



Coordination and Decision Support for International Outfall Interceptor Breach in Nogales Wash

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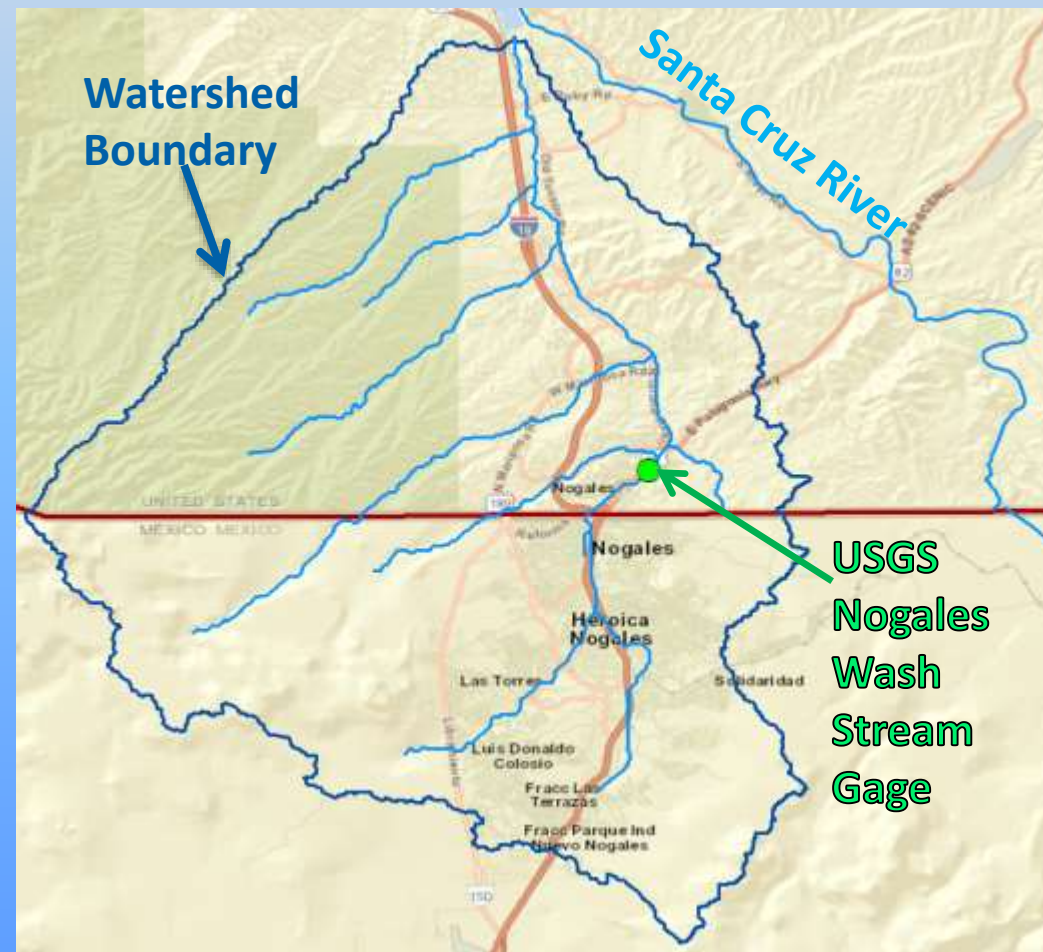
National Weather Service Tucson

- Weather forecast offices staffed 24/7
- 260 miles of International Boundary with Mexico
- Several rivers flow north from Mexico



Nogales Wash Watershed

- Begins in Mexico and flows north into Arizona
- Sonora population much larger than Arizona
- Tributary of Santa Cruz River
- Annual mean flow 7 cfs/2.1 ft



Nogales Wash

- Concrete lined channel ~2 miles
- Constructed in 1930s by International Boundary and Water Commission (IBWC)
- Concrete has been damaged and lost thickness



Nogales Wash Flooding

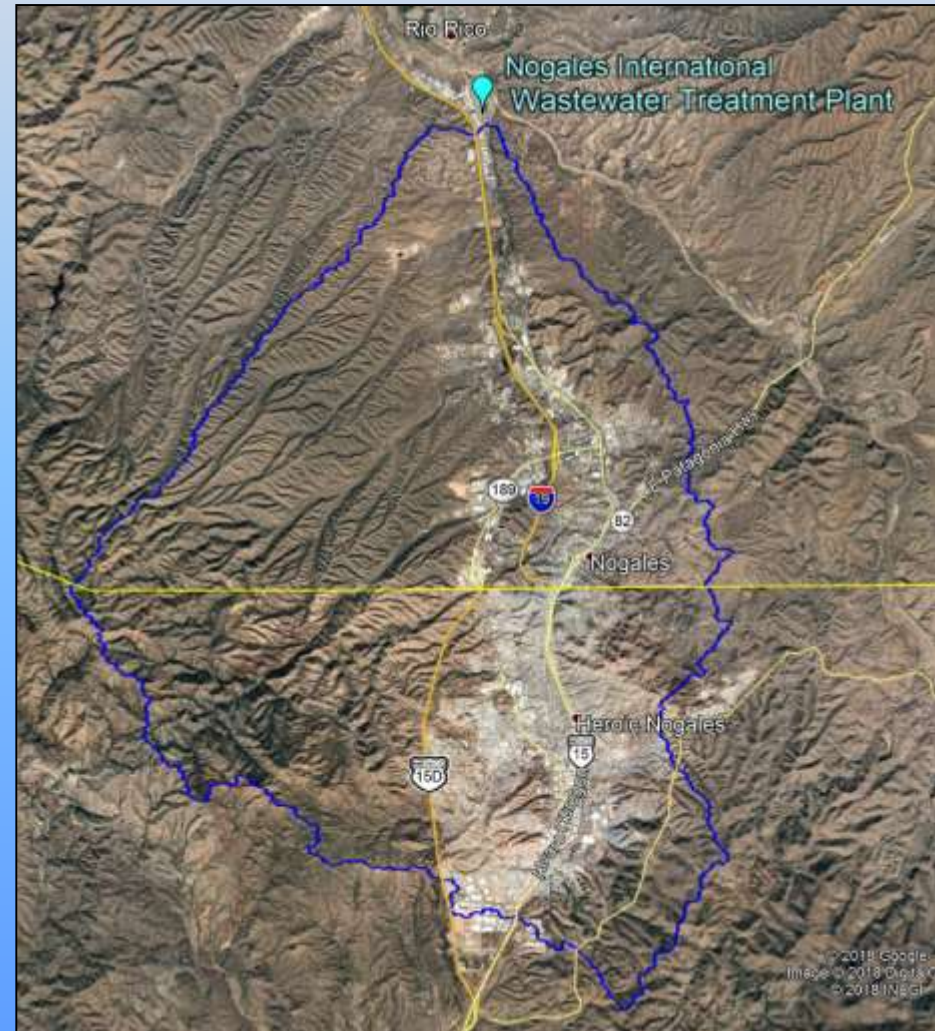
- 2ft stage to over 9ft within 15-30 minutes



