



MEMORANDUM

Date: September 10, 2014

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

From: C.H. Huckelberry
County Administrator

A handwritten signature in black ink, appearing to be "C.H. Huckelberry", is written over the typed name and title.

Re: **Preliminary September 8, 2014 Storm Report from the Regional Flood Control District**

Attached is a report from the Regional Flood Control District (RFCD) regarding the 24-hour rainfall event that occurred on September 8, 2014 (Attachment 1). As you know, Pima County was not significantly affected by the rainfall event; however, Phoenix and Maricopa County were severely impacted.

The attached material provided by the RFCD Director includes a 24-hour Radar Estimated Precipitation Total Map. As you can see, central and east Tucson, as well as the area over the San Xavier District, received intense rainfall; the most severe being in the San Xavier District, which received up to four inches of rain. Given the intensity and distribution of rainfall, other than two tragic loss of life events (one in Pima County and one in Pinal County), there was little public property damage and only minor private property and/or flooding damage.

The nearly complete Arroyo Chico flood control project is responsible for significant public and private property damage reduction. This project, which began with a feasibility study in 1996, now has a total cost of nearly \$71.9 million; \$46.6 million in federal funding and a \$25.3-million RFCD match. The project substantially eliminated flood damages that would have occurred in the Arroyo Chico Basin. The improvements have removed over 1,315 residential, multifamily, commercial and industrial properties from the floodplain. Many, if not most, of these properties would have been flooded if the improvements had not been completed.

These improvements began with the reconstruction of the Dell Urich Golf Course into a series of detention basins followed by a detention basin constructed on Tucson Unified School District's Cherry Field, then followed by a series of further downstream basins in the vicinity of Park Avenue and Highland Road. The report shows flooding of Alvernon Way near the upstream side of the Dell Urich Golf Course, ponding in the detention basins within the golf course, and ponding detained flood waters within the Park Avenue Basin at Highland Road. Attachment 2 is a photograph of the drained Randolph Basin. The soil staining shows the level of ponding that occurred at this basin.

The Honorable Chair and Members, Pima County Board of Supervisors
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The pre-project 100-year stormwater discharge was estimated at 3,400 cubic feet of water per second. Due to the combination of detention basins, this discharge has been reduced to 269 cubic feet of water per second, or reduced by 92 percent. An actual hydrograph of the storm shows the peak outflow of the basin system was approximately 250 cubic feet of water per second, and the detention basins drained slowly and safely over a 24-hour period.

The September 8 estimated flood event on the Arroyo Chico Basin was rated a 50-year flood event. A project study indicates that without the Tucson Drainage/Arroyo Chico project, the greatest flood inundation damage would have occurred downstream of Reid Park. The map included as Attachment 3 shows the area (shaded in pink) that would have otherwise been flooded on September 8. It is estimated the flood damage from this single event could have been in excess of \$83 million if this project had not been nearly completed.

Attachment 4 to this memorandum is a fact sheet for Arroyo Chico that provides detailed information, including the economic, environmental, social and cultural benefits of this project.

CHH/mjk

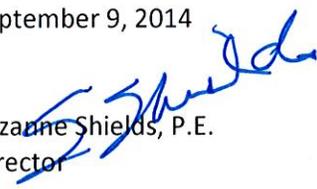
Attachments

c: John Bernal, Deputy County Administrator for Public Works
Suzanne Shields, Director, Regional Flood Control District

ATTACHMENT 1

DATE: September 9, 2014

TO: C. H. Huckelberry
County Administrator

FROM: Suzanne Shields, P.E.
Director 

SUBJECT: Storm Report for September 8, 2014

On September 8, 2014, eastern Pima County experienced an area wide storm event which was concentrated mainly in the central to northwest areas with rainfall values ranging from 1 inch to over 4 inches (see attached details on rainfall and stream flows).

There was sustained flows in all of the major watercourses including 25,000 cubic feet per second (cfs) in the Santa Cruz River; 12,700 cfs in the Rillito River; and 7,800 cfs in the Cañada del Oro Wash. The radar estimates from the National Weather Service of the 24-hour precipitation totals show the extent of the storm (see attached map). A large storm cell over the San Xavier District resulted in four plus inches of rainfall which resulted in the 25,000 cfs in the Santa Cruz River.

