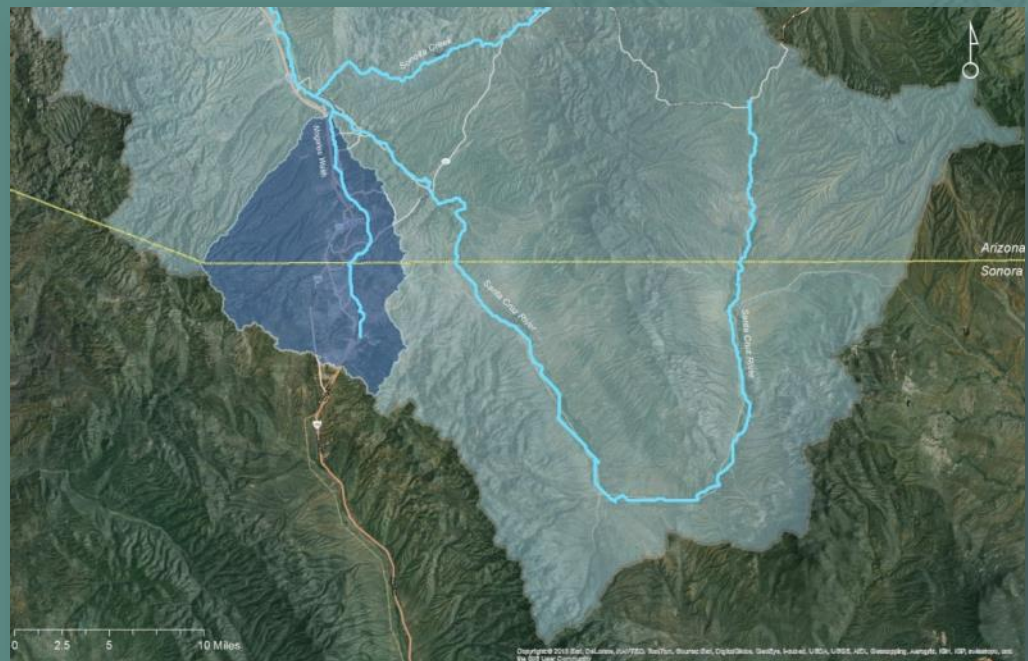


Binational Stormwater and Wastewater Challenges in the Border Communities of Ambos Nogales

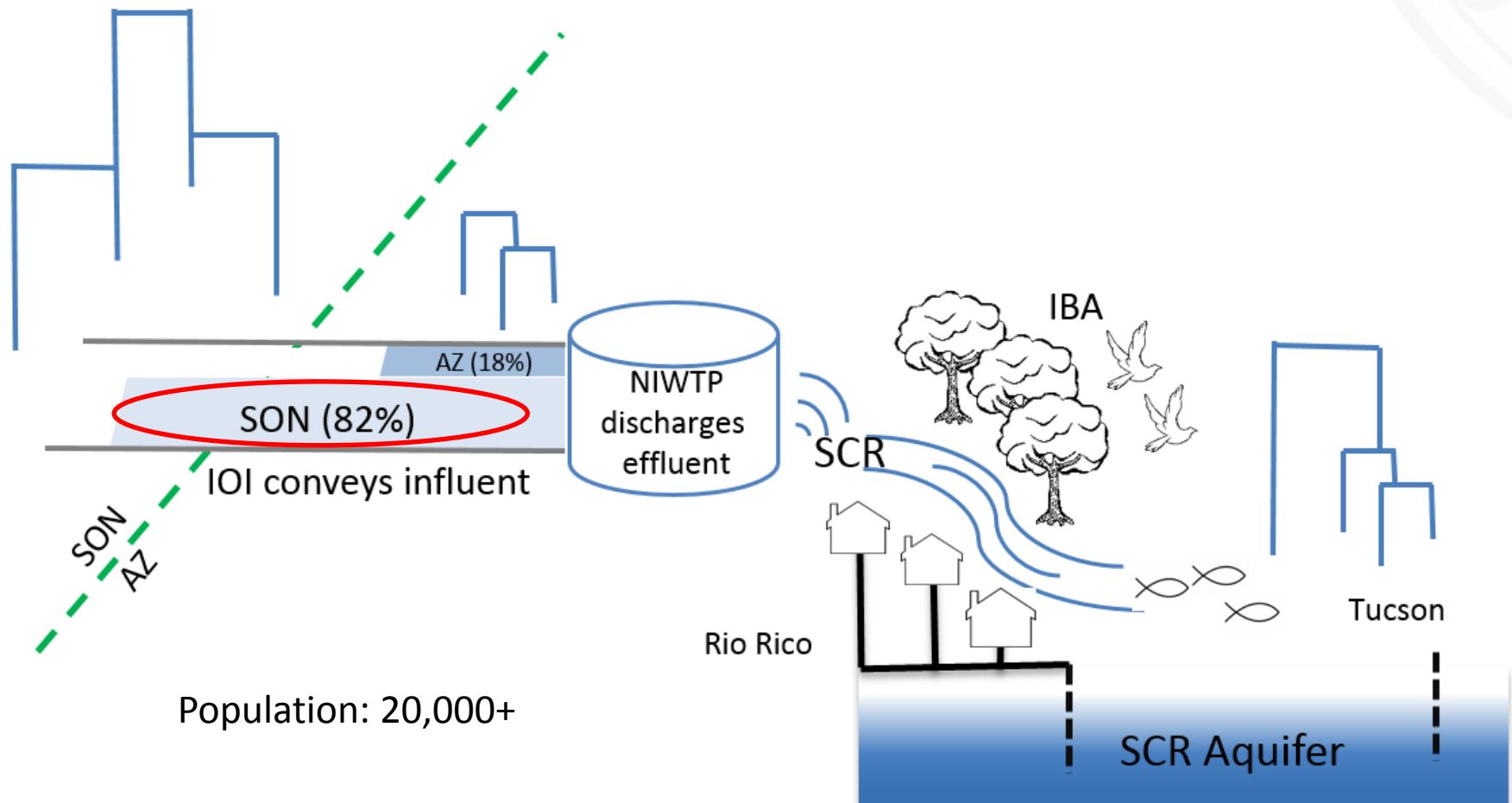
Friends of the Santa Cruz River
Tubac Community Center
November 15, 2017

M.S. Hans Huth
Arizona Department of Environmental Quality (ADEQ)



Pretreatment

Population: 300,000+



Population: 20,000+



Final Report (revision 1)

Nogales International Wastewater Treatment Plant Maximum Allowable Headworks Loading Development

Prepared for
**United States Section, International Boundary
and Water Commission (USIBWC)**

