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In cooperation with the Nevada Department of Transportation

Flood of July 8, 1999, in Las Vegas Valley, southern Nevada

Background

The Las Vegas, Nev., metropolitan area (Fig. 1) experienced some of the worst flooding in recent years on July 8, 1999, when thunderstorms passed through Las Vegas Valley. Floodwaters from these thunderstorms caused damage to public property amounting to $20,500,000 and damaged or destroyed 369 homes (Manning, 1999). Also attributed to the floodwaters were two fatalities—one by drowning in Flamingo Wash and the other in a traffic accident (Schoenmann, 1999). This fact sheet characterizes the atmospheric conditions and documents the peak-discharge estimates from this flood event.

Las Vegas Valley is drained by Duck Creek, Tropicana Wash, Flamingo Wash, Las Vegas Wash, and several smaller tributaries. Water in these drainages generally flows eastward through Las Vegas to Las Vegas Wash and on toward Lake Mead, an impoundment of the Colorado River. Within the Las Vegas drainage basin are several flood-control facilities that were designed by the Clark County Regional Flood Control District to store water from flash floods temporarily to mitigate downstream flooding and property damage.

Las Vegas Valley is in a region characterized by a series of northward-trending mountain ranges and intervening valleys filled by eroded sediments (Purkey and others, 1994). One component in the eroded sediments is calcium carbonate, the main ingredient of limestone. When calcium carbonate mixes with moisture and then dries, caliche is formed (Skinner and Porter, 1992). The presence of caliche throughout Las Vegas Valley is significant because it is nearly impervious to water. The combination of widespread caliche, soil moisture, and antecedent conditions such as urban growth can result in flash flooding and subsequent high-volume runoff from relatively moderate precipitation amounts.

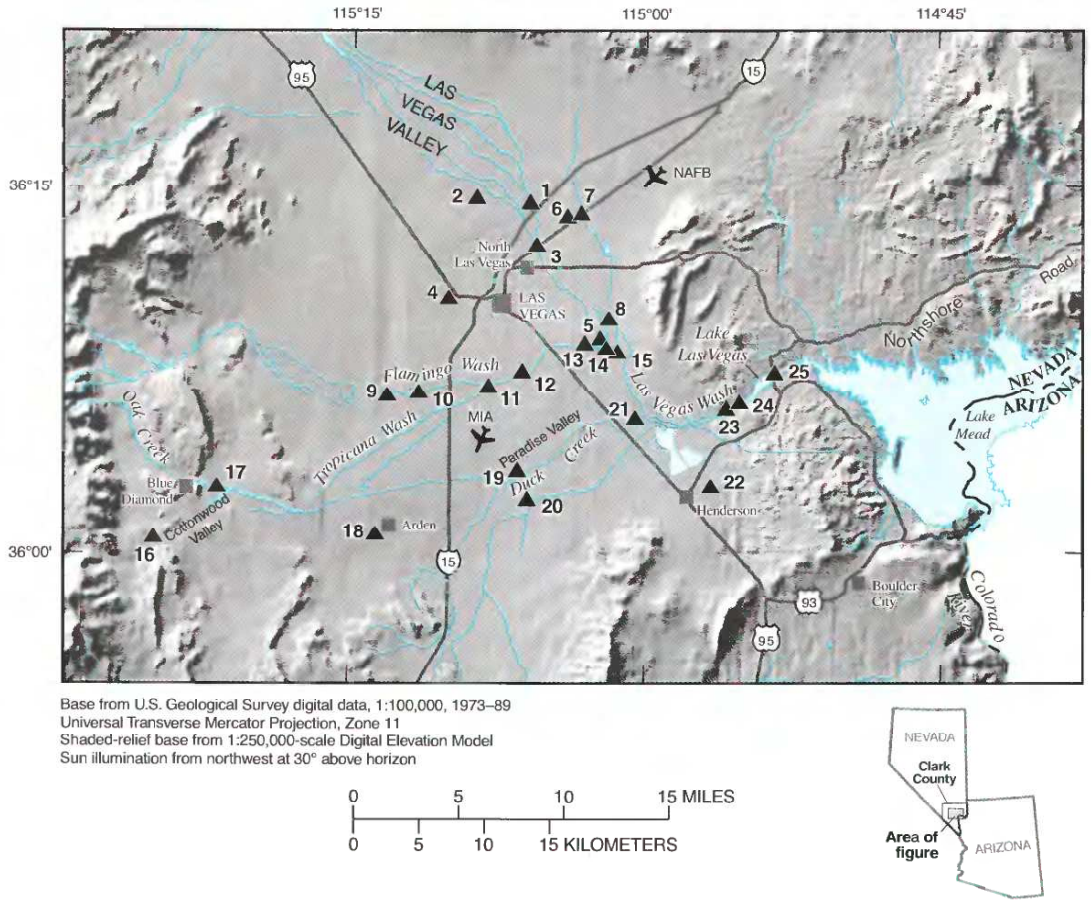

Figure 1. Geographic and hydrologic features in Las Vegas Valley, southern Nevada. Triangles locate streamflow-gaging stations; labels indicate site numbers used in report. MIA, McCarran International Airport; NAFB, Nellis Air Force Base.

