have been appropriately incorporated and that building locations are approved, prior to the issuance of a building permit.

If any of the above seven items are to be required, it shall be so specified no later than during the review of the report. Efforts shall be made to identify necessary requirements as early in the review process as possible.

H. If the geologic or geotechnical report fails to meet the standards of this Chapter, or if the reviewing official determines additional information is needed pursuant to this subsection, the applicant will be given a reasonable time period to expand or correct the report. The time period, beginning when the request for additional information is relayed to the applicant, shall be no less than 90 days, nor more than 180 days, as determined by the reviewing official. Failure to provide the additional information within the time period specified shall result in expiration of the application.

17.59.100 Compliance with the Recommendations of the Geologic/ Geotechnical Report and Conditions of the Development Authorization

Unless specified otherwise by the reviewing official, all recommendations of the geologic/geotechnical report and the conditions of the development authorization, including

those specified during the review process of 17.59.090, are to be fully implemented during construction of the proposed development.

To ensure compliance, the following actions shall occur, unless specified otherwise by the reviewing official:

A. The geologist and/or geotechnical engineer that prepared the geologic/ geotechnical report(s) must be on site, at the cost of the applicant, during the applicable phases of construction—particularly during grading/excavation phases, deep foundation installation, and the construction of any retaining structures.

B. No final inspection shall be approved, no public improvement shall be accepted, no certificate of occupancy shall be issued, and no performance bond shall be released until the geologist/geotechnical engineer who signed the geologic/geotechnical report(s) certifies, in writing, that the completed improvements and structures conform to the descriptions and requirements contained in said report, and that all the required inspections were made and approved by the geologist and/or geotechnical engineer that signed said report(s).

17.59.110 Appeals

An applicant may appeal a decision made under the provisions of this chapter only after the reviewing official has issued a final decision on the application. The appeal shall set forth the specific grounds or issues upon which the appeal is based. The appeal shall be submitted in writing to Iron County in accordance with the appeal provisions of this title and Utah State Code.

An applicant who appeals the interpretation or administration of this geologic-hazard ordinance in a land-use decision may utilize the provisions of 17-27a-703 UCA, relating to a panel of experts to serve as the appeal authority for purposes of determining the technical geologic aspects of the appeal. The decision on the associated land use appeal shall still be made by the otherwise specified appeal authority, based on the decision of the panel of geologic experts. A joint hearing before the panel of geologic experts and the appeal authority is authorized and recommended.

17.59.115 Exceptions

Any exception to the requirements of this chapter is to be considered through the variance process of Chapter 17.64, and/or the constitutional takings review of Chapter 17.80.

Nothing within this chapter shall preclude Iron County from developing and adopting alternative geologic regulations for specific geological locations, provided the purposes of this chapter are maintained.

17.59.120 Fees

A. Scoping Meeting Fee. The fee to attend a scoping meeting with the County is $75.00, plus any cost for the County to acquire the services of a qualified consultant to assist in the scoping determination. Payment for the cost of the qualified consultant shall be made directly from the applicant to the consultant.

B. Application Fees.

1. The application fee for review of a required geologic study shall be the amount of costs actually incurred by the County. A deposit shall be paid by the applicant prior to the review of a required geologic report, in the amount of $250.00 when the geologic report appears relatively straightforward to the County, and $900.00 when the County believes that the geologic report and subsequent review will be complex or lengthy. Costs will be billed or refunded based on actual time and expenses incurred. Any amount due in excess of the initial deposit shall be paid by the applicant prior to receiving the requested development authorization.

2. The application fee for review of a required geotechnical study that is not associated with a building permit is $75.00.

C. Peer Review. The county may require peer review of studies, as set forth in this chapter. In such case, the applicant shall retain a qualified geologist/geotechnical engineer as appropriate to the type of geologic hazard(s) identified and be solely responsible for the costs thereof. Payment of such peer review consultant(s) shall be the direct responsibility of the applicant.

D. Appeal Fee. The appeal fee is established as the actual costs incurred by the County, provided if there are costs for a geologic panel pursuant to §17.27a.703(2) UCA, the County will contribute 50% of the cost of the panel. The appellant is responsible for 100% of all other associated costs.

17.59.130 Warning and Disclaimer

The following warnings and disclaimers are provided. The geologic study areas designated herein represent only those potentially hazardous areas known to Iron County and should not be construed to include all possible potential hazards areas. This ordinance and the geologic study areas may be amended as new information becomes available. The provisions of this chapter do not in any way assure or imply that areas outside the geologic study areas are free from the possible adverse effects of geologic hazards. This chapter shall not create any liability on the part of Iron County, any Iron County officer, Iron County reviewer, or Iron County employee thereof for any damages from geologic hazards that result from reliance on this chapter or any administrative requirement or decision lawfully made hereunder.

