MEMORANDUM

Date: July 24, 2018

To: The Honorable Chairman and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Regional Flood Control District Storm Report for July 8 and 10, 2018**

Significant rainfall occurred on both July 8, 2018 and July 10, 2018 in nearly the same geographic location within Pima County. The storms were very intense, with Regional Flood Control District (RFCD) rain gauges measuring over one inch of rainfall in less than 10 minutes and a total of 2.12 inches in one hour.

The attached July 20, 2018 memorandum from the RFCD Director reports on these storms. The most significant damage occurred from a Union Pacific Railroad derailment that occurred on July 10, 2018. Other than this derailment there was little damage. As you can see flooding in this area is characterized by sheet flooding as it approaches Interstate 10 and the Union Pacific Railroad.

Two stormwater detention basins existed in the area and both were near their limits of capacity. The Massingale Basin and Countryside Basin, together, stored approximately 100 acre-feet of stormwater.

Photographs associated with the July 17 memorandum from a RFCD Principal Hydrologist are attached in addition to the photos contained in the July 20 report from the RFCD Director.

It is important to understand that any member of the public can access the RFCD alert system by visiting http://alertmap.rfcd.pima.gov/Gmap/Gmap.html the desktop version or http://alertmap.rfcd.pima.gov/dwmobile/ the mobile version). This alert system provides rainfall and runoff information from 102 rain gauge and 36 stream gauge locations throughout Pima County. Rainfall results are displayed for any length of time. This system has been useful in predicting rainfall and runoff information, important to emergency responders.

CHH/anc

Attachments

c: Carmine DeBonis, Jr., Deputy County Administrator for Public Works
Suzanne Shields, Director, Regional Flood Control District

ATTACHMENT 1

PIMA COUNTY
FLOOD CONTROL

MEMORANDUM

DATE: July 20, 2018

TO: C. H. Huckelberry
County Administrator

FROM: Suzanne Shields, P.E.
Director

SUBJECT: **Storm Report for July 8 and July 10, 2018**

On July 10, 2018, a significant storm in the northwest area caused considerable flooding including accumulation of floodwaters that overtopped the Union Pacific Railroad (UPRR) near Cortaro Farms Road. Several factors contributed to the magnitude of the storm's impact including the:

- Significant storm event in nearly the same area on July 8, 2018, which saturated the soils in the watershed ;
- Nature of the distributary flow paths on the Tortolita Fan due to the braided, intertwining washes; and
- Extreme intensity of this storm event.

JULY 8TH and 10TH STORMS

The July 10 storm was the second storm event occurring over the area north of the Cañada del Oro Wash between Oracle Road and Interstate 10 (I-10). The first storm on July 8, 2018 had a similar footprint to the July 10 storm (see radar storm images). This first storm was a significant, but low intensity storm with rainfall of 2 to 3.5 inches over several hours. Runoff from the July 8 storm was minimal, but saturated the clay alluvial soils within the watershed. The saturated soils in this area reduced infiltration capacity and increased the runoff during the July 10 storm.

The July 10 storm was a high intensity storm in a 30 minute to one-hour time period. At the Arthur Pack Regional Park (Thornydale Road and Linda Vista Drive), the Regional Flood Control District's (District) rain gage measured 1.02 inches in 10 minutes with a total of 2.12 inches within one hour. Discussion with the Tucson National Weather Service confirmed that the storm resulted in high intensity rainfall over the northwest area. Viewed from downtown, the zone of rainfall was an eerie green and someone in the area reported that visibility was minimal. This intense rainfall resulted in large peak flood discharges.

GEOMORPHOLOGY

The Tortolita Fan (Fan) is dissected by numerous shallow drainage channels, which are insufficient to carry flows from larger storm events. The flow paths begin in the Tortolita Mountains and spread out as they flow downstream so that midway down the Fan there is not just one path for flow for each watershed. While there may be one primary wash during small flow events; larger events floodwaters will spill over into a network of washes that, when large enough, intertwine between watersheds. Aerial reconnaissance following the storm showed that floodwaters flowed throughout the braided wash network, even in areas that do not normally carry flow, but the magnitude of this storm did not cause the floodwaters to divert between watersheds. As floodwaters travel downstream flows coalesce creating a broad floodplain zone upstream of the railroad and I-10 (see figure of floodprone areas on the Tortolita piedmont).

UPRR DERAILMENT ON JULY 10, 2018

A train derailed during the July 10 storm and UPRR is investigating the cause of the derailment. From a storm and flood perspective, floodwaters from Hardy Wash south of Twin Peaks Road flowed north joining with floodwaters from other local washes. The floodwaters and debris overtopped the railroad due to the

blockage on I-10 and the railroad culverts from sediment and debris. District staff took photographs at the site on July 10, which showed large volumes of debris across and along the railroad from Twin Peaks northward including in the area of the derailment. Floodwaters went over the top of the first set of tracks (eastern track set) and started a head cut between the first and second set of tracks. The gravel ballast under the second set of railroad ties (western track set) appeared to have washed-out leaving the tracks, railroad ties and rails unsupported (see photographs). It should be noted that the loss of ballast and movement of the rails would have also been exasperated by the movement of rail cars over the tracks.

UPRR allowed District staff to view the film taken from inside the cab of the front engine. The train was traveling on the western rail, and at first just the eastern rail was under water, then both rails were under water and not visible. The peak of the flooding had passed with debris marking the high watermark; however, the water was still actively flowing north as well as flowing over and under the rails. The primary source of the flooding came from Hardy Wash. The site of the derailment is a low spot and there was a debris pile about 50 feet long and 4 to 5 feet high and had accumulated on the tracks. When the train hit the debris, visibility was lost entirely and the emergency breaking system engaged.