USGS Nogales Wash Stream Gage Annual Peak Flows		
Date	Gage Height (ft)	Streamflow (cfs)
29-Jul-2010	11.2	6410
9-Sep-2011	7.76	3060
15-Aug-2012	9.45	4610
6-Jul-2013	7.44	2790
25-Jul-2014	9.8	5120
20-Aug-2015	10.25	5410
3-Aug-2016	10.35	5510
10-Aug-2017	10.42	5580

International Outfall Interceptor

- Conveys wastewater from Nogales, Sonora & AZ to the Nogales International Wastewater Treatment Plant
- Portions lie underneath Nogales Wash
- Owned by the City of Nogales
- International Boundary and Water Commission operates & maintains treatment plant

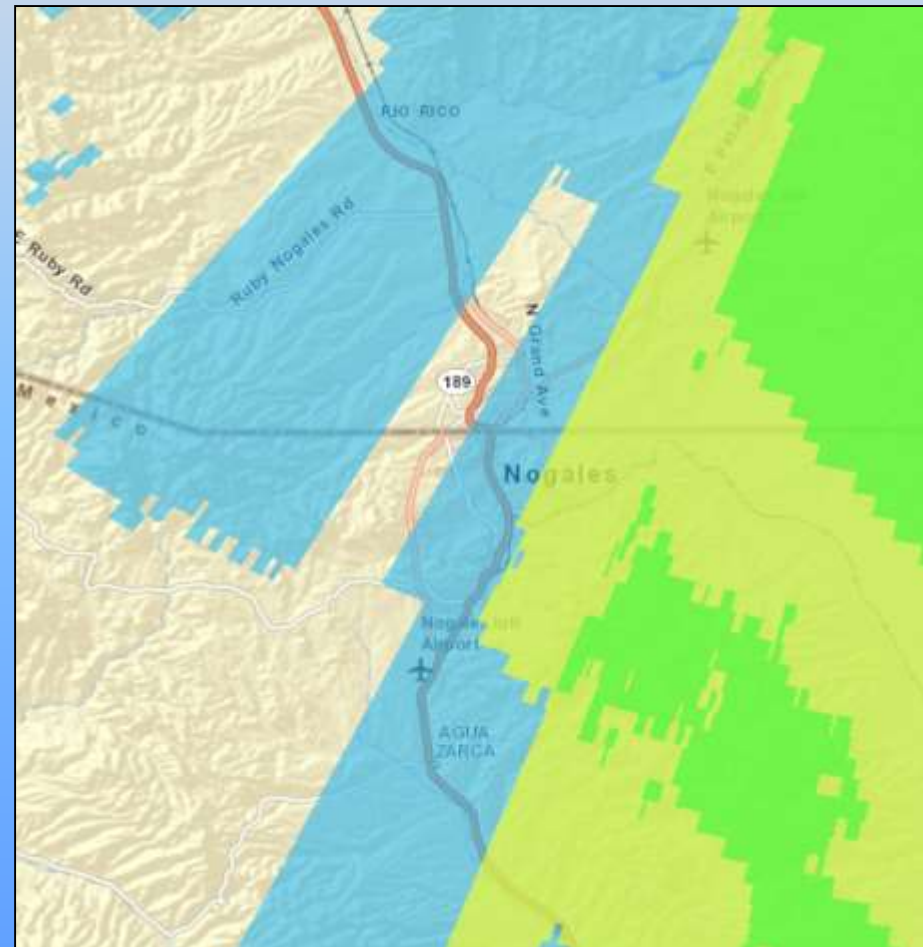
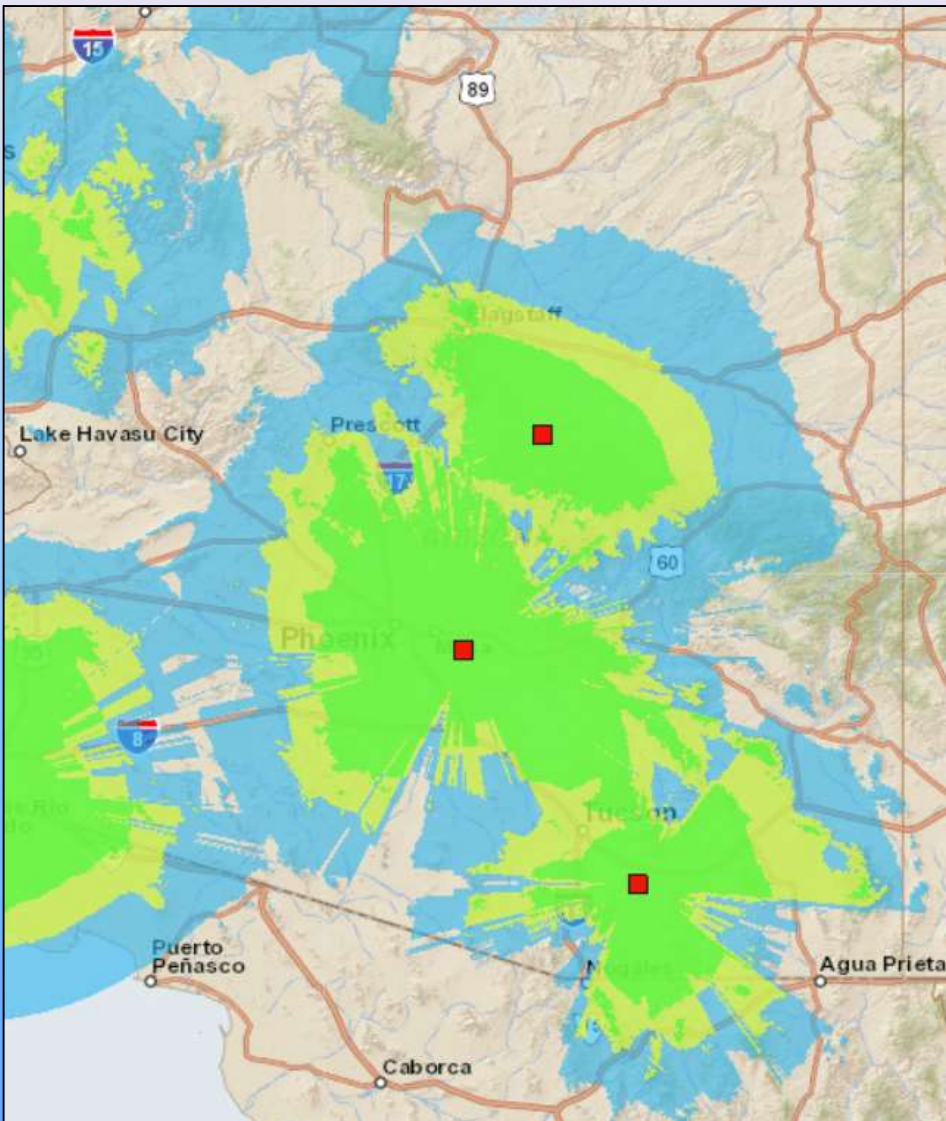


