DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-871
LOUISVILLE QUAD., COLORADO

EXPLANATION

L — LANDSLIDE DEPOSITS--Masses of earth and rock that have moved downslope as earthflows and slumps that have formed along the margins of gravel-capped mesas where springs and seeps have saturated the underlying shaly or clayey parts of the Pierre Shale, the Laramie and the Arapahoe Formation (all Upper Cretaceous). The term landslide deposit is used for these mapped features because it is not known if they are actively moving at the time the aerial photographs were taken or sometime in the past. For a more complete discussion of landslides and their activity in the adjoining Golden quadrangle, the reader is referred to Simpson (1973)

A — ACTIVE LANDSLIDE--Man-induced and natural landslides. Induced landslides were caused by oversteepened slopes, excavation at the base of inactive landslides and leaking irrigation ditches. Activity of this type has been observed since 1971--particularly in May 1973 when as much as 4 inches of rain fell in the general area

S — AREAS SUSCEPTIBLE TO SLIDING--Generally slopes steeper than 10 percent, which is equivalent to a 10 m vertical rise for every 100 m measured horizontally. Geologic factors including rock type, seasonal water-table conditions and slope orientation also influence slope stability. For example, slopes of only a few degrees on saturated shale have failed. South-facing slopes are drier because the rate of evaporation is much higher and thus more stable than equally steep north-facing slopes. Slopes steeper than 10 percent that are underlain by sandstone units of the Fox Hills Sandstone (Upper Cretaceous) and the lower part of the Laramie Formation are generally not susceptible to large slope failures. However, they are included with this unit because the overlying veneer of colluvium is unstable and subject to slow to rapid downhill movement. Eroded deposits that lack recognizable landslide morphology may be present locally. Locally, slopes of less than 10 percent may be unstable, and a detailed geologic and engineering investigation should be conducted at sites prior to development

(blank) — AREAS BELIEVED TO BE STABLE UNDER CONDITIONS EXISTING IN 1971

——— CONTACT--Dashed where approximately located. Contacts around landslide areas are shown as solid lines but were compiled from aerial photographs several years old; consequently they may not exactly show the present outlines of landslide deposits. Limits of areas susceptible to landsliding are very approximate and thus are represented by dashed lines

NOTES TO MAP USERS
(Modified from Wright and Reid, 1975.)

Many landslides have been identified in various parts of the Front Range Urban Corridor. Inasmuch as landslide susceptibility is generally higher within or adjacent to areas that have a history of landsliding, maps that show the distribution of landslide deposits also indicate areas of potential natural and artificially induced landsliding. This map was prepared by viewing overlapping vertical aerial photographs with a stereoscope and by checking the results on the ground. This method allows the geologist to see a three-dimensional model of the terrain to be analyzed and thereby permits him to map the distribution and infer the nature and origin of various landforms.

Landslides were recognized on aerial photographs by a combination of such general features as (1) small isolated ponds, lakes, and other closed depressions; (2) springs; (3) abrupt and irregular changes in slope and drainage pattern; (4) hummocky or irregular surfaces; (5) steep, arcuate scarps; (6) irregular soil and vegetation patterns; and (7) level areas within steeper slopes. Most problems associated with the photointerpretation of aerial photographs are related to scale and quality of the photographs. Generally, features smaller than 60 m in largest dimension are not shown because they are too small to be clearly identified on the aerial photographs or clearly shown on the topographic base map. Photographs used to compile this map are of good quality and are from the following U.S. Geological Survey contracts: GS-VCUC (1971) scale 1:24,000; GS-VAP (1953) scale 1:46,000; GS-VAQC (1963) scale 1:17,400 and 1:25,600; GS-VBBL (1964) scale 1:17,400 and also Army Map Service photography made in 1955, scale 1:60,000.

REFERENCES

Malde, H. E., 1955, Surficial geology of the Louisville quadrangle, Colorado: U.S Geol. Survey Bull. 996E, p. 217-259.

Rahmanian, V. D., 1975, Deltaic sedimentation and structure of the Fox Hills and Laramie Formations, upper Cretaceous, southeast of Boulder, Colorado: Golden, Colorado School of Mines, M.S. thesis.

Simpson, H. E., 1973, Map showing landslides in the Golden quadrangle, Jefferson County, Colorado: U.S. Geol. Survey Misc. Ser. Map I-761B.

Spencer, F. D., 1961, Geologic map of the Louisville quadrangle, Colorado: U.S. Geol. Survey Geol. Quad Map GQ-151.

Wright, R. H., and Reid, G. O., 1975, Photointerpretive map of landslides and surficial deposits of northernmost Napa County, California: U.S. Geol. Survey Misc. Field Studies Map MF-677.

Base from U.S. Geological Survey, 1965, photorevised 1971.

SCALE 1:24000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

PHOTO INTERPRETIVE MAP SHOWING AREAS UNDERLAIN BY LANDSLIDE DEPOSITS AND AREAS SUSCEPTIBLE TO LANDSLIDING IN THE LOUISVILLE QUADRANGLE, BOULDER AND JEFFERSON COUNTIES, COLORADO

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