The mid-town area received two to three inches of rainfall; the detention basin complex in the Del Urich Municipal Golf Course was filled (see attached figure and photos). In 1996 Pima County built a series of six detention basins within the golf course to intercept and detain runoff from the upstream reach of the Arroyo Chico and the tributaries of Naylor Wash and Paseo Grande Wash. These basins were designed to store 530 acre-feet of runoff and to reduce the 100-year storm discharge from of 3,400 cfs to only 269 cfs. The basins at the Arroyo Chico Watershed performed exceedingly well. As shown in the attached hydrograph, these detention basins allowed the runoff from the storm to be slowly and safely released over a 24-hour period; the estimated peak outflow was 250 cfs. Similarly, the most recently constructed detention basins between Cherry Avenue and Park Avenue intercepted flow from Arroyo Chico and Railroad Wash and further reduced and contained flood waters that would have impacted Fourth Avenue and the central downtown area (see attached photo of the basin at Highland Avenue).

If you need further information, please let me know.

SS/tj

Attachments

c: John Bernal, Deputy County Administrator – Public Works
Bill Zimmerman, Deputy Director – Regional Flood Control District
Eric Shepp, Floodplain Manager – Regional Flood Control District

Preliminary Storm Report Period: 8:00 AM, 09/08/14 - 8:00 AM, 09/09/2014

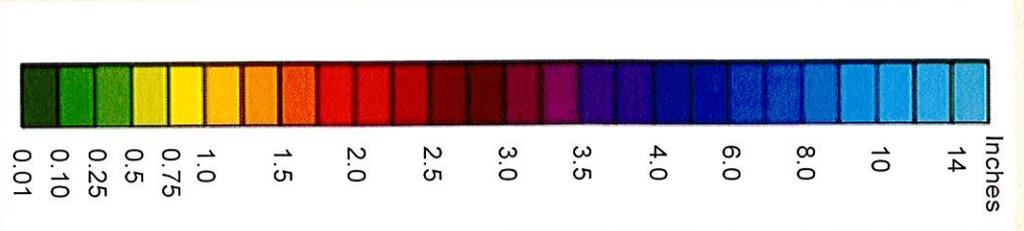
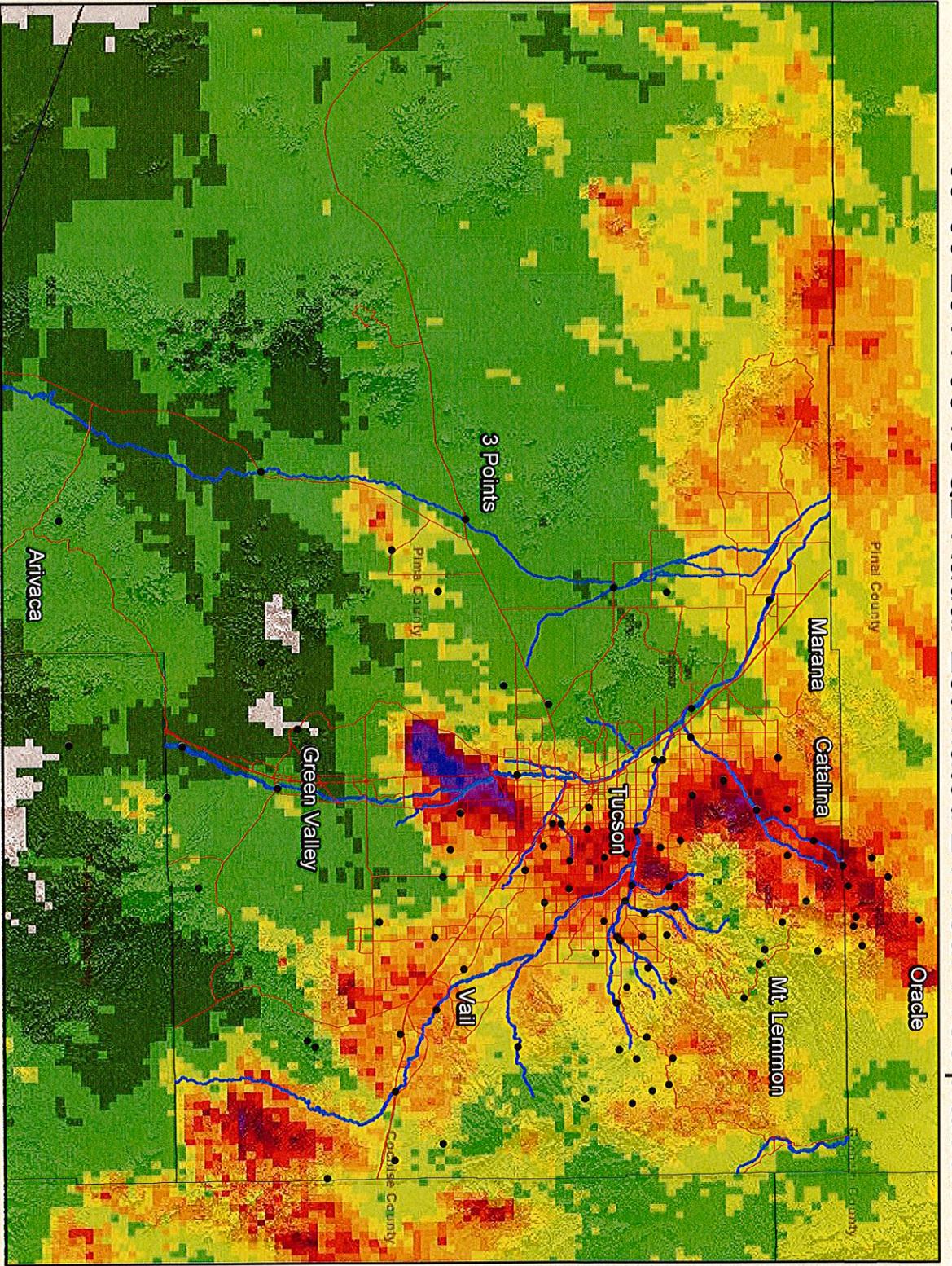
Following are significant precipitation amounts (greater than or equal to 1 inch) and stream flow registered by ALERT sensors:

