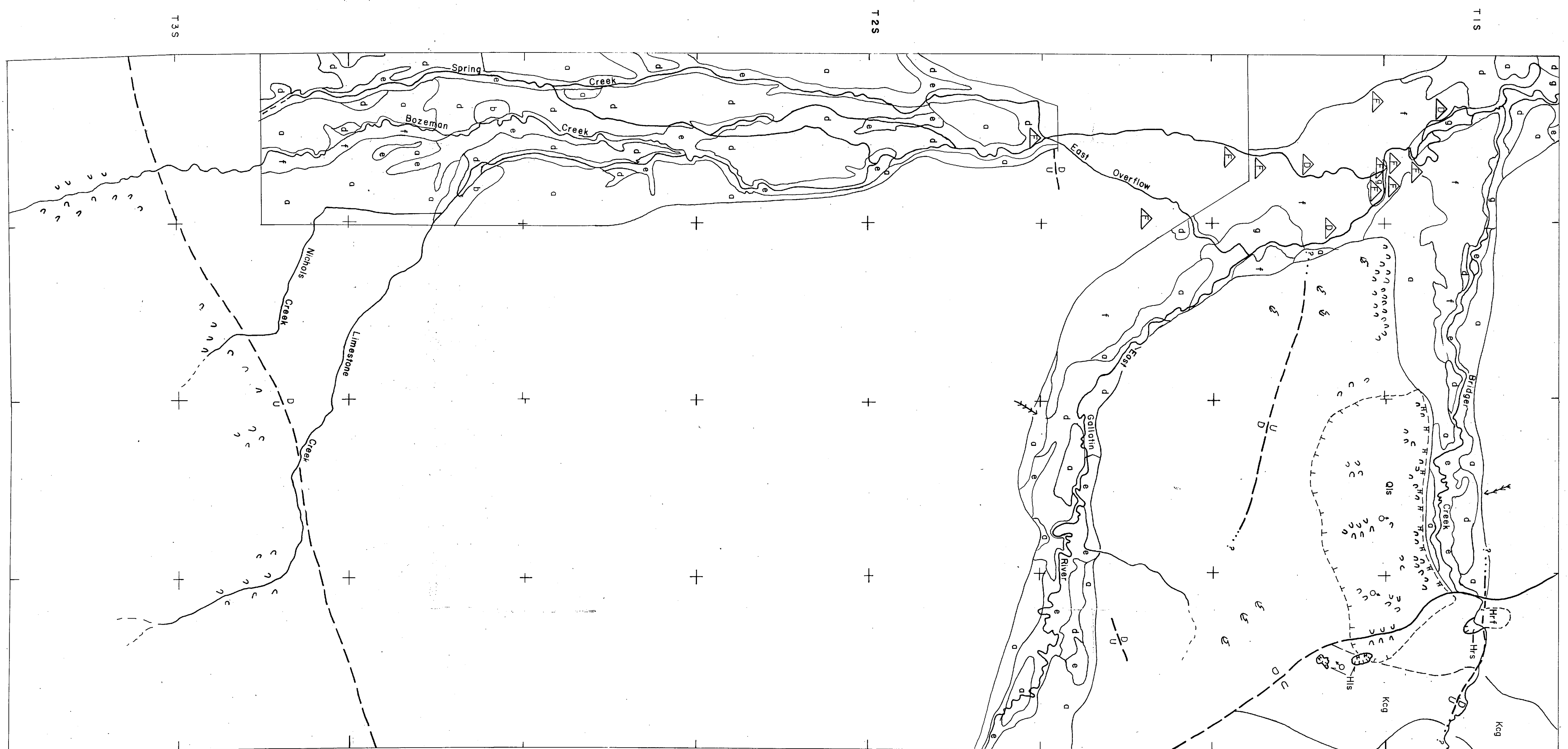
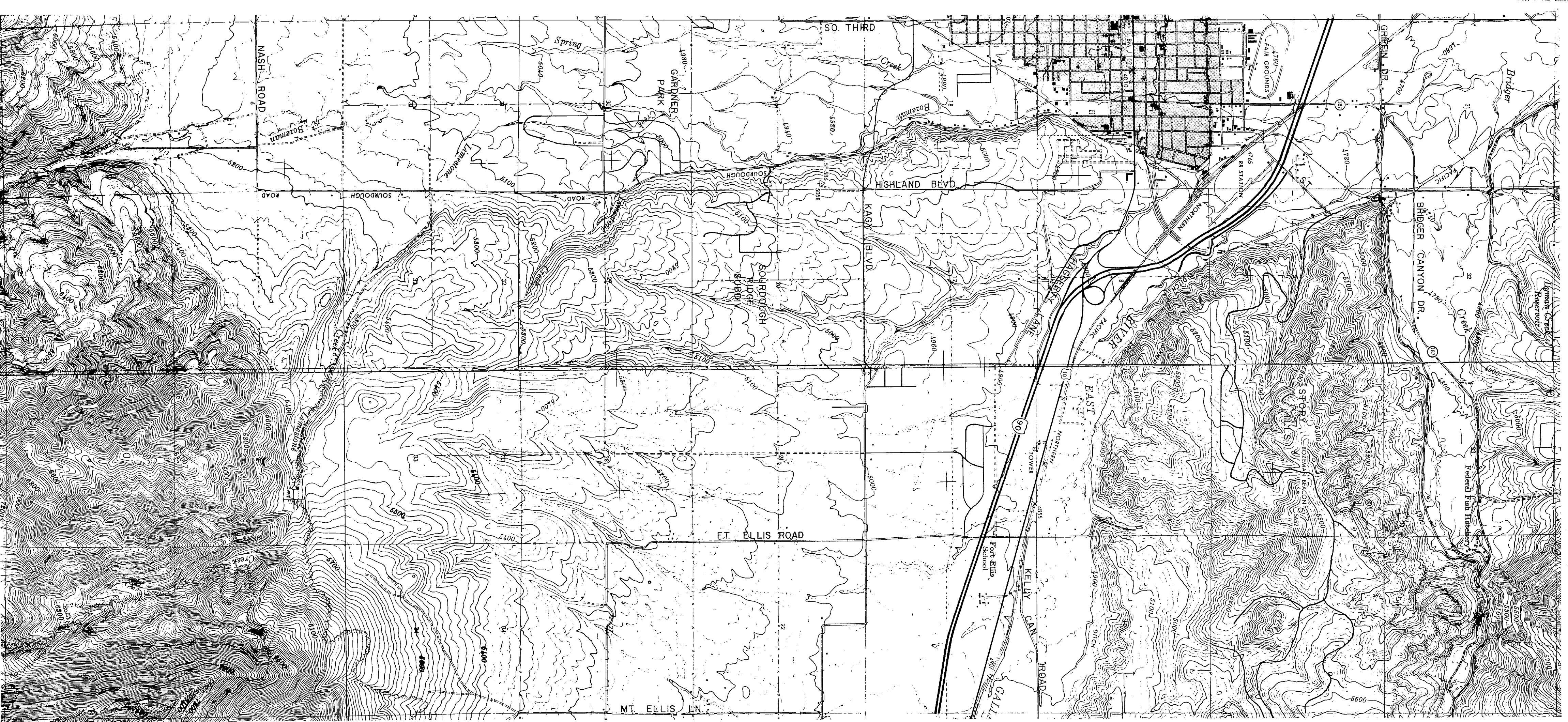