Monsoon Season

- June 15 – September 30
- 50% annual rain falls during the Monsoon
- Thunderstorms with heavy rainfall and flash flooding

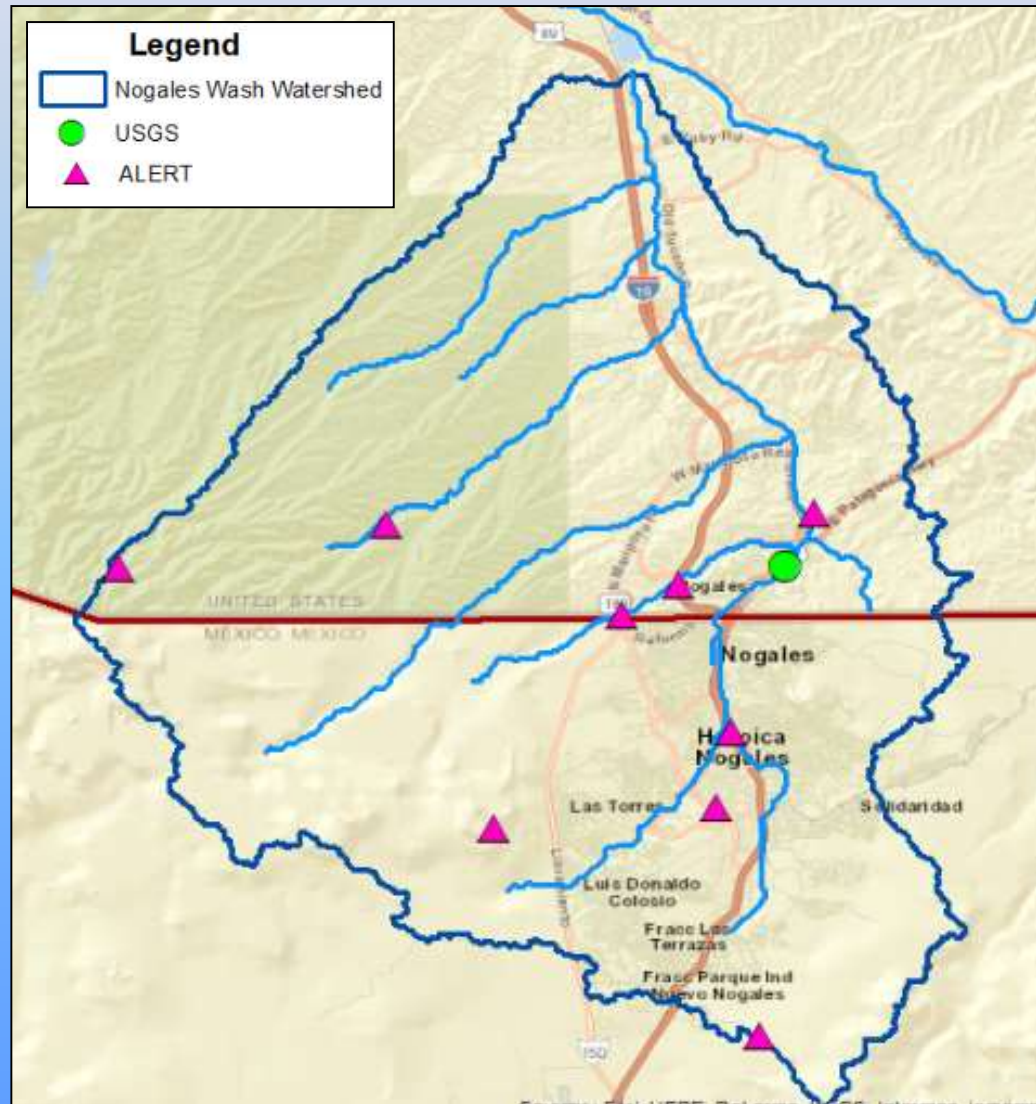


Radar Coverage



Gages

- 1 USGS stream gage on Nogales Wash
- 9 ALERT gages in Arizona and Sonora



IOI Breach

- July 25, 2017 City of Nogales Public Works reported a partial breach of IOI
- City notified IBWC of a dislodged manhole
- July 26 & 27 City of Nogales, Santa Cruz County, and State of Arizona Declarations of Emergency
- July 26 NWS notified of breach and request for weather briefings
- July 27 Arizona Governor requests assistance from Army Corps of Engineers