Under Contract IBM04D0005, Task Order IBM08T0035

November 2009

CH2MHILL
445 Executive Center Blvd., Suite 110
El Paso, TX 79902



21.19 kg Ni / day



8.36 kg Ni / day

6.27 kg Ni /day



9.62 kg Ni / day



Figure 9: Nickel (Ni) Daily Loading NIWTP Border Station

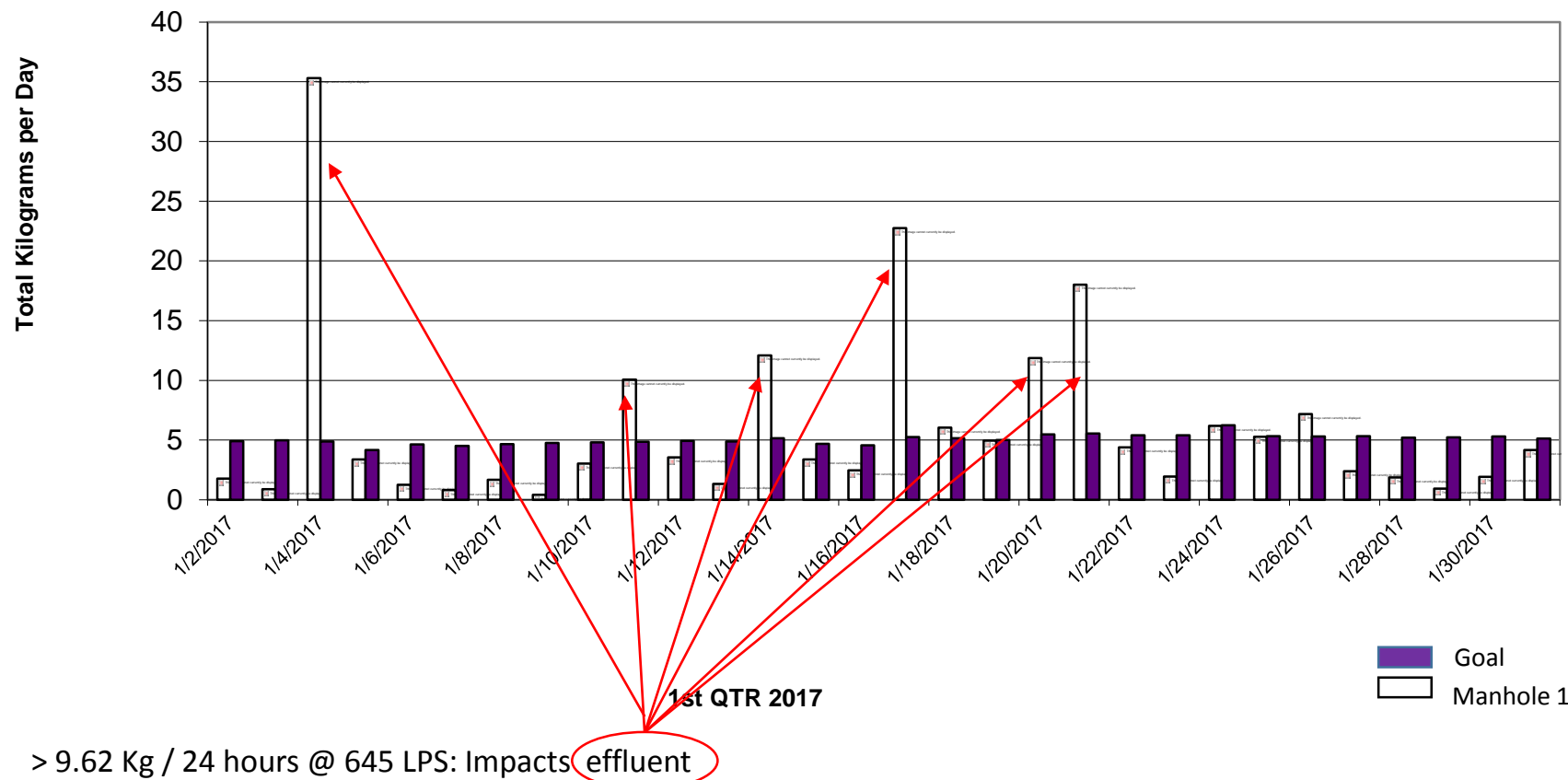
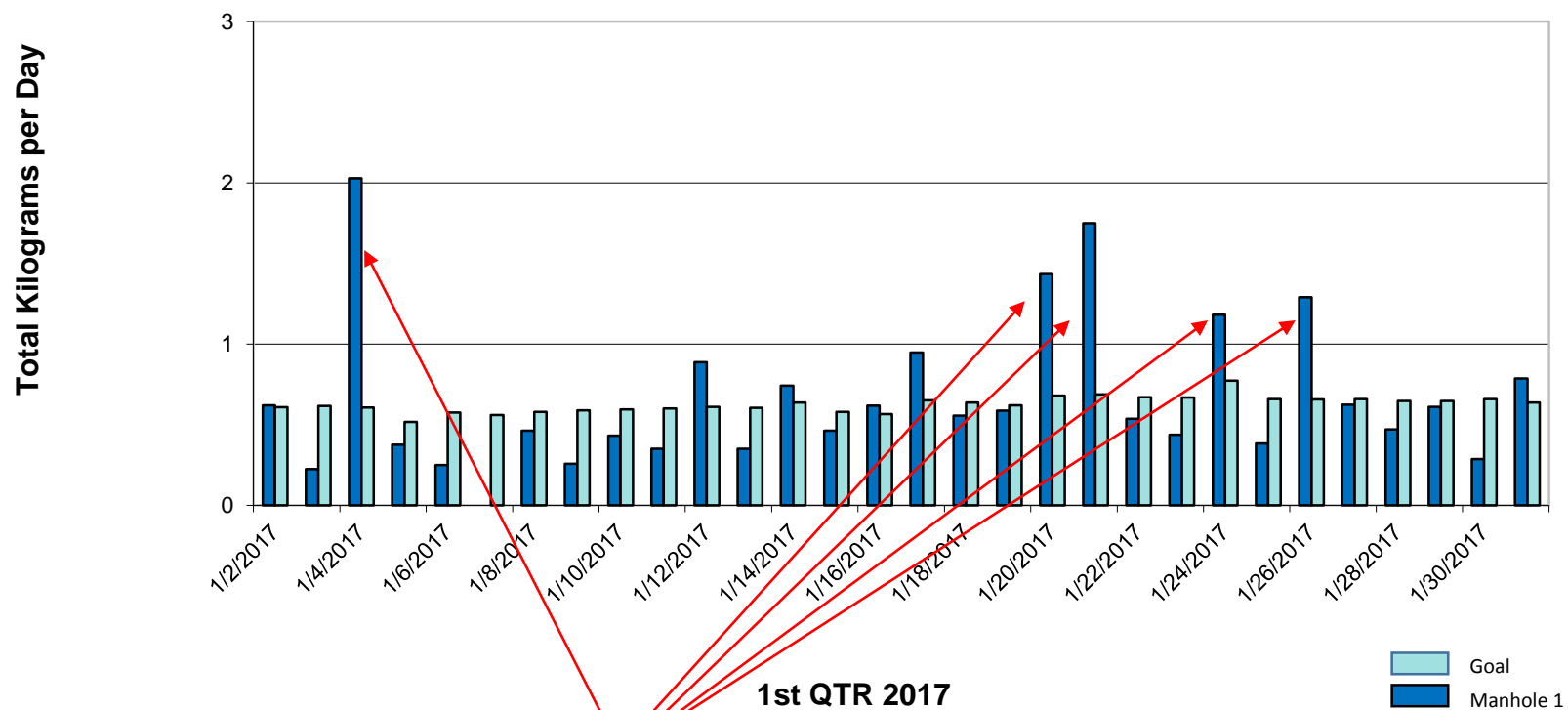




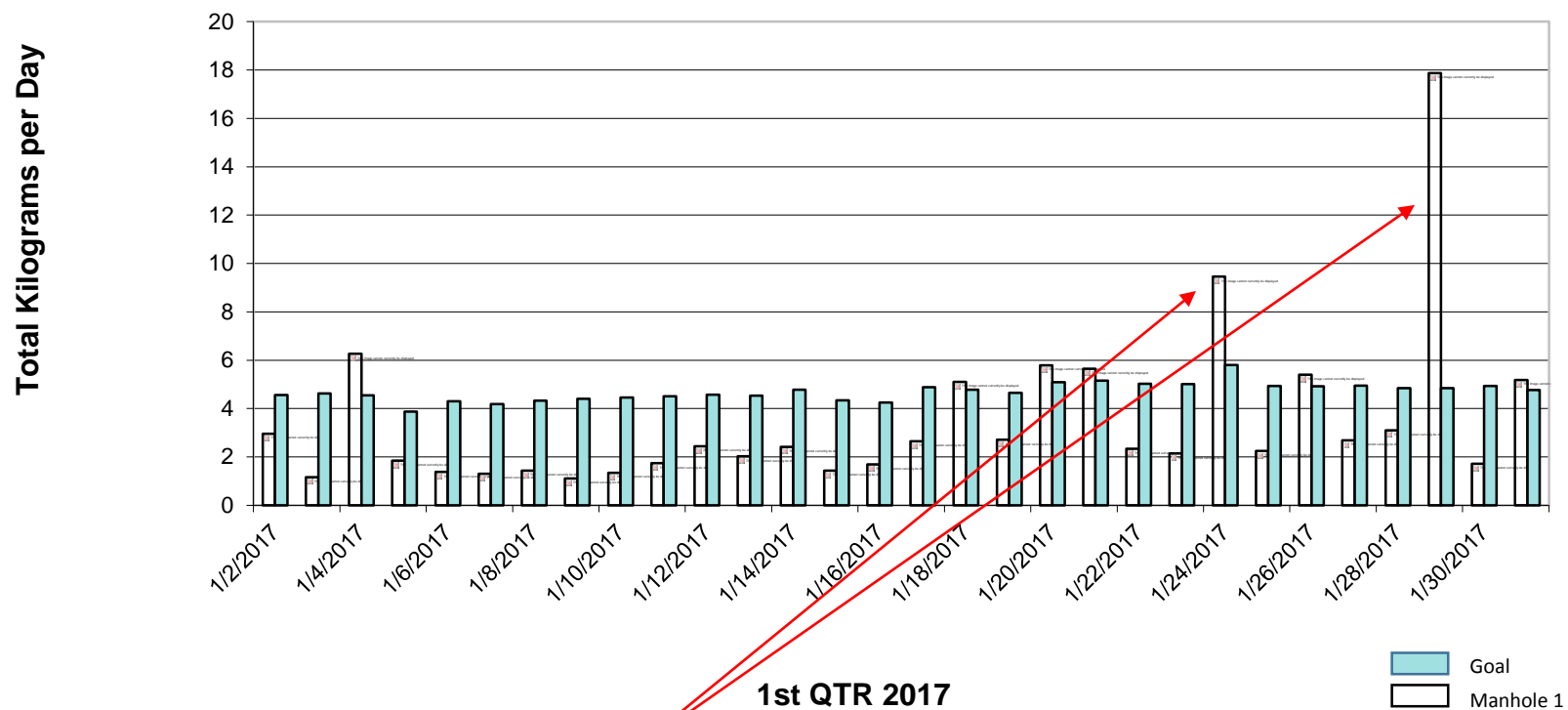
FIGURE 4: Chromium (Cr) Daily Loading NIWTP Border Station



> 1.02 Kg / 24 hours @ 645 LPS: Impacts biosolids



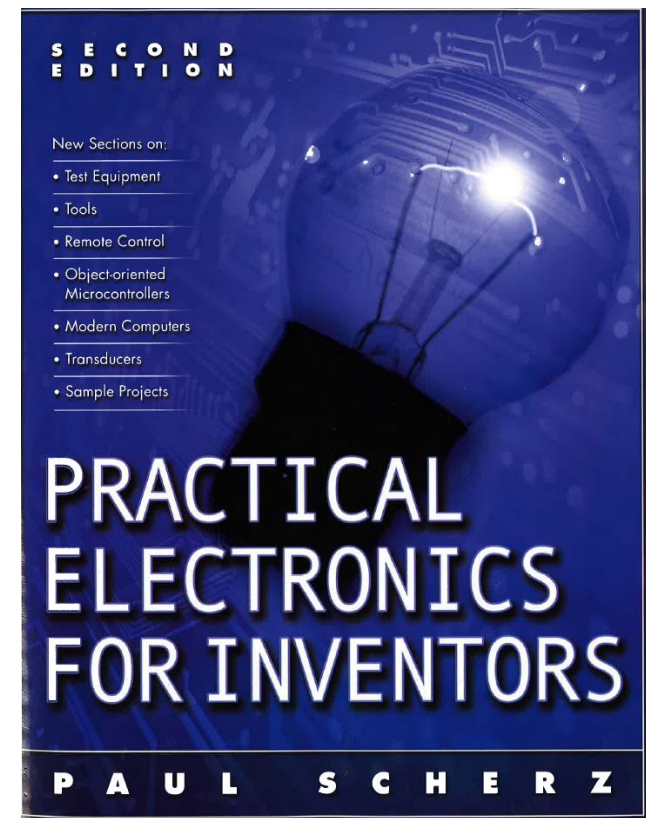
FIGURE 5: Copper (Cu) Daily Loading NIWTP Border Station