17.59.140 Conflicting Regulations

In cases of conflict between the provisions of this chapter and the zoning ordinance, building code, subdivision ordinance, or any other ordinance of Iron County, the most restrictive provision shall apply.

17.59.150 Iron County Geologic-Hazard acknowledgment

Property owners receiving a permit or approval for development regulated by this chapter and within an identified landslide/slope instability, debris-flow, surface-fault-rupture, rock-fall, liquefaction, land subsidence, or earth fissure hazard area (not just a study area) shall sign a Geologic-Hazard Acknowledgment Statement. The document shall be a County-approved form, which states that the property owner(s) acknowledge that the property is located in a geologically hazardous area, that they have received and read the geologic/geotechnical report(s) for the property, and that they agree to abide by the recommendations of the report(s).
The acknowledgment must be submitted with the building permit application.

Subdivision plats shall delineate where these geologic hazards, related setbacks, and non-buildable areas are located in the subdivision.

17.59.160 References

This ordinance represents a compilation of material from a variety of sources. A review of these sources will provide the reader with additional knowledge and understanding of the geologic hazards and review procedures summarized herein. These sources include:

Association of Engineering Geologists, Utah Section, 1986, Guidelines for preparing engineering geologic reports in Utah: Utah Geological and Mineral Survey Miscellaneous Publication M, 2 p., available online at http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm.

Biek, Robert F., et. al., 2010, Interim Geologic Map of the West Part of the Panguitch 30' x 60' Quadrangle, Garfield, Iron and Kane Counties, Utah: Utah Geological Survey Open File Report 577, scale 1:65,000.

Blake, T.F., Hollingsworth, R.A., and Stewart, J.P., editors, 2008, Recommended procedures for implementation of DMG Special Publication 117, Guidelines for analyzing and mitigating landslide hazards in California: Los Angeles, California, Southern California Earthquake Center, 110 p., 1 appendix, available online at
http://www.conservation.ca.gov/cgs/shzp/webdocs/Documents/sp117.pdf.

Christenson, G.E., Batatian, L.D., and Nelson, C.V., 2003, Guidelines for evaluating surface-fault-rupture hazards in Utah: Utah Geological Survey Miscellaneous Publication 03-6, 14 p., available online at **http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm**.

DuRoss, C.B., and Kirby, S.M., 2004, Reconnaissance investigation of ground cracks along the western margin of Parowan Valley, Iron County, Utah: Utah Geological Survey Report of Investigation 253, 17 p., available online at
http://geology.utah.gov/ghp/consultants/pubs/iron.htm.

Elliott, Ashley H., and Harty, Kimm M., 2010, Landslide Maps of Utah: Utah Geological Survey Map 246DM, Scale 1:100,000, available online at http://geology.utah.gov/maps/geohazmap/iron.htm

International Code Council, 2009, International building code: Country Club Hills, Illinois, 868 p.

—2009, International residential code: Country Club Hills, Illinois, 675 p.

Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M., 2008, Geologic hazards and adverse construction conditions, St. George—Hurricane metropolitan area, Washington County, Utah: Utah Geological Survey Special Study 127, 105 p, available online at **http://geology.utah.gov/maps/geohazmap/washington.htm**.

Lund, W.R., DuRoss, C.B., Kirby, S.M., McDonald, G.N., Hunt, G., and Vice, G.S., 2005, The origin and extent of earth fissures in Escalante Valley, southern Escalante Desert, Iron County, Utah: Utah Geological Survey Special Study 115, 30 p., available online at **http://geology.utah.gov/ghp/consultants/pubs/iron.htm**.

Giraud, R.E., 2005,Guidelines for the geologic evaluation of debris-flow hazards on alluvial fans in Utah: Utah Geological Survey Miscellaneous Publication 05-6, 16 p. ., available online at http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm.

Hylland, M.D., 1996,Guidelines for evaluating landslide hazards in Utah: Utah Geological Survey Circular 92, 16 p., available online at http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm.