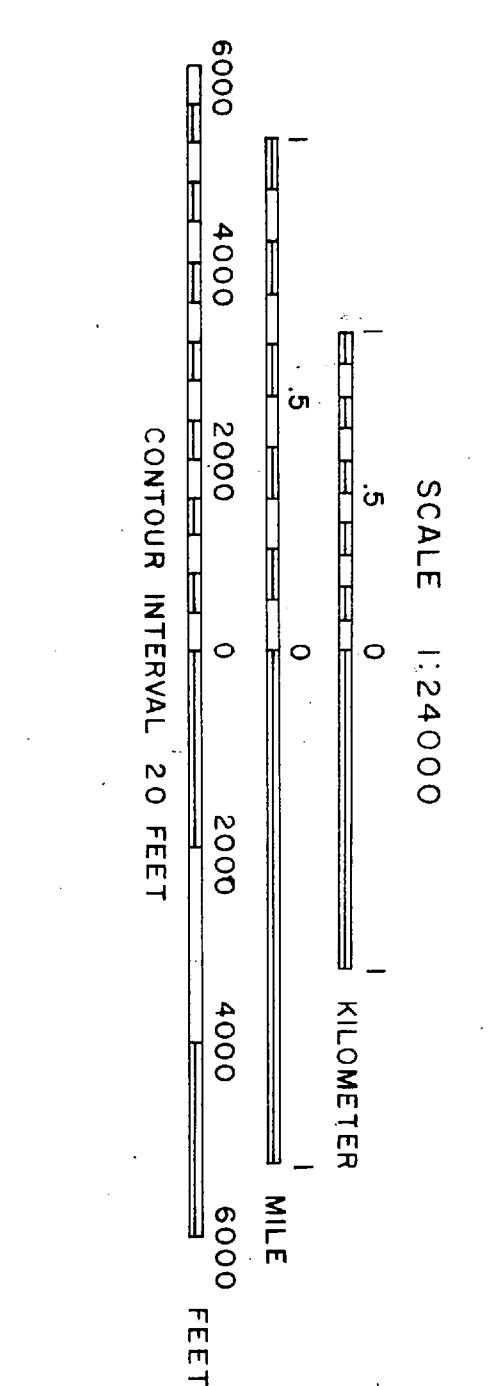