> 7.65 Kg / 24 hours @ 645 LPS: Impacts effluent

In order of Importance:

1. Nickel – effluent, biosolids
2. Chromium – biosolids, SSOs
3. Copper – effluent, microbiology



Thin- and Thick-Film Resistors

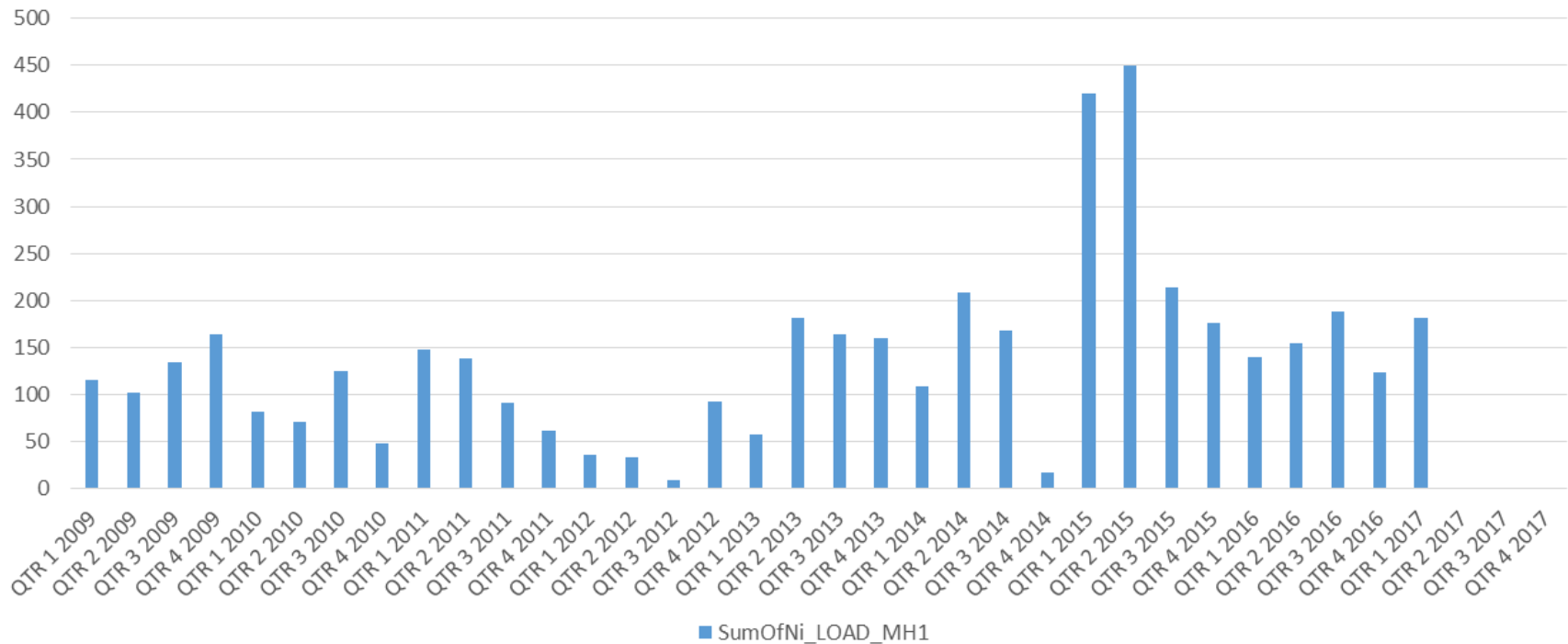
Thin-film resistors are made by depositing an extremely thin layer of **NiCr** resistive film (less than 1 μm) on an aluminum oxide substrate, while using **NiCu** materials as conducting electrodes. Thin-film technology offers extreme precision and stability

2009 – 2017

Quarterly Nickel Loadings (kg)



Quarterly Loadings for Nickel*
(30 days monitored per quarter)



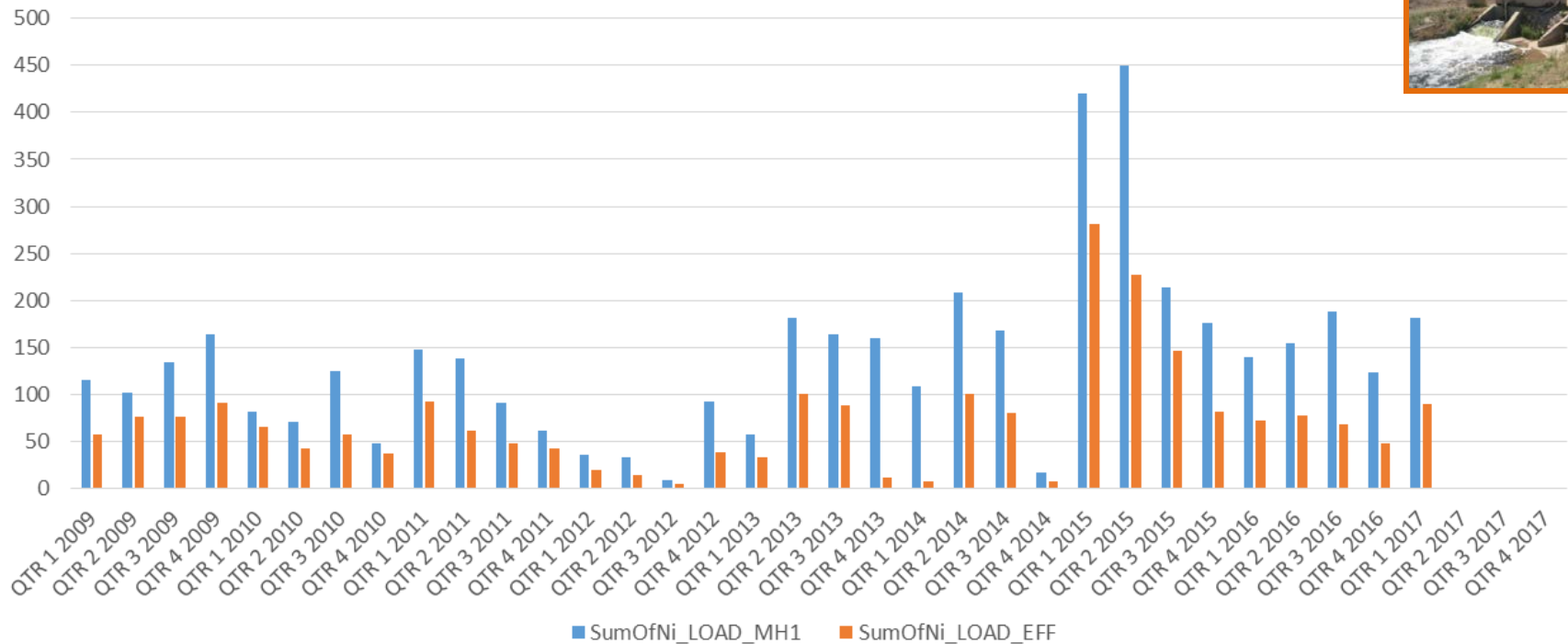
*Loadings not plotted where Ni not detected in effluent.

2009 – 2017

Quarterly Nickel Loadings (kg)



Quarterly Loadings for Nickel*
(30 days monitored per quarter)

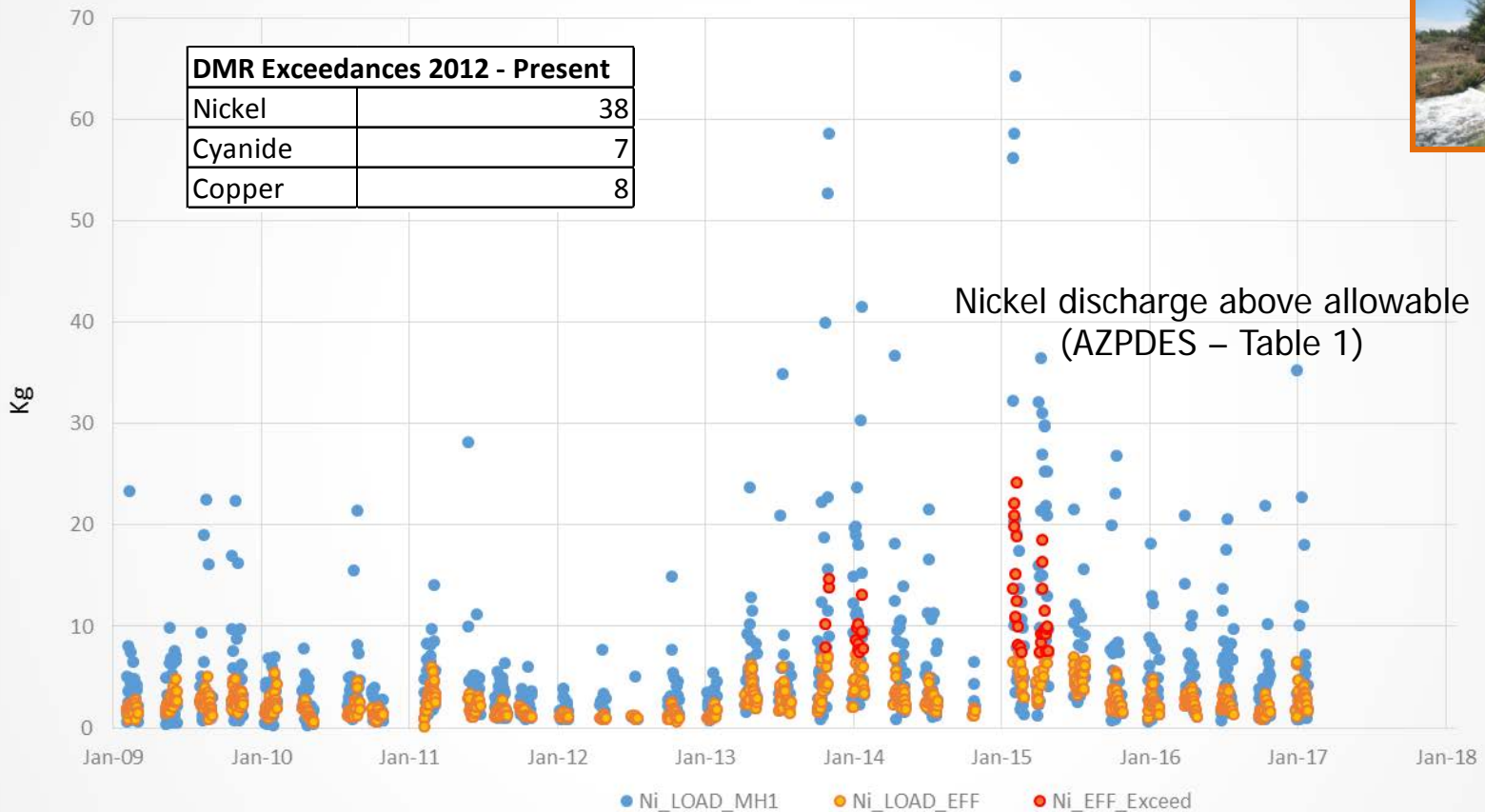


*Loadings not plotted where Ni not detected in effluent.

