Rainfall & Flood Event Report
August 21-22, 2012

prepared by
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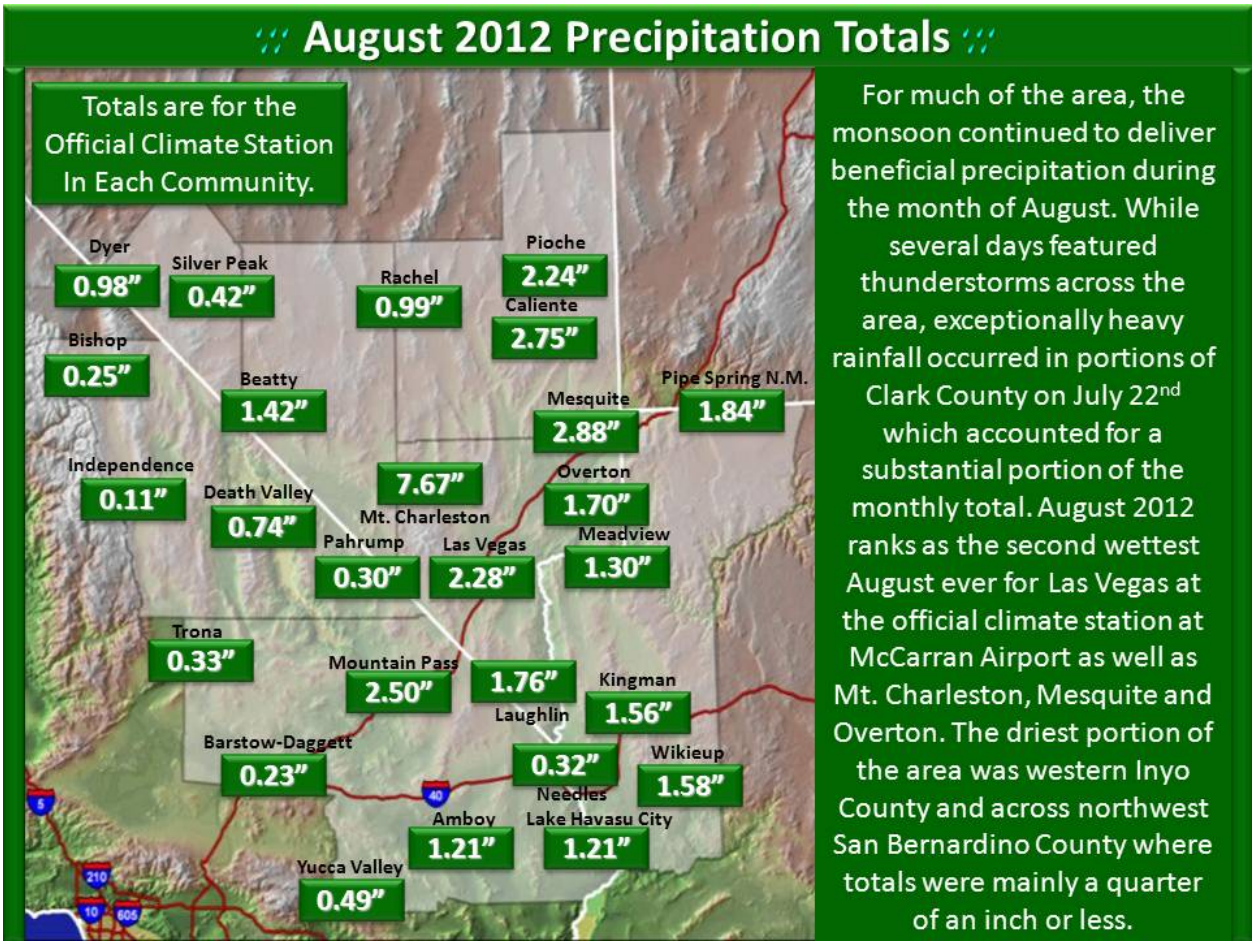
The 2012 summer monsoon was very active and August 2012 was unusually wet throughout Clark County according to the National Weather Service (NWS). The NWS, which began keeping records of the Las Vegas weather in 1937, has reported that the 2.28 inches of rainfall measured at the official gage located at McCarran International Airport makes August 2012 the second wettest August on record. Normal monthly precipitation for August is 0.33 inches. A total of 12 thunderstorm days were also recorded in Las Vegas (normal is 3.3 days), tying this month with August 1955 for the highest number of thunderstorm days for any month. Other official climate stations through Clark County and southern Nevada also measured abnormally large amounts of rainfall as presented in the figure below.



The NWS recorded 1.65 inches of rainfall from the thunderstorms that moved across the southern part of the Las Vegas Valley in the mid-morning hours of August 22. This was the second highest calendar day total ever measured by the local NWS office. These storms produced significant runoff and numerous instances of flooding of streets and low lying areas, particularly in the southeast quadrant of the Las Vegas Valley. Damage to public and private properties was limited as flood control facilities functioned as designed. One death was associated with this event when a young man apparently fell into the Pittman Wash near Sunset Road and was swept several miles downstream.

Exceptionally high atmospheric moisture was in place throughout Clark County for several days preceding August 22. Dewpoint temperatures consistently exceeded 55 degrees as early as August 17th, and exceeded 70 degrees in some locations on August 21-22. The National Weather Service (NWS) recognized the potential for severe rainfall and flash flooding and initiated a series of telephone conference calls and informational briefings with local emergency responders. The first call of this nature was on August 17 and additional briefings were conducted on August 21-22. Given the concern that an upper level disturbance moving into the area from the west, combined with the abundant moisture that was already in place, would trigger severe rainfall, the local office of the NWS issued a Flash Flood Warning on August 21 for the following day. (A copy of the NWS *Preliminary Summary of the August 22, 2012 Las Vegas Heavy Rain and Flash Flood Event* which includes a discussion of the atmospheric conditions is attached to this report)

Moderate to heavy rainfall in the Clark County area began in the late evening hours on August 21 as thunderstorms moved into and north of Mesquite. Over approximately a five hour period, 13 Regional Flood Control District Flood Threat Recognition System (FTRS) rain gages in the Mesquite area reported more than 1.5 inches of rainfall; 10 of those gages reported more than 2 inches of rainfall during that period. Tables 1 and 2 present representative rainfall data collected by FTRS gages for this event. Figures 1-8 present the 24-hour rainfall totals throughout Clark County as reported by the FTRS.