Photo by Jonathon Clark

Agencies Involved in IOI Breach

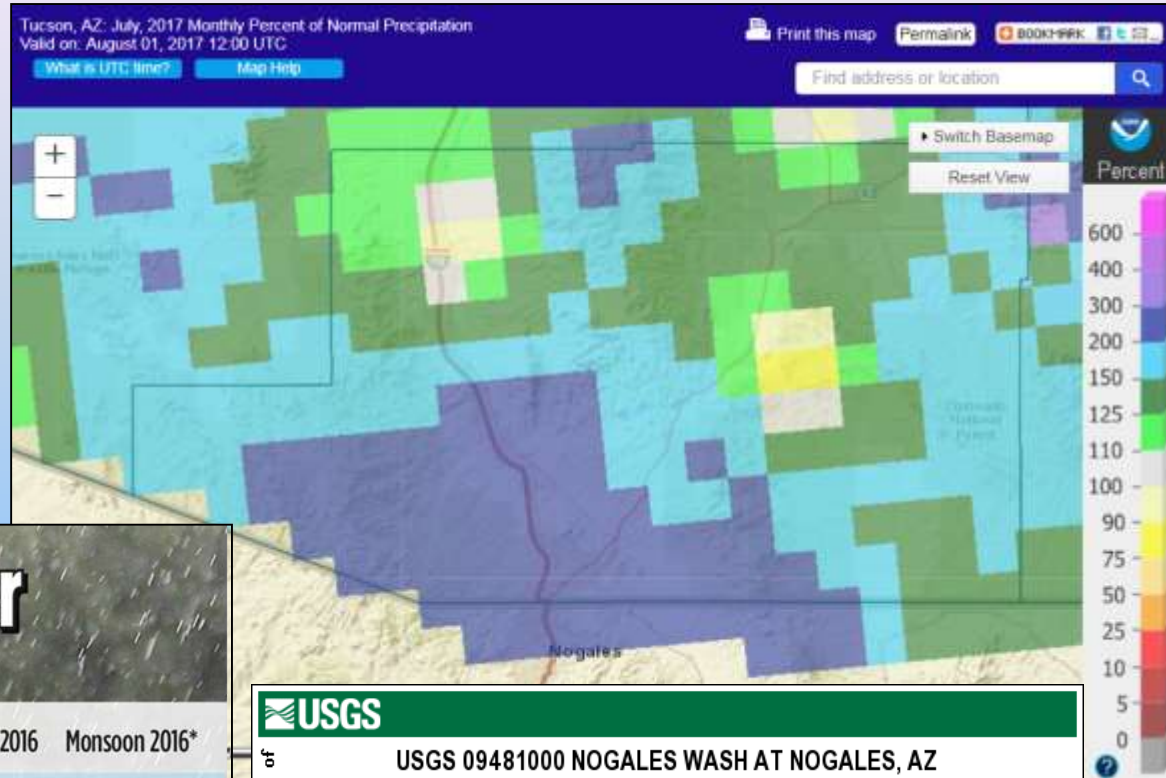


US Army Corps
of Engineers®



Rainfall & Runoff prior to IOI Breach

- July 2017 rainfall well above normal of 4"
- July 17 & 20 widespread rainfall



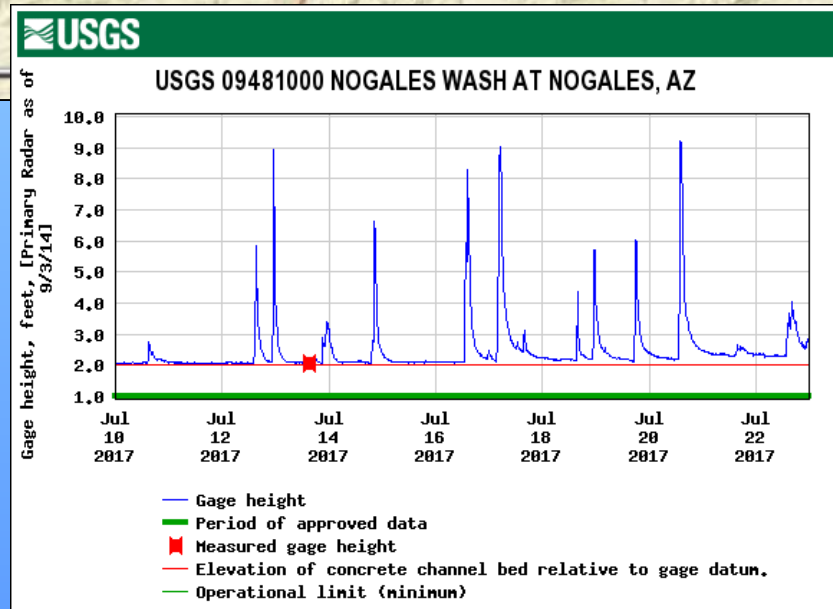
A month of wet weather

Local precipitation amounts in inches, this year and last

Rain gauge location	July 2017	July 2016	Monsoon 2016*
Ephriam Canyon (Western Ave.) and I-19	10.67	3.23	11.18
Mariposa Port of Entry	10.28	2.27	11.69