FLOOD CONTROL INFRASTRUCTURE AND ACTIVITIES

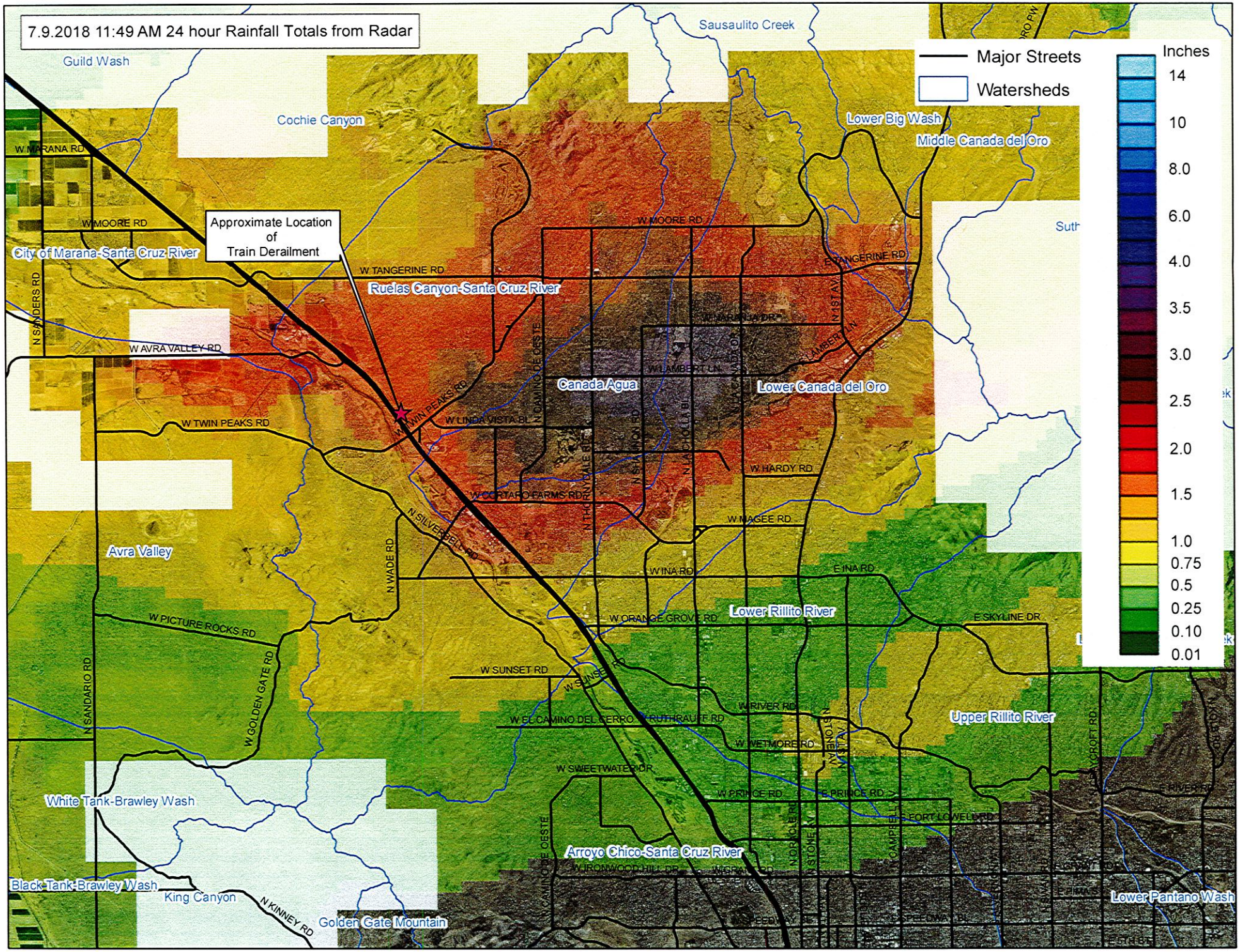
During and after the storm, District staff and Town of Oro Valley staff inspected drainage channels, culverts, dip sections and detention basins along roadways, the Cañada del Oro Wash, and within subdivisions including Countyside Valley, North Ranch, Orangewood Estates and Gatewood Ranch. Because of the interface between drainage in Oro Valley and the unincorporated areas, the District and Oro Valley made a coordinated effort to clear and maintain drainage channels, tributaries to the Cañada del Oro Wash, and other flood control structures prior to the monsoon season. During the storm, Oro Valley reported 3-foot standing waves in the North Ranch channel; however, even with such high flows, the earlier maintenance minimized flood damages. Another factor that mitigated flood flows and reduced flooding were the various detention basins owned by the District. District staff has prepared a brief report on the flood flows collected at two of the larger detention basins at Countryside and Massingale Road (see attached).