Runoff from this storm system was captured and slowly released by the three detention basins north of I-15 (Town Wash, Abbott Wash and Pulsipher Wash). Each of these detention basins functioned as designed and each impounded 6-8 feet of storm runoff. Flood control channels safely conveyed the runoff to the Virgin River. Damages resulting from the rainfall and subsequent runoff were largely limited to erosion of landscaped and unpaved areas. It was reported that one residence was flooded when runoff from a hillside at the back of the property entered the building and caused damage to the flooring and sheet rock. No significant damages to other private of public properties have been reported.

Showers and thunderstorms began moving into the Las Vegas Valley after 6AM on August 22, and intensified and became more numerous after 9AM. The heaviest rainfall occurred after 10AM and continued until around 1PM. While most parts of the Valley saw at least 0.50 inches

of rain, the most rain occurred across the southern part of the Valley. The storm's movement was generally from the southwest to the northeast with the most intense rain cells tracking along and south of St. Rose Parkway and I-215. During this event nine FTRS rain gages reported more than 2 inches of rainfall; a total of 26 FTRS rain gages measured more than 1.5 inches of rain. Tables 3 and 4 present a representative summary of the rainfall data collected by the FTRS gages in the southern part of the Las Vegas Valley for this event.

While the rainfall intensities were generally not impressive, the total volume of rain over a large area resulted in significant runoff in all of the water courses throughout the Valley. Detention basins performed as designed, capturing significant volumes of runoff from upstream areas and releasing the runoff at greatly reduced rates to the facilities downstream (Table 5). The most impressive flows appear to have occurred in Duck Creek and Pittman Wash. Estimates of the flow in the lower reaches of Duck Creek indicate that the peak flow was near the design capacity of that channel. Table 6 presents information on the maximum water depths measured by FTRS gages as well as an estimate of the peak discharges at those locations.

The runoff caused numerous instances of flooded roadways and intersections as the runoff made its way to the flood control channels and storm drains. Several motorists were stranded and needed assistance when their vehicles stalled in the high water. Local public works departments temporarily closed several roads due to flow through low-water crossings and ponded water as well as debris in the roadways.

Damage to private properties was limited. There was no known damage to residences or businesses reported in either Las Vegas or North Las Vegas. In Henderson, flooding of three residences and several businesses has been reported. There were many additional reports of damage to parked cars and landscaping. A church in the vicinity of Bermuda Road and Cactus Avenue suffered several feet of flood waters flowing through the property. It was apparent that piles of dirt, rock and debris that had been informally dumped along Cactus Avenue between Amigo Street and Radcliff Street acted as a dike and diverted storm runoff that otherwise would have entered a gravel pit located on the north side of Cactus Avenue. This diversion may have resulted in the flooding of the church property on the adjacent parcel.

In addition to clean-up of debris from the roadways, there were some limited damages to public properties. Along the Flamingo Wash at Eastern Avenue, a portion of the concrete apron on the upstream approach was displaced and partially blocked flow through three of the five cells under Eastern Avenue. After flow receded, the displaced portion of the apron was tipped back into place as a temporary measure until a more permanent solution could be developed and implemented. Along Duck Creek, flood flows damaged or displaced gabion baskets in several locations, as well as causing the erosion of the channel side slopes in one reach near Nellis Blvd.; however, it is not believed that these damages adversely affected channel performance significantly. Flow in the Pittman Wash near US-95 was at or exceeded channel capacity;

approximately 700 feet of chain-link fencing along the top of the channel walls was ripped out by the flood flows.

Overall, it is apparent that the flood control facilities functioned as designed throughout the area. There were no facility failures or known damages other than those mentioned above. The Pittman Wash Channel as it turns east to pass under Stephanie Street was flowing at maximum capacity during this event and modifications to improve or increase the conveyance capacity may be warranted.

During this flood event, there was one death when a Green Valley High School student was swept downstream by flood flows in Pittman Wash near Sunset Road. Local news media reported that he accidentally fell into the wash after climbing over a wall with friends to observe the flood flows. There were several other instances reported by the local media of others intentionally entering the flood flows in Duck Creek and Pittman Wash.

Summary

The combination of extremely moist air and an upper level disturbance moving into the Clark County area triggered wide-spread heavy rainfall throughout many areas of Clark County. The local office of the National Weather Service accurately forecast the severe weather several days in advance of its occurrence. The NWS communicated well with local governments and emergency responders both before and throughout this event.

Most of the Las Vegas Valley received at least 0.50 inches of rain, with the south Valley experiencing more than 2 inches of rain in many areas. The Mesquite area also saw in excess of 2 inches of rainfall, as did some of the less-populated parts of Clark County. This wide-spread heavy rainfall resulted in significant flows in all of the major washes and channels in the Las Vegas Valley. The downstream reaches of both Duck Creek and Pittman Wash were flowing near design capacities. Damages to both private and public properties were limited. One death occurred when a young man entered Pittman Wash near Sunset Road and was swept downstream.

The Regional Flood Control District's Flood Threat Recognition System functioned well throughout this event, providing accurate and timely data on rainfall and water levels. Post-event verifications of high water marks indicate that accurate data was reported. The calibrations of several tipping bucket rain gages were checked and the equipment was found to be functioning well within tolerances. It is believed that the FTRS data is credible.

Table 1. Rainfall Summary Mesquite Area 08/21-22/2012. (All units are inches)

Station ID	2564	2574	2584	2594	2599	2664	2674	2684	2694	2754	2784	3144
08/22/12												
1700	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1600	0.12	0.12	0.04	0.04	0.04	0.04	0.04	0.00	0.00	0.00	0.00	0.00
1500	0.08	0.12	0.20	0.20	0.28	0.08	0.28	0.20	0.28	0.24	0.16	0.04
1400	0.00	0.00	0.04	0.08	0.04	0.12	0.00	0.08	0.08	0.12	0.08	0.20
1300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
1200	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.08
1100	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0900	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0800	0.08	0.08	0.04	0.04	0.00	0.00	0.04	0.00	0.00	0.00	0.04	0.00
0700	0.31	0.20	0.35	0.28	0.24	0.28	0.28	0.39	0.31	0.28	0.12	0.08
0600	0.43	0.24	0.35	0.39	0.43	0.47	0.35	0.28	0.39	0.39	0.43	0.39
0500	0.16	0.08	0.12	0.04	0.20	0.00	0.00	0.08	0.12	0.08	0.04	0.55
0400	0.20	0.24	0.51	0.51	0.31	0.24	0.47	0.55	0.39	0.12	0.28	0.00
0300	0.28	0.24	0.71	0.75	0.83	0.08	0.91	0.98	0.87	0.28	0.91	0.00
0200	0.12	0.16	0.20	0.12	0.04	0.31	0.08	0.08	0.12	0.16	0.08	0.00
0100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00
08/21/12												
2400	0.43	0.24	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00
2300	0.63	0.35	0.04	0.00	0.00	0.28	0.04	0.08	0.00	0.00	0.00	0.00
2200	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71
2100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS:	**2.87**	**2.09**	**2.60**	**2.44**	**2.40**	**2.05**	**2.48**	**2.72**	**2.56**	**1.73**	**2.13**	**2.09**

