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FLOOD AND RELATED DEBRIS FLOW HAZARDS
LAS VEGAS SE QUADRANGLE
NEVADA

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PURPOSE AND SCOPE

This study was done in cooperation with the Nevada Bureau of Mines and Geology to estimate the 100-year flood peaks and corresponding flood plains on major drainages and to define flood- and debris-hazard zones. Statistically, a 100-year flood has a 1 percent chance of being equaled or exceeded in any one year. Peak flows equal to the 100-year flood may occur several times, or not at all, within any given 100-year period. Floods greater or less than the 100-year flood, however, may occur in any area at any time.

The estimates of 100-year peak flows for the major drainages in the study area, which were used in this report, were determined by the U.S. Soil Conservation Service (SCS) in an extensive flood investigation of the area (Soil Conservation Service, 1978). Different estimates may be obtained depending upon the analytical methods used, but the values were considered reasonable and within the limits of accuracy based on the available data.

The SCS delineations of the flood plains were used for the most part except in the central and southern parts where their delineations do not fit this type of presentation. Their results, however, were considered in the flood and debris classifications shown on the Flood- and Debris-Hazard map (NBMG Map 3A1).

Water depths and velocities were determined from actual measurements of the July 1975 flood and on the SCS estimated values. The estimates of sediment transport were based on the work of Glancy (1969), Glancy and Harmsen (1975), Glancy and Katzer (1977), Katzer, and others (1976), Katzer and Glancy (1978), and numerous field investigations of flash floods by the author.

PHYSIOGRAPHY

The Las Vegas SE quadrangle area is in the southeastern part of Las Vegas Valley, and receives surface-water runoff from the surrounding mountains, alluvial fans, and upgradient parts of the valley floor. The area is drained by Las Vegas Wash which terminates in Lake Mead on the Colorado River.

FLOOD AND DEBRIS HAZARDS

Historical floods in Las Vegas Valley have been partially listed by Katzer and others (1976) and more completely by the SCS (1977). Thunderstorms have produced the most intense precipitation and caused more damage than other type storms. The July, 1975 thunderstorm was probably the most severe since records have been kept. Peak flows in most major drainages exceeded any previously measured or estimated and damage estimates were between 4 and 5 million dollars.

Hydrologically, the Las Vegas SE quadrangle is bounded on the northeast by Las Vegas Wash, on the northwest by Flamingo Wash, and on the south by the drainages from the McCullough Range. Duck Creek traverses the central part of the area.

The estimated 100-year flood peak on Las Vegas Wash is 19,000 ft^3/s (538 m^3/s). Water depths may exceed 10 ft (3 m) in some areas and mean velocity range from about 2 to 4 ft/s (0.6 to 1.2 m/s). Locally, maximum velocities may exceed 10 ft/s (3 m/s). Sediment transported will consist of mainly fine-grained material and will present no special hazard. Road crossings will probably be washed out; however, under current conditions channel erosion will be minimal throughout most channel reaches because of the dense vegetal growth. An exception is the 15-20 ft (5-6 m) of vertical headcutting that is moving upstream in Las Vegas Wash about 2.5 mi (4 km) downstream from where Las Vegas Wash exits the Las Vegas SE quadrangle. The headcutting is accelerated during periods of runoff; if it continues unchecked it will eventually reach the Las Vegas SE quadrangle and will destroy road crossings and marshlands, thus affecting wildlife habitat and reducing the natural biochemical filtering effects of the vegetation on water pollutants. Continuing accelerated sediment loads downstream from the headcutting will effect physical, chemical, and biological changes downstream and eventually in Lake Mead.

The estimated 100-year flood peak on Flamingo Wash is 3,500 ft^3/s (99 m^3/s). If the bridges on Tioga and Eastern Avenues become blocked by debris, the flow will be forced over them but will still stay in the flood-channel area. Debris will consist of fine- to coarse-grained sediment. Water depths may reach a maximum of 5 ft (1.5 m) and maximum water velocities should be less than 10 ft/s (3 m/s). However, the effective channel width is being decreased by the dumping of fill in the form of concrete and asphalt chunks and other manmade debris and this action will tend to increase water depths and velocities in the main channel. Some reaches of the channel bottom consist of well-cemented gravel which is highly resistant to erosion, thus vertical erosion may be minor in these reaches compared to lateral erosion.

The estimated 100-year flood peak on Duck Creek is about 3,900 ft^3/s (110 m^3/s). Water depths will generally be less than 5 ft (1.5 m) except where the creek bounds the northerly edges of the Whitney Mesa. There, depths may reach a maximum of 10 ft (3 m), and locally range up to 15 ft (5 m). Mean water velocity will range from about 2 to 10 ft/s (0.6-3 m/s) with maximum velocities about 15 ft/s (5 m/s) in some areas. Debris moved by these flows will consist of mostly fine- to coarse-grained sediments with some small cobbles.

There are many homes on the flood plain of Duck Creek which will probably be damaged to some extent in a 100-year flood. Additionally, the heavy vegetal growth in the channel and flood plain will promote debris clogging of the channel by retarding floating debris and may force water out of its established flood plain into areas that are generally considered outside of the 100-year flood plain.

The McCullough Range drainages are subject to extreme flooding in some areas. In contrast to the rest of the quadrangle, McCullough Range channels contain sediments of all sizes, including large boulders, that are readily available for transport. The SCS (1978) has estimated the 100-year flood from several of these drainages to be about 200 $(ft^3/s)/mi^2$ [$(5.7\ m^3/s)/km^2$] of drainage area. Individual drainage areas within the mountain block encompass only a few

square miles; however, when they reach the alluvial fans some combine with adjacent drainages. Many drainages on the alluvial fans are generally poorly entrenched, commonly perched on or near a crown, and can cause widespread sheet flow and shallow flooding. Relatively minor changes in flow depth throughout areas of possible inundation will occur through a significant range in peak flow.

The paths the flood flows will follow are quite variable and depend upon obstructions, both natural and manmade. Debris-bearing floods readily abandon shallow channels when debris unpredictably blocks the channel and diverts the flow. Thus, some areas that appear safe from water-dominated flooding could be subjected to serious flooding and debris hazards caused by unpredictable debris-diverted flow.

The map boundaries between the various flood-debris hazard zones are controlled by the relationship between water depth, velocity, and character of debris. All zones are probably present to some degree in any given flood; however, it is impractical to show them. The change from one hazard zone to another is not a stable, definitive boundary and should be considered a gradational zone that can fluctuate under different types of flow conditions. Additionally, within any given flood-debris hazard zone there may be areas that are either more or less hazardous than indicated. These areas are not shown because either they are too small in areal extent or it was economically infeasible to evaluate them within the scope of this project. Thus, adequate planning for specific areas or sites requires detailed on-site mapping with great attention to the combined effects of the flood peaks and their accompanying debris loads.

LAND ALTERATION

The hazardous areas outlined on the flood and debris hazard map may either increase or decrease in size and degree of hazard in the future because of man's and nature's activities. For example, construction on flood plains may divert flood peaks into areas that otherwise would be flood free. Channel improvement projects could increase channel capacities and thereby reduce local hazards but may increase hazards downstream from the project. Urbanization commonly increases surface-water runoff which may contribute to local flooding; thus, any modification of the present hydrologic system has many ramifications and should be made only after careful evaluation of the probable effects.

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