Reported values are for 24 hours as of 8:00 AM. Streamflow values are preliminary and not field verified.

Sensor ID	Location	Rain Gauge	Stream Gauge	
		inch	Depth feet	Discharge cfs
Catalina Area				
1010	Horseshoe Bend Road in Saddlebrooke	1.61		
1020	approximately 0.5 mile southwest of Oracle	3.07		
1040	Edwin Road 1.3 miles east of Lago Del Oro Parkway	3.27		
1050	approximately 1.5 miles west of Charouleau Gap	3.5		
1060	approximately 1.1 miles northeast of Charouleau Gap	3.54		
1070	northeast corner of Catalina State Park	1.46		
1080	Cañada Del Oro Wash northeast of Saddlebrooke	1.65	6.4	1,500
1100	Cañada Del Oro Wash at Golder Ranch Road	2.05	4.22	2,020
Santa Catalina Mountains				
1030	Oracle Ridge, approximately 1.5 miles north of Rice	2.91		
1090	Mount Lemmon	2.87		
1110	Cañada Del Oro Wash 0.3 miles south of Coronado	3.43	2.5	280
1130	Samaniego Peak on Samaniego Ridge	4.29		
1140	Dan Saddle on Oracle Ridge	2.83		
2150	Catalina Highway 0.8 miles west of Palisade Ranger	1.65		
2280	Green Mountain	1.18		
2290	Sabino Creek 0.6 miles south southeast of Marshall	1.38	2	80
Santa Catalina Foothills				
2090	Tanque Verde Wash at Tanque Verde Guest Ranch	1.02	1.5	50
2100	Swan Road at Calle del Pantera	1.85		
2160	Sabino Creek at USFS Dam	1.18	2.6	630
2170	Ventana Canyon Wash at Sunrise Road	2.8	2.7	900
2190	near El Marah on Bear Canyon Road	1.06		
2200	Agua Caliente Wash at Tanque Verde Road	1.38	1	100
2210	Houghton Road 0.1 miles south of Catalina Highway	1.22		
2220	Agua Caliente Park	0.98		
2230	El Camino Rinconado 0.5 miles north of Reddington	1.5		
2240	Mt Lemmon Highway near Mile Post 3	1.34		
2390	Finger Rock Wash at Sunrise Road	2.2		
Redington Pass Area				
2020	Redington Pass south of Park Tank	1.93		
2030	Redington Pass east southeast of Italian Trap Tank	1.65		
2040	Redington Road near White Tank	1.38		
2050	Bellota Ranch Road near Redington Road	1.38		
2070	Tanque Verde Wash 0.5 miles south of Chiva Tank	1.18	1.7	200
2080	Redington Road near Alamo Well	1.46		