2564 Mesquite 1; 9 miles north of Mesquite
2574 Mesquite 3; 7 miles north of Mesquite
2584 Mesquite Airport
2594 Jim Wilson (aka, town Wash) Detention Basin
2599 Town Wash Channel
2664 Mesquite 2; 11 miles northwest of Mesquite
2674 Pulsipher Wash Detention Basin
2684 Abbott Wash Detention Basin
2694 Abbott Wash Channel
2754 Bunkerville; 7 miles south of Mesquite
2784 Windmill Wash Detention Basin, Bunkerville
3144 California Wash 3; 13 miles SSW of Glendale

Table 2. Peak Rainfall Intensities (all units are inches)
August 21-22, 2012
Mesquite/Bunkerville

Stn ID	5 min	10 min	15 min	30 min	1 hr.	2 hrs.	3 hrs.	TOTAL
2564	0.20	0.35	0.47	0.87	0.94	1.06	1.06	**2.87**
2574	0.20	0.35	0.39	0.55	0.55	0.55	0.63	**2.09**
2584	0.16	0.28	0.31	0.55	1.02	1.38	1.42	**2.60**
2594	0.12	0.24	0.31	0.55	0.98	1.34	1.34	**2.44**
2599	0.16	0.24	0.31	0.55	0.79	1.18	1.26	**2.00**
2664	0.16	0.28	0.35	0.39	0.59	0.67	0.83	**2.05**
2674	0.08	0.20	0.28	0.51	0.98	1.42	1.46	**2.48**
2684	0.16	0.31	0.39	0.67	1.18	1.57	1.61	**2.72**
2694	0.16	0.28	0.35	0.51	0.91	1.30	1.38	**2.56**
2754	0.12	0.20	0.20	0.39	0.55	0.67	0.75	**1.73**
2784	0.12	0.28	0.39	0.59	0.91	1.26	1.30	**2.13**
3144	0.35	0.51	0.55	0.63	0.79	0.91	0.98	**2.09**

2564 Mesquite 1; 9 miles north of Mesquite
2574 Mesquite 3; 7 miles north of Mesquite
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2784 Windmill Wash Detention Basin, Bunkerville
3144 California Wash 3; 13 miles SSW of Glendale

Table 3. Rainfall Summary Southern Las Vegas Valley 08/21-22/2012. (All units are inches)

Stn ID	4099	4544	4619	4644	4704	4714	4719	4724	4734	4759	4769	4774
08/22/12												
1800	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1730	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1700	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.00	0.08	0.00	0.04
1630	0.08	0.04	0.04	0.04	0.08	0.04	0.16	0.08	0.08	0.00	0.08	0.04
1600	0.04	0.08	0.04	0.00	0.04	0.04	0.00	0.08	0.04	0.04	0.00	0.04
1530	0.00	0.00	0.04	0.00	0.04	0.12	0.04	0.08	0.08	0.04	0.08	0.08
1500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1430	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1400	0.00	0.04	0.04	0.04	0.00	0.00	0.04	0.00	0.04	0.00	0.00	0.00
1330	0.04	0.00	0.00	0.00	0.12	0.00	0.04	0.08	0.00	0.04	0.04	0.00
1300	0.08	0.12	0.08	0.08	0.00	0.04	0.00	0.00	0.12	0.04	0.04	0.08
1230	0.08	0.04	0.12	0.12	0.04	0.16	0.16	0.16	0.24	0.12	0.12	0.04
1200	0.31	0.71	0.28	0.08	0.12	0.20	0.28	0.31	0.20	0.24	0.28	0.43
1130	0.20	0.43	0.12	0.04	0.28	0.12	0.16	0.55	0.12	0.16	0.16	0.31
1100	0.00	0.00	0.51	0.20	0.28	0.83	0.43	0.08	1.02	0.51	0.35	0.12
1030	0.67	0.67	0.31	0.55	0.31	0.31	0.63	0.00	0.00	0.12	0.00	0.08
1000	0.04	0.43	0.20	0.47	0.04	0.16	0.04	0.04	0.16	0.39	0.79	0.83
0930	0.43	0.55	0.08	0.24	0.55	0.04	0.12	0.43	0.00	0.04	0.35	0.47
0900	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
0830	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS:	**2.01**	**3.15**	**1.85**	**1.89**	**1.89**	**2.09**	**2.13**	**1.93**	**2.09**	**1.81**	**2.32**	**2.56**

4099 Las Vegas Wash at Rainbow Garden Weir
4544 Las Vegas Wash at Pabco Road
4619 Lower Duck Creek Detention Basin
4644 NWS Offices
4704 Sloan at I-15
4714 Pittman-Pecos Channel
4719 Pittman East Detention Basin
4724 Anthem Detention Basin
4734 Pittman Wash at Wigwam Ave.
4759 Pittman Park Detention Basin
4769 Pioneer Detention Basin
4774 TIMET

Table 4. Peak Rainfall Intensities (all units are inches)
August 21-22, 2012
Southern Las Vegas Valley

Stn ID	5 min	10 min	15 min	30 min	1 hr.	2 hrs.	3 hrs.	TOTAL
4099	0.28	0.43	0.43	0.51	1.06	1.14	1.65	**2.01**
4544	0.39	0.67	0.91	1.02	1.61	2.09	2.80	**3.15**
4619	0.12	0.24	0.31	0.63	0.83	1.26	1.54	**1.85**
4644	0.16	0.31	0.43	0.51	1.02	1.42	1.54	**2.01**
4704	0.20	0.31	0.43	0.55	0.59	1.18	1.57	**1.89**
4714	0.28	0.51	0.67	0.94	1.02	1.42	1.73	**2.36**
4719	0.16	0.31	0.47	0.83	1.06	1.42	1.69	**2.17**
4724	0.20	0.35	0.39	0.63	0.87	1.10	1.38	**1.93**
4734	0.28	0.47	0.63	1.02	1.14	1.57	1.69	**2.28**
4759	0.28	0.43	0.47	0.59	0.79	1.30	1.54	**1.81**
4769	0.35	0.59	0.71	0.71	1.10	1.46	1.89	**2.32**
4774	0.47	0.71	0.83	0.83	1.34	1.65	2.20	**2.56**