Data Collection

The U.S. Geological Survey operates a network of streamflow-gaging stations (Fig. 1) in Clark County in cooperation with the Nevada Department of Transportation and other Federal, State, and local agencies. Data from the stations are crucial for water-supply planning, flood monitoring and warning, emergency response, dam and reservoir-system operation, establishing flood-insurance rates, and engineering and maintenance of bridges, roads, and other structures.

Most of these stations provide real-time data through satellite relay or radiotelemetry. Data from the stations are used by the National Weather Service , the Clark County Regional Flood Control District, and other agencies to manage water supplies, forecast floods, and issue flood warnings.

U.S. Geological Survey field crews obtained some of the highest discharge (flow) measurements ever recorded at several gaging stations within the Las Vegas Wash drainage basin during the July 8, 1999, flood (Fig. 2). Hydraulic surveys were made immediately after the flood to determine peak discharge at stations where field crews were unable to obtain discharge measurements during the high flows. The data contribute to understanding flood behavior, enhance efforts to minimize destruction caused by floods, and provide data for planning.

Peak Discharges

Information on peak discharges for selected gaging stations (Fig. 1) in Las Vegas Valley is shown in the accompanying table. The data include July 1999 peak discharges, gaging-station period of record, and date and magnitude of the largest historical peak discharge recorded prior to July 1999 (Kane and Wilson, 2000).

Flood of July 8, 1999

On July 8, several precursers for severe weather merged in the Las Vegas Valley. The presence of high amounts of precipitable water and instability in the lower portions of the atmosphere provided the needed heat and potential energy. The triggering mechanism for the heavy rainfall was an inverted trough in the middle to upper levels of the atmosphere (Haro and others, written commun., 1999).

Intense rainfall in the Las Vegas Valley on the order of 3 to 5 inches of rain per hour was not uncommon; many precipitation gages recorded 1.5 to 3.0 inches of rain in a 60- to 90-minute period (Timothy E. Sutko, Clark County Regional Flood Control District, written commun., 1999).

Erosion, channel scour, and sediment deposition were observed by U.S. Geological Survey field crews along Duck Creek, Flamingo Wash, and the lower part of Las Vegas Wash just upstream from Lake Las Vegas Resort[1]. Street flooding was widespread in the valley as multiple intersections and major streets pooled or channeled runoff. Flamingo Wash had extensive channel scour and sediment deposition upstream from its confluence with Las Vegas Wash. Several homes and businesses in the Flamingo Wash drainage were damaged or destroyed when flow in Flamingo Wash left its channel and eroded its stream banks (Koch and Radke, 1999; Radke, 1999). At the Lake Las Vegas[1] dam, streamflow exceeded the capacity of the two bypass conduits and the overflow culverts and flowed over the road into the lake (Fig. 2).

Runoff from the storm occurred in nearly all the tributaries to Las Vegas Wash. Peak flows for the period of record occurred in Duck Creek (sites 19 and 21, Fig. 1), Flamingo Wash (sites 12 and 13), Bird Spring wash (site 18), and North Las Vegas detention-basin outlet (site 1). At Flamingo Wash at Eastern Avenue (site 12) a peak flow of 6,800 cubic feet per second was the highest measured since 1969. Peak flows along Las Vegas Wash were measured also at Las Vegas Wash near Sahara Avenue (site 5), below Flamingo Wash confluence (site 14), at Vegas Valley Drive (site 15), above Three Kids wash (site 22), and at Las Vegas Wash overflow at Lake Las Vegas inlet (site 23; Fig. 2). A peak flow of 18,000 cubic feet per second at Las Vegas Wash above Three Kids wash was the highest measured in Las Vegas Wash for more than 40 years. At Las Vegas Wash near Boulder City (site 24; Fig. 3), a peak flow was estimated to be 10,700 cubic feet per second, which included the combined flows of Las Vegas Wash through the bypass conduit and Lake Las Vegas spillways (Steven Weber, Lake Las Vegas Resort, oral commun., 1999).

The usefulness of flood-control facilities (Zapler, 1999), streamflow monitoring, and proper atmospheric monitoring cannot be overstated. For the foreseeable future, the Las Vegas Valley, because of its location, topography, and urban growth, likely will continue to be affected significantly by flash floods.