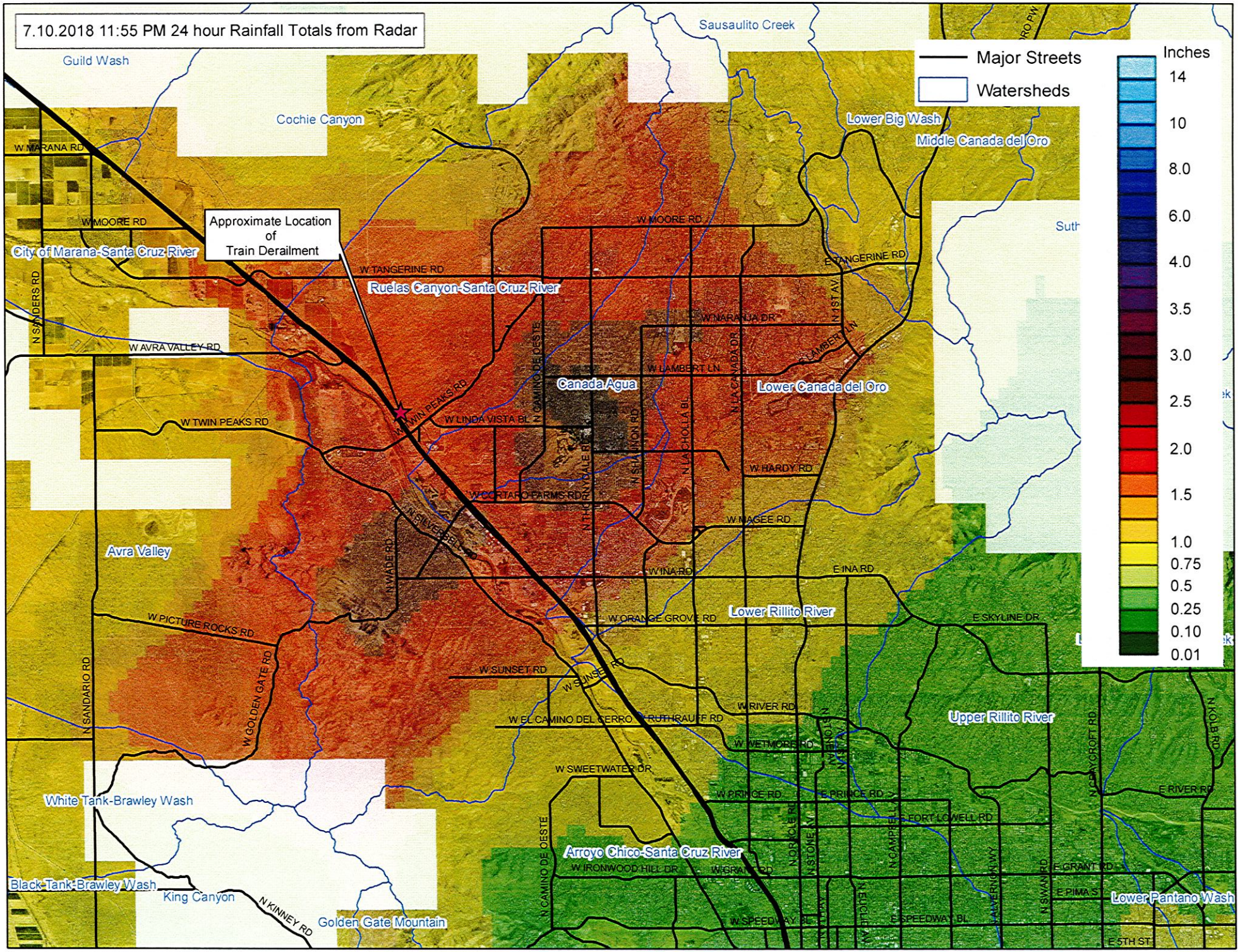
Proper floodplain management, the presence of flood control improvements, and the maintenance of these improvements provided a positive benefit, which protect residential and commercial structures, and public infrastructure from these types of events.

SS/tj

Attachments

c: Carmine DeBonis, Deputy County Administrator – Public Works
Eric Shepp, P.E., Deputy Director – Regional Flood Control District
Andy Dinauer, P.E., Deputy Director – Regional Flood Control District


7.9.2018 11:49 AM 24 hour Rainfall Totals from Radar
Major Streets
Watersheds
Inches
14
10
8.0
6.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.75
0.5
0.25
0.10
0.01
Approximate Location of Train Derailment
Sausalito Creek
Guild Wash
Cochie Canyon
Lower Big Wash
Middle Canada del Oro
City of Marana-Santa Cruz River
Ruelas Canyon-Santa Cruz River
Canada Agua
Lower Canada del Oro
Avra Valley
Lower Rillito River
Upper Rillito River
White Tank-Brawley Wash
Arroyo Chico-Santa Cruz River
Black Tank-Brawley Wash
King Canyon
Golden Gate Mountain
Lower Pantano Wash
W MARANA RD
W MOORE RD
W TANGERINE RD
N SANDERS RD
W AVRA VALLEY RD
W TWIN PEAKS RD
W LINDA VISTA BL
W HARDY RD
W MAGEE RD
W INA RD
E INA RD
W ORANGE GROVE RD
E SKYLINE DR
W PICTURE ROCKS RD
N SANDARIO RD
W GOLDEN GATE RD
N SILVERBELL RD
N WADE RD
W SUNSET RD
W RIVER RD
W WETMORE RD
W SWEETWATER DR
W PRINCE RD
E PRINCE RD
FORT LOWELL RD
W IRONWOOD HILL DR
N KINNEY RD


7.10.2018 11:55 PM 24 hour Rainfall Totals from Radar
Approximate Location of Train Derailment
Major Streets
Watersheds
Inches
14
10
8.0
6.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.75
0.5
0.25
0.10
0.01
Guild Wash
Sausalito Creek
Cochie Canyon
Lower Big Wash
Middle Canada del Oro
City of Marana-Santa Cruz River
Ruelas Canyon-Santa Cruz River
Canada Agua
Lower Canada del Oro
Avra Valley
Lower Rillito River
Upper Rillito River
White Tank-Brawley Wash
Arroyo Chico-Santa Cruz River
Black Tank-Brawley Wash
King Canyon
Golden Gate Mountain
Lower Pantano Wash
W MARANA RD
W MOORE RD
W TANGERINE RD
E TANGERINE RD
W AVRA VALLEY RD
W TWIN PEAKS RD
W LINDA VISTA BL
W HARDY RD
W MAGEE RD
W INA RD
E INA RD
W ORANGE GROVE RD
E SKYLINE DR
W PICTURE ROCKS RD
W SUNSET RD
W RIVER RD
W EL CAMINO DEL CERRO
RUTHRAUFF RD
W WETMORE RD
W SWEETWATER DR
W PRINCE RD
E PRINCE RD
E FORT LOWELL RD
E RIVER RD
W IRONWOOD HILL DR
W SPEEDWAY BL
E SPEEDWAY BL
E GRANT RD
E PIMA ST
E 5TH ST
N SANDERS RD
N SANDARIO RD
N WADE RD
W GOLDEN GATE RD
N CAMINO DE OESTE
N SHANNON RD
N LA CHOLLA BL
N 1ST AV
N KINNEY RD