Peña Blanca Lake	12.4	1.3	10.94
Calabazas Canyon (south of Peña Blanca Lake)	13.62	3.5	14.45
Palo Parado Bridge (Rio Rico)	5.79	1.93	9.76
Casa Blanca and SR 82 (Patagonia-Sonoita)	5.71	2.48	10.08
Santa Cruz River in Tubac	3.58	3.66	8.35
South-central Nogales, Sonora	13.78	2.83	10.94
Chimine Wash (central Nogales, Sonora)	11.85	3.27	10.63
Average of all gauges in area	8.49	2.9	10.85

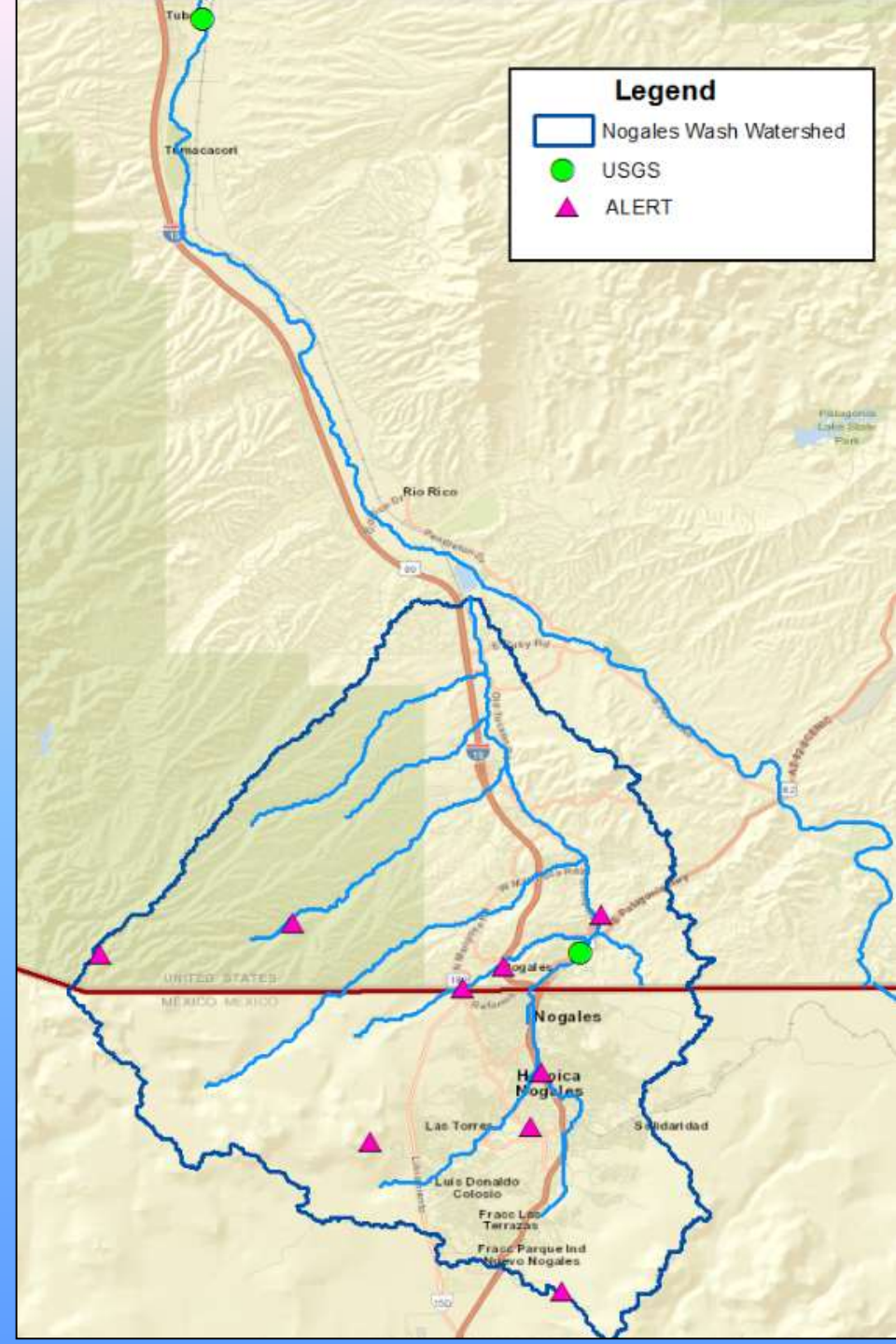
* Monsoon season in Arizona is June 15-Sept. 30
SOURCE: Santa Cruz County Flood Control District