4099 Las Vegas Wash at Rainbow Garden Weir
4544 Las Vegas Wash at Pabco Road
4619 Lower Duck Creek Detention Basin
4644 NWS Offices
4704 Sloan at I-15
4714 Pittman-Pecos Channel
4719 Pittman East Detention Basin
4724 Anthem Detention Basin
4734 Pittman Wash at Wigwam Ave.
4759 Pittman Park Detention Basin
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4774 TIMET

Table 5. Maximum Depth and associated Storage Volumes

Facility Name	Max Depth	Volume
Lower Duck Creek	8 feet	260 acre feet
Duck Creek Railroad	5.3 feet	150 acre feet
Upper Flamingo	5.7 feet	130 acre feet
Tropicana	24 feet	110 acre feet
Pittman East	13 feet	90 acre feet
Pioneer	18 feet	90 acre feet
McCullough Hills	5.7 feet	21 acre feet

Table 6. Maximum Depth and associated Peak Discharge

Location	Max Depth	Discharge (est)
Pittman Wash at Stephanie	5.3 feet	5,500 cfs
Duck Creek near Broadbent	5 feet	10,300 cfs
Flamingo Wash at Nellis	3.3 feet	3,420 cfs
Las Vegas Wash		
at Sahara	5.3 feet	3,600 cfs
at Vegas Valley Drive	2.7 feet	4,670 cfs
at Rainbow Garden Weir	5 feet	7,870 cfs

The discharge estimates presented are ***estimates*** and subject to change.

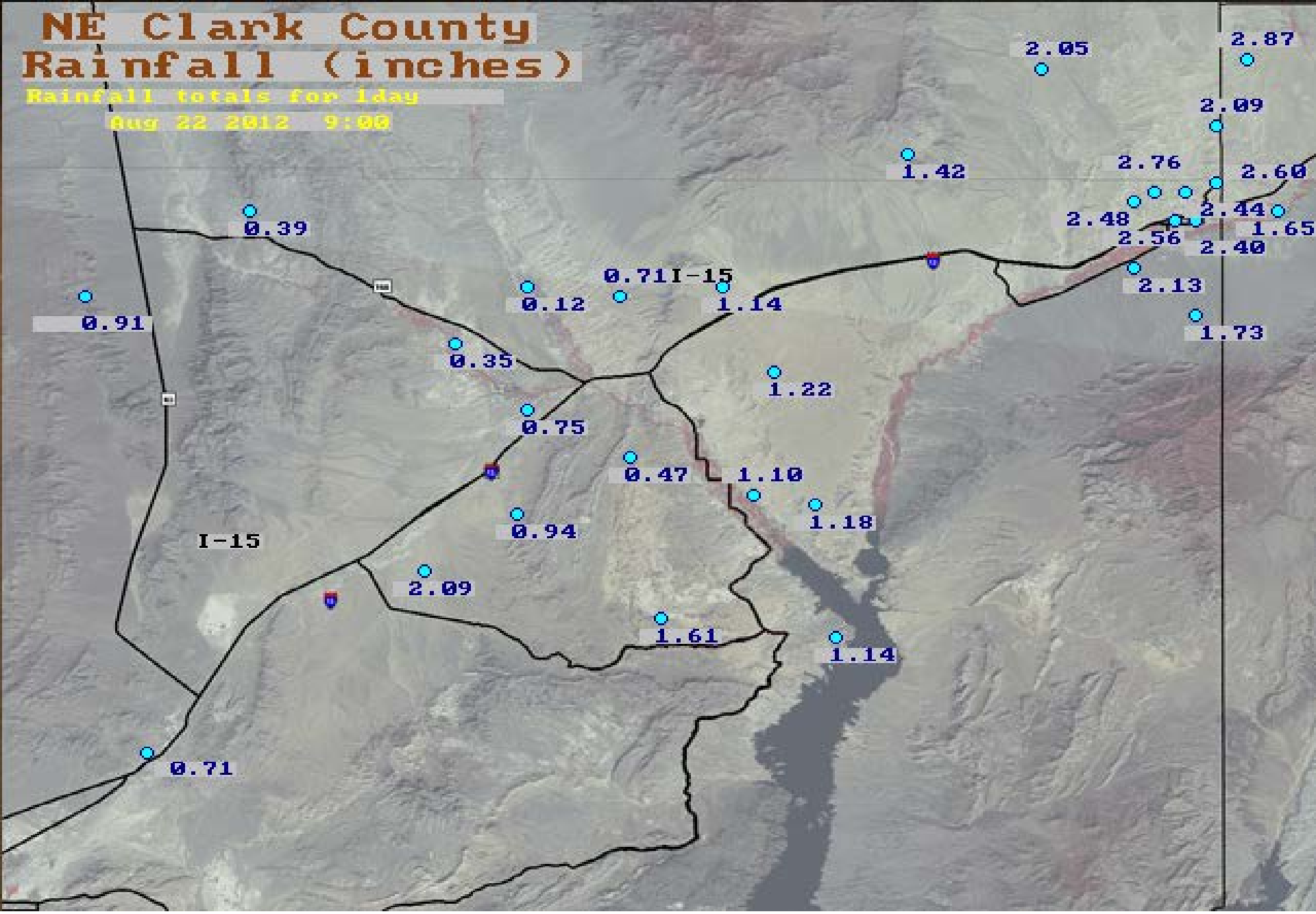

Figure 1. Northeast Clark County rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