—Daron J. Tanko and Richard L. Kane

Figure 2. Views of Las Vegas Wash overflow at Lake Las Vegas inlet (site 24, Fig. 1), July 8, 1999, showing floodwaters (near peak flow, 17,000 cubic feet per second) discharging into lake through culvert structure and over road. Photograph by David Beck, U.S. Geological Survey.

[1]"Lake Las Vegas Resort" and "Lake Las Vegas" are unofficial names in local use for a residential-resort development east-southeast of Las Vegas, Nev. Water flows into the lake from Las Vegas Wash and its tributaries during extreme flow events.

Peak discharges at selected sites in Las Vegas Valley, southern Nevada

[Site no.: Number used to identify gaging station in Fig. 1. Peak-discharge data are reported to differing accuracies depending on method of computation (such as whether instantaneous-discharge measurement or indirect computation) and on assessed data quality; data were compiled from U.S. Geological Survey (1974, 1976), Frisbie and others (1984, 1985), Bostic and others (1997), Bonner and others (1998), and Preissler and others (1999) and from unpublished data on file at U.S. Geological Survey offices in Las Vegas, Nev.]

Site no.	Streamflow-gaging station		Peak discharge, July 8, 1999 (cubic feet per second)	Period of record through 1999 (water years)	Largest historical peak discharge recorded prior to July 8, 1999	
	Number	Name			Date	Magnitude (cubic feet per second)
1	09419649	North Las Vegas detention-basin outlet at Craig Road near North Las Vegas, Nev.	551	1992–99	August 14, 1998	250
2	094196497	Gowan detention-basin outlet near North Las Vegas, Nev.	608	1991–99	August 9, 1997	644
3	09419650	Las Vegas Wash at North Las Vegas, Nev.	2,600	1963–78, 1982–99	July 3, 1975	12,000
4	094196557	Las Vegas creek at Meadows detention basin at Las Vegas, Nev.	141	1989–99	July 15, 1996	195
5	09419658	Las Vegas Wash near Sahara Avenue near Las Vegas, Nev.	8,100	1975, 1988–99	September 11, 1998	4,400
6	09419659	Sloan channel tributary at Las Vegas Boulevard near North Las Vegas, Nev.	440	1988–99	September 11, 1998	920
7	09419660	Las Vegas Wash tributary near Nellis Air Force Base	20	1961–84, 1986–99	October 9, 1972	618
8	09419665	Sloan channel at Charleston Boulevard near Las Vegas, Nev.	441	1988–99	September 11, 1998	1,230
9	09419673	Flamingo Wash at Torrey Pines Drive near Las Vegas, Nev.	1,000	1988–99	July 16, 1990	3,920
10	09419674	Flamingo Wash at Decatur Boulevard at Las Vegas, Nev.	3,000	[1]1965–81, 1983–90, 1992–99	August 10, 1983	4,760
11	09419676	Tropicana Wash at Swenson Street bridge at Las Vegas, Nev.	2000	1983–84, 89–99	July 20, 1998	4,000
12	094196775	Flamingo Wash at Eastern Avenue near Las Vegas, Nev.	6,800	[2]1969–99	August 10, 1983	4,700
13	094196781	Flamingo Wash at Nellis Boulevard near Las Vegas, Nev.	5,600	[3]1969–87, 1989–99	June 10, 1990	4,100
14	094196783	Las Vegas Wash below Flamingo Wash confluence near Las Vegas, Nev.	11,000	1984, 1986, 1996–99	September 11, 1998	6,100
15	094196784	Las Vegas Wash at Vegas Valley Drive near Las Vegas, Nev.	11,000	1984, 1999	July 22, 1984	6,500
16	09419680	Cottonwood Valley near Blue Diamond, Nev.	200	1961–99	January 25, 1969	1,100
17	09419682	Oak Creek wash near Blue Diamond, Nev.	700	1987–99	August 16, 1990	820
18	09419685	Bird Spring wash near Arden, Nev.	40	1987–99	July 20, 1998	35
19	09419688	Duck Creek at Eastern Avenue at Paradise Valley	4,300	1974, 1984, 1987–96, 1999	August 19, 1984	4,130
20	09419695	Pittman wash at Wigwam Parkway near Henderson, Nev.	376	1988–99	September 11, 1998	1,450
21	09419696	Duck Creek at Tropicana Avenue at East Las Vegas, Nev.	3100	1980–89, 1998–99	September 11, 1998	3,000
22	09419740	C-1 channel near Warm Springs Road at Henderson, Nev.	180	1990–99	August 10, 1997	2,700
23	09419753	Las Vegas Wash above Three Kids wash below Henderson, Nev.	18,000	[4]1957–99	September 11, 1998	9,600
24	09419756	Las Vegas Wash overflow at Lake Las Vegas inlet	17,000	1991–99	September 11, 1998	9,560
25	09419800	Las Vegas Wash near Boulder City, Nev.	10,700	1969–84	August 14, 1984	7,760

[1]During 1965–81, equivalent station operated at Flamingo Wash at Las Vegas, Nev. (09419675).