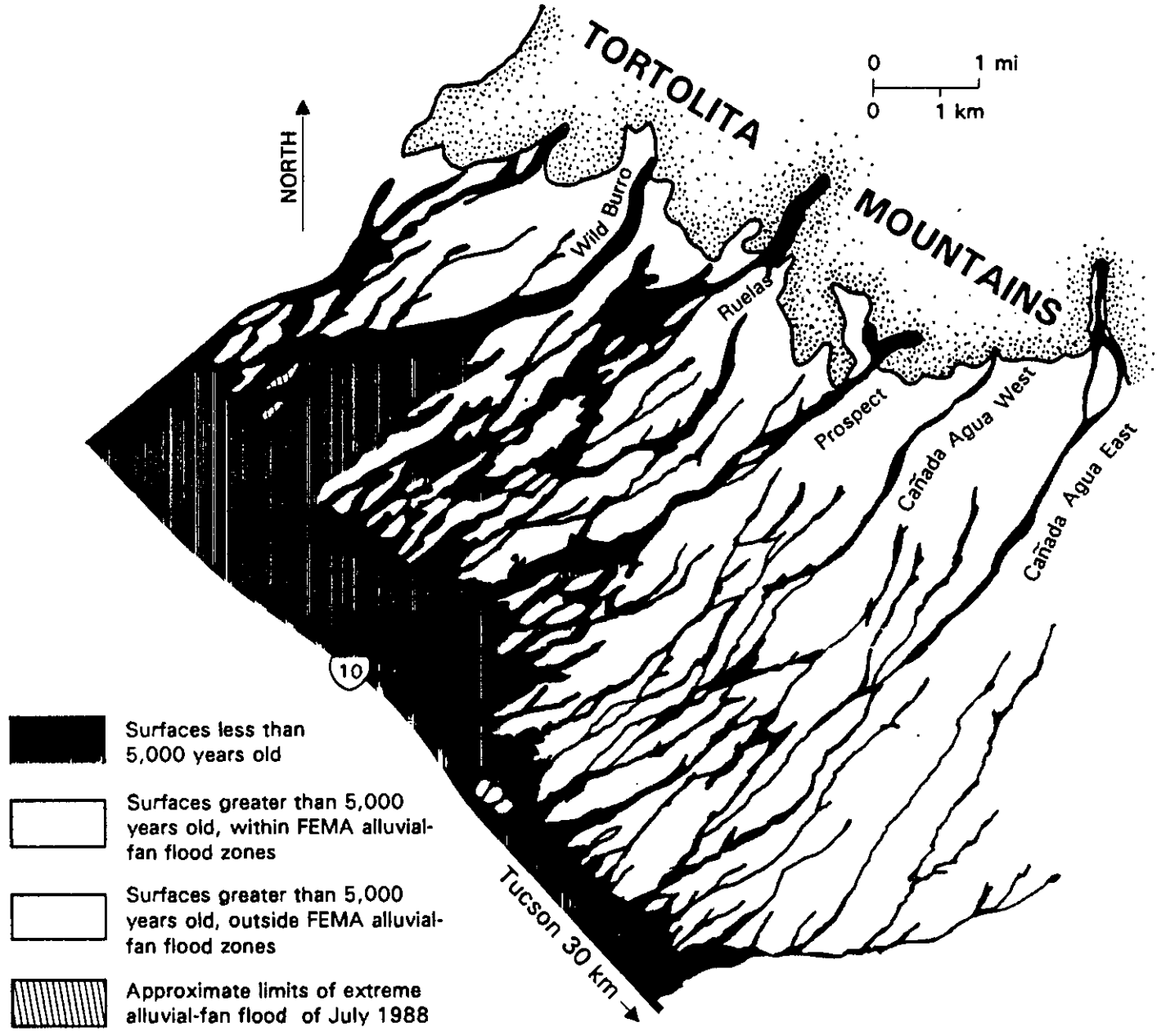
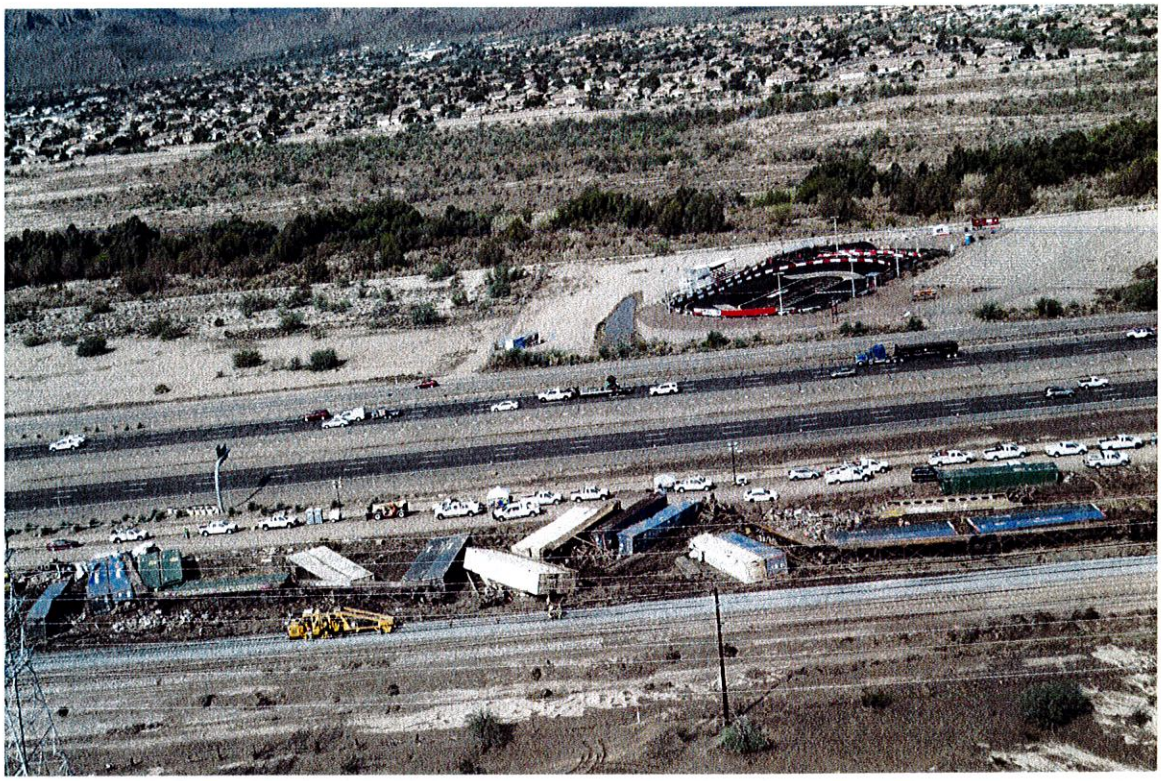


Figure 5. Contrast between flood-prone areas on the Tortolita piedmont determined through geomorphic analyses and the 100-year floodplains shown on published FIRMs (FEMA, 1989). Lightest shaded areas are included within 100-year floodplains but have not been flooded for at least 5,000 years.