From Nogales International



USGS Coordination

- 2 USGS Stream Gages
- Increased data feed for Nogales Wash and Santa Cruz River at Tubac, AZ
- 5 minute readings





Additional sites identified that were impacted by high flows and flooding

Nogales IOI Incident



Photos from USACE
Los Angeles District



NWS Support

- Daily Weather Briefings to WebEOC July 26 – Aug 29
- AZ DEMA coordination calls July 27 to August 15
- USACE coordination calls August 1-19

**NATIONAL WEATHER SERVICE TUCSON, AZ
WEATHER BRIEFING, NOGALES I.O.I. FORECAST**

Issued: Thu, July 28, 2017
9:00 AM MST



Summary: There is a really good chance for strong storms with heavy rain to occur in the Nogales area this afternoon and again late this evening (two episodes). Either of them could be heavy enough to produce significant flow in the Nogales wash and the Santa Cruz river. Another round of heavy rain is likely Saturday afternoon and evening.

TODAY: Showers and thunderstorms are expected to develop over the area around mid-afternoon with heavy rains possible over the Nogales area on both sides of the border. Rainfall amounts with these storms could be heavy, with the potential for moderate to significant flows in the wash and river if the area takes a direct hit. The potential exists for another surge to be deep enough to head north toward the Tucson area.

Moderate Confidence to High Confidence that rains causing elevated flow in the Nogales wash and additional flow in the Santa Cruz will occur. **Moderate Confidence to High Confidence** in timing when rain will occur resulting in elevated flows.

TONIGHT: There is a really good chance that a second round of storms will move across the area between 8 pm and midnight. If these occur the rain will be heavy enough to cause, or at least maintain elevated flows in the Nogales wash and the Santa Cruz river.

Moderate Confidence that thunderstorms will occur in the Nogales area later this evening with rainfall causing added flow or maintaining the flow in the Nogales wash and Santa Cruz river during the evening hours and overnight hours.

**NATIONAL WEATHER SERVICE TUCSON, AZ
WEATHER BRIEFING, NOGALES I.O.I. FORECAST**

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SATURDAY INTO SATURDAY NIGHT: Abundant showers and thunderstorms are expected once again and the Nogales area is likely to be impacted at some point during the mid afternoon into nighttime hours. Again, rainfall amounts with these storms may be heavy, and with the already saturated soils, it won't take much rain to cause additional elevated flows in the wash or the river.

Moderate to High Confidence that thunderstorms will occur over the Nogales area during the afternoon and evening hours with rainfall causing more flows in the Nogales wash and Santa Cruz river.

OUTLOOK SUNDAY THROUGH TUESDAY:

Sunday into Sunday night - Still expecting some afternoon and evening thunderstorms around the region but to a somewhat lower degree vs Saturday. However with the expected rains Friday and Saturday, soils will be rather saturated and it will require less rain to get water flowing in the wash and river.

Monday into Tuesday - Expecting a lower threat of thunderstorms around the region for a reduced chance of flow in the washes or the river.

ADDITIONAL RESOURCES:

[Click for the latest forecast for the area from Nogales to Rio Rico](#)
[Latest USGS Stage Data for Nogales Wash at Nogales](#)
[Recent Nogales Wash ALERT Gauge Stage Information](#)

**NATIONAL WEATHER SERVICE TUCSON, AZ
WEATHER BRIEFING, NOGALES I.O.I. FORECAST**

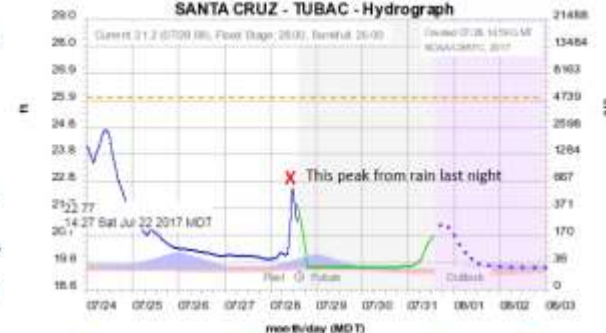
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DOWNSTREAM FORECAST INFORMATION

Santa Cruz River @ Tubac River Stage & Forecast

Colorado Basin River Forecast Center
SANTA CRUZ - TUBAC - Hydrograph



The most current forecast can be found at: <https://go.usa.gov/xRQCK>

The surge noted on the graph above at the Tubac gauge from last night's rain will likely be 2-3 ft deep at Continental by noon, and up to 1-2 ft as far north as Tucson late today.

NWS Support

- 24/7 weather monitoring
- Severe thunderstorm & flash flood warnings
- Flood Advisories

BULLETIN - EAS ACTIVATION REQUESTED
Flash Flood Warning
National Weather Service Tucson AZ
109 PM MST SAT JUL 29 2017

The National Weather Service in Tucson has issued a

- * Flash Flood Warning for...
South central Santa Cruz County in southeastern Arizona...
- * Until 415 PM MST
- * At 108 PM MST, Doppler radar indicated thunderstorms producing heavy rain across Nogales Sonora where one inch of rain has fallen in 15 minutes. Flash flooding is expected to begin shortly in Nogales Arizona.
- * Some locations that will experience flooding include...
Nogales, Rio Rico Southeast and Rio Rico Southwest.