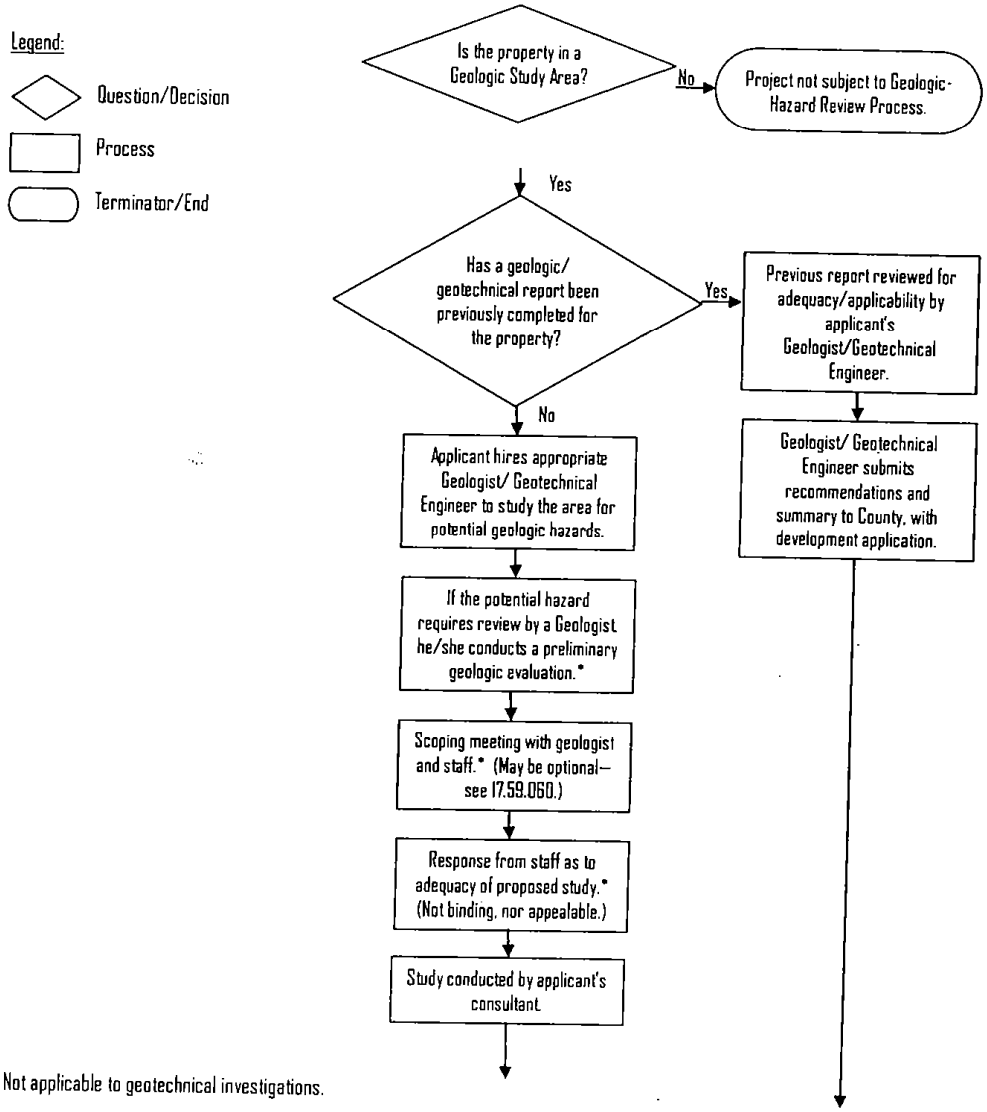
Morgan County, March 2010, Morgan County geologic hazards ordinance (incl. Appendices), Draft Version, and Adopted Version (June 2010).

Peter D. Rowley, et. al., 2006, Interim Geologic Map of the Cedar City 30' x 60' Quadrangle, Iron and Washington Counties, Utah: Utah Geological Survey Open File Report 476DM, scale 1:100,000, available online at **http://geology.utah.gov/maps/geomap/30x60/index.htm**.