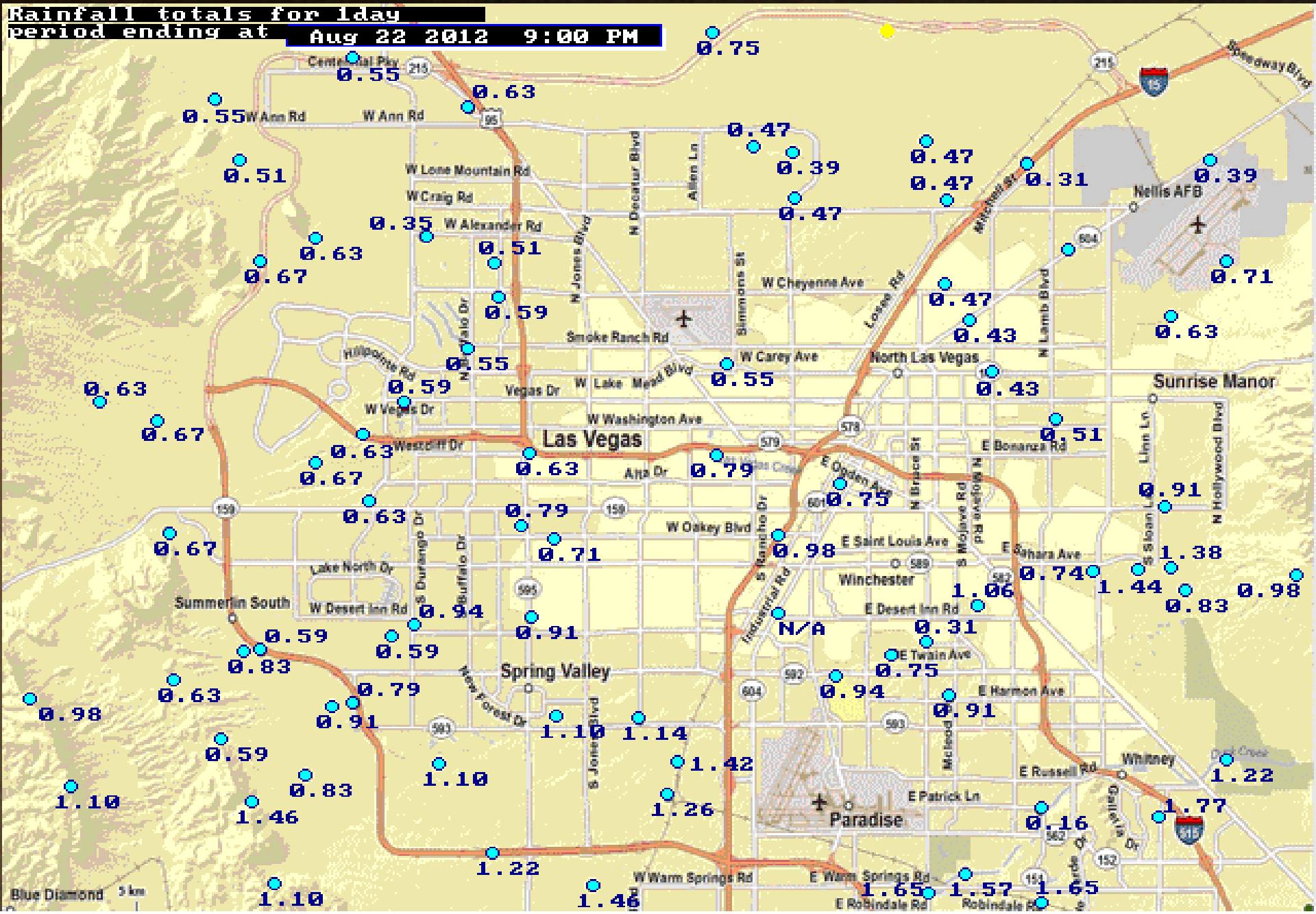

Figure 2. Central Las Vegas Valley rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

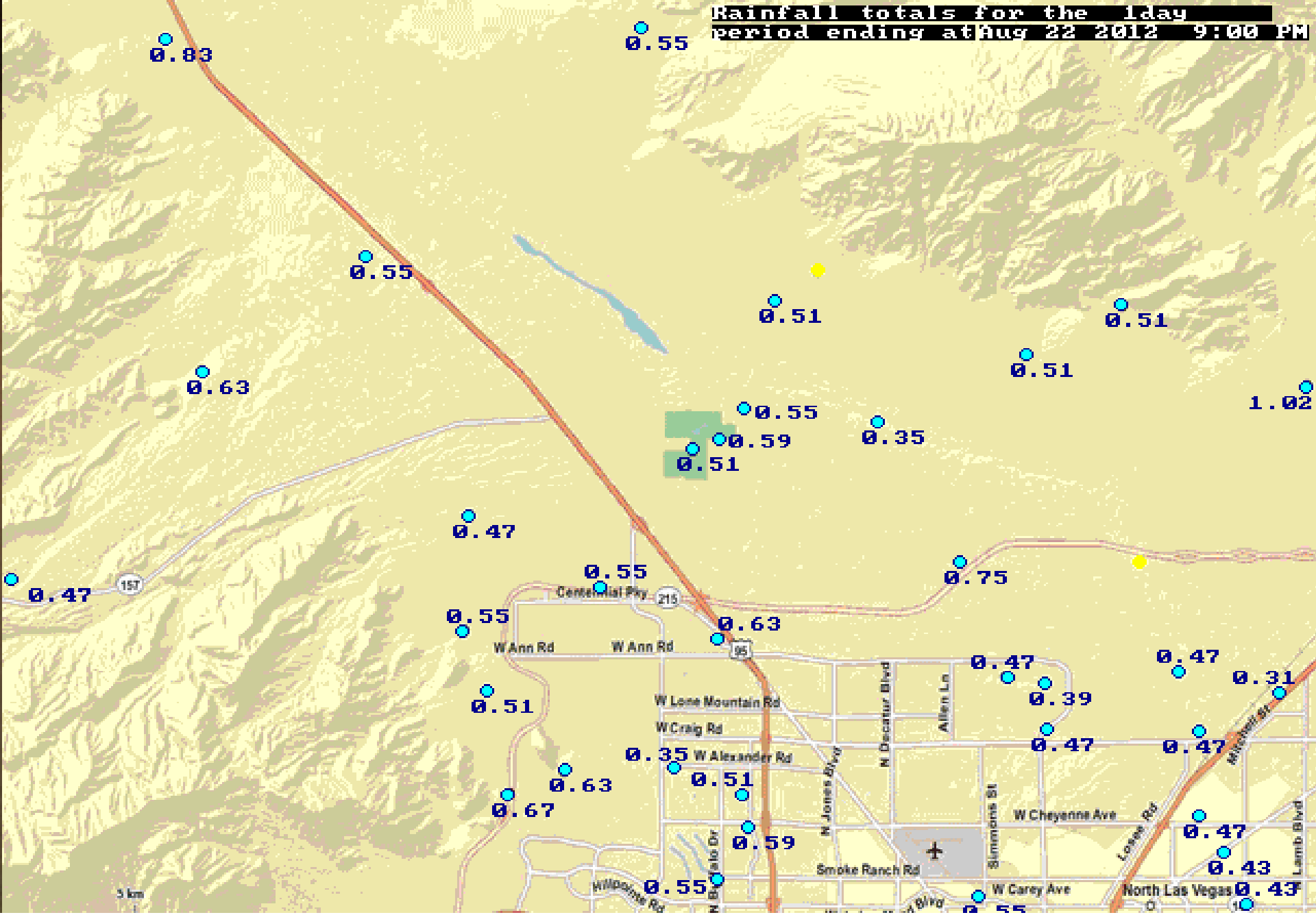

Figure 3. Northwest Las Vegas Valley rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