2009 - 2017 Daily Loadings (kg)



Nickel Loading Comparison - Manhole 1 (MH1) vs. Effluent (EFF)*



*Loadings not plotted where Ni not detected in effluent.

To protect freshwater plants and animals against nickel, a proposed range of less than 25 to 96 μg total recoverable Ni/L is recommended by various authorities (Table 10). This range will protect most species of freshwater biota; however, certain species have reduced survival within this range, including embryos of rainbow trout (*Oncorhynchus mykiss*) at 11 $\mu\text{g}/\text{L}$ (Birge and Black 1980), daphnids (*Ceriodaphnia dubia*) at 13 $\mu\text{g}/\text{L}$ (Schubauer-Berrigan et al. 1993), and embryos of the narrow-mouthed toad (*Gastrophryne carolinensis*) at 50 $\mu\text{g}/\text{L}$ (Birge and Black 1980; USEPA 1980). Mixtures of metals are additive or more-than-additive in toxicity and, in some cases, will exceed the recommended water quality criteria based on the individual metals. Such additive effects were demonstrated for daphnids and rainbow trout using water quality criteria developed in the

Table 7. Taxonomic group, organism, dose, and other variables

Effect

Reference^a

Daphnid, *Ceriodaphnia dubia*

13 $\mu\text{g}/\text{L}$

>200 $\mu\text{g}/\text{L}$

*

LC50 (48 h) at pH 8.0-8.5

LC50 (48 h) at pH 6.0-6.5

13**

13

* **LC50** is the lethal concentration required to kill 50% of the population.

** World Health Organization (WHO). 1991. Nickel. Environmental Health Criteria 108. 383 pp.

Biological Science Report USGS/BRD/BSR-1998-0001
April 1998

Contaminant Hazard Reviews
Report No. 34



**NICKEL HAZARDS TO FISH, WILDLIFE, AND INVERTEBRATES:
A SYNOPSIS REVIEW**

by
Ronald Eisler

Patuxent Wildlife Research Center
U.S. Geological Survey
Laurel, MD 20708

Whole Effluent Toxicity (WET) Testing





OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

INTERNATIONAL BOUNDARY AND WATER COMMISSION UNITED STATES AND MEXICO

August 11, 2016

Ms. Marcia Colquitt
Manager
Arizona Department of Environmental Quality
Water Quality Compliance Enforcement Unit
1110 West Washington Street
Phoenix, Arizona 85007

WET Failures

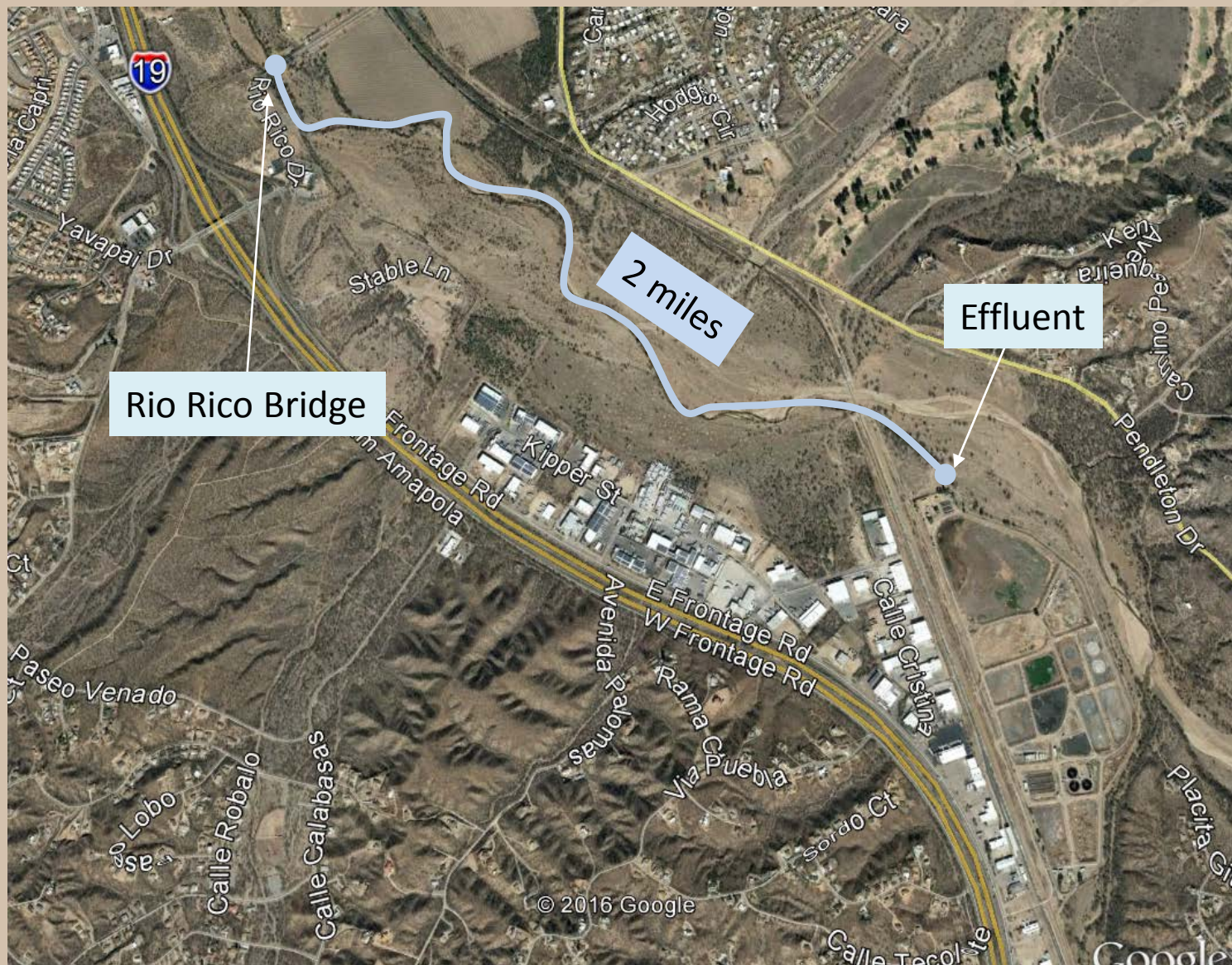
Re: Nogales International Wastewater Treatment Plant Toxicity Identification Evaluation.

Dear Ms. Colquitt:

The International Boundary and Water Commission, United States Section (USIBWC) under Arizona Pollutant Discharge Elimination System permit AZ0025607 is notifying the Arizona Department of Environmental Quality (ADEQ) that the USIBWC will be initiating a Toxicity Identification Evaluation (TIE), phase I pursuant to Part IV, Section D.3 and 4 of the permit.

The Nogales International Wastewater Treatment Plant (NIWTP) had a failure for reproduction for *Ceriodaphnia dubia* in May 2016. The USIBWC then began a series of Whole Effluent Toxicity testing every 2 weeks for 4 testing cycles. During the expanded series of testing, the NIWTP again experienced a failure for reproduction for *C. dubia*.

