Nogales SSO and Pretreatment Priority Matrix

Distinct Problem	Root Cause	Ranked Recommendations	Recommendation Rough Cost Estimate[5]	Relationship to MOU / ASESP
Sanitary Sewer Overflows (SSOs): Sanitary sewer overflows (SSOs) occur frequently in Ambos Nogales, primarily due to severe flooding during the summer monsoons. In addition to microbial contamination, SSOs sometimes contain pollutants from poorly treated industrial discharges. **Rough estimate of Arizona current costs:** $109,170 in FY2018.	Numerous factors, including insufficient number, operation and maintenance of flood control structures in Nogales, Sonora; Mexico's practice of using the IOI to mitigate flood events, and unplanned development in the floodplain in Nogales, Sonora. The result is releases of untreated sewage into residential and business neighborhoods in the City of Nogales and the Santa Cruz River watershed.	1. **Build stormwater structures in Nogales, Sonora.** Recommendations are outlined studies commissioned by the International Boundary and Water Commission [1,2] which focus on the construction of tributary detention basins for flood damage reduction in Nogales, Sonora. The city already has 11 detention basins; limited maintenance is provided. The Nogales, Sonora Institute for Municipal Planning and Research (IMIP) has proposed building an additional 9 basins at specific sites to assist with flood mitigation[3]. Site selection is based on new studies commissioned by the city given development at basin sites recommended in 2005[4].	$2,400,000 (Includes SOW + Construction) (MXN original estimates converted to US Dollars, 19 pesos to the dollar exchange rate) +50% = **$3,600,000**	Arizona/Sonora Environmental Strategic Plan (ASESP). Priority Water Projects - Pages 7, 9, 21, 22: This project aims to support maintenance of existing gabions and promote new stormwater gabions as appropriate, and evaluate other formal flood-control alternatives. The goal is to protect the residents of Ambos Nogales and secure its municipal assets by strengthening the region's stormwater management infrastructure while reducing the risk of stormwater-induced sanitary sewer overflows (SSOs).
		2. **Maintain existing (and new) stormwater structures in Sonora.** The USGS[2] study highlights the need for continuous maintenance to ensure basins can operate at full capacity over time.	Annual: $128,000 (MXN original estimates converted to US Dollars, 19 pesos to the dollar exchange rate) + 50% = **$192,000**	
Industrial Contaminants in the Santa Cruz River: On average, 200 lbs. of metal (nickel) are discharged to the Santa Cruz River each month. The Nogales, Sonora Municipal Pretreatment Program regulates the quality of wastewater discharged by maquiladoras. These discharges are treated in Arizona. Sonoran oversight of industrial discharges meets Mexico's minimum federal requirements (NOM-002), but is insufficient to detect and respond to dumps of industrial contaminants when they occur. These impact U.S. infrastructure and the operation of the Nogales International Wastewater Treatment Plant, threaten Arizona's groundwater resources, and impair the Santa Cruz River. **Rough estimate of Arizona current costs:** legal case to address this issue is $1,166,923 (to date).	Additional resources are required for Nogales, Sonora to provide the necessary oversight to meet U.S. standards for environmental protection in Arizona. Solicitations to both Mexico's Federal Department of Water Resources (CONAGUA) and the International Boundary and Water Commission (IBWC) by both ADEQ and Nogales, Sonora have been inconsequential. Minor support has been facilitated through the EPA Border 2020 program, but is far short of what is needed for sustainability.	3. **Stand-up the Nogales, Sonora Pretreatment Program in matters that go above and beyond Mexico's NOM-002 requirements.** (i.e. collection-system source characterization via monitoring, followed by specific outfall monitoring). Current monitoring is on a one-time annual basis. Additional monitoring is needed to ensure compliance on a continuous basis. Increased monitoring requires additional funding for equipment, personnel, and sample analyses in Mexican-certified labs to ensure there is continuous detection and regulatory response to dumping. Updates summarizing respective activities and results will be shared at quarterly Binational Technical Committee meetings already hosted by IBWC. ***Ongoing Support.*** Sustainability will require ongoing support of equipment, staff, and water quality analyses to support activities not required under NOM-002	One time: $269,000 +50% = **$403,500** Annual: $241,000 +50% = **$361,500**	Priority Water Projects - Pages 7, 9, 21, 25: This project aims to leverage federal resources to strengthen institutional pretreatment processes in Nogales, Sonora so that contaminant loadings can be mitigated at their source. Respective processes include wastewater monitoring in the binational conveyance for source characterization, information exchange with the regulated community, and support of Mexico's Industrial Wastewater Discharge Limits (NOM-002) where needed.
Nogales Wash Bank Erosion Leading to IOI and Manhole Damage: Because reaches of the IOI are aligned in the open channel of Nogales Wash, the sewer pipe and manholes are subject to damage and rupture due to bank erosion. **Rough estimate of Arizona costs:** included in SSO estimate for ADEQ. Other State agencies have costs associated with this problem.	Poorly selected IOI alignment and lack of bank stabilization and stormwater detention along the Nogales Wash.	4. **Bank Protection and Wash Crossing Reinforcement.** Protect current alignment by reinforcing Nogales Wash Banks and IOI crossings.	One time: $17M – $32M +50% = **$26M – $48M**	Not in ASESP
		5. **Implement the Santa Cruz County Master Plan.** The Ephraim, Mariposa, Portrero Creek detention basins will assist with bank protection for the alignment of the IOI in the Nogales Wash, but only for storms that fall on the west side of the watershed. The Baffert detention basin will assist with bank protection for storms that fall in the urban area of Ambos Nogales, and may also provide the added benefit of trapping solid waste. These projects will do very little to address existing SSO and Industrial contaminants in the Santa Cruz originating from Sonora, but may help prevent a future failure of the IOI in Arizona.	Provided by others	