	Rincon Mountains			
4100	Manning Camp in the Rincon Mountains	1.22		
4110	Rincon Creek at X-9 Ranch	0.91		
	Greater Tucson			
2110	Tanque Verde Road at Tanque Verde Wash	1.06		
2120	Sabino Canyon Road at Tanque Verde Wash	1.81	2.7	2,500
2300	Rosewood Street west of Harrison Road	1.18		
2310	Rancho El Mirador north of Broadway Boulevard	0.75		
2320	Beverly Avenue at Hawthorne Street	2.05		
2330	Kolb Road at Golf Links	2.2		
2350	Rillito Creek at Dodge Boulevard	2.13	6.9	9,470
2360	Rillito Creek at La Cholla Boulevard	1.22	7.1	12,700
2370	Alamo Wash at Glenn Street	1.69	3.8	1,500
2380	Ruthrauff Road at La Cholla Boulevard	1.14		
4160	Irvington Road near Pantano Road	0.79		
4180	Pantano Wash at Houghton Road	1.18		
6040	Santa Cruz River at Valencia Road		10.5	25,000
6180	Arroyo Chico at Cherry Street	1.02	3.6	
6190	Arroyo Chico at Randolph Way	2.24	3.4	
6230	Tucson Diversion Channel at Ajo Detention Basin	1.34	2.9	1,170
6240	Country Club Road near Columbia Street	1.54		
6250	Craycroft Road at Golf Links Road	2.83		
6260	Irvington Road at Belvedere Avenue	1.73		
6270	Valencia Road at Pima Air Museum	1.3		
	Southern Tucson Area			
6200	Summit Street at Epperson Lane	2.24		
6210	Franco Wash at Swan Road	0.91	1.3	140
6220	Houghton Road at Dawn Road	1.42		
	Altar/Avra Valley Area			
6380	Altar Wash at Highway 286	0.79		
6410	Diamond Bell near Stagecoach Road at Killarney Av	0.83		
6420	Brawley Wash at Highway 86		1.1	70
6450	Hilltop Road at Riveria Road	0.75		
6460	Picture Rocks Community Center	1.22		
	Marana/Oro Valley Area			
1200	Cañada Del Oro Wash at Ina Road		6.8	7,800
1230	Calle Concordia at Calle El Milagro	3.54		
1240	Moore Road at La Cholla	1.97		
1250	Pima Wash at Ina Road	3.86	2.3	
1260	Big Wash at Rancho Vistoso Boulevard	2.83		
1270	Big Wash Wash at Canada Del Oro Wash (Oracle P	3.15	5.5	7,330
1273	Canada Del Oro Wash near Oracle Road		4.4	4,880
6110	Santa Cruz River 0.5 miles east of Sanders Road	1.02		
	Vail Area			
4250	Pantano Wash east of Vail		5.2	3,650
4310	Davidson Canyon Wash at Interstate 10		2.1	1,300

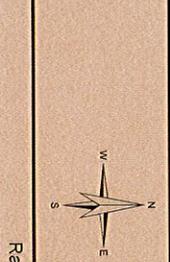
09-09-2014 0848 Q2 Radar Estimated 24 Hour Precipitation Total





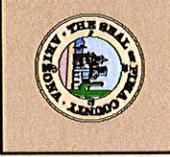
 Pima County Regional Flood Control District
 915 E. Congress - 3rd Floor
 Tucson, AZ 85710
 (520) 246-1800 FAX: (520) 246-1821
<http://www.pima.gov>

● ALERT Stations
 — Major Streets
 — Major Washes
 — County Boundary



Radar Data Courtesy of NOAA/NOS nowCOAST

The information depicted on this display is the result of digital analysis performed on a variety of databases provided and maintained by several government agencies. The accuracy of the information is not guaranteed and the collective accuracy of these databases on the date of the analysis. The Pima County Regional Flood Control District makes no claims regarding the accuracy of the information depicted herein.