UPS
53

ATTACHMENT 2

PIMA COUNTY
FLOOD CONTROL

MEMORANDUM

DATE: July 17, 2018

TO: Eric Shepp, P.E.
Deputy Director and Floodplain Administrator

FROM: Jacob Prietto, CFM
Principal Hydrologist

SUBJECT: **July 10, 2018: Post-Flood Investigation – Massingale Basin & Countryside Basin**

Background:

On July 10, 2018, unincorporated Pima County northwest of the City of Tucson received significant rainfall: 2.4 inches of rainfall was recorded over a one-hour ten minute duration at ALERT Gage #1000 (Arthur Pack Park), located northwest of N. Thornydale Road/W. Overton Road intersection.

Summary:

On July 11, 2018, District staff performed site visits to two Pima County owned and operated regional stormwater basins: Massingale Basin (T12S, R13E, Sec. 31) and Countryside Basin (T12S, R12E, Sec. 24). Photographs were taken to document high water marks, recent erosional activity, spillway and general basin conditions.

On July 12, 2018, District staff performed supplementary observations by helicopter of the basins and the surrounding watersheds. Photographs were taken to document to overall health of the watersheds and waterways after the recent rainfall event.

High water marks were recorded with respect to the spillway elevation. Utilizing the most up-to-date digital elevation model (DEM) of the basin topography, the volume of stormwater retained by the two basins were calculated.

Results:

- Massingale Basin – the high water mark was recorded approximately 1.5 ft. below the spillway elevation, which demonstrates approximately 67 acre-ft. of stormwater retention/detention.

- Countryside Basin – the high water mark was recorded approximately 1.0 ft. below the spillway elevation, which demonstrates approximately 30 acre-ft. of stormwater retention/detention.

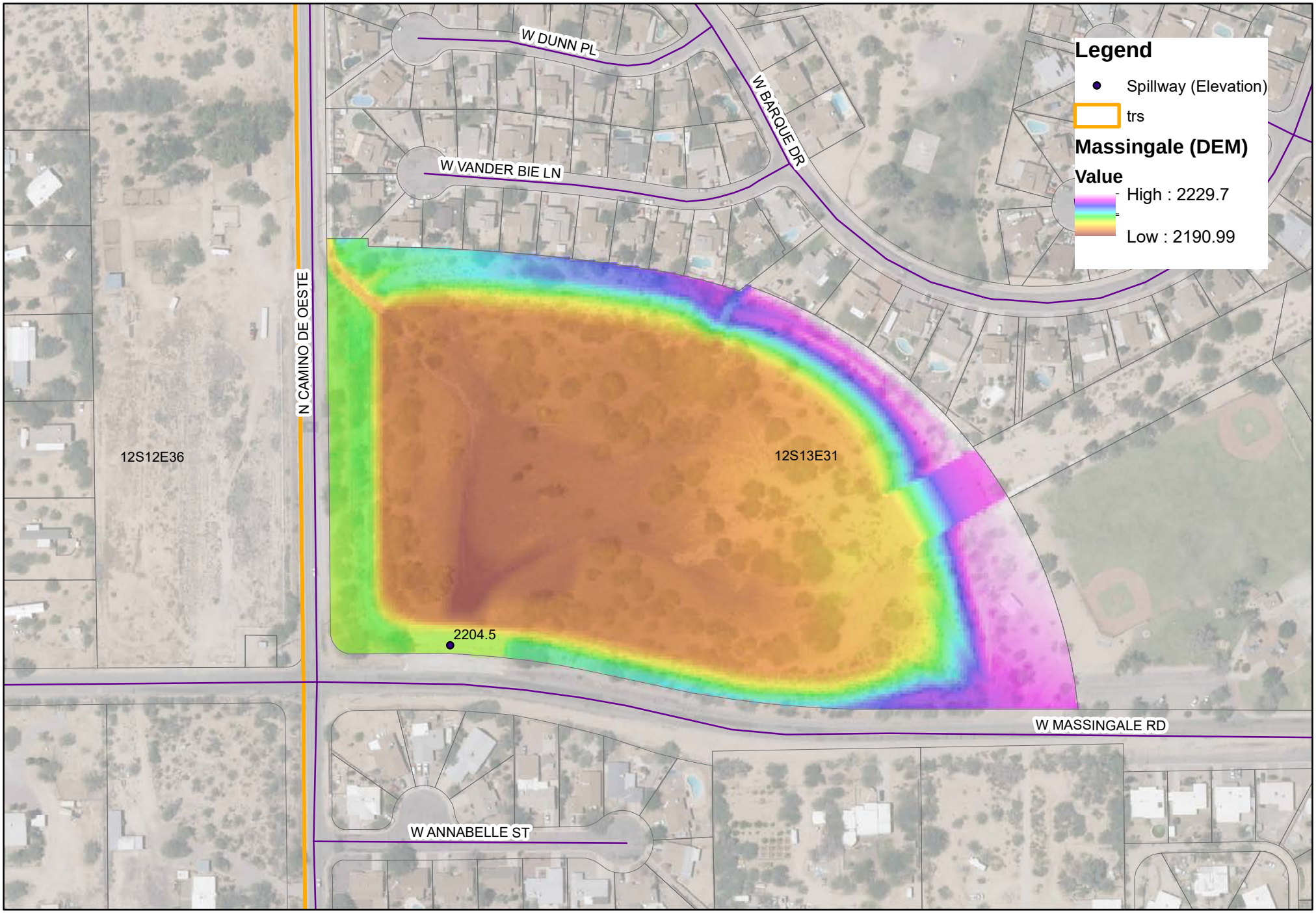
Figures 1 and 2 illustrate the DEM utilized for the volume calculations; Table 1 summarizes the results.