Nogales SSO and Pretreatment Priority Matrix

NOTES

[1] U.S. Army Corps of Engineers, Los Angeles District. *Ambos Nogales Special Flood Damage Reduction Study Nogales, Sonora, Mexico Prepared for the International Boundary and Water Commission.* Revised September 2005.

[2] U.S. Geological Survey Open-File Report 2010-1262, 112 p. *Nogales flood detention study*: http://pubs.usgs.gov/of/2010/1262/

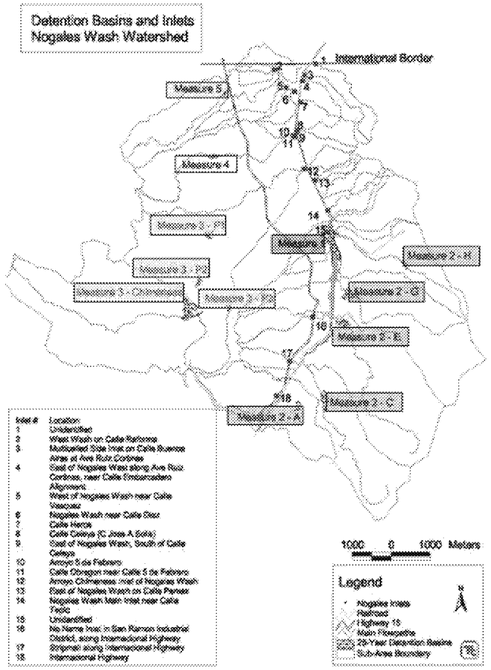
[3] Prevención y Control de inundaciones en Nogales, Sonora – Resumen Técnico (July 12, 2016)

[4] Telephone and email communication with IMIP (November 17, 2017)

[5] Rough cost estimates were developed using available information over a short period of time. A 50% contingency was added consistent with the Association for the Advancement of Cost Engineering (AACE) guidelines for rough order of magnitude (ROM) cost estimates.