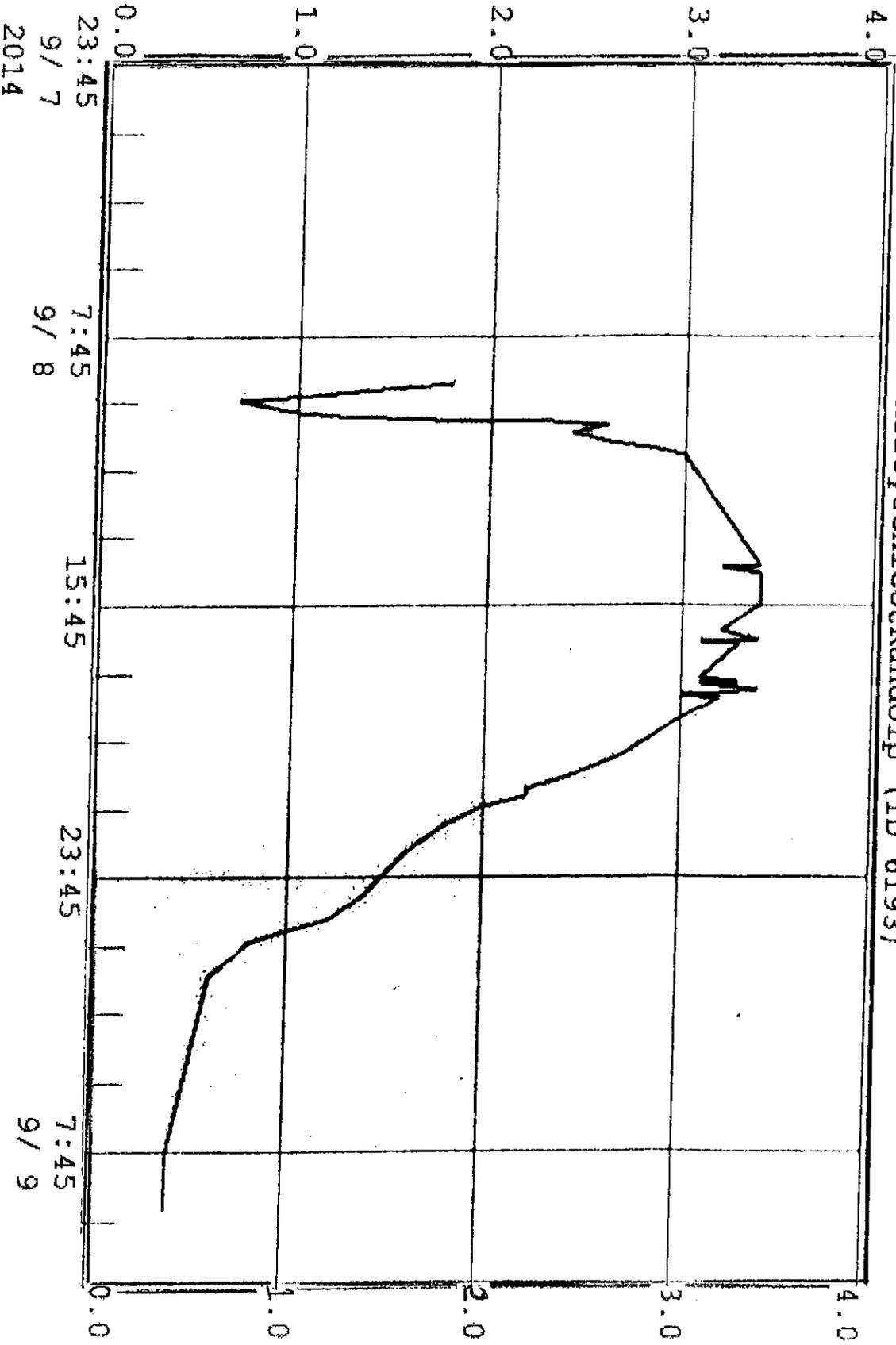
Alvernon Way Flooding Upstream of Del Ulrich Golf Course Detention Basin