Attachments:

- 07-10-2018 2355 Q2 Radar Estimated 24 Hour Precipitation Total
- PCRFCD ALERT System Data Display - #1000 Arthur Pack Park, Precipitation Gage
- Massingale Basin – Photograph log: July 11-12, 2018
- Countryside Basin – Photograph log: July 11-12, 2018

Basin	TRS	Major Cross Streets	Parcel	Spillway Elevation	High Water Mark		
					Height*	Elevation	Volume
			(acres)	(ft)	(ft)	(ft)	(acre-ft)
Massingale	T12S, R13E, Sec. 31	N. Camino De Oeste / W. Ina Rd	15.9	2204.5	-1.5	2203.0	67.3
Countryside	T12S, R12E, Sec. 24	N. Camino De Oeste / W. Linda Vista Blvd	12.2	2264.1	-1.0	2263.1	30.1

*Datum equals spillway elevation



N

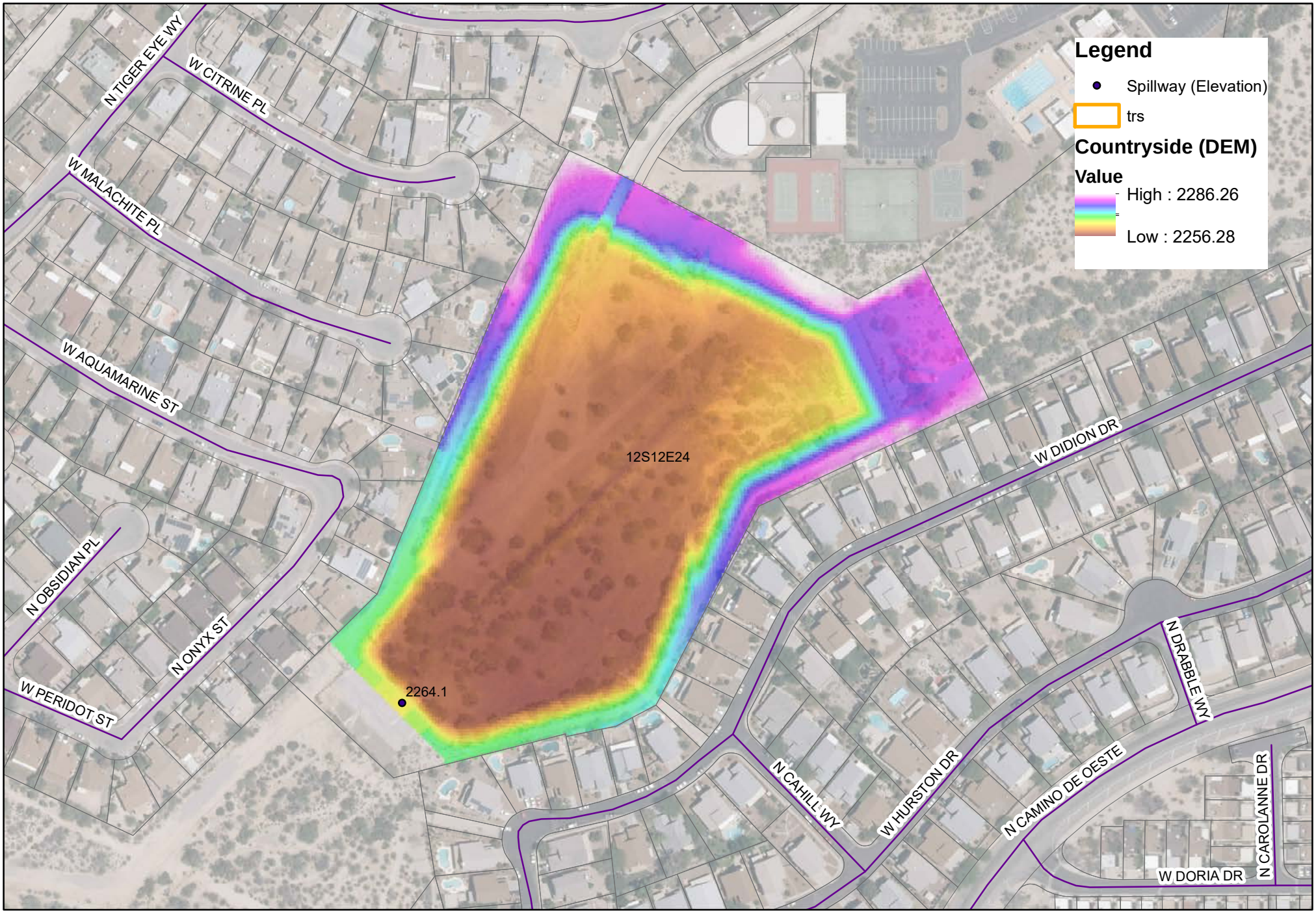
0 100 200 400 Feet

1 inch = 200 feet

July 10, 2018: Post-Flood Investigation
Figure 1 - Massingale Basin

PIMA COUNTY
FLOOD CONTROL

Date: 7/17/2018



N

0 100 200 400 Feet

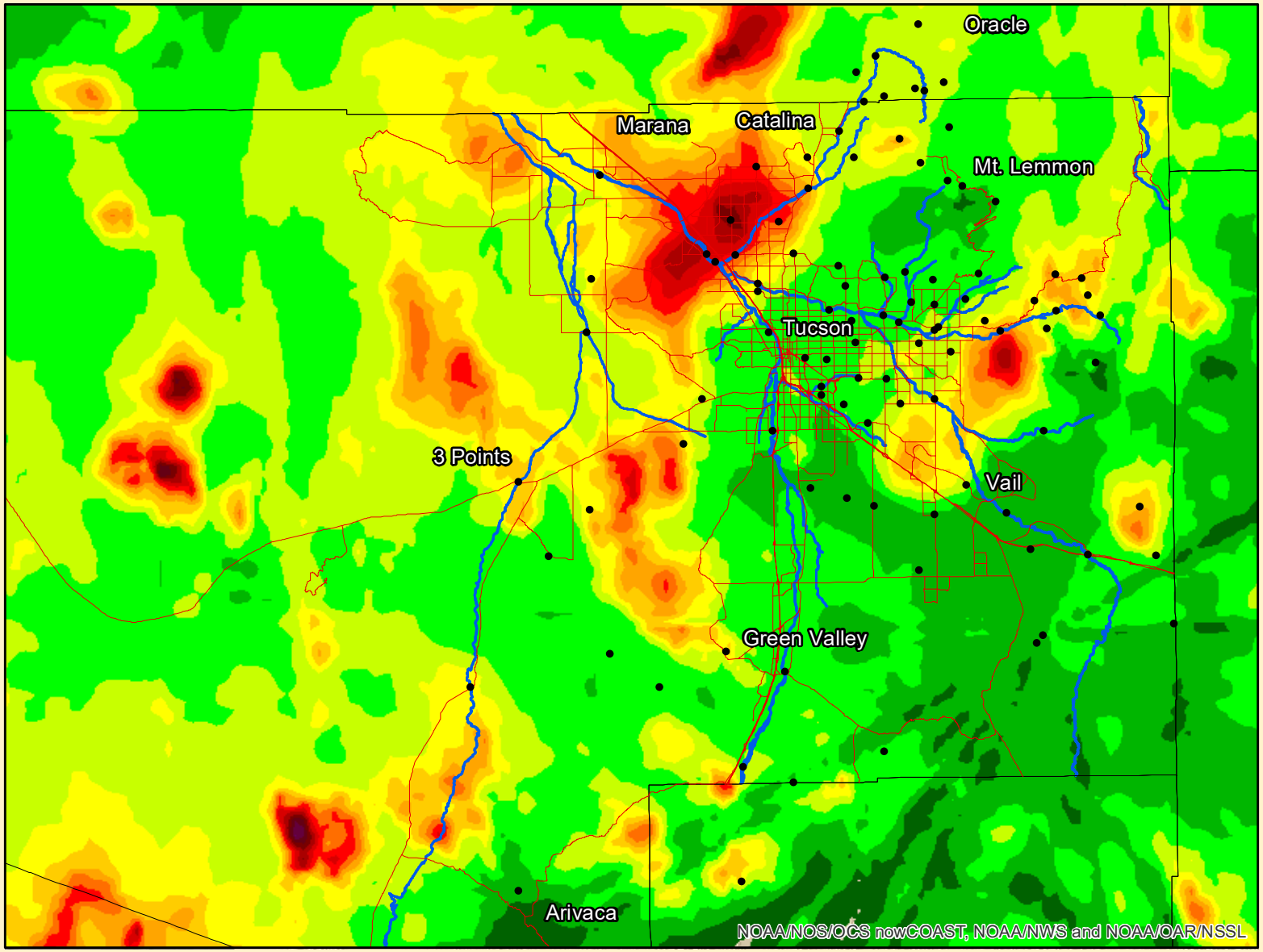
1 inch = 200 feet

July 10, 2018: Post-Flood Investigation
Figure 2 - Countryside Basin

PIMA COUNTY
FLOOD CONTROL

Date: 7/17/2018

07-10-2018 2355 Q2 Radar Estimated 24 Hour Precipitation Total



Inches
14
10
8.0
6.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.75
0.5
0.25
0.10
0.01

Pima County Regional Flood Control District
201 N Stone Ave - 9th Floor
Tucson, Arizona 85701-1207
(520) 724-4600, FAX: (520) 724-4621
http://www.rfcd.pima.gov

ALERT Stations
Major Streets
County Boundary
Major Washes

N
W E
S

0 5 10 20 Miles

Radar Data Courtesy of NOAA/NOS nowCOAST

PCRFCD ALERT System Data Display

1000 Arthur Pack Park - Santa Cruz Basin
Precipitation Gage

Data Suffix Legend:
? = Provisional reading. This reading exceeds data validation criteria and may not be accurate.

