

## 06/08/2004

### 5 MINUTE RAINFALL RATES

Zone: A

50 dbz or greater = 0.56"

45 dbz = 0.39"

40 dbz = 0.27"

35 dbz = 0.19"

Zone: B

50 dbz or greater = 0.12"

45 dbz = 0.08"

40 dbz = 0.06"

35 dbz = 0.04"

Zone: C

50 dbz or greater = 0.24"

45 dbz = 0.17"

40 dbz = 0.11"

35 dbz = 0.08"

#### Notes:

Hail provided notable 'contamination' of the 0.5 degree base reflectivity from the KFTG - Doppler in this event. This contamination was most notable across Zone B and to a lesser extent across Zone C. Hail contamination across Zone A was deemed relatively minimal. These zones were divided on a combination of observed Z-R patterns in concert with mesoscale atmospheric analysis corroborated by radar observations of the event. The Z-R (radar-rainfall) relationship was calculated for the entire project area based on these Zones. In summary the traditional technique used by HDR for Z-R relationships was applied in Zone A. In Zone B, the values used were equal to that of Zone A divided by 4.68, and divided by 2.35 for Zone C. Maximum observed 5-min peak rainfall was 0.70" (1.29"/10min) at UDFCD gage 1010. Three separate thunderstorm cells contributed to the precipitation that was observed across the project area.

## 06/27/2004

### 5 MINUTE RAINFALL RATES

50 dbz or greater = 0.27"

45 dbz = 0.19"

40 dbz = 0.13"

#### Notes:

No hail contaminated occurred with this event per analysis and observations. The overall average ratio on this event in terms of observed rainfall to radar estimated rainfall was 1.08 (on average a 8% underestimate when all gages were considered). Storms associated with this event were slow moving with light surface winds thus the Z-R relationship required minimal-to-no adjustment when considering other meteorological factors with respect to rainfall calculations.

## **07/23/2004**

### **5 MINUTE RAINFALL RATES**

50 dbz or greater = 0.27"

45 dbz = 0.19"

40 dbz = 0.13"

#### **Notes:**

Two 'waves' of storms occurred on this event. Fortunately, little-to-no hail was reported on this date. The final Z-R relationship indicated some of the gage sites slightly overestimated and some gage sites slightly underestimated. In summary, all gage-radar relationships averaged to a ratio of 0.93 which is a 7% overestimate, on average.

## **08/18/2004 (Thunderstorm Event)**

### **5 MINUTE RAINFALL RATES**

0.26" = 50 dbz or greater

0.12" = 45 dbz (However, for area over Denver Zoo 1360. 0.26" = 45 dbz)

0.08" = 40 dbz

0.05" = 35 dbz

#### **Notes:**

Our Z-R relationship was close with the exception of a few gages in which heavy rainfall was observed with associated low reflectivity directly above them. The main gage affected by this was UDFCD-ALERT gage 1360 (Denver Zoo). Further analysis of this event showed a 20-25 knot sub-cloud wind out of the north-northeast. A basic geometric calculation indicated that the rainfall was likely falling from cloud base of a storm that was 0.8 miles to the north of the gage. Thus, an additional gage for 1360 was mimicked at 0.8 miles north. The result was a new accumulated value of 3.20" which was a difference of 0.05" from the actual observed site which was 3.15". This geographic adjustment greatly assisted in validating this periods' Z-R relationship as applied to the analysis area.

## **08/18/2004 (Overnight Rainfall)**

### **5 MINUTE RAINFALL RATES**

50+ dbz – 0.16"

45 dbz – 0.11"

40 dbz – 0.08"

35 dbz – 0.05"

30 dbz – 0.04"

#### **Notes:**

It appeared this event had two slightly different air masses with the shift between the first and the second occurring around 9-10 pm. Moderate to heavy upslope rainfall occurred during the evening hours (600 PM to 1000 PM) which then transitioned into light rainfall and dribbles during the overnight hours (1000 pm to 500 am). The total ratio for all gages during this period was 1.01 which greatly increased confidence in this event period.