Del Urich Golf Course Detention Basin



Arroyochico@Randolph (ID 6193)



1 days beginning 09/07/14 23:45:00

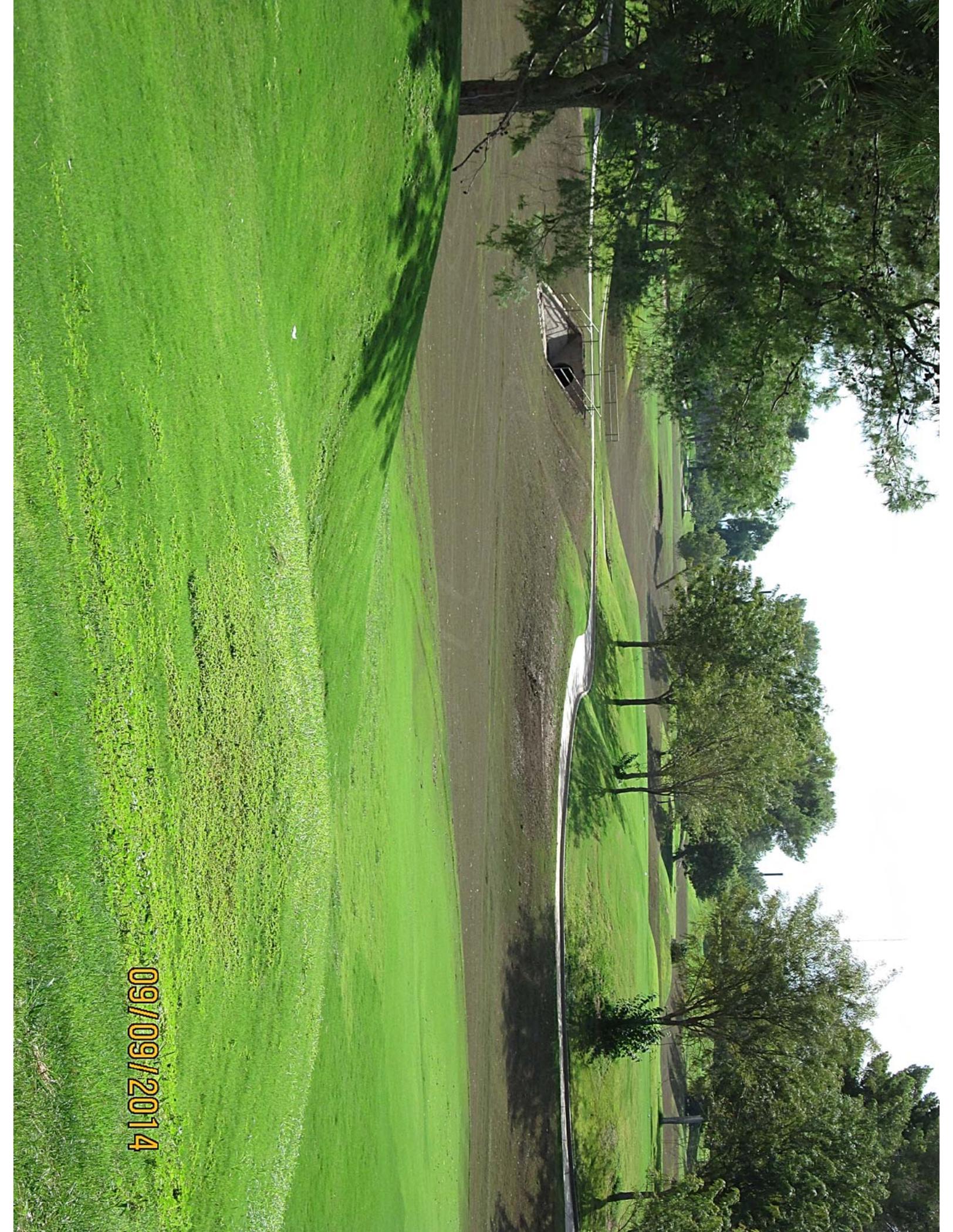
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Park Avenue Basin at Highland Road