FIGURES

Figure 1: Recommendations for placement of Stormwater Detention Features (ACE/IBWC Study, 2005) (Area in purple polygon, Figure 4)



Sin Medidas

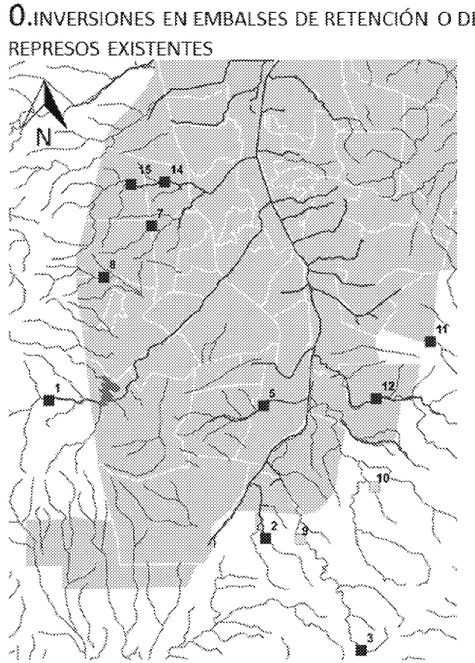
350,000 m^2
539 estruct.

Impacto de Medidas (Cuencas de Retención)

2.	308,800 m^2 457 estruct.	Δ Δ	41,200 m^2 82
3.	307,700 m^2 437 estruct.	Δ Δ	1,100 m^2 20
4.	306,800 m^2 435 estruct.	Δ Δ	900 m^2 2
5.	306,800 m^2 435 estruct.	Δ Δ	0 m^2 0

1. (Sin Calculo – área desarrollada)

Figure 2: Existing Stormwater Detention Features in Nogales, Sonora (Area in purple polygon, Figure 4)



Ubicación de las obras autorizadas por FONDEN 2014 en el sector Hídrico

CONCEPTO	AÑO	RECUSOS	IMPORTE
Reparación de Represo Chimeneas	2008	CONAGUA	$ 1'377,065.00
Reparación de Acceso a Represo Villa Sonora	2011	CONAGUA con recursos FONDEN 2008	$ 8,400.00
Reparación de Represo UNISON	2012	CONAGUA con recursos FONDEN 2008	$ 4'918,623.00
Reparación de Represo Maquiladoras	2009	Fondos Municipales 2008	$ 1'696,206.20
Regulación Sistema Pueblitos (Cañada del Muerto)	2014	FONDEN 2014	$ 4'566,192.56
Reparación Arroyo Flores Magón	2014	FONDEN 2014	$ 979,030.40
Regulación Arroyo Solidaridad	2014	FONDEN 2014	$ 1'718,968.20
Regulación Arroyo Centauro (Monumentos de Piedra)	2014	FONDEN 2014	$ 1'449,254.22
Reparación de Represo 5 de Febrero	2014	FONDEN 2014	$ 1'035,845.20
Capulines	2008	COCEF Programa Frontera 2012	-
Cuesta Blanca	2008	COCEF Programa Frontera 2012	-
TOTAL			$ 17'749,584.78

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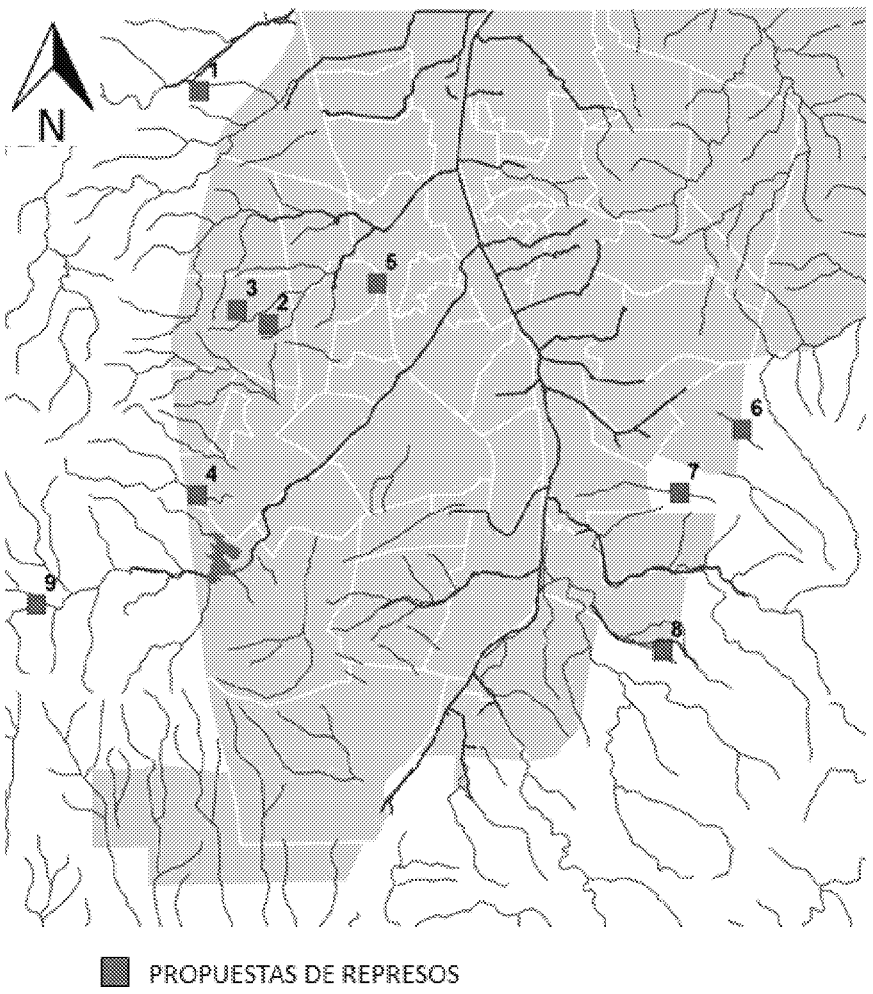
Figure 3: City of Nogales, Sonora Recommendations for Placement of New Stormwater Detention Features (2016)
(Area in purple polygon, Figure 4)

1. FICHA TÉCNICA

PROPUESTA 9 REPRESOS PARA NOGALES



	CONCEPTO	TOTAL
1	**Construcción de Represa de Retención y control de Inundaciones "Mariposas"** incluye: Construcción de estructura de embalse y vertedor con gavión	$ 1,246,175.76
2	**Sistema de Retención Pluvial Pueblitos.-** Construcción de Laguna B y Vertedor	$ 1,513,254.60
3	**Sistema de Retención Pluvial Pueblitos.-** Construcción de Laguna C y Vertedor	$ 1,952,356.70
4	**Proyecto ejecutivo para Sistema de Retención Pluvial "La Muralla"** incluye: Diseño de Adaptación de Laguna, Vertedor y Estudios Necesarios.	$ 1,991,403.83
5	**Proyecto ejecutivo para Sistema de Retención Pluvial "Los Ángeles"** incluye: Diseño de Laguna, Vertedor y Estudios Necesarios.	$ 2,031,231.91
6	**Proyecto ejecutivo para Regulación de Arroyo Solidaridad 2** incluye Diseño de Laguna, Vertedor y Encausamiento	$ 2,071,856.55
7	**Proyecto ejecutivo para Sistema de Retención Pluvial "Los Soldados"** incluye: Diseño de Estructura de Embalse, Vertedor con Gavión y Estudios Necesarios.	$ 2,113,293.68
8	**Proyecto ejecutivo de Sistema de Retención Pluvial "San Carlos"** incluye: Diseño de Estructura de Embalse y Vertedor con Gavión.	$ 2,155,559.55
9	**Proyecto Ejecutivo de Magna Presa en Arroyo Chimeneas** incluye: Diseño y todos los Estudios Necesarios. Incluye solo Proyecto)	$ 8,000,000.00

NOGALES

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Figure 4: Santa Cruz County Master Plan Detention Features (green triangles)

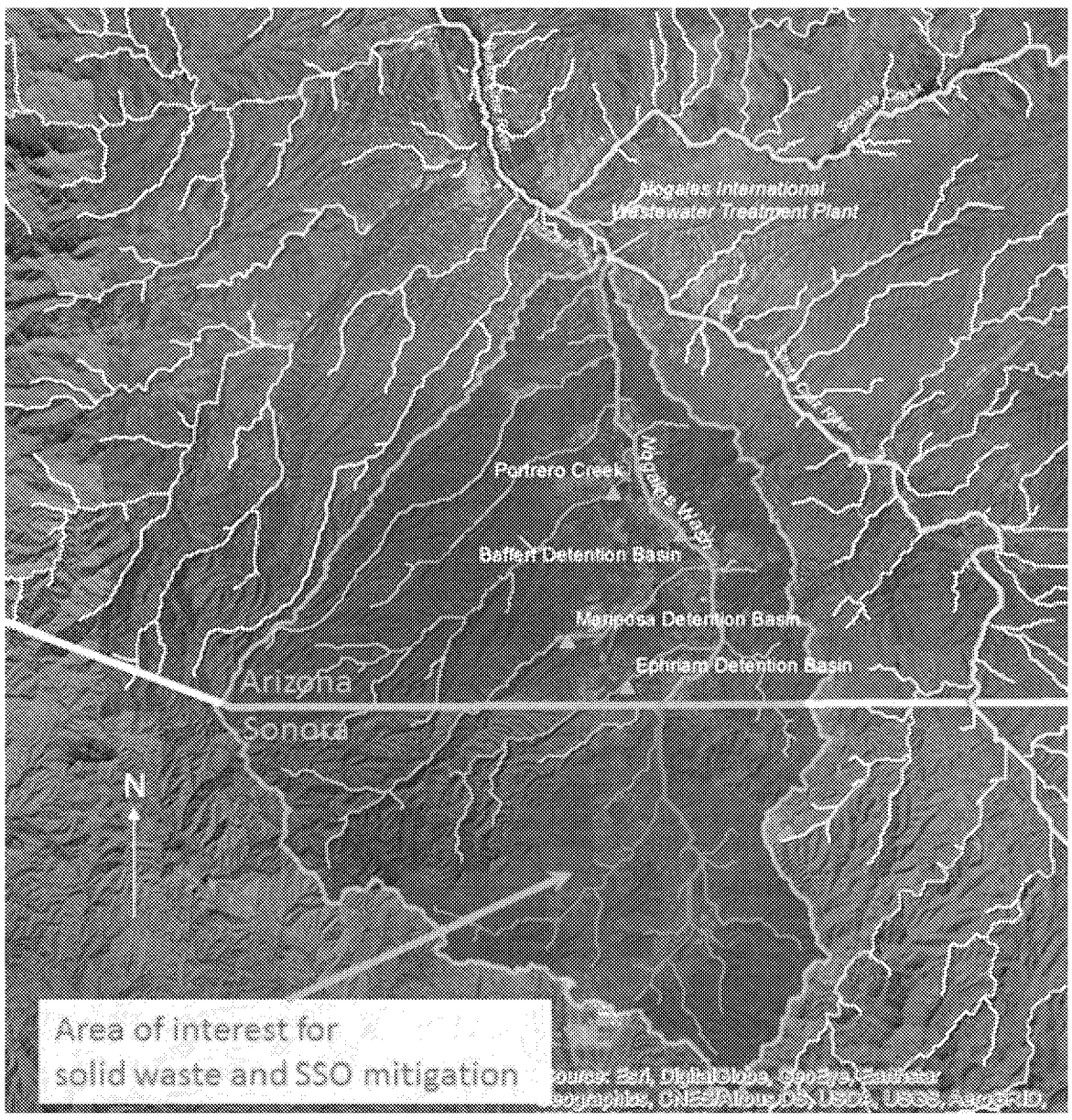

Figure 5 – Conceptual Bank and Crossing Protection