Severe Weather Statement
National Weather Service Tucson AZ
319 PM MST WED AUG 9 2017

AZC023-092230-
/O.CON.KTWC.SV.W.0066.000000T0000Z-170809T2230Z/
Santa Cruz-
319 PM MST WED AUG 9 2017

...A SEVERE THUNDERSTORM WARNING REMAINS IN EFFECT UNTIL 330 PM MST
FOR SOUTH CENTRAL SANTA CRUZ COUNTY...

At 316 PM MST, a severe thunderstorm was located 8 miles southwest of Rio Rico Southwest, or just west of Nogales, moving west at 10 mph. Strong winds, small hail and very heavy, flooding rains have been reported with this storm.

NWS Support

- Heads up on storms that could impact Nogales Wash via WebEOC & phone calls

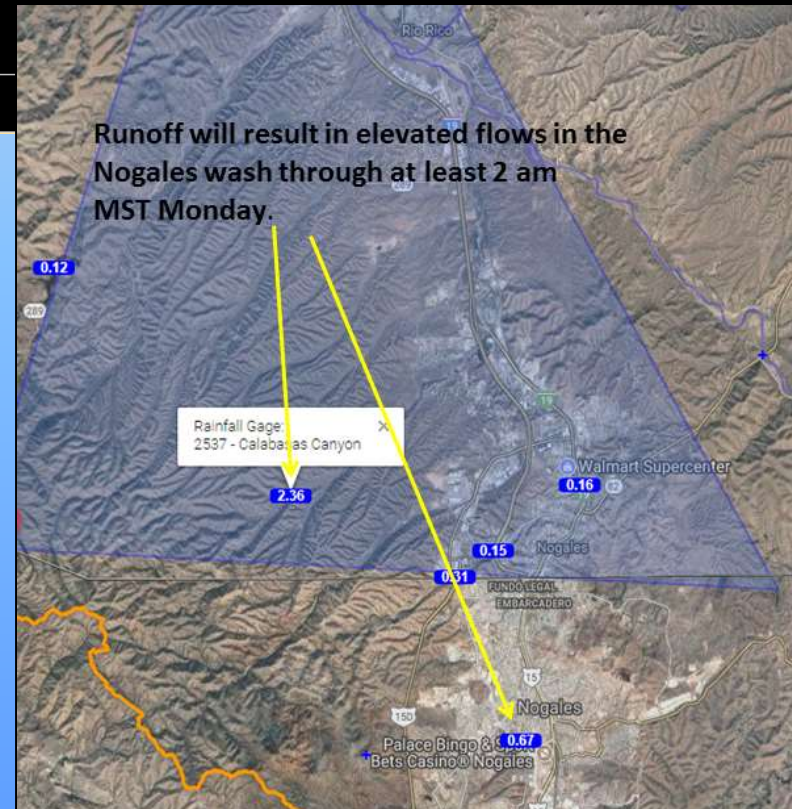
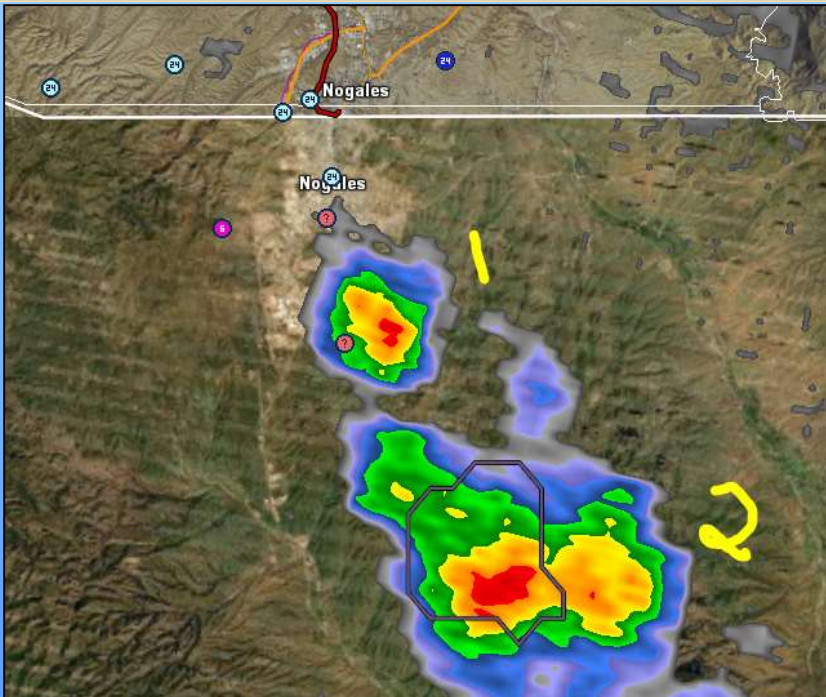
This small storm (#1) over the far southern part of Nogales Sonora has mostly dissipated and produced a little bit of rain over the southern part of the city. This might produce a foot or so rise in the wash in a couple of hours.

More concern is to watch storm #2 further to the south and we are watching.