[2]During 1969–89, equivalent station operated at Flamingo Wash at Maryland Parkway at Las Vegas, Nev. (09419677).

[3]During 1969–87, equivalent station operated at Flamingo Wash near mouth at Las Vegas, Nev. (09419678).

[4]During 1957–87, equivalent station operated at Las Vegas Wash near Henderson, Nev. (09419700).

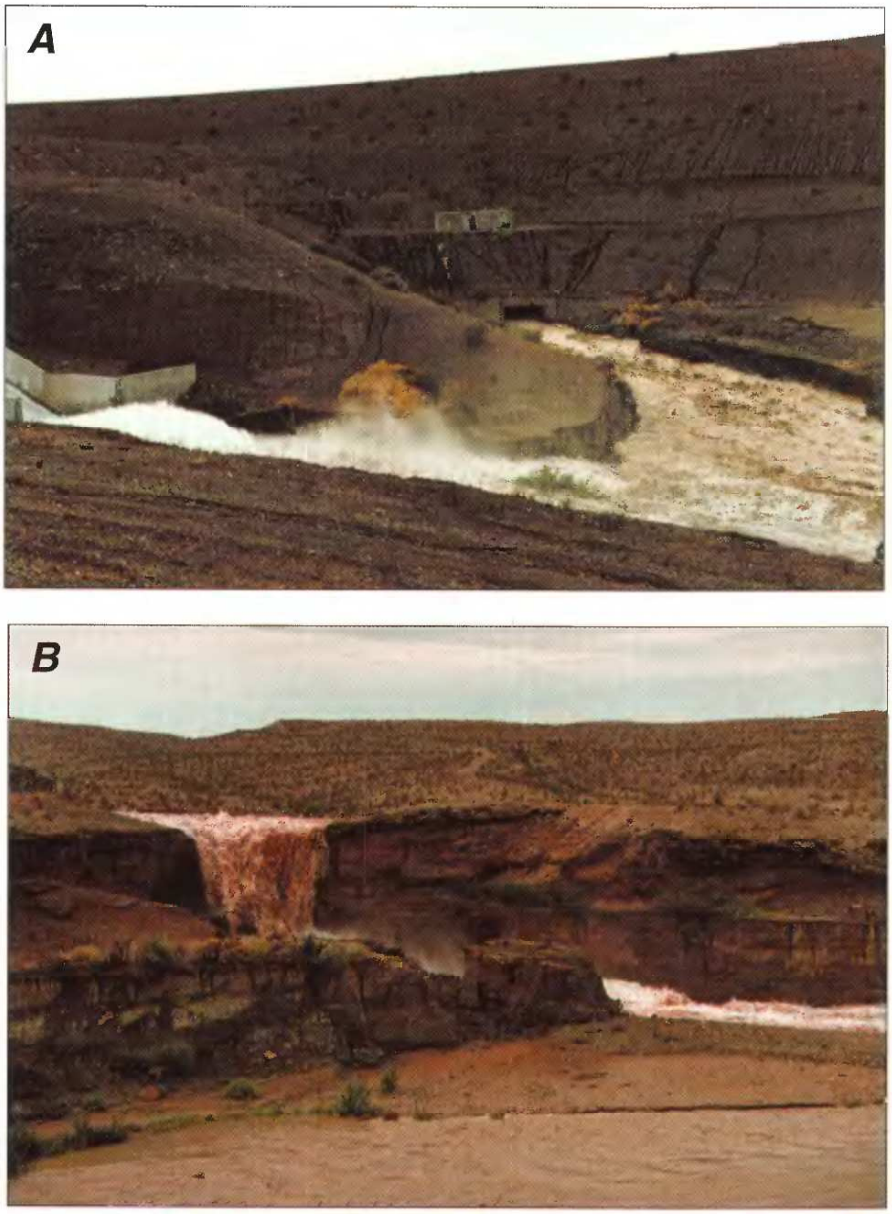

Figure 3. Las Vegas Wash near Boulder City (site 25, Fig. 1), looking upstream from Northshore Road bridge, showing estimated peak outflow of 10,700 cubic feet per second from Lake Las Vegas and Las Vegas Wash. Photographs taken by David Beck, U.S. Geological Survey. *A*, Lake Las Vegas overflow service spillway (left) and Las Vegas Wash outflow conduit (right). *B*, Lake Las Vegas overflow auxiliary spillway.

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