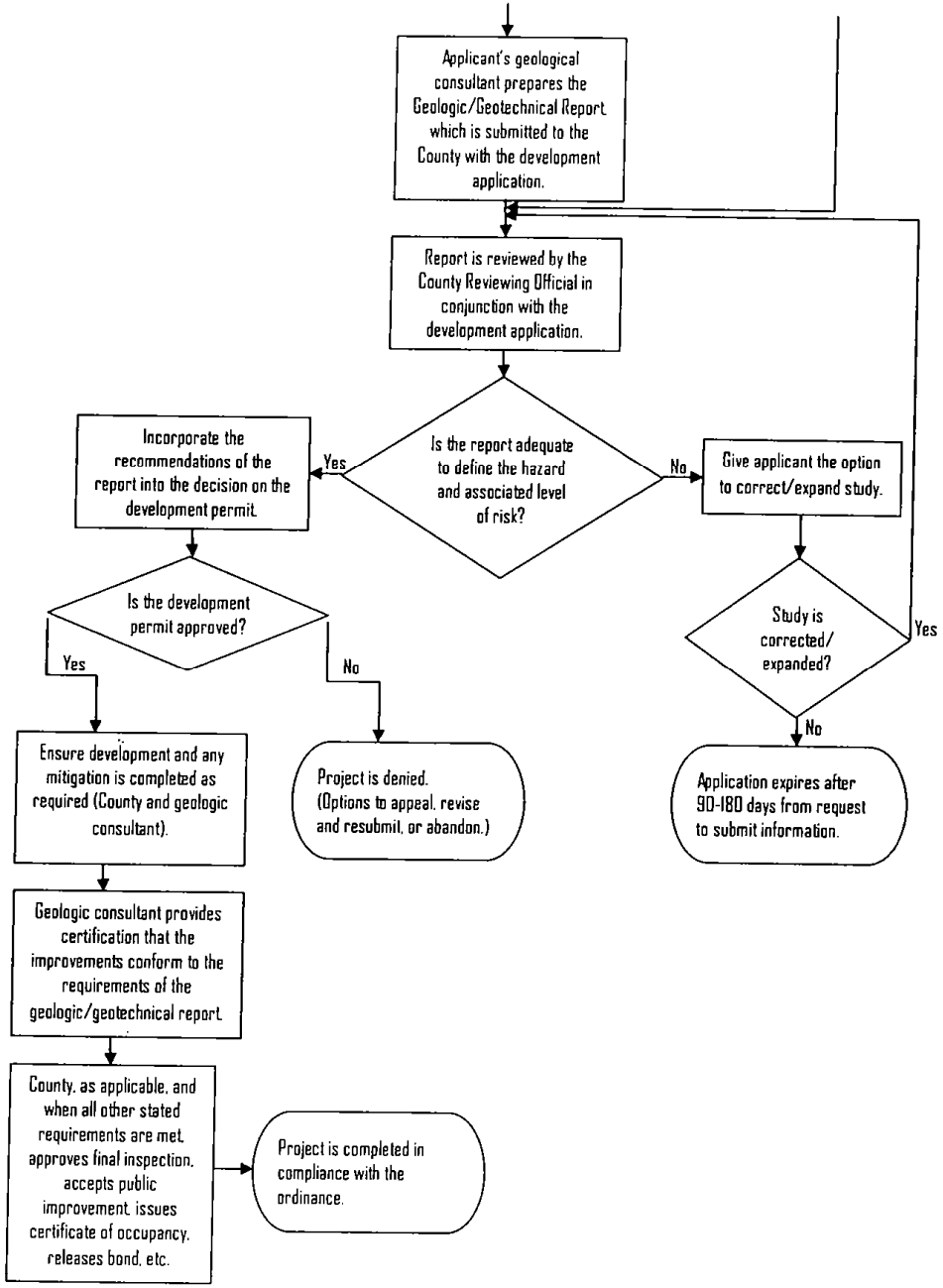
Utah Geological Survey, Geologic Hazards Program, Feb. 2010, Utah State Office of Education—Geologic-hazard report guidelines and review checklist for new Utah public school buildings: Utah State Office of Education, available online at **http://geology.utah.gov/ghp/consultants/rpt_guidelines.htm**.

U.S. Geological Survey, 2010, Quaternary fault and fold database of the United States: available online at http://earthquake.usgs.gov/hazards/qfaults/

TYPICAL GEOLOGIC-HAZARD REVIEW PROCESS



* Not applicable to geotechnical investigations.


Applicant's geological consultant prepares the Geologic/Geotechnical Report which is submitted to the County with the development application.
Report is reviewed by the County Reviewing Official in conjunction with the development application.
Is the report adequate to define the hazard and associated level of risk?
Yes
No
Incorporate the recommendations of the report into the decision on the development permit.
Give applicant the option to correct/expand study.
Is the development permit approved?
Yes
No
Study is corrected/ expanded?
Yes
No
Ensure development and any mitigation is completed as required (County and geologic consultant).
Project is denied. (Options to appeal, revise and resubmit, or abandon.)
Application expires after 90-180 days from request to submit information.
Geologic consultant provides certification that the improvements conform to the requirements of the geologic/geotechnical report.
County, as applicable, and when all other stated requirements are met, approves final inspection, accepts public improvement, issues certificate of occupancy, releases bond, etc.
Project is completed in compliance with the ordinance.