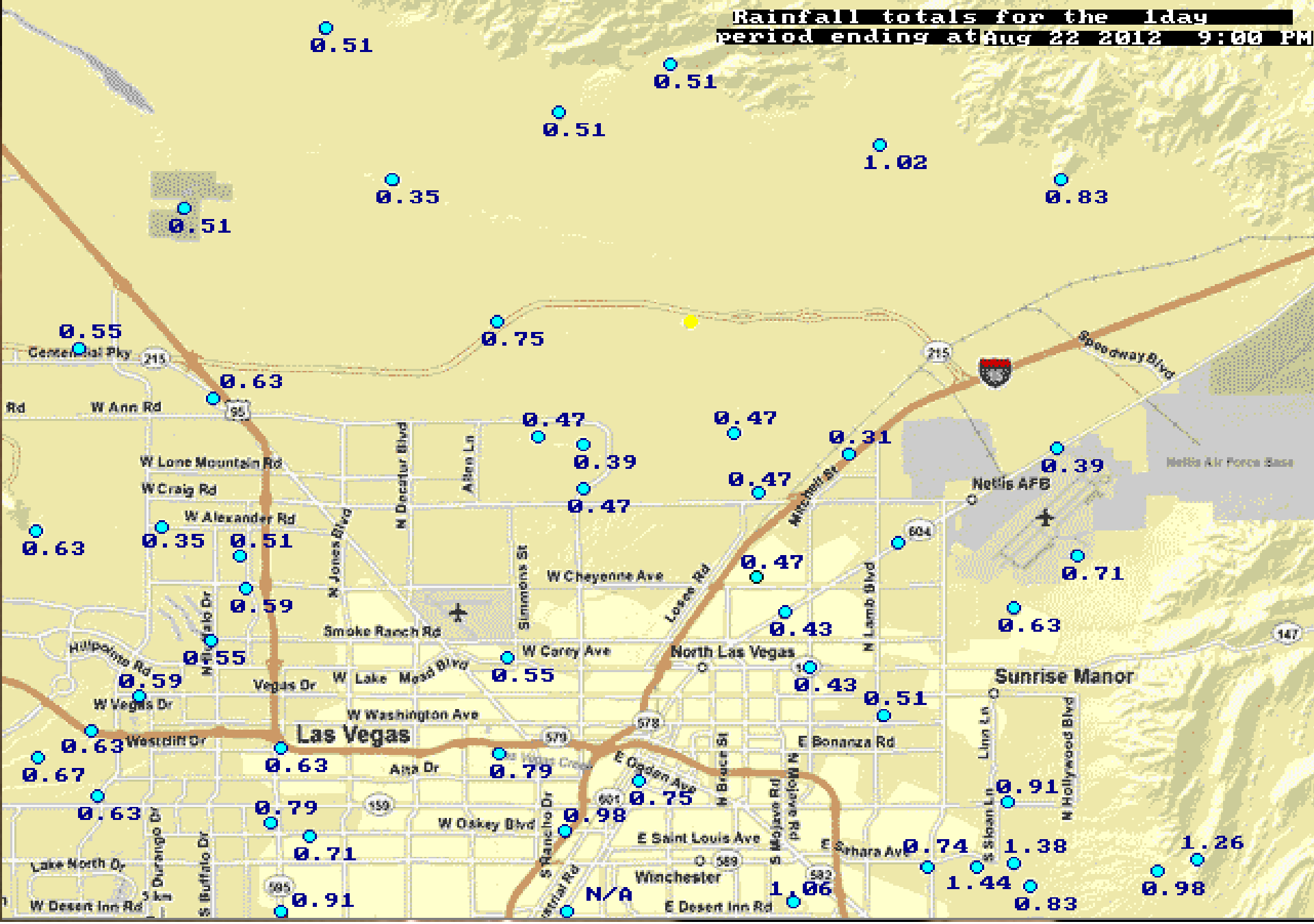

Figure 4. Northeast Las Vegas Valley rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