ATTACHMENT 2



09/09/2014

ATTACHMENT 3

TUCSON DRAINAGE / ARROYO CHICO PROJECT

Phase 2 Construction Sequence

Phase 2B: Park Avenue Basins
& High School Wash
Construction Estimate: \$27,898,000
Construction Start: Sept., 2010

Phase 2A: Cherry Field and
Railroad Wash Confluence
Construction Cost: \$20,223,000
Construction Completed: Dec., 2010

Phase 2B:
Upstream Channel Improvements

Phase 1: Randolph South Detention Basin

Pima County constructed in 1996
Construction cost: \$13,130,000



ATTACHMENT 4

TUCSON DRAINAGE AREA (ARROYO CHICO)

FACT SHEET

Background

The U.S. Army Corps of Engineers (“the Corps”) and the Pima County Regional Flood Control District (“the District”) have worked very closely throughout the design and construction of the Tucson Drainage Area (Arroyo Chico) project (“the Project”) to ensure cost effectiveness and to maximize benefits. The benefit to cost (b/c) analyses has been prepared at each step of the planning and design phases of the project, i.e., Project Feasibility Study (1996), Concept Design (1999); Value Engineering (2000); and Design Documentation (2001).

Study and Design Costs

- Local Sponsor: \$ 1,298,000
- Federal: \$ 2,598,000

Construction Phase I (Randolph Detention Basin Complex)

- Local Sponsor: \$13,130,000 for Phase I in 1996 Dollars.¹
- Federal: None. Local sponsor paid all costs for Phase I. The sponsor sought and was granted project credit approval for construction costs incurred.

Construction Phase II (Park Avenue Detention Basin Complex)

- Phase II A, Cherry Field Basin constructed in 2008 (1 of 4 detention basins):
Local Sponsor: \$ 2,888,000 (5% cash contribution and all rights-of-way)
Federal: \$22,283,000
- Phase II B Final three detention basins and upstream channel:
Local Sponsor: \$ 5,794,300
Federal: \$18,225,500

Construction Phase III (High School Wash Storm Drain)

- Construction of Storm Drain to Begin in 2014:
Local Sponsor: \$ 1,080,000
Local Sponsor Utilities: \$ 1,077,000
Federal Share: \$ 3,720,000

Project Economic Benefits

The Corps’ b/c ratio only calculates “federal” benefits associated with the flood control project. And while that is clearly important, it does not include additional and significant regional economic benefits that will accrue to the City of Tucson and Southern Arizona. Completion of the project will directly benefit the regional transportation infrastructure and the City of Tucson’s downtown central business area.

Direct – Immediate Benefits

1. Create 261 job years.¹

¹ Phase I costs when constructed in 1996; the value in 2008 is \$18,800,000.

2. Direct employment of approximately 40 construction workers for 20 months.
3. Remove 1,315 residential, multi-family, commercial, and industrial structures from the FEMA 100-year floodplain with a total assessed property value of \$364,758,000.
4. Remove 71 publicly owned parcels (not reflected in assessed value) including 3 schools and 8 acres the maintenance and bus yard for Tucson Unified School District.
5. Reduce flood repairs and inundation costs to the public infrastructure of \$2,070,000 annually.
 - ✓ Protect 16 acres of active Union Pacific Railroad, 1.26 track miles.
 - ✓ Protect 4.6 miles of major streets including the Interstate 10 corridor.
 - ✓ Protect future Tucson Modern Streetcar, TIGER Grant, \$63,000,000.