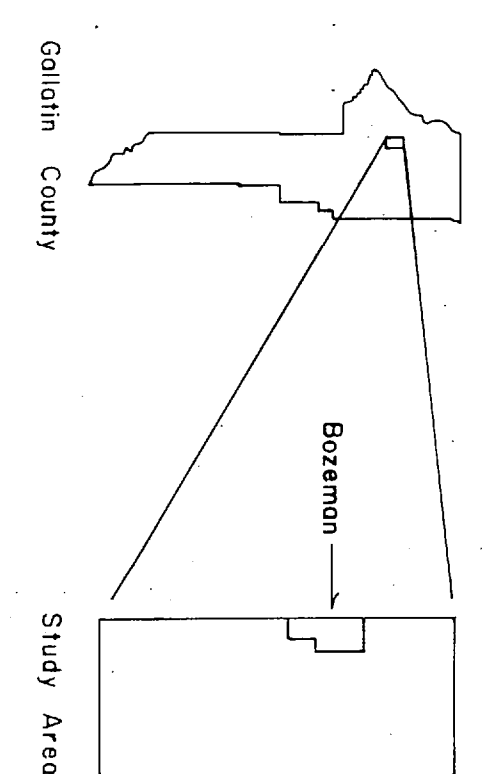
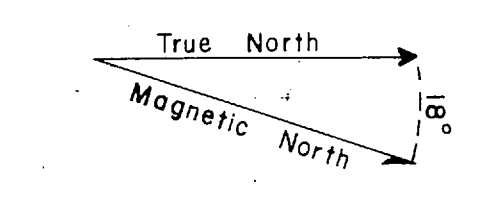