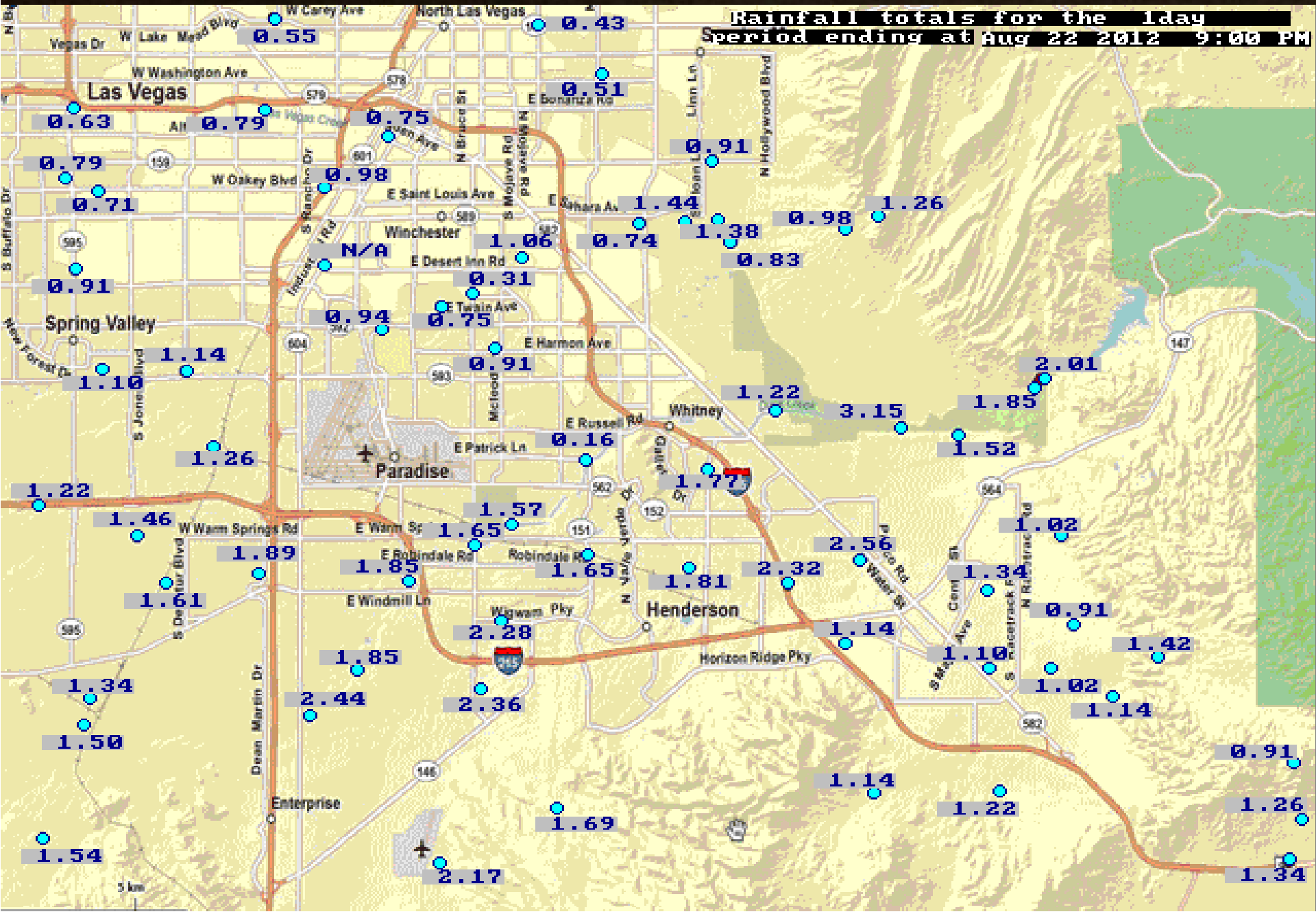

Figure 5. Southeast Las Vegas Valley rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

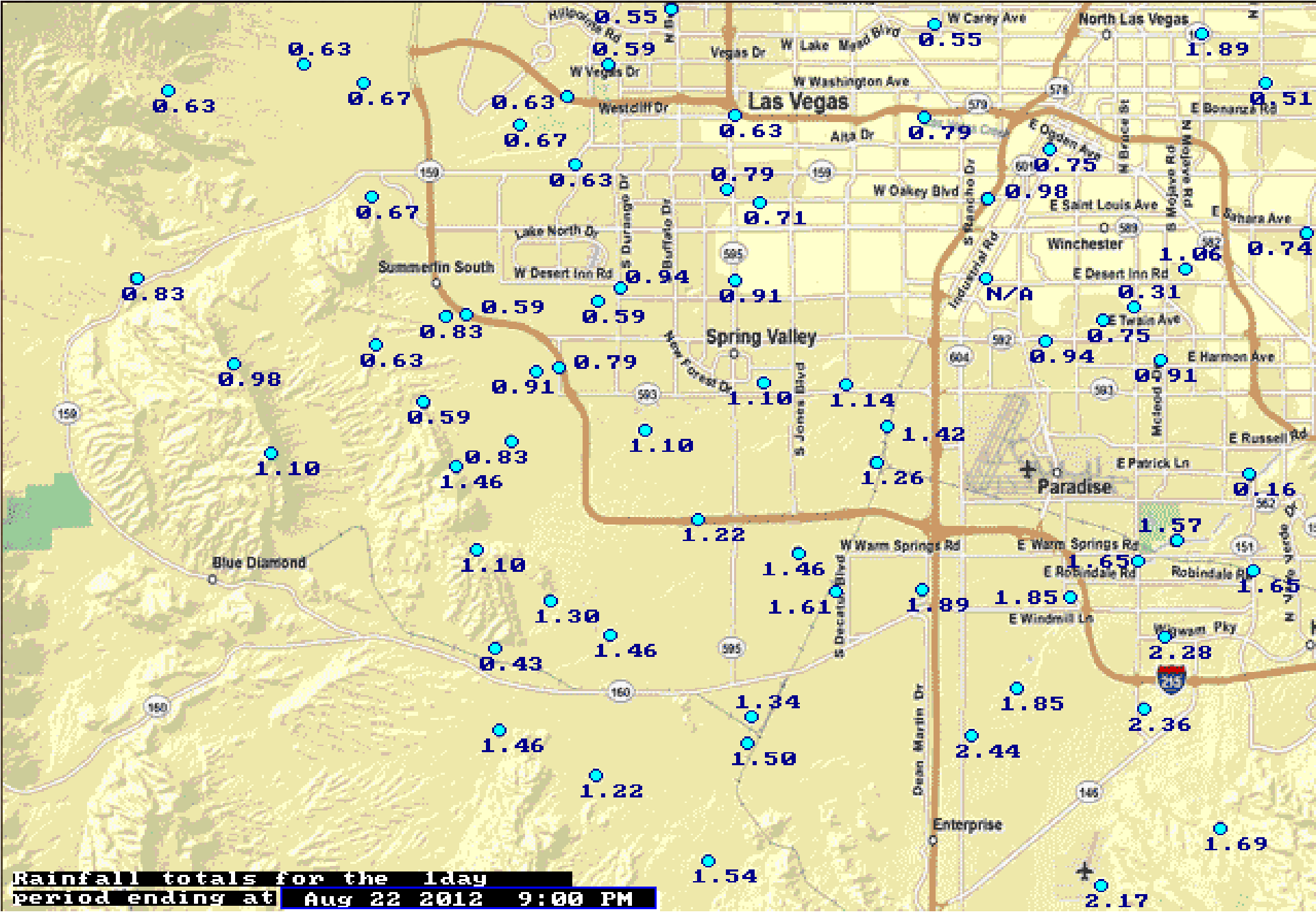

Figure 6. Southwest Las Vegas Valley rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