2015-16 Ambient Monitoring Data



IBWC Ambient Monitoring Data

2014 AZPDES Permit Requirement

PERMIT NO. AZ0025607

NOGALES INTERNATIONAL WASTEWATER TREATMENT PLANT
AMBIENT SURFACE WATER QUALITY MONITORING RESULTS 2015

PARAMETER	Santa Cruz River U.S. of NIWTP outfall				Rio Rico Highway Bridge				Santa Gertrudis			
	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4
Flow rate (CFS)	N.M.	NO FLOW	NO FLOW	NO FLOW	N.M.	9.0	30.0	9.5	N.M.	9.0	15.0	9.0
Dissolved Oxygen (mg/l)	N.M.				N.M.	6.9	6.1	7.07	N.M.	6.1	5.9	8.72
PH (S.U.)	N.M.				N.M.	7.9	7.3	8.33	N.M.	7.9	6.9	8.8
Temperature (Celsius)	N.M.				N.M.	26.0	23.3	14.2	N.M.	24.5	22.0	12.6
Electrical Conductivity	N.M.				N.M.	697.5	664.1	767.6	N.M.	785.6	673.9	757.6
Chlorine, Total Residual (µg/l)	N.M.				N.M.	N.M.	N.M.	0.02	N.M.	N.M.	N.M.	0.01
Ammonia as N (mg/l)	N.R.				N.R.	2.33	< 1	3.55	N.R.	< 1	< 1	< 1
Nitrate/Nitrite as N (mg/l)	N.R.				N.R.	5.14	8.81	4.22	N.R.	1.61	4.22	4.6
Nitrogen, Total Kjeldahl (mg/l)	N.R.				N.R.	3.13	1.34	4.6	N.R.	< 1	1.07	< 1
Carbonaceous Oxygen Demand (mg/l)	N.R.				N.R.	2	< 2	2	N.R.	< 2	4	2
Phosphorus (mg/l)	N.R.				N.R.	2.42	1.62	2.85	N.R.	0.57	1.06	1.57
Orthophosphorus (mg/l)	N.R.				N.R.	2.35	1.48	2.82	N.R.	0.52	0.66	1.54
Chlorophyll (µg/l)	N.R.				N.R.	1.59	1.36	0.75	N.R.	4.09	1.28	0.37
Cadmium, total (µg/l)	N.M.				N.M.	0.4	< 0.1	< 0.1	N.M.	0.6	0.2	0.1
Cadmium, dissolved (µg/l)	N.M.				N.M.	< 0.1	< 0.1	< 0.1	N.M.	0.4	< 0.1	0.6
Chromium, total (µg/l)	N.M.				N.M.	11	< 5	< 5	N.M.	< 5	< 5	< 5
Chromium, dissolved (µg/l)	N.M.				N.M.	< 5	< 5	< 5	N.M.	< 5	< 5	< 5
Copper, total (µg/l)	N.M.				N.M.	40	< 10	< 10	N.M.	< 10	< 10	< 10
Copper, dissolved (µg/l)	N.M.				N.M.	< 10	< 10	< 10	N.M.	< 10	< 10	< 10
Nickel, total (µg/l)	N.M.				N.M.	150	30	70	N.M.	< 20	< 20	20
Nickel, dissolved (µg/l)	N.M.				N.M.	100	30	70	N.M.	< 20	< 20	20
Zinc, total (µg/l)	N.M.				N.M.	170	20	40	N.M.	< 20	30	< 20
Zinc, dissolved (µg/l)	N.M.				N.M.	40	< 20	30	N.M.	< 20	< 20	20
Hardness (mg/l)	N.M.				N.M.	174	167	167	N.M.	264	207	207

IBWC Ambient Monitoring Data 2016 AZPDES Permit Requirement

PERMIT NO. AZ0025607

NOGALES INTERNATIONAL WASTEWATER TREATMENT PLANT
AMBIENT SURFACE WATER QUALITY MONITORING RESULTS 2016

PARAMETER	Santa Cruz River U.S. of NIWTP outfall				Rio Rico Highway Bridge				Santa Gertrudis			
	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4	QTR 1	QTR 2	QTR 3	QTR 4
Flow rate (CFS)	NO FLOW	NO FLOW	NO FLOW	NO FLOW	10	7.0	5.0	12.0	9	6.5	5.0	12.0
Dissolved Oxygen (mg/l)					7.69	7.78	6.83	8.32	8.24	8.41	6.41	8.9
PH (S.U.)					7.74	7.87	7.8	7.87	7.76	7.96	7.76	7.7
Temperature (Celsius)					13.1	20.2	27.3	12.4	12.9	17.9	24.3	11.4
Electrical Conductivity					739.4	752.8	786.4	732.3	750.4	777.4	816.4	751.3
Chlorine, Total Residual (µg/l)					60	30	0	N.M.	50	30	0	N.M.
Ammonia as N (mg/l)					< 1.0	N.R.	< 1.0	< 1.0	< 1.0	N.R.	< 1.0	< 1.0
Nitrate/Nitrite as N (mg/l)					5.67	N.R.	17.2	10.2	3.34	N.R.	6.67	6.12
Nitrogen, Total Kjeldahl (mg/l)					< 1.0	N.R.	1.14	< 1.0	< 1.0	N.R.	< 1.0	< 1.0
Carbonaceous Oxygen Demand (mg/l)					2	N.R.	2	2	2	N.R.	3	2
Phosphorus (mg/l)					1.82	N.R.	3.97	1.94	0.87	N.R.	1.3	1.36
Orthophosphorus (mg/l)					1.75	N.R.	3.81	2.15	0.88	N.R.	1.24	1.34
Chlorophyll (µg/l)					1.87	N.R.	2.43	0.85	1.28	N.R.	0.64	0.85
Cadmium, total (µg/l)					< 0.1	< 0.1	< 0.1	0.3	0.2	0.1	0.4	< 0.1
Cadmium, dissolved (µg/l)					< 0.1	< 0.1	0.1	0.1	0.2	0.1	0.2	< 0.1
Chromium, total (µg/l)					< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chromium, dissolved (µg/l)					< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Copper, total (µg/l)					< 10	< 10	10	< 10	< 10	< 10	< 10	< 10
Copper, dissolved (µg/l)					< 10	30	< 10	< 10	< 10	< 10	< 10	< 10
Nickel, total (µg/l)					30	40	30	40	< 20	< 20	< 20	< 20
Nickel, dissolved (µg/l)					30	40	30	40	< 20	< 20	< 20	< 20
Zinc, total (µg/l)					20	30	40	50	< 20	20	< 20	< 20
Zinc, dissolved (µg/l)					30	30	40	40	< 20	20	< 20	< 20
Hardness (mg/l)					154	159	162	163	202	256	244	213



Distribution and Extent of Heavy Metal Accumulation in Song Sparrows (*Melospiza melodia*), Upper Santa Cruz River Watershed, Southern Arizona, 2011–12

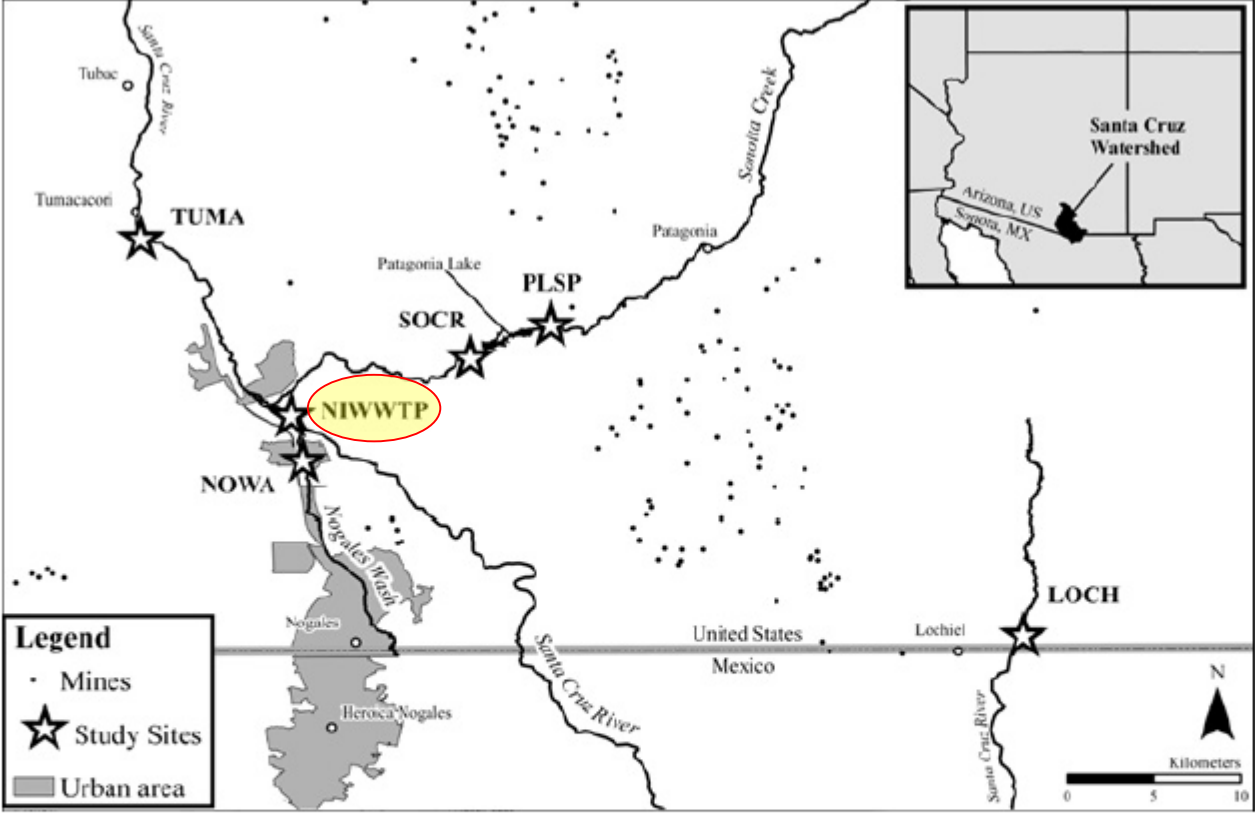
By Michael B. Lester and Charles van Riper III

Open-File Report 2014–1072

U.S. Department of the Interior
U.S. Geological Survey



“Song Sparrows (*Melospiza melodia*; fig. 1) provide an ideal subject for studying the extent of contaminant exposure because their non-migratory habits in the Southwest (Davis and Arcese, 1999) will mean that any contaminants they may have did not come from other locations, such as wintering grounds.”



“Mean concentrations were highest at the NIWWTP site, most notably for Cd and Ni. Mean concentrations of Mo also were one of the highest in 2011, and Cr both years, although they did not exceed background levels. However, Cd and Ni exceeded background concentrations in Song Sparrow feathers at the treatment plant. Cadmium is a non-essential mineral that can cause bone or kidney damage when exposure is high or long term. Both metals are also known carcinogens (Kakkar and Jaffery, 2005). The high Cd and Ni concentrations in feathers at the treatment plant were likely a result of industry in urban Nogales, as wastewater containing these metals was pumped from Nogales to the treatment plant.”