County - Pima PLN Tech Specialist (ESF 5) - carl.cerniglia@noaa.gov at 14:35:16 on 07/31/2017

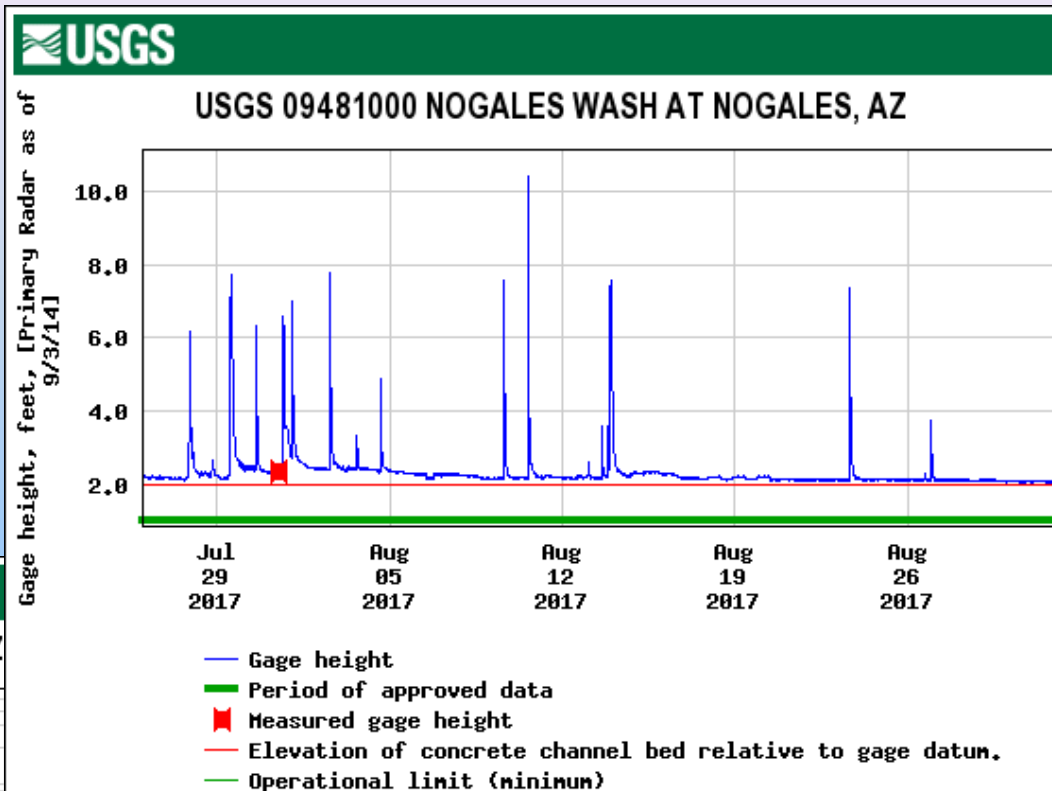
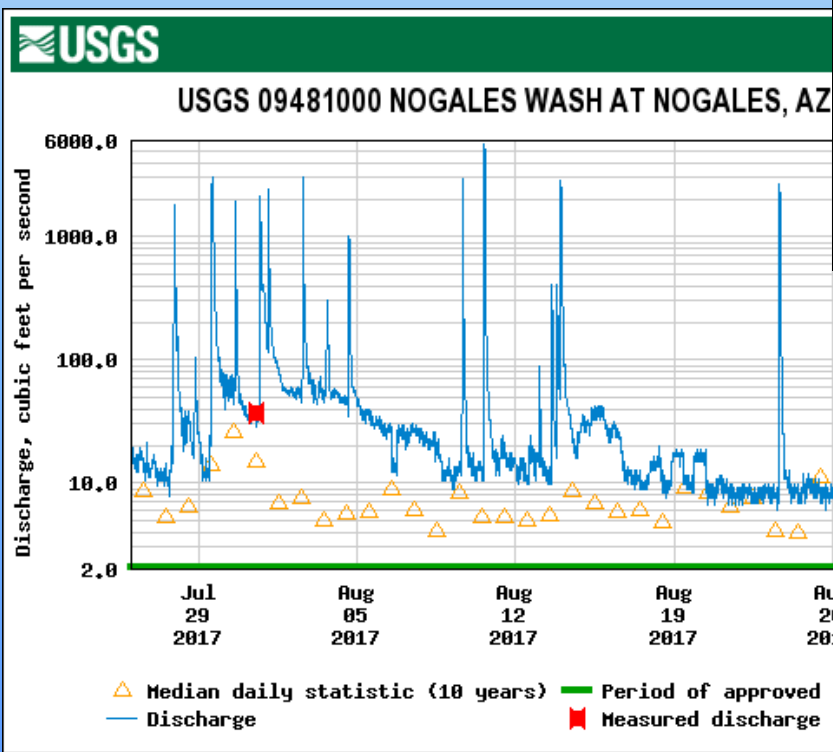
Priority
High

Incident: Santa Cruz County - Nogales I.O.I 07-25-2017



Challenges to repair IOI

Numerous high flows



IOI Breach Temporary Fix



**International Boundary and Water Commission
United States Section**

For immediate release
August 2, 2017

SEWAGE LEAK IN NOGALES HAS BEEN CONTAINED



IOI Breach Fixed



**International Boundary and Water Commission
United States Section**

For immediate release
October 6, 2017

**CONSTRUCTION TO BEGIN OCTOBER 9 ON
SEWER MANHOLE 89 IN RIO RICO, ARIZONA**



Photos from Ray Sayre



**International Boundary and Water Commission
United States Section**

For immediate release
October 31, 2017

**CONSTRUCTION COMPLETE ON
SEWER MANHOLE 89 IN RIO RICO, ARIZONA**



Conclusion

- Close monitoring of weather conditions was critical for repair work
- Coordination with USGS improved access to stream gage data
- Better understanding of rainfall thresholds in Sonora that trigger high flows in Arizona
- Local Weather Forecast Offices available 24/7 to support public agencies during weather impacting events



Photos from USACE Los Angeles District