Date	Time	inches
07/16/2018	10:55:13	7.56
07/15/2018	22:55:12	7.56
07/15/2018	10:55:12	7.56
07/15/2018	09:43:10	7.56
07/15/2018	07:52:42	7.52
07/14/2018	22:55:12	7.44
07/14/2018	10:55:12	7.44
07/13/2018	22:55:11	7.44
07/13/2018	10:55:11	7.44
07/12/2018	22:55:11	7.44
07/12/2018	10:55:10	7.44
07/12/2018	05:03:49	7.44
07/11/2018	22:55:10	7.4
07/11/2018	10:55:10	7.4
07/10/2018	22:55:10	7.4
07/10/2018	15:01:33	7.4
07/10/2018	14:56:44	7.36
07/10/2018	14:52:35	7.32
07/10/2018	14:45:49	7.28
07/10/2018	14:41:21	7.24
07/10/2018	14:37:51	7.2
07/10/2018	14:35:39	7.17
07/10/2018	14:33:45	7.13
07/10/2018	14:31:48	7.09
07/10/2018	14:30:26	7.05
07/10/2018	14:29:13	7.01
07/10/2018	14:27:59	6.97
07/10/2018	14:26:27	6.93
07/10/2018	14:25:39	6.89
07/10/2018	14:24:00	6.85
07/10/2018	14:22:50	6.81
07/10/2018	14:21:35	6.77
07/10/2018	14:20:21	6.73
07/10/2018	14:18:56	6.69
07/10/2018	14:17:06	6.65
07/10/2018	14:14:25	6.61
07/10/2018	14:12:40	6.57
07/10/2018	14:10:55	6.54
07/10/2018	14:08:31	6.5
07/10/2018	14:05:07	6.46
07/10/2018	14:04:06	6.42
07/10/2018	14:03:33	6.38
07/10/2018	14:02:52	6.34
07/10/2018	14:02:16	6.3
07/10/2018	14:01:39	6.26
07/10/2018	14:01:09	6.22
07/10/2018	14:00:39	6.18
07/10/2018	14:00:09	6.14
07/10/2018	13:59:39	6.1
07/10/2018	13:59:09	6.06
07/10/2018	13:58:16	6.02
07/10/2018	13:57:27	5.94
07/10/2018	13:56:59	5.87
07/10/2018	13:56:28	5.83
07/10/2018	13:55:39	5.67
07/10/2018	13:55:17	5.63
07/10/2018	13:54:19	5.47
07/10/2018	13:53:54	5.43
07/10/2018	13:53:39	5.35
07/10/2018	13:53:08	5.31
07/10/2018	13:52:49	5.24
07/10/2018	13:52:19	5.2
07/10/2018	13:51:49	5.16
07/10/2018	13:51:24	5.12
07/10/2018	10:55:09	5.08
07/09/2018	22:55:09	5.08