PLATE 4 GEOLOGIC CONSTRAINTS Southeast Margin of the Gallatin Valley



Base Map from U.S. Coast and Geodetic Survey
Upper Missouri River Basin Survey, 1947, B 1948
Map Numbers 87, 88, 97, B 98



The hazards from earthquake phenomena, especially ground shaking, exist throughout the study area. Ground shaking is related to earthquake magnitude, distance from the epicenter, area geology, and soil conditions. The geologic constraints on human activity in this context means the unconsolidated earth materials over bedrock. In general, unconsolidated earth materials display greater vibration amplitudes than bedrock. However, soft soils different from the induced vibration frequencies in bedrock or stiff soil. The duration of an event is important in its effect on soil response. For example, an increase in pore water pressure contact and the soil may undergo liquefaction. Some soils in the area are subject to liquefaction when wet.

The following guidelines apply to construction procedures:

1. In general, build tall buildings on bedrock or shallow soils. If this is not practical, then design the structure for the soil.
2. In general, build short buildings on deeper soils. Wood frame buildings tend to withstand seismic shaking rather well because of their inherent flexibility.
3. Avoid construction on silty or sandy soils which may be saturated periodically.
4. Avoid steep slopes, landslide areas, fault lines, and areas with potentially unstable slopes.

If possible, these areas should be utilized for parks or open space.

EARTHQUAKE HAZARDS

Mass movement hazards range from rapid unpredictable rockfall events to predictable slow creep. In some cases, avoidance is the best solution for extreme exposure. In some cases, avoidance is the best solution for extreme exposure. In some cases, avoidance is the best solution for extreme exposure.

MASS MOVEMENT HAZARDS

When exposure hazards range from rapid unpredictable rockfall events to predictable slow creep. In some cases, avoidance is the best solution for extreme exposure. In some cases, avoidance is the best solution for extreme exposure.

MASS MOVEMENT CONSTRAINTS

Geologic conditions which contribute to, or are indications of mass movement, and are not in conflict with human activity are mass movement constraints. Constraints reviewed here include steep, soilification and the inherently unstable Colorado group Colorado group rocks contribute to hazard conditions and thus deserve special attention.

COLORADO GROUP ROCKS: These units, located east of the Bridger Creek shear zone, contribute to existing hazard conditions because of a dip slope attitude and varied sand-shale lithology. Areas of human activity are generally limited to relatively minor hazard problems. Future use of this area must carefully weigh the risks of possible hazard generation against the necessity of human encroachment for development purposes.

CHERP: The slow downhill movement of soil debris from wetting or drying or deformation under the soil's own weight, and can crack foundation walls and cause tilting of utility poles. The slopes upon which it occurs, however, are often steep and thus limit human activity.

SOILFICTION: Slope movement caused by seasonal and diurnal freezing and thawing and saturation of surficial soil materials over a frozen sub-surface. The process appears restricted to areas of human activity. The process appears restricted to areas of human activity. The process appears restricted to areas of human activity.

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EXPLANATION

(Boundaries are approximate; statements are general; specific evaluations require on-site investigation.)

Soil Symbol	Geologic Constraints	Septic System	Excavations	Dwelling with Basement	Dwelling without Basement	Streets	Picnic Areas
a	Slight or moderate with moderate cap	Slight or moderate slow permeability	Slight or moderate to gravel 40 to 60 inches	Severe: HRP and DCP	Severe: HRP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
b	Slight or moderate with moderate cap	Slight or moderate slow permeability	Severe: HRP and DCP	Slight or moderate	Slight or moderate	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
d	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
e	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
f	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
g	Moderate or severe: depth 40 to 60 inches	Moderate or severe: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%

FLOODPLAIN SOILS - SCS, 1972

Soil Symbol	Geologic Constraints	Septic System	Excavations	Dwelling with Basement	Dwelling without Basement	Streets	Picnic Areas
a	Slight or moderate with moderate cap	Slight or moderate slow permeability	Slight or moderate to gravel 40 to 60 inches	Severe: HRP and DCP	Severe: HRP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
b	Slight or moderate with moderate cap	Slight or moderate slow permeability	Severe: HRP and DCP	Slight or moderate	Slight or moderate	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
d	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
e	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
f	Moderate: depth 40 to 60 inches	Moderate: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%
g	Moderate or severe: depth 40 to 60 inches	Moderate or severe: depth 40 to 60 inches	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Severe: HRP and DCP	Slight to severe: slopes 2 to 6% more than 6%