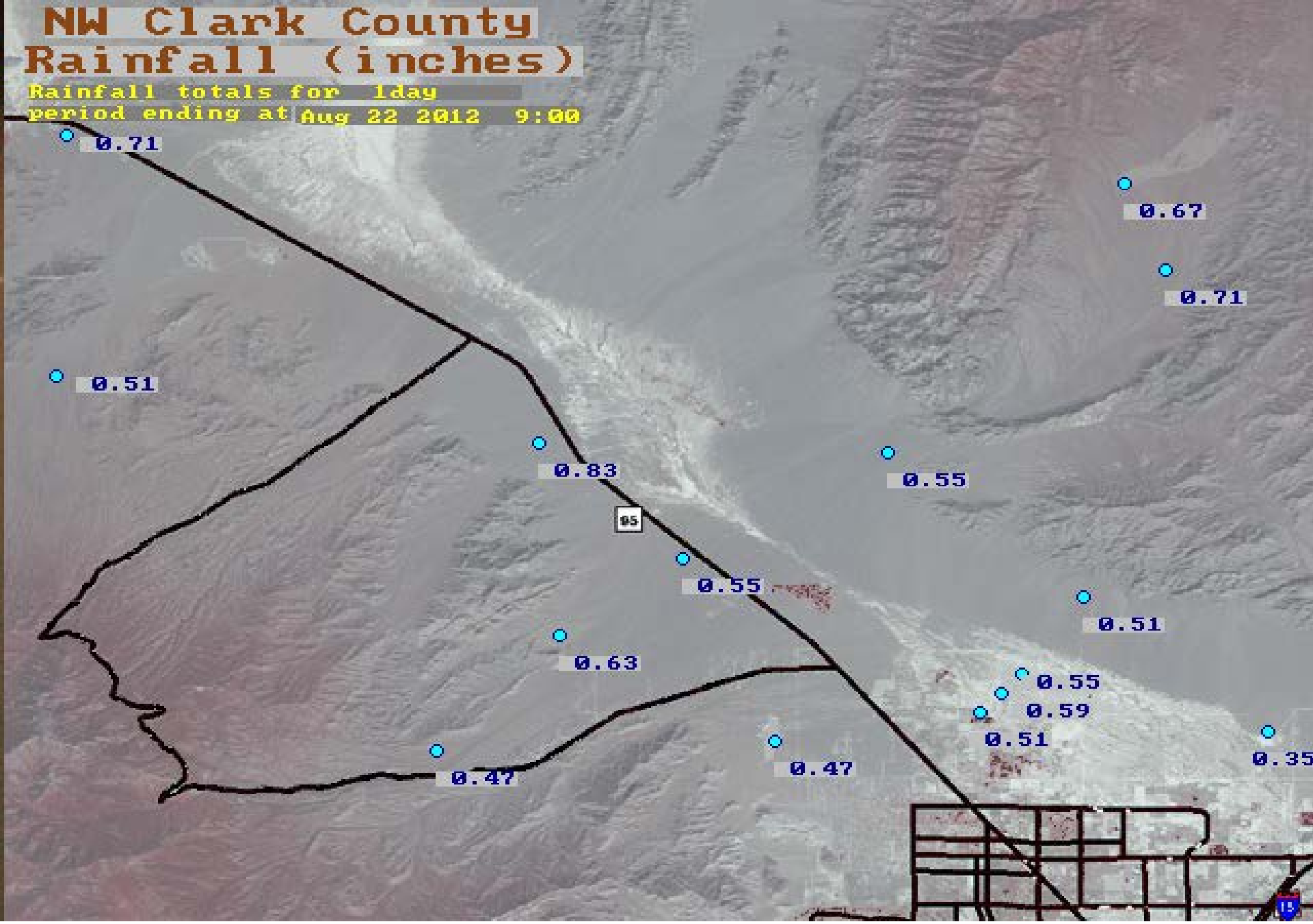

Figure 7. Northwest Clark County rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

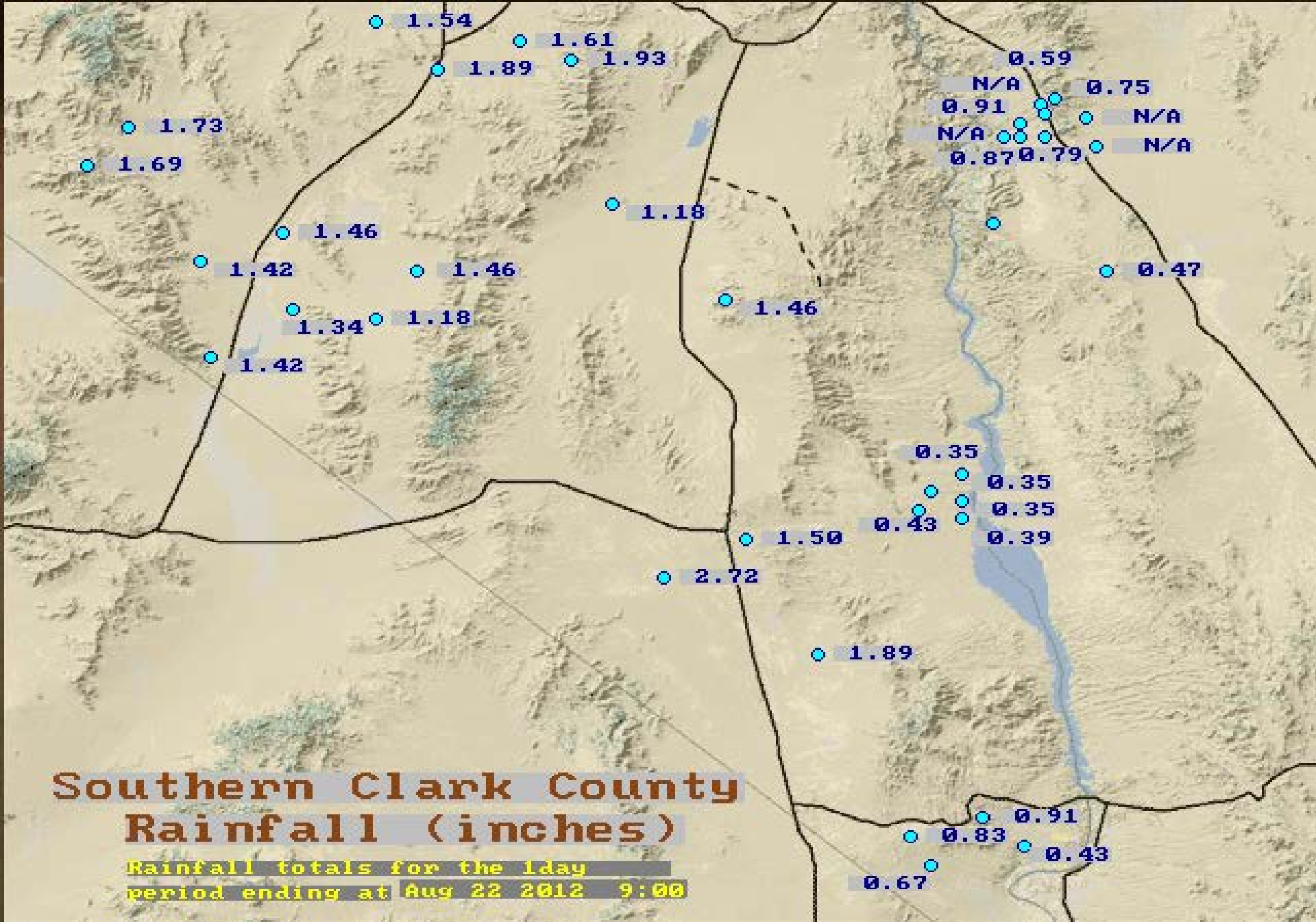

Figure 8. Southern Clark County rainfall totals for the 24-hour period ending at 9PM August 22, 2012. (CCRFCD FTRS)

Duck Creek east of Mountain Vista
Gabion Damage

Duck Creek west of Stephanie
Gabion Damage

Duck Creek east of Nellis
Slope Erosion