07/09/2018	10:55:09	5.08
07/08/2018	22:55:08	5.08
07/08/2018	19:55:38	5.08
07/08/2018	19:50:13	5.04
07/08/2018	19:46:01	5
07/08/2018	19:39:58	4.96
07/08/2018	19:37:17	4.92
07/08/2018	19:36:25	4.88
07/08/2018	19:35:38	4.84
07/08/2018	19:34:34	4.8
07/08/2018	19:32:59	4.76
07/08/2018	19:32:00	4.72
07/08/2018	19:30:33	4.69
07/08/2018	19:28:24	4.65
07/08/2018	19:25:38	4.61
07/08/2018	19:23:29	4.57
07/08/2018	19:21:29	4.53
07/08/2018	19:20:18	4.49
07/08/2018	19:19:17	4.45
07/08/2018	19:18:25	4.41
07/08/2018	19:16:43	4.37
07/08/2018	19:14:13	4.33
07/08/2018	19:11:34	4.29
07/08/2018	19:09:14	4.25
07/08/2018	19:05:20	4.21
07/08/2018	19:03:02	4.17
07/08/2018	19:01:01	4.13
07/08/2018	18:59:40	4.09
07/08/2018	18:58:50	4.06
07/08/2018	18:57:28	4.02
07/08/2018	18:48:52	3.98
07/08/2018	18:47:30	3.94
07/08/2018	18:46:24	3.9
07/08/2018	18:43:48	3.86
07/08/2018	18:42:24	3.82
07/08/2018	18:40:57	3.78
07/08/2018	18:39:36	3.74
07/08/2018	18:38:09	3.7
07/08/2018	18:36:58	3.66
07/08/2018	18:35:46	3.62
07/08/2018	18:34:28	3.58
07/08/2018	18:33:58	3.54
07/08/2018	18:33:28	3.5
07/08/2018	18:32:55	3.46
07/08/2018	18:32:08	3.43
07/08/2018	18:30:59	3.39
07/08/2018	18:29:16	3.35
07/08/2018	18:27:47	3.31
07/08/2018	18:26:22	3.27
07/08/2018	18:24:38	3.23
07/08/2018	18:23:37	3.19
07/08/2018	18:22:42	3.15
07/08/2018	18:21:37	3.11
07/08/2018	18:20:55	3.07
07/08/2018	16:07:13	3.03
07/08/2018	15:40:25	2.99
07/08/2018	10:55:08	2.95
07/07/2018	22:55:08	2.95
07/07/2018	18:16:08	2.95


N. Camino De Oeste
North Camino De Oeste
Photos showing current water elevations -post event
Massingale Basin
basin spillway structure
W. Massingale Road
W Barque Dr
W Woodridge Ln
W Massingale Rd
Camino de Oeste
Map
Satellite

Massingale Basin - post storm event 07-10-18
View west along the spillway outlet showing the water elevation

N 32° 20' 42.16"
W 111° 03' 43.54"
RIMG1924.JPG 2400 ft
2018/07/11
8:22:25 AM
7/11/2018

Massingale Basin - post storm event 07-10-18
View east at the basin spill way - showing current water elevation

Massingale Basin - post storm event 07-10-18
View across the spillway - taking measurements

Storm event high water mark

N 32° 20' 42.23"
W 111° 03' 44.34"

RIMG1921.JPG 2631 ft

2018/07/11 8:21:23 AM
7/11/2018


Massingale Basin - post storm event 07-10-18
Close up of the high water mark for the storm event
24" of freeboard at the spillway
N 32° 20' 42.25"
W 111° 03' 44.49"
RIMG1920.JPG 2667 ft
2018/07/11
8:21:10 AM
7/11/2018

Massingale Basin - post storm event 07-10-18
View north across Massingale Basin
Only the tops of the mature trees sticking out of the water

N 32° 20' 42.12"
W 111° 03' 43.47"
RIMG1923.JPG 2436 ft
2018/07/11
8:22:08 AM
7/11/2018

Massingale Basin - post storm event 07-10-18
View north along the west of the basin - high water mark

High water mark 4' below the top of the bank protection

N 32° 20' 44.90"
W 111° 03' 46.45"

RIMG1917.JPG 2711 ft

2018/07/11 8:18:46 AM
7/11/2018

Massingale Basin - post storm event 07-10-18
View north along the west of the basin - high water mark

N 32° 20' 44.66"
W 111° 03' 46.40"

RIMG1918.JPG 2729 ft

2018/07/11

8:19:05 AM
7/11/2018

Country side Basin

Spillway photos

Aerial photos of the spilway erosion

Countryside Basin - post 7-10-18 storm event
View south -overview of the basin from the north inlet drainage way

Countryside Basin - post 7-10-18 storm event
Close up of a mature tree in the basin - high water mark on the tree

Countryside Basin - post 7-10-18 storm event
South end of the basin - outlet spillway

N 32° 22' 09.77"
W 111° 04' 27.61"

RIMG1946.JPG 2261 ft

2018/07/11

10:27:52 AM
7/11/2018

Countryside Basin - post 7-10-18 storm event
High water mark on the outlet spillway

Countryside Basin - post 7-10-18 storm event
Sizeable section of the chain link fencing had been knocked down

Countryside Basin - post 7-10-18 storm event
Aerial view of the basin looking north

N 32° 22' 02.95"
W 111° 04' 34.88"
RIMG1989.JPG 2659 ft
2018/07/12
10:14:07 AM
7/12/2018

Countryside Basin - post 7-10-18 storm event
Aerial view of the basin looking at down stream erosion

Another view of the down stream erosion

N 32° 22' 11.15"
W 111° 04' 34.01"
RIMG1990.JPG 2694 ft
2018/07/12
10:14:15 AM
7/12/2018

Countryside Basin - post 7-10-18 storm event
Aerial view of the basin looking at down stream erosion

Countryside Basin - post 7-10-18 storm event
Aerial view of the basin looking south

N 32° 22' 22.55"
W 111° 04' 18.76"

RIMG1992.JPG 2731 ft

2018/07/12

10:14:38 AM
7/12/2018