■ Indirect Benefits

1. Jobs added in industries supplying construction materials and for operation and maintenance of the facilities.
2. Construction and service industry providing construction material is estimated to generate \$1,185,000 (5% of total construction costs) to local and state tax revenues.
3. Residential structures removed from the FEMA 100-year floodplains would **save individual households \$2,000 to \$3,000 annually in flood insurance costs for a total annual savings of \$2,420,000.** Households could then spend the savings on goods and services.

■ Long-Term Benefits

1. Protect Interstate 10 from flooding and the federal investment to this transportation corridor. Currently, improvements to Interstate 10 are being completed through downtown Tucson using more than \$200 million in federal funds.
2. Protect State Route 210, the Barraza–Aviation Parkway through downtown Tucson, which includes \$85 million in local funding.
3. Increase economic development of businesses and industries in areas removed from the FEMA 100-year floodplain within the federally designated empowerment zone created to revitalize the Tucson economy.
4. Increase economic development associated with the Union Pacific Railroad and Tucson’s designation by U.S. Customs as a “Port of Entry” to facilitate the free and competitive flow of regional international trade between the U.S. and Mexico.

Environmental Benefits

Reducing flooding and ponding of storm waters along the railroad and associated industrial areas will significantly reduce the potential for increased soil and groundwater contamination. Shallow groundwater below the downtown Tucson area has been contaminated with petroleum hydrocarbons, most commonly diesel fuels, from leaking underground storage tanks associated with the railroad. There is evidence of gasoline and halogenated volatile organic compounds in the soil, shallow groundwater and regional aquifer. Much of the contamination in the soils and groundwater is derived from leaking underground storage tanks including dry cleaning facilities, pipelines, manufacturing sites and other industrial facilities concentrated along the railroad corridor. Within the current 100-year floodplain there are:

- 1) Two Arizona State superfund sites, Park-Euclid and 7th Street (Arizona), where volatile organic compounds have contaminated soils and groundwater. These sites total 33 acres.
- 2) Fifteen leaking underground storage tanks including diesel and volatile organic compounds.

¹ Executive Office, Council of Economic Advisors, Estimates of Job Creation from the American Recovery and Reinvestment Act, May 2009

During the design of the Park Avenue Basins, the Corps and Pima County worked closely with the Arizona Department of Environmental Quality on contamination issues related to the Park-Euclid superfund site to control surface flooding and the potential impacts to groundwater conditions.

Social Benefits

More than half of the households in the City of Tucson housing market are by definition “low-income” (derived from income and household size). The 2008 American Community Survey indicated that, for Tucson as a whole, the median income per household is 70.4% below the national median income. Within the area to be protected by the proposed Park Avenue Detention Basins there are:

1. 9,467 households and of those households 2,780 or 29% are below the poverty level.*
2. 48% of the population are minorities*:

- 25% Hispanic
- 11% Other
- 4% Asian
- 3% African American
- 3% Two Races
- 2% American Indian

**2000 Census Data*

The residential structures being protected represent low to moderate income housing within Tucson’s urban core.

Cultural Benefits

Tucson may well be the oldest continuously inhabited city in America with over 4,000 years of human occupation by Native Americans, Spaniards, Mexicans, and Anglo Pioneers—one civilization overlapping another. Arroyo Chico flows through Tucson historic zones including El Presidio San Agustín established in 1775 by the Royal Spanish Army as a frontier presidio. Later, the United States located the early Fort Lowell in the same location. Tucson incorporated as a City in 1877. The El Presidio Historic District was listed in the National Register of Historic Places (NRHP), and contains the oldest homes in Tucson built in circa 1850 to 1924.

■ Flood Control Improvements

1. The improvements will remove 172 acres of National Registered Historic Districts from the 100-year floodplain.
2. The improvements will protect 11 NRHP structures:
 - Hereford House 330 N. Main
 - Hinchcliffe Court 405 N. Granada
 - Hinchcliffe House 330 N. Granada
 - Historic Warehouse District – UPRR-Toole-Stone
 - Kruttschnitt House 297 N. Main
 - Olcott House – 234 N. Main
 - Rockwell House 405 W. Franklin
 - Second Owl Club 378 N. Main
 - Steinfeld House/First Owl’s Club 300 N. Main
 - Telles Block Washington – Telles – Meyer –Court
 - Verdugo House 317-325 N. Main