June 05, 2017

1. BEIF Grant Sub-agreements

Organismo Operador Municipal de Agua Potable,
Alcantarillado y Saneamiento de Nogales, Sonora
Periferico Luis Donald Colosio No. 2300,
C.P. 84005, Nogales, Sonora

RE: BEIF Construction Assistance and Debt Service Assistance Grant Agreement No. SN7950 "Expansion of the Water and Wastewater Systems to the Southwest Area of Nogales, Sonora"

Dear Ing. Corrales:

I am pleased to advise you that your application for construction assistance from the Border Environment Infrastructure Fund (BEIF) from the United States Environmental Protection Agency (EPA) in support of the "Expansion of the Water and Wastewater Systems to the Southwest Area of Nogales, Sonora" (the "Project") has been approved. The North American Development Bank (NADB) will administer this Construction Assistance (the "Agreement") pursuant to the terms and conditions of the Cooperative Agreement XP-99T511701 between NADB and the EPA dated September 28, 2016.

The total amount authorized is up to US\$5,259,444, which may be used for construction assistance (the "BEIF Grant"), subject to the terms and conditions of this Agreement and its Annexes 1-11.

ANNEX 8

INDUSTRIAL-COMMERCIAL PRE-TREATMENT PROGRAM

1. Pretreatment Program Schedule. Recipient, within its service boundary line and authorities granted by law, shall expand and enhance its industrial waste pretreatment program to reduce industrial and commercial waste discharges impacting the Ambos Nogales wastewater collection and treatment systems in accordance with the following schedule below. Where Recipient's authorities are not sufficient to implement pretreatment program requirements, Recipient will actively coordinate and initiate agreements with agencies that have these authorities so as to achieve pretreatment program goals. Pretreatment reports will be delivered to NADB and EPA in Spanish and, where possible, in English.

i. Within 30 days of the signing date of this Agreement, Recipient shall provide NADB and EPA the information outlined in paragraph 2.A. ii. below.

ii. Within 30 days of the signing date of this Agreement, Recipient shall provide to NADB/BECC and EPA the existing industrial and commercial pretreatment program plan including, but not limited to, schedule of inspections, reports, enforcement response program, budget, personnel and equipment. The plan shall be based on, but is not limited to, the elements and steps outlined in paragraph 2 below.

iii. Within 180 days of the signing date of this Agreement, Recipient shall provide a technical memorandum confirming that Los Alisos WWTP has enough treatment capacity to receive the new Wastewater (WW) flows, the manner in which those flows will be conveyed to Los Alisos WWTP, and present a contingency plan in the case there is any failure which would cause an untreated discharge to the U.S.

iv. Within one-year of the signing date of this Agreement, Recipient shall complete a study to determine the Maximum Allowed Headworks Loading (MAHL) for Los Alisos Wastewater Treatment Plant (WWTP). The Recipient shall provide, to

2. Regulated Community Engagement

Nogales, Sonora Chapter of Environmental Health Specialists

October 5, 2016

November 30, 2016

May 18, 2017

September 13, 2017

Nogales Port Authority

September 27, 2017

Association of Maquiladoras of Sonora – Board of Directors

October 18, 2017

3. Source Characterization



Convocatoria 2017 SOLTA-C-17-003

Programa Frontera 2020

27 de abril – 31 de mayo 2017

Favor de llenar y enviar esta portada electrónicamente junto con su propuesta	
Título del Proyecto: (MÁXIMO 10 PALABRAS)	Caracterización de Fuentes Contaminantes en Aguas Residuales de Nogales, Sonora
Nombre oficial de su organización o institución:	Organismo Operador Municipal de Agua Potable, Alcantarillado y Saneamiento de Nogales
Nombre del contacto principal:	Cesar Octavio Campa Delgado
Domicilio:	Bulevar Luis Donald Colosio No. 2300, Col. Unidad Deportiva, Nogales, Sonora, C.P. 84065
Correo electrónico:	cesar.campa@oomapasnogales.gob.mx , ingenierocampa@gmail.com
Número de teléfono:	6313151637
No. de Registro CLUNI	No Aplica
Cantidad solicitada del Programa Frontera 2020 (en dólares de EE.UU.):	\$ 12,544.80 <u>dlls</u>
Cantidad total de la propuesta (en dólares de EE.UU.):	\$ 20,803.80 <u>dlls</u>
Cartas de Manifestación de Apoyo de Recursos de Apalancamiento:	<p>Sí <input type="checkbox"/> No <input type="checkbox"/> ¿Cuántas? : <u>3</u></p> <p>(Se requieren Cartas de Manifestación de Apoyo de Recursos de Apalancamiento de cada entidad que contribuirá recursos al proyecto. Todas las cartas deben ser incluidas con la propuesta. Para más información, consulte la página 4 de la Convocatoria.)</p>

EPA Border 2020 Proposal for Source Characterization



Misael Cabrera
Director

ADEQ's participation would mostly consist of supporting the following activities:

- Providing technical assistance to OOMAPAS-NS for project execution
- Transporting split samples to U.S. laboratories for analyses and reporting



City of Phoenix
WATER SERVICES DEPARTMENT
ENVIRONMENTAL SERVICES DIVISION
Quality Reliability Value

On behalf of City of Phoenix, I am confirming our support for the EPA Border 2020 Proposal entitled "Wastewater Contamination Source Characterization Study for Nogales, Sonora" being submitted by the Nogales, Sonora Potable Water and Wastewater Utility (OOMAPAS-NS). We understand the challenges associated with high costs for water quality analyses, and we are willing to support project stakeholders with analyses of up to 40 samples for total chromium, copper, nickel, and zinc for samples expected to yield 0.50 mg/l or higher. Our Compliance laboratory is licensed by the Arizona Department of Health Services.

(OOMAPAS-NS). We understand the challenges associated with high costs for water quality analyses. We are pleased to provide support for project stakeholders with analyses of up to 40 samples for total chromium, copper, nickel, and zinc for samples expected to yield 0.50 mg/l or higher. Our laboratory is certified by the Arizona Department of Health Services for Inductively Coupled Plasma (ICP) analyses by EPA Method 200.7 for the intended metals.



PIMA COUNTY
WASTEWATER RECLAMATION
201 NORTH STONE AVENUE
TUCSON, ARIZONA 85701-1207



Arizona-Sonora Environmental Strategic Plan 2017-2021

PROJECTS FOR BUILDING THE ENVIRONMENT AND THE ECONOMY
IN THE ARIZONA-SONORA BORDER REGION

4. Prioritize the Nogales Watershed

Partners:

- *Arizona Department of Environmental Quality (ADEQ)*
- *Arizona Game and Fish Department (AZGFD)*
- *Arizona-Mexico Commission (AMC)*
- *Comisión de Ecología y Desarrollo Sustentable del Estado de Sonora (CEDES)*
- *Comisión Estatal del Agua del Estado de Sonora (CEA)*
- *Comisión Sonora-Arizona (CSA)*
- *Border Environment Cooperation Commission/ Comisión de Cooperación Ecológica Fronteriza (BECC/COCEF)*
- *North American Development Bank/ Banco de Desarrollo del América de Norte (NADB/BANDAN)*
- *North American Research Partnership (NARP)*

Water

- Stormwater Control in Nogales, Sonora for the Protection of Binational Infrastructure and Public Health
- Infrastructure for Metals and E. coli Attenuation in the San Pedro River
- Implementation of Green Infrastructure in Nogales, Sonora for the Protection of Binational Stormwater Quality
- Industrial Pretreatment Support in Nogales, Sonora for the Protection of Binational Water Quality

The agencies that will be implementing the plan signed a memorandum of understanding on December 2, 2016 during a Summit of the Arizona-Mexico Commission and the Comisión Sonora-Arizona. Arizona Governor Doug Ducey and Sonora Governor Claudia Pavlovich also signed as honorary witnesses.



5. Bring ELT to the Border

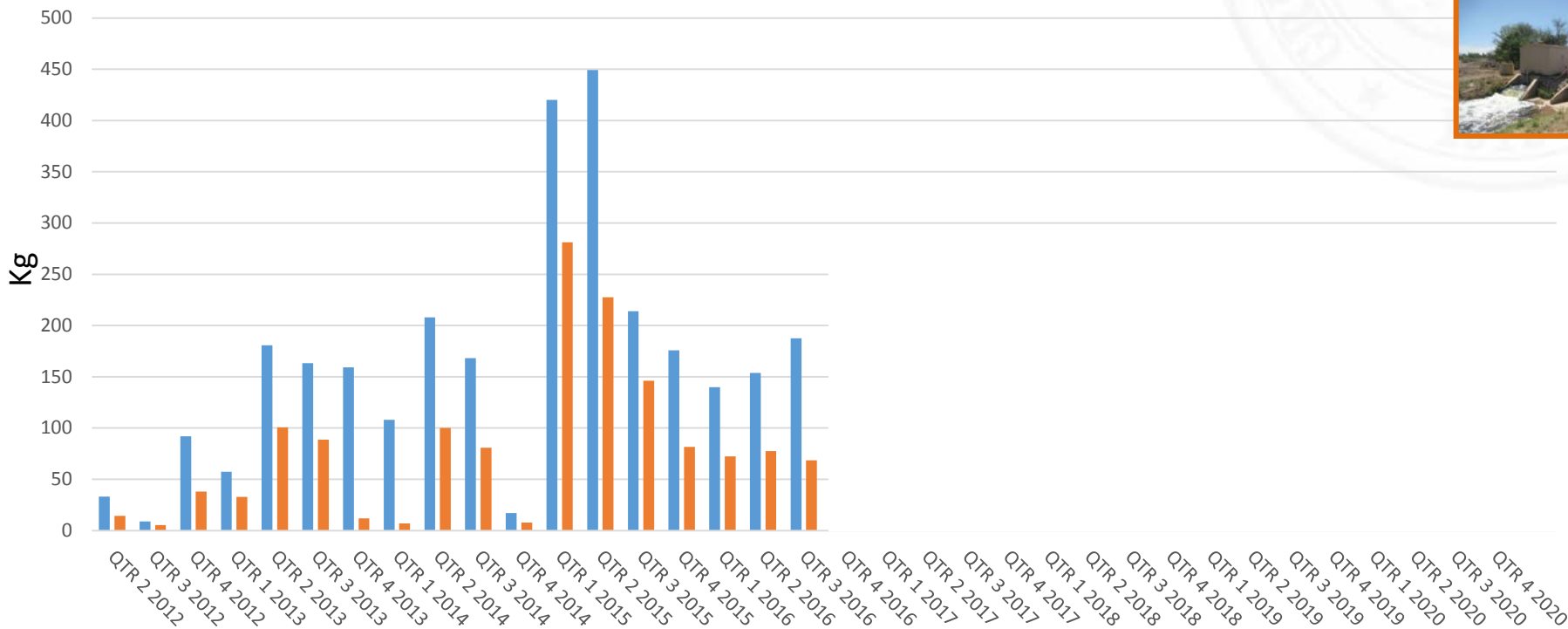


How are we doing?

Nickel

Quarterly Loading*

(30 days monitored per quarter)



Updated: 9/20/2017

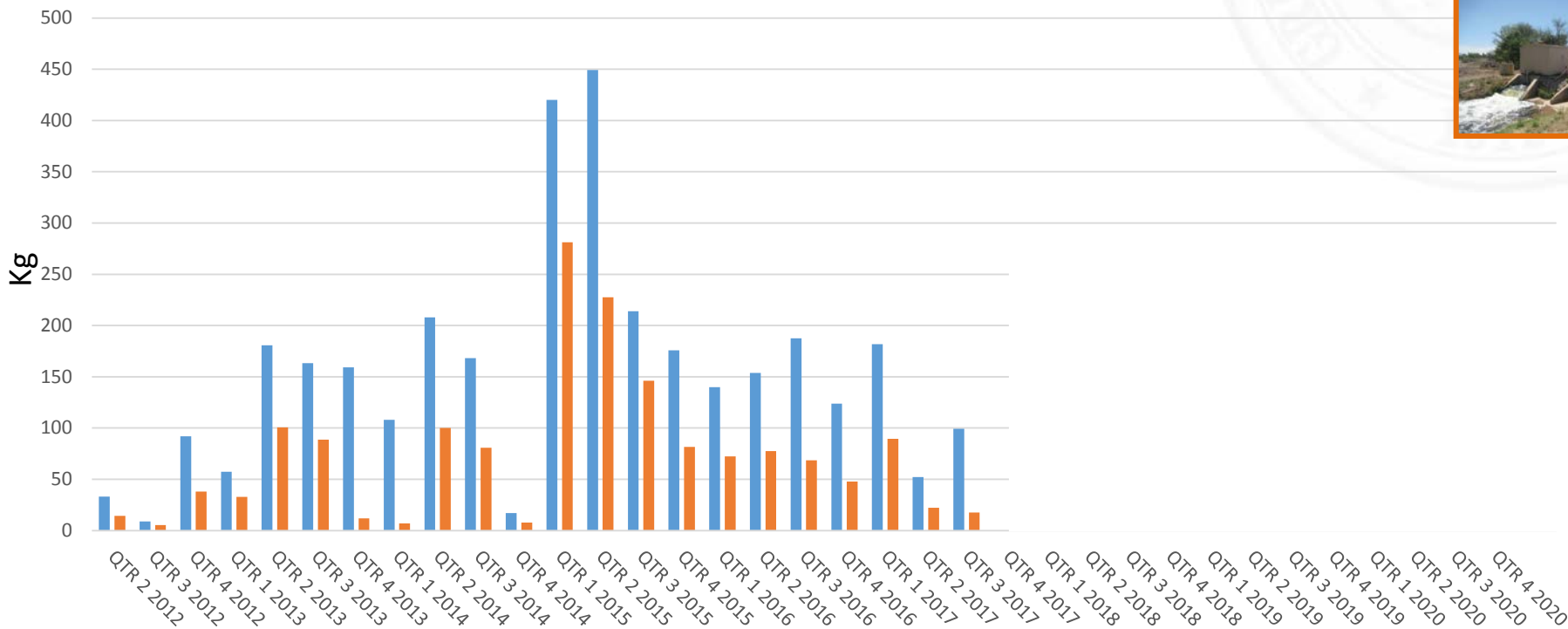
*Loadings not shown when not detected in effluent

How are we doing?

Nickel

Quarterly Loading*

(30 days monitored per quarter)



Updated: 9/20/2017

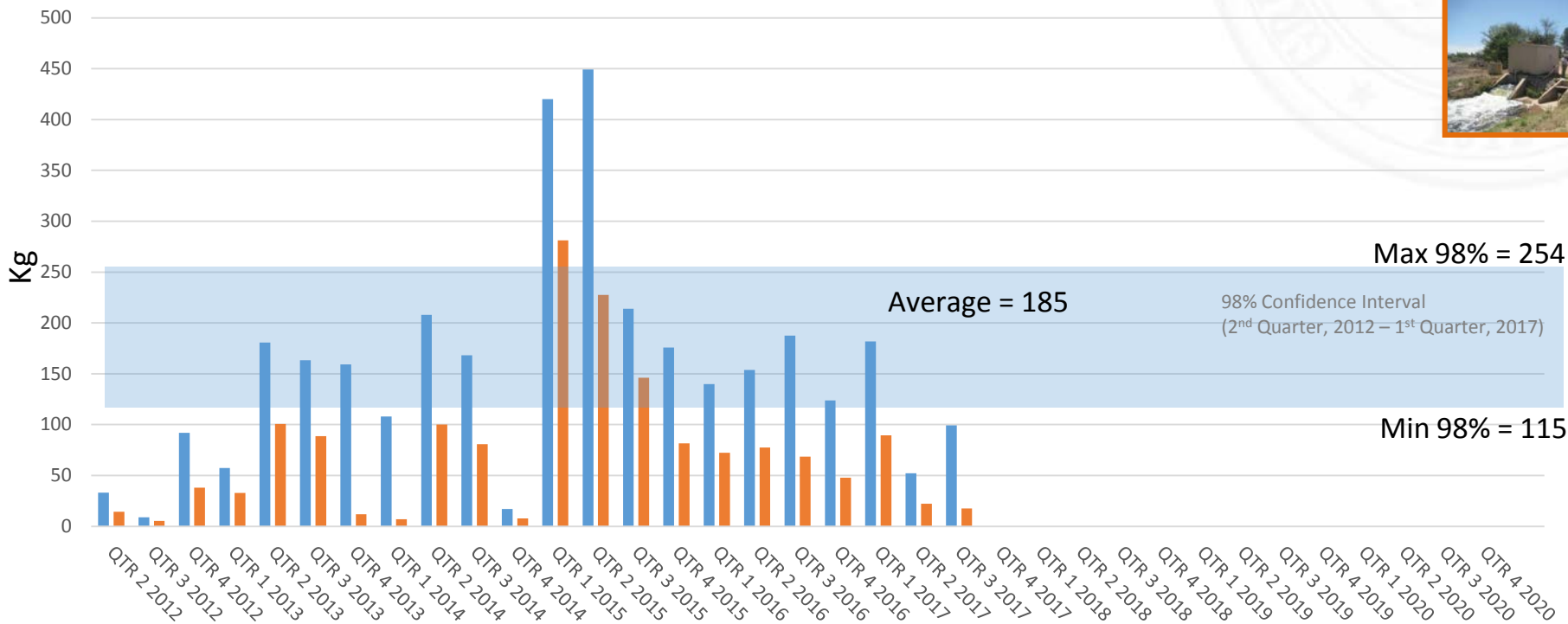
*Loadings not shown when not detected in effluent

How are we doing?

Nickel

Quarterly Loading*

(30 days monitored per quarter)



Updated: 9/20/2017

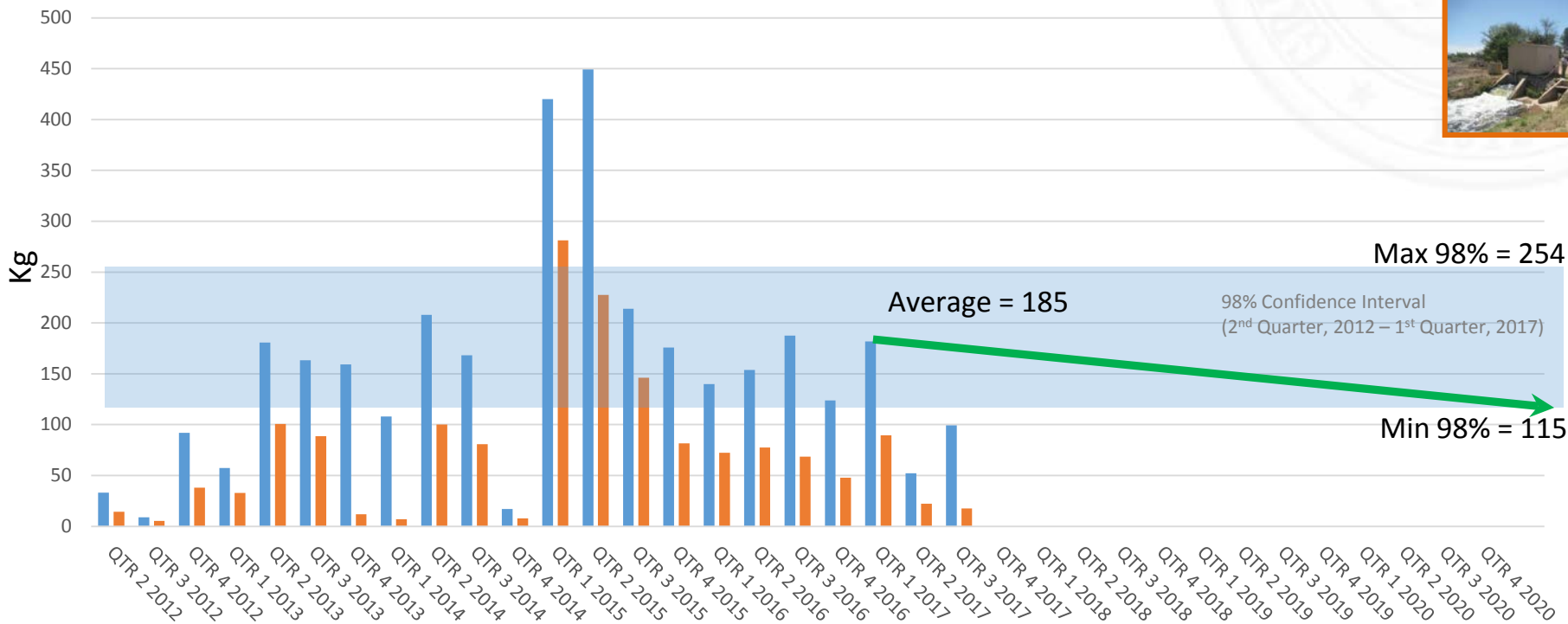
*Loadings not shown when not detected in effluent

How are we doing?

Nickel

Quarterly Loading*

(30 days monitored per quarter)



Max 98% = 254

Average = 185

98% Confidence Interval
(2nd Quarter, 2012 – 1st Quarter, 2017)

Min 98% = 115

Updated: 9/20/2017

*Loadings not shown when not detected in effluent

U.S.-Mexico Border 2020 Program | US EPA - ADEQ

https://www.epa.gov U.S.-Mexico Border 2020 Prog...

File Edit View Favorites Tools Help

EPA United States Environmental Protection Agency

Environmental Topics Laws & Regulations About EPA Search EPA.gov

U.S.-Mexico Border 2020 Program

CONTACT US SHARE

Environmental Improvement

[Read about environmental projects along the U.S.-Mexico Border](#)

1 2 3 4

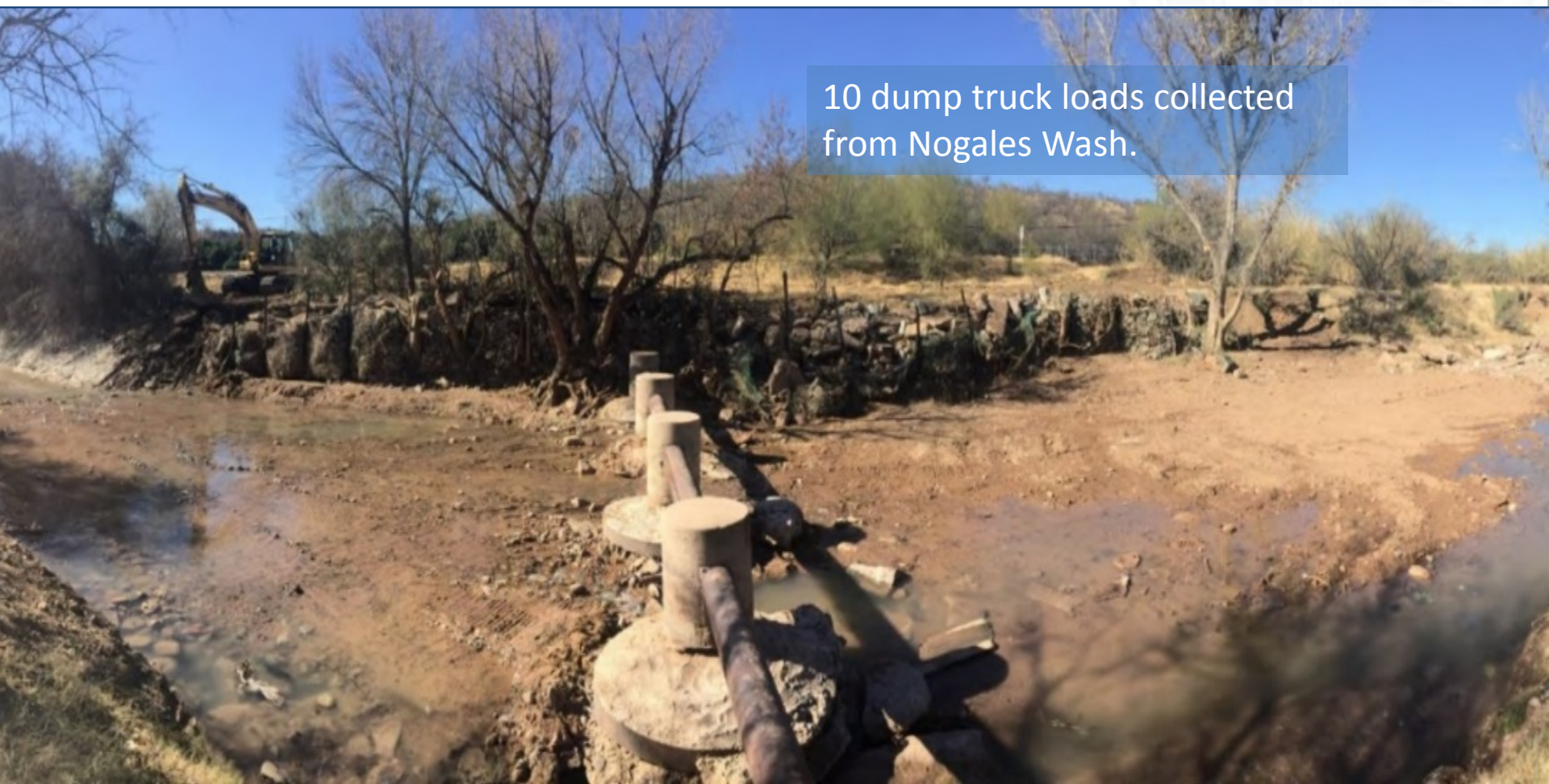
Border News

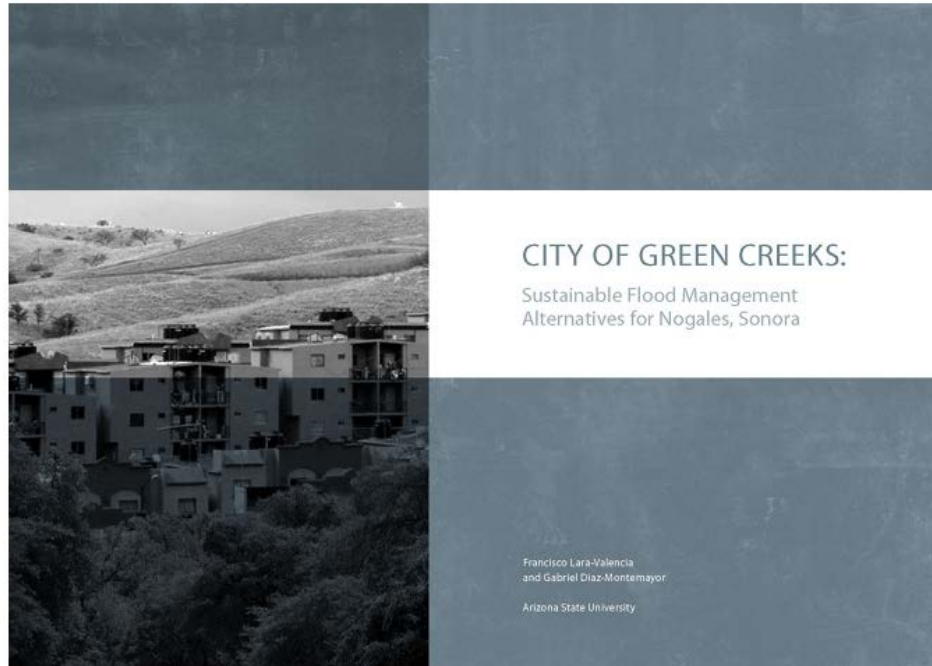
- [Funding: BEIF Region 6 Prioritization Process](#) EXIT
- [BEIF Region 6 Workshops](#)
- [Region 6 Border Program Newsletter \(Nov 2016 - March 2017\)](#)
- [U.S. EPA - BHC Accomplishments Report \(2015-2016\)](#)

100%



10 dump truck loads collected
from Nogales Wash.



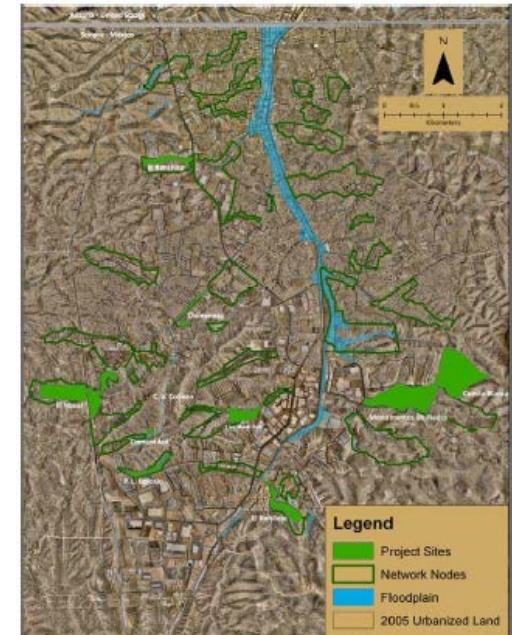


CITY OF GREEN CREEKS:

Sustainable Flood Management
Alternatives for Nogales, Sonora

Francisco Lara-Valencia
and Gabriel Diaz-Montemayor

Arizona State University



Problemática en Prepa Municipal



Trabajos en Prepa Municipal



Modificación de Reglamentos Municipales relacionados:

IMIP communicated that the State of Sonora now recognizes the concept of green infrastructure (GI) in state laws dealing with urban development and environmental protection. This change now provides a legal framework for municipalities in Sonora to *develop their own stormwater regulations*.

In response, Nogales has developed a draft ordinance that includes stormwater control from new developments, which City Council will be taking under consideration “shortly”. (March 22, 2017)



On the Horizon



Photo courtesy of
M.I. Claudia Gil Anaya
M.U. Edgar Castellanos



November 6, 2017
East of Carmen

Thank You!



M.S. Hans Huth
Arizona Department of Environmental